
INSTALLATION AND SERVICE INSTRUCTIONS

DUAL-TEC™ WALL-MOUNT PACKAGE AIR CONDITIONER

Models:

D25A2PA	D35A2PA	D42A2PA	D25L2PA	D35L2PA	D42L2PA
	D35A2PB	D42A2PB	D25L2PB	D35L2PB	D42L2PB
D28A2PA	D36A2PA	D48A2PA	D28L2PA	D36L2PA	D48L2PA
D28A2PB	D36A2PB	D48A2PB	D28L2PB	D36L2PB	D48L2PB
		D60A2PA			D60L2PA
		D60A2PB			D60L2PB

Part of the Bard DC Free Cooling Unit System

***NOTE: LC Series Controllers must be used with
D-Series Wall-Mount Units***



Climate Control Solutions

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

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GENERAL INFORMATION

DC FREE COOLING UNIT SYSTEM

The Bard DC Free Cooling Unit system is composed of two (2) D-Series DUAL-TEC™ wall-mount air conditioners matched with one (1) LC Series lead/lag controller. The D-Series, specifically engineered for the telecom market, can provide outdoor air cooling during power loss situations through the use of onsite -48VDC positive ground battery banks.

NOTE: *The LC Series lead/lag controller and the D-Series wall-mount units are designed specifically to work together. The controller cannot run other Bard models or other brands of systems, nor can other controllers or thermostats run the D-Series wall-mount units. They are a complete system, and must be used together.*

WALL-MOUNT AIR CONDITIONER UNITS

The D-Series units operate on both VAC and VDC power under normal power supply conditions. If there is loss of VAC power supply (shore and/or back-up generator) the unit will continue to operate as free cooling or ventilation system using the shelter's VDC power. The indoor blower and free cooling unit operate from -48VDC and no inverter is required.

The units will supply 100% of rated cooling airflow in free cooling mode with ability to exhaust the same amount through the unit itself without any additional relief openings in the shelter.

Each of these units are fully charged with refrigerant and have auxiliary heat installed.

GENERAL

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

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

The unit is designed for use with or without duct work. Flanges are provided for attaching the supply and return ducts.

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

These instructions and any instructions packaged with any separate equipment required to make up the entire air conditioning system should be carefully read before beginning the installation. Note particularly 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 **ADDITIONAL PUBLICATIONS** for information on codes and standards.

Sizing of systems for proposed installation should be based on heat loss calculation made according to methods of Air Conditioning Contractors of America (ACCA). The air duct should be installed in accordance with the *Standards of the National Fire Protection Association for the Installation of Air Conditioning and Ventilating Systems of Other Than Residence Type, NFPA No. 90A, and Residence Type Warm Air Heating and Air Conditioning Systems, NFPA No. 90B*. Where local regulations are at a variance with instructions, installer should adhere to local codes.

SHIPPING DAMAGE

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

These units must remain in upright position at all times.

ADDITIONAL PUBLICATIONS

These publications can help when installing the air conditioning system. They can usually be found at the local library or purchased directly from the publisher. Be sure to consult the current edition of each standard.

National Electrical CodeANSI/NFPA 70
Standard for the Installation of Air Conditioning and Ventilating SystemsANSI/NFPA 90A
Standard for Warm Air Heating and Air Conditioning SystemsANSI/NFPA 90B
Load Calculation for Residential Winter and Summer Air Conditioning ACCA Manual J
Duct Design for Residential Winter and Summer Air Conditioning and Equipment Selection ACCA Manual D

For more information, contact these publishers:

Air Conditioning Contractors of America (ACCA)

1712 New Hampshire Ave. N.W.
Washington, DC 20009
Telephone: (202) 483-9370 Fax: (202) 234-4721

American National Standards Institute (ANSI)

11 West Street, 13th Floor
New York, NY 10036
Telephone: (212) 642-4900 Fax: (212) 302-1286

American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE)

1791 Tullie Circle, N.E.
Atlanta, GA 30329-2305
Telephone: (404) 636-8400 Fax: (404) 321-5478

National Fire Protection Association (NFPA)

Batterymarch Park
P. O. Box 9101
Quincy, MA 02269-9901
Telephone: (800) 344-3555 Fax: (617) 984-7057

ANSI Z535.5 Definitions:

Danger: Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury. The signal word “DANGER” is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.

Warning: Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.

Caution: Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.

Notice: [this header is] preferred to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to “NOTICE” the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.



WARNING

Electrical shock hazard.

Have a properly trained individual perform these tasks.

Failure to do so could result in electric shock or death.

WARNING

Fire hazard.

Maintain minimum 1/4” clearance between the supply air duct and combustible materials in the first 3’ feet of ducting.

Failure to do so could result in fire causing damage, injury or death.

WARNING

Heavy item hazard.

Use more than one person to handle unit.

Failure to do so could result in unit damage or serious injury.

CAUTION

Cut hazard.

Wear gloves to avoid contact with sharp edges.

Failure to do so could result in personal injury.

SECTION 1:

INSTALLATION

INSTRUCTIONS

LIST OF NECESSARY MATERIALS/TOOLS

Additional hardware and miscellaneous supplies are needed for installation. These items are field supplied and must be sourced before installation. This list also includes tools needed for installation.

LIST OF MATERIALS/TOOLS

- Personal protective equipment/safety devices
- Supply/return grilles
- Field-fabricated sleeves (if necessary)
- Fasteners sufficient for mounting the units such as 5/16" diameter anchor/carriage/lag bolts
- 7/8" diameter washers
- Caulking materials
- Miscellaneous hand and power tools and jobsite or shop materials
- Lifting equipment with the necessary capacity and rigging to safely move/install the systems
- Electrical supplies:
 - Two (2) 20A circuit breakers for the shelter DC power plant (one per wall-mount unit)
 - Two (2) various size circuit breakers for the shelter AC breaker box (see Table 1.1: Electrical Specifications on page 16)
 - High-voltage wire of various gauges (see Table 1.1)
 - Communication wire: 2-wire, 18 gauge, shielded with drain
 - Miscellaneous electrical supplies including rigid/flexible conduit and fittings, junction boxes, wire connectors and supports

NOTICE

The following are required and must be sourced prior to installation of these units.

- Two (2) 20A circuit breakers for the shelter DC power plant (one per wall-mount unit)

Circuit breakers for Emerson Network Power (ENP) power plants (used in most telecomm shelters built today) are available directly through the following distributors:

- Emerson Network Power: 440.288.1122
- Master Electronics: 888.473.5297 or www.onlinecomponents.com

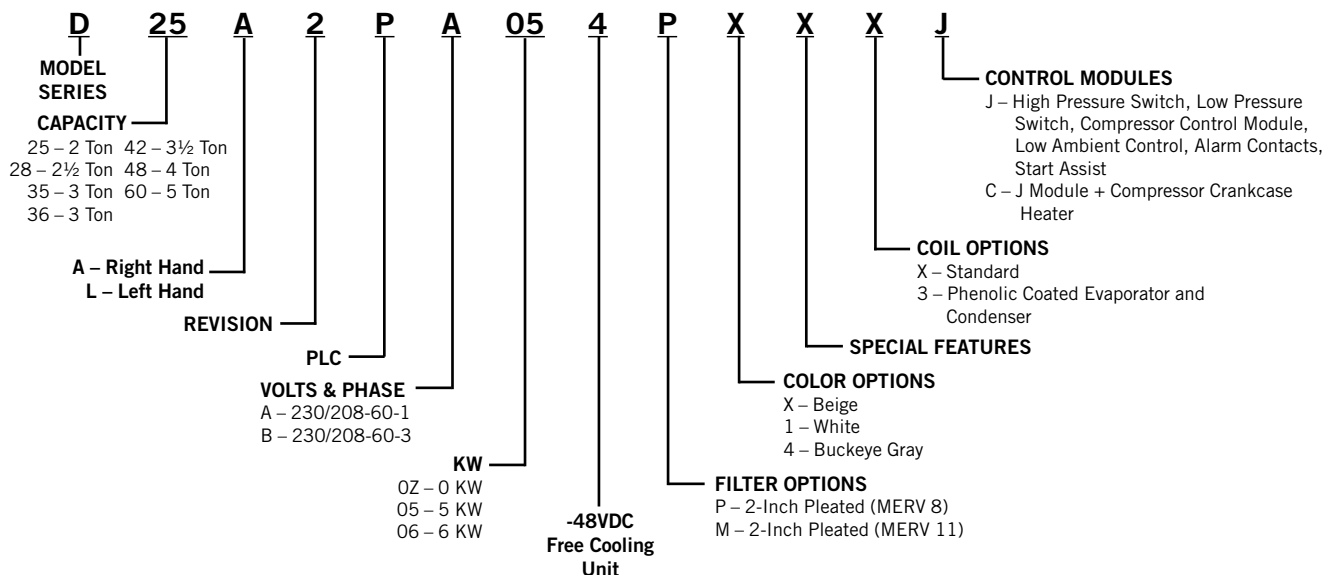
Emerson Network Power (ENP) Part Number

- 20A circuit breaker: P/N 101601

Always confirm the application before ordering.

FIGURE 1.1

D-Series DUAL-TEC™ Wall-Mount Unit Model Nomenclature



NEW SHELTER INSTALLATION VS. RETROFIT INSTALLATION

These installation instructions cover both new shelter installations and retrofit installations. Each installation is unique and may require special accommodations and modifications. Although Bard Manufacturing follows a long-established tradition of manufacturing equipment using industry standard dimensions for building penetration, it is occasionally necessary to move or enlarge supply and return openings when replacing non-standardized equipment in a retrofit application.

MINIMUM CLEARANCE

D-Series wall-mount air conditioners are available in both right-hand access models and left-hand access models. Right-hand access models have the heat strip access panel, external circuit breakers access panel and internal controls access panel on the right side of the unit. Left-hand access models are a mirror image of the right-hand access models, and allow two wall-mount units to be placed in relatively close proximity and yet still allow complete access for maintenance and repair.

On side-by-side installations, maintain a minimum of 26" clearance on control side to allow access to control panel and heat strips, and to allow proper airflow to the outdoor coil. For installations where units are installed with both control panels facing each other (inward), maintain a minimum of 36" clearance to allow access. Additional clearance may be required to meet local or national codes.

Care should be taken to ensure that the recirculation and obstruction of condenser discharge air does not occur. Recirculation of condenser discharge air can be from either a single unit or multiple units. Any object such as shrubbery, a building or a large object can cause obstructions to the condenser discharge air. Recirculation or reduced airflow caused by obstructions will result in reduced capacity, possible unit pressure safety lockouts and reduced unit service life.

For units with blow through condensers, such as the D-Series units, it is recommended there be a minimum distance of 10' between the front of the unit and any barrier or 20' between the fronts of two opposing (facing) units.

Clearances Required for Service Access and Adequate Condenser Airflow

MODELS	LEFT SIDE	RIGHT SIDE
All covered by this manual	26"	26"
Units with control panels facing each other (inward)	36" between units	

CLEARANCE TO COMBUSTIBLES

WARNING

Fire hazard.

Maintain minimum 1/4" clearance between the supply air duct and combustible materials in the first 3' of ducting.

Failure to do so could result in fire causing damage, injury or death.

The unit itself is suitable for 0" clearance, but the supply air duct flange and the first 3' of supply air duct require a minimum of 1/4" clearance to combustible material. However, it is generally recommended that a 1" clearance is used for ease of installation and maintaining the required clearance to combustible material. See Figures 1.3A-C on pages 10-12 for details on opening sizes.

Minimum Clearances Required to Combustible Materials

MODELS	SUPPLY AIR DUCT FIRST 3'	CABINET
All covered by this manual	1/4"	0"

MODEL IDENTIFICATION

Identify the specific model using the model nomenclature information found in Figure 1.1 and/or model/serial tag found on the unit on the opposite side of the control and access panels. See Figure 1.2 on page 8 for dimensions and critical installation requirements.

WALL-MOUNT UNIT INSTALLATION

MOUNTING THE UNITS

WARNING

Heavy item hazard.

Use more than one person to handle unit.

Failure to do so could result in unit damage or serious injury.

NOTE: It may be best to spot some electrical knockouts (such as those located on the back of the wall-mount unit) before units are mounted and access is unavailable or limited (see Figure 1.2 to locate pre-punched knockouts).

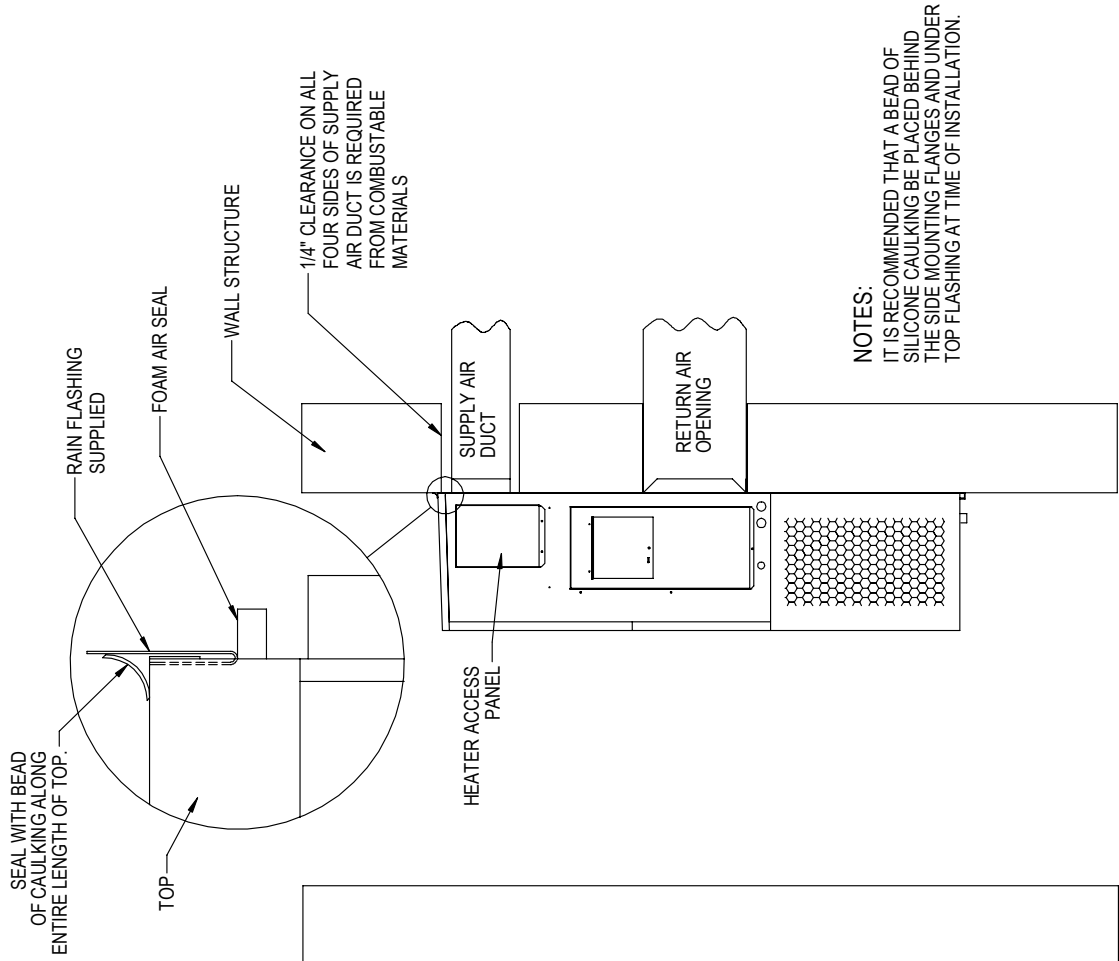
Two holes for the supply and return air openings must be cut through the wall as shown in Figures 1.3A-C on pages 10-12. On wood frame walls, the wall construction must be strong and rigid enough to carry the weight of the unit without transmitting any unit vibration. Concrete block walls must be thoroughly inspected to insure that they are capable of carrying the weight of the installed unit.

In retrofit (unit replacement) installations, the openings cut for the original equipment may not line up exactly with needs of this installation. Modifications may need to be made, such as increasing or decreasing the size of the wall cutouts. The existing bolt placement may not line up in which case the original bolts would need to be removed or cut away.

1. These units are secured by wall mounting flanges which secure the unit to the outside wall surface at both sides. A bottom mounting bracket, attached to skid for shipping, is provided for ease of installation, but is not required.
2. The unit itself is suitable for 0" clearance, but the supply air duct flange and the first 3' of supply air duct require a minimum of 1/4" clearance to combustible material. However, it is generally recommended that a 1" clearance is used for ease of installation and maintaining the required clearance to combustible material. See Figures 1.3A-C for details on opening sizes.
3. Locate and mark lag bolt locations and location for optional bottom mounting bracket, if desired (see Figures 1.3A-C).
4. Mount bottom mounting bracket (if used).
5. If desired, hook top rain flashing (attached to front-right of supply flange for shipping) under back bend of top.
6. Position unit in opening and secure with fasteners sufficient for the application such as 5/16" lag/anchor/carriage bolts; use 7/8" diameter flat washers on the bolts. It is recommended that a bead of silicone caulking be placed behind the side mounting flanges.
7. Secure optional rain flashing to wall and caulk across entire length of top (see Figures 1.3A-C).
8. For additional mounting rigidity, the return air and supply air frames or collars can be drilled and screwed or welded to the structural wall itself (depending upon wall construction). Be sure to observe required clearance if combustible wall.
9. A plastic drain hose extends from the drain pan at the top of the unit down to the unit base. There are openings in the unit base for the drain hose to pass through. In the event the drain hose is connected to a drain system of some type, it must be an open or vented type system to assure proper drainage.

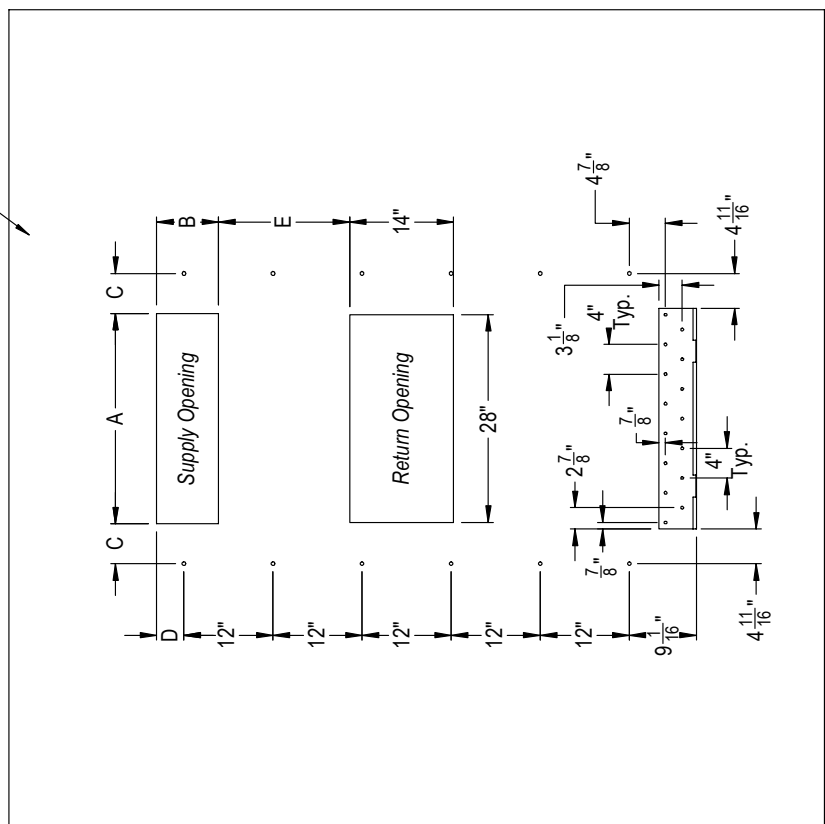
FIGURE 1.3A
D25A, D25L, D35A, D35L
Mounting Instructions

	A	B	C	D	E
REQUIRED DIMENSIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	28 3/8	8 3/8	5 3/8	3 11/16	17 5/8
REQUIRED DIMENSIONS TO MAINTAIN RECOMMENDED 1" CLEARANCE FROM COMBUSTIBLE MATERIALS	29 7/8	9 7/8	4 5/8	4 7/16	16 7/8



NOTES:
 IT IS RECOMMENDED THAT A BEAD OF SILICONE CAULKING BE PLACED BEHIND THE SIDE MOUNTING FLANGES AND UNDER TOP FLASHING AT TIME OF INSTALLATION.

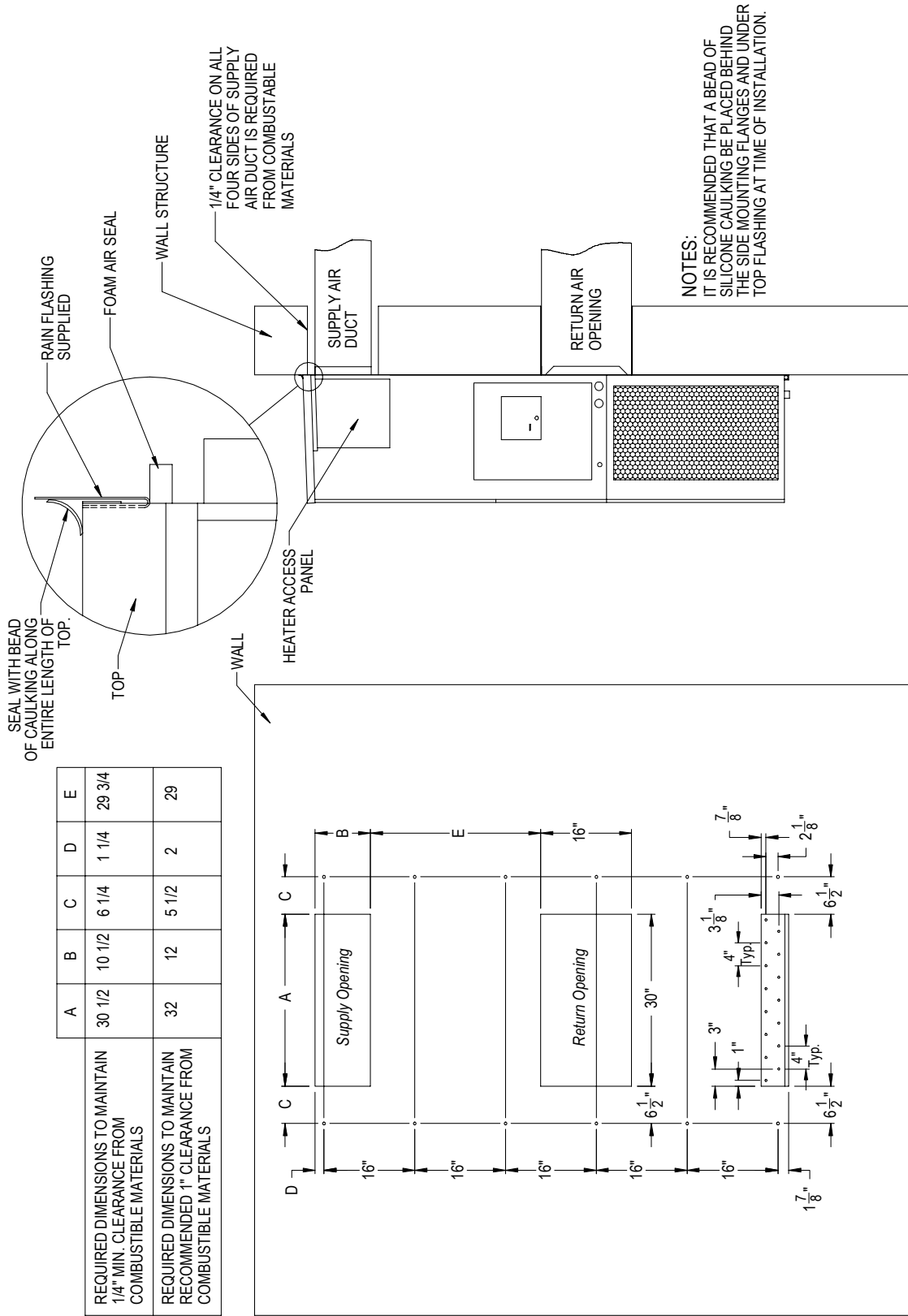
Right Side View



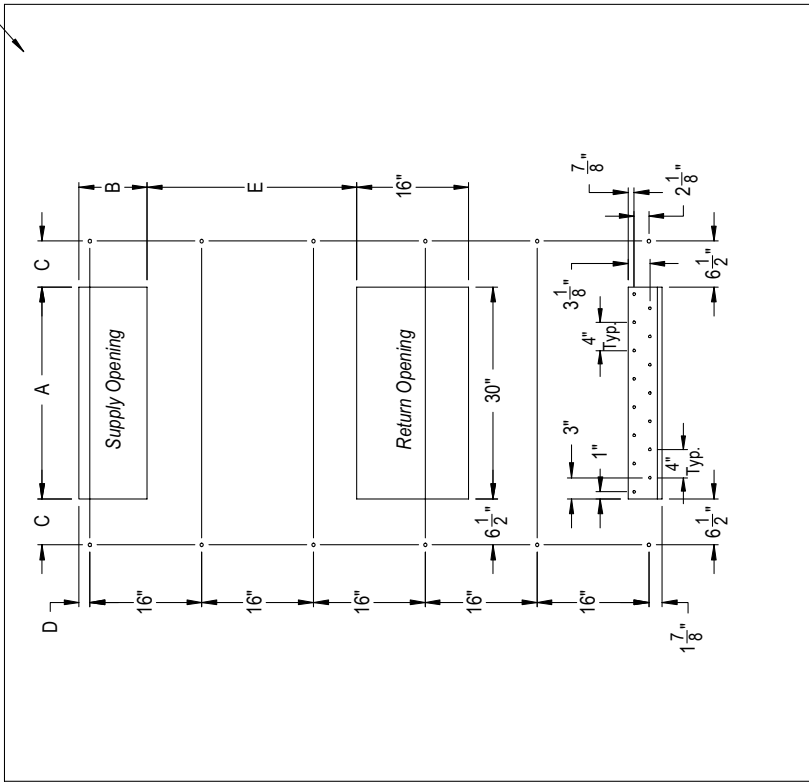
Wall Opening and Hole Location View

MIS-3944

FIGURE 1.3B
D28A, D28L, D36A, D36L, D42A, D42L
Mounting Instructions



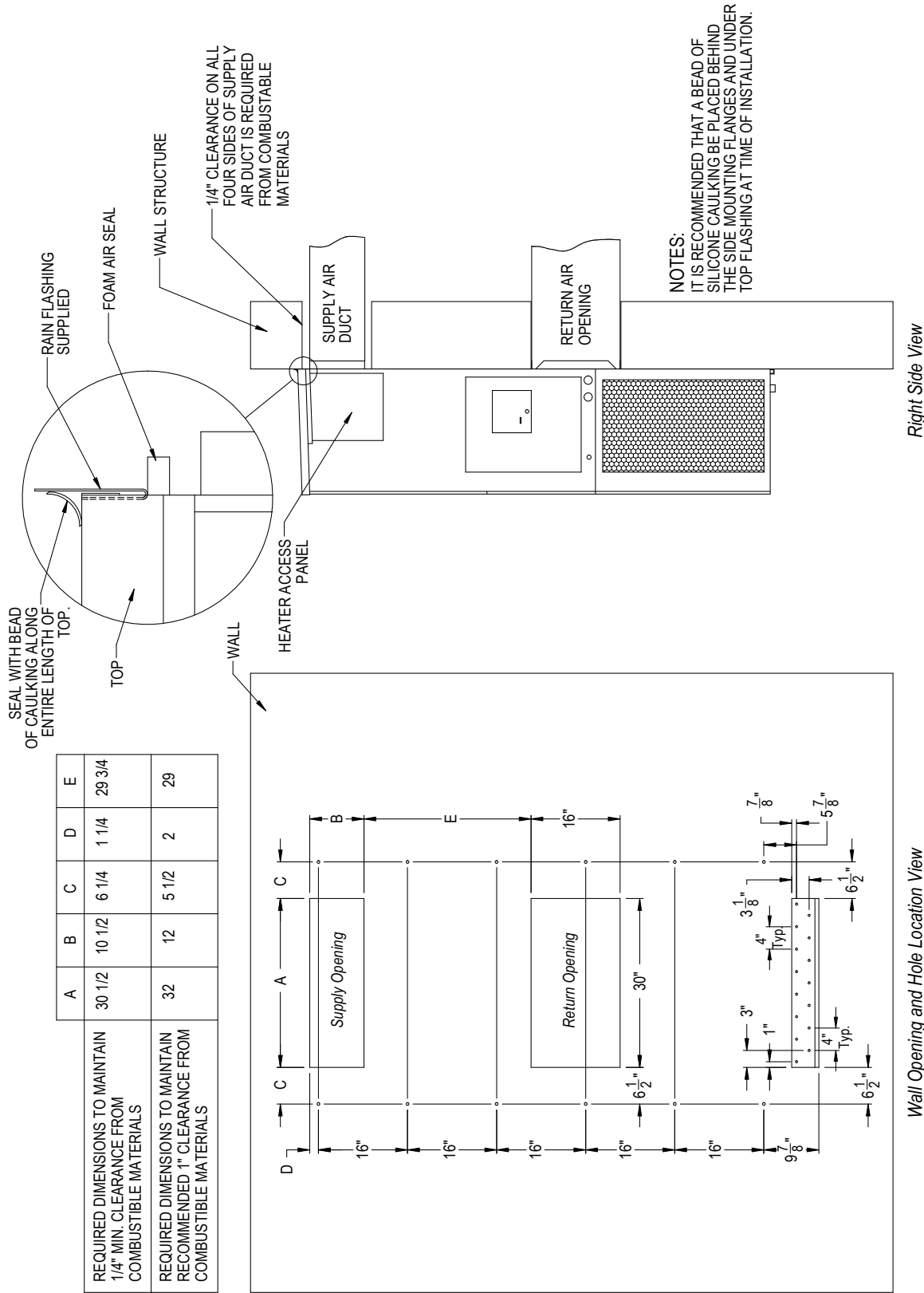
	A	B	C	D	E
REQUIRED DIMENSIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	30 1/2	10 1/2	6 1/4	1 1/4	29 3/4
REQUIRED DIMENSIONS TO MAINTAIN RECOMMENDED 1" CLEARANCE FROM COMBUSTIBLE MATERIALS	32	12	5 1/2	2	29



Right Side View

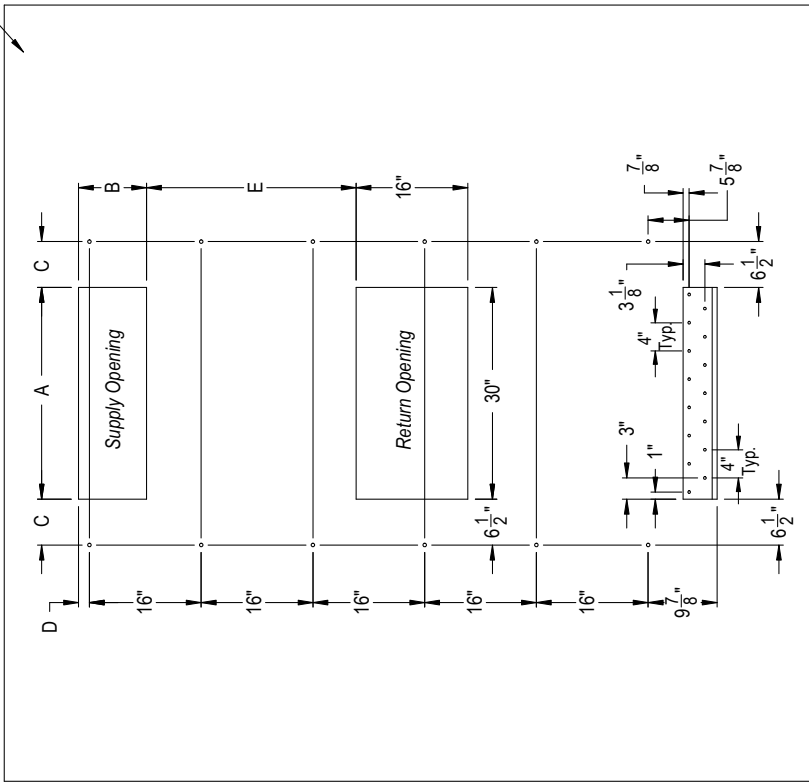
Wall Opening and Hole Location View

FIGURE 1.3C
D48A, D48L, D60A, D60L
Mounting Instructions



SEAL WITH BEAD OF CAULKING ALONG ENTIRE LENGTH OF TOP.

	A	B	C	D	E
REQUIRED DIMENSIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS	30 1/2	10 1/2	6 1/4	1 1/4	29 3/4
REQUIRED DIMENSIONS TO MAINTAIN RECOMMENDED 1" CLEARANCE FROM COMBUSTIBLE MATERIALS	32	12	5 1/2	2	29



NOTES:
 IT IS RECOMMENDED THAT A BEAD OF SILICONE CAULKING BE PLACED BEHIND THE SIDE MOUNTING FLANGES AND UNDER TOP FLASHING AT TIME OF INSTALLATION.

Right Side View

Wall Opening and Hole Location View

FIGURE 1.4
Electric Heat Clearance

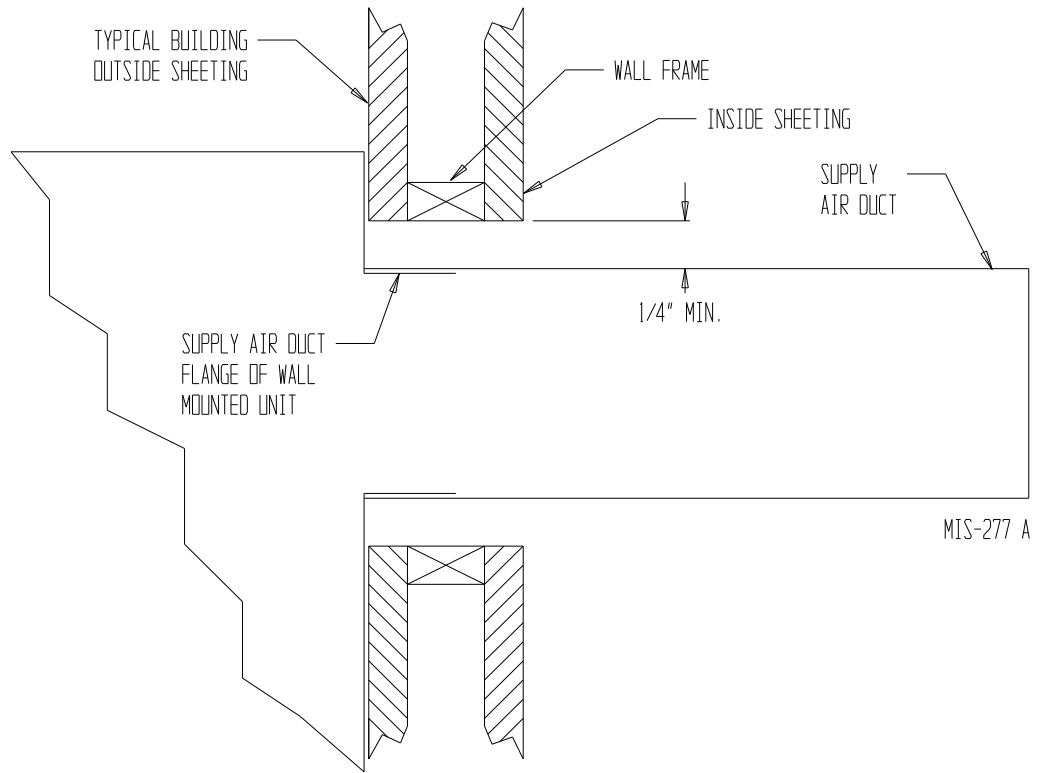


FIGURE 1.5
Wall Mounting Instructions

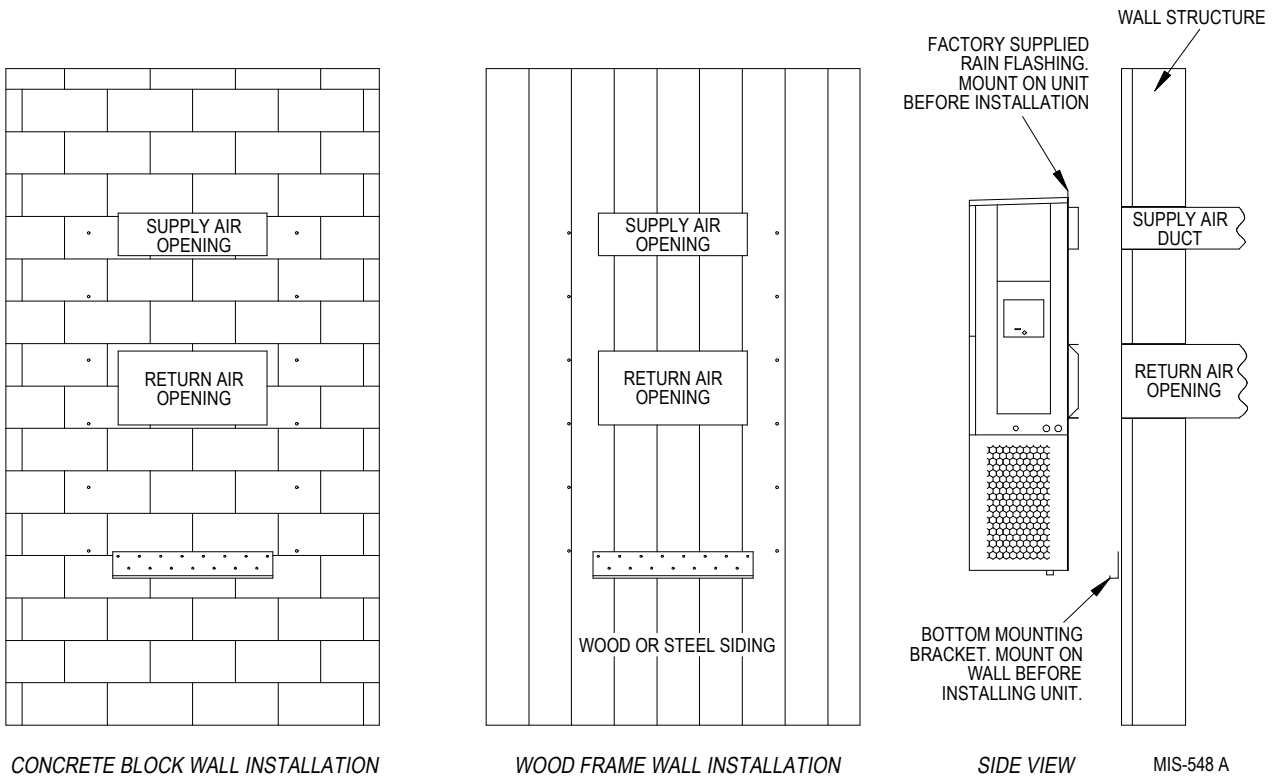


FIGURE 1.6
Wall Mounting Instructions

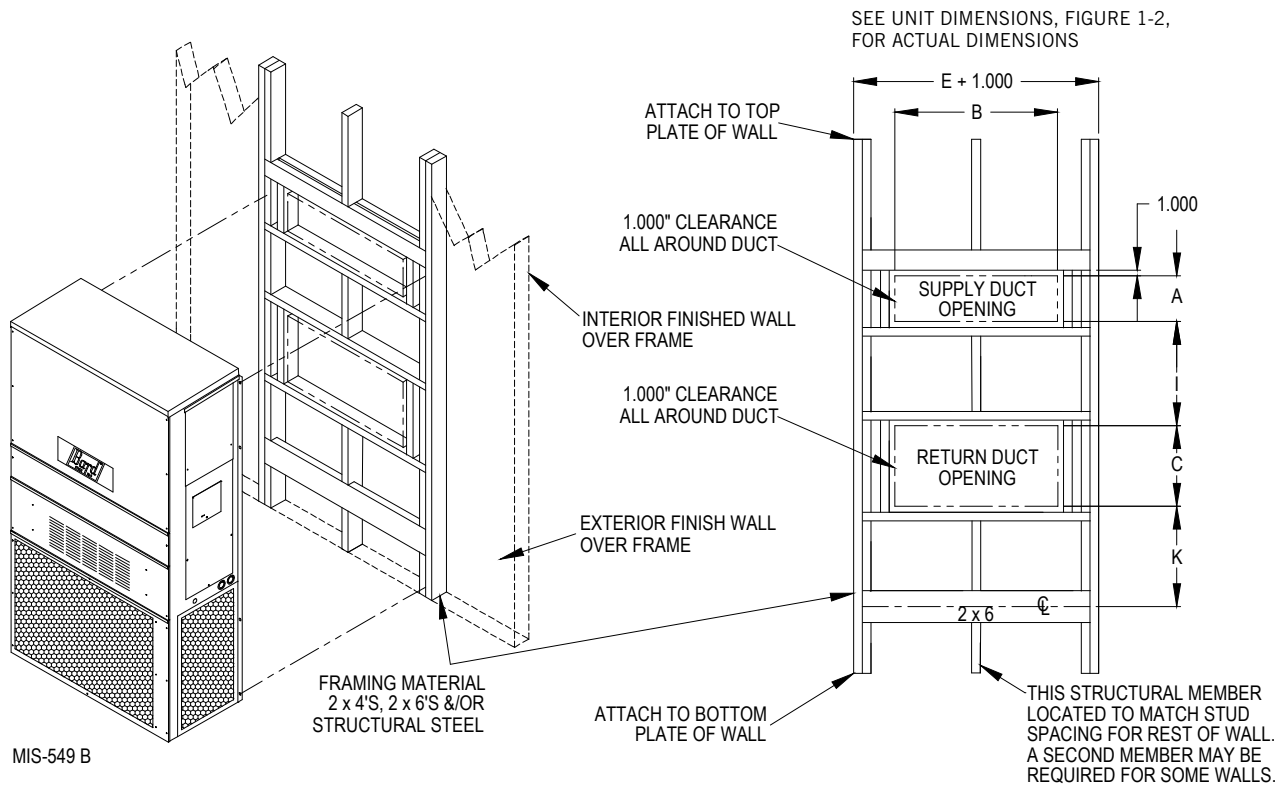
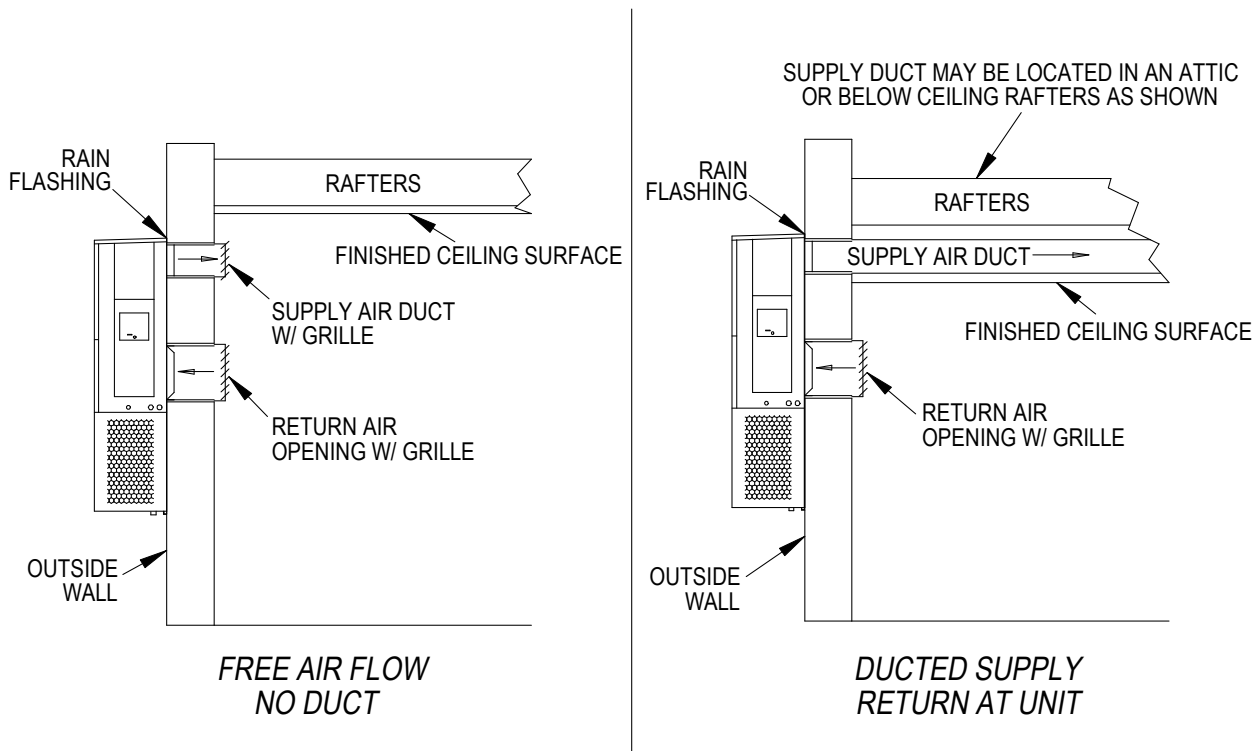


FIGURE 1.7
Common Wall Mounting Installations



WALL-MOUNT UNIT SUPPLY WIRING

NOTICE

All models covered by this installation instruction require dual power sources: **VAC utility power** to run the compressor, heat and outdoor fan motor and **-48 VDC power** to operate the indoor blower and DC free cooling damper.

These units require a positive ground -48 VDC copper conductor field wire connection. Refer to the unit wiring diagram for more information.

WARNING

Electrical shock hazard.

Have a properly trained individual perform these tasks.

Failure to do so could result in electric shock or death.

Refer to the unit rating plate or Table 1.1 on page 16 for wire sizing information and maximum fuse or circuit breaker size. Each outdoor unit is marked with a “Minimum Circuit Ampacity”. The field wiring used must be sized to carry that amount of current. 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.

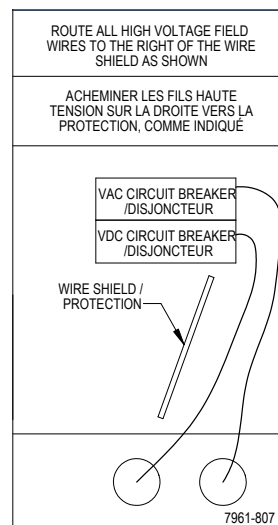
The electrical data lists fuse and wire sizes (75°C copper) for all models including the most commonly used heater sizes. Also shown are the number of field power circuits required for the various models with heaters.

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.

Route all field wires to the right of the wire shield as shown in the circuit routing label found in Figure 1.8 (and also on the wall-mount units).

Run communication wires in separate conduit whenever possible. If a unique installation occurs where it is not possible to isolate the communication wires, it is permissible to run communication wires in a conduit which contains a dedicated VDC voltage line. In all cases, the communication wires must be shielded, twisted wire and utilize proper filtration at the main communications board. **It is never permissible to run communication wires with VAC voltage lines.**

FIGURE 1.8
Circuit Routing Label



See Figure 1.9 on page 17 to reference VAC and VDC supply wiring landing points.

IMPORTANT: 230/208V 1 phase and 3 phase equipment use dual primary voltage transformers. All equipment leaves the factory wired on 240V tap. **It is very important that the correct voltage tap is used.** For 208V operation, reconnect from 240V to 208V tap (see Figure 1.10). The acceptable operating voltage range for the 240 and 208V taps are: 240V Tap (253 – 216) and 208 Tap (220 – 197).

The disconnect access door on this unit may be locked to prevent unauthorized access to the disconnect. To convert for the locking capability, bend the tab located in the bottom left-hand corner of the disconnect opening under the disconnect access panel straight out. This tab will now line up with the slot in the door. When shut, a padlock may be placed through the hole in the tab preventing entry.

**TABLE 1.1
Electrical Specifications**

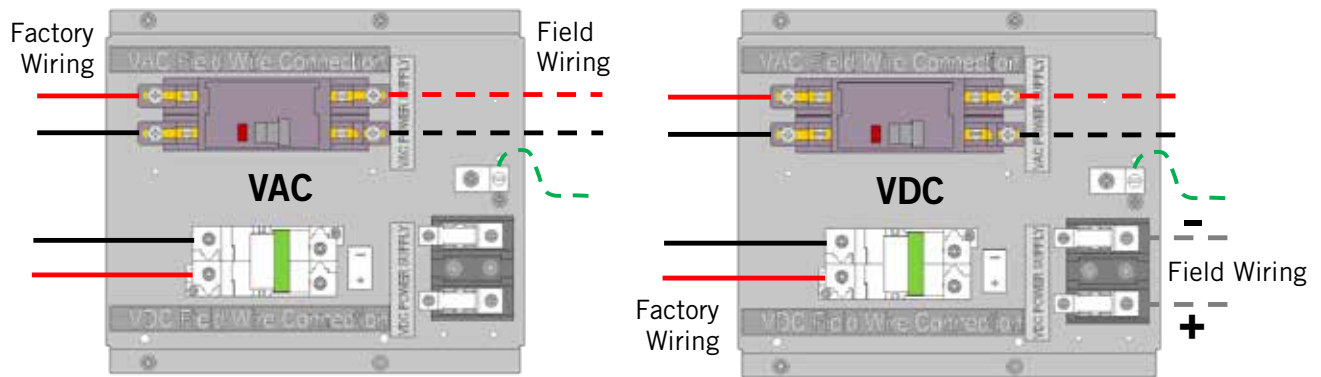
Model	Rated Volts, Hertz & Phase	AC POWER CIRCUIT			DC POSITIVE GROUND POWER CIRCUIT		
		Minimum Circuit Ampacity	Maximum External Fuse or Ckt. Breaker	Field Power/ Ground Wire Size	Minimum Circuit Ampacity	Maximum External Fuse or Ckt. Breaker	Field Power/ Ground Wire Size
D25A2PA0Z/D25L2PA0Z	208/230-60-1	19	30	10/10	15.6	20	12
D25A2PA05/D25L2PA05	208/230-60-1	26	30	8/10	15.6	20	12
D35A2PA0Z/D35L2PA0Z	208/230-60-1	24	40	8/10	15.6	20	12
D35A2PA05/D35L2PA05	208/230-60-1	26	40	8/10	15.6	20	12
D35A2PB0Z/D35L2PB0Z	208/230-60-3	19	25	10/10	15.6	20	12
D35A2PB06/D35L2PB06	208/230-60-3	19	25	10/10	15.6	20	12
D28A2PA05/D28L2PA05	208/230-60-1	26	30	10/10	15.6	20	12
D28A2PB06/D28L2PB06	208/230-60-3	18	20	12/12	15.6	20	12
D36A2PA05/D36L2PA05	208/230-60-1	26	40	8/10	15.6	20	12
D36A2PB06/D36L2PB06	208/230-60-3	18	25	10/10	15.6	20	12
D42A2PA05/D42L2PA05	208/230-60-1	26	40	8/10	15.6	20	12
D42A2PB06/D42L2PB06	208/230-60-3	20	25	10/10	15.6	20	12
D48A2PA05/D48L2PA05	208/230-60-1	30	50	8/10	15.6	20	12
D48A2PB06/D48L2PB06	208/230-60-3	20	30	10/10	15.6	20	12
D60A2PA05/D60L2PA05	208/230-60-1	36	60	6/10	15.6	20	12
D60A2PB06/D60L2PB06	208/230-60-3	30	40	8/10	15.6	20	12

These "Minimum Circuit Ampacity" values are to be used for sizing the field power conductors. Refer to the National Electric Code (latest version), Article 310 for power conductor sizing.

CAUTION: When more than one field power 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 current carrying conductors are in a raceway.

Maximum size of the time delay fuse or circuit breaker for protection of field wiring conductors.
Based on 75°C copper wire. All wiring must conform to the National Electric Code and all local codes.

FIGURE 1.9
VAC and VDC Supply Wiring Landing Points



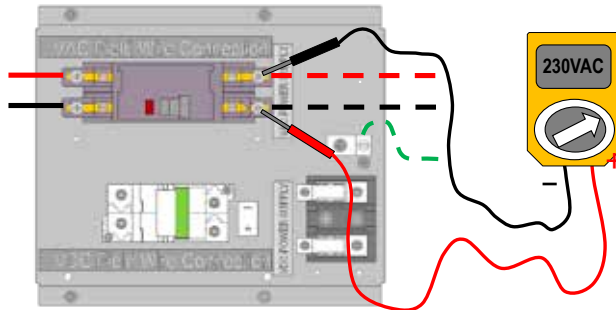
NOTE: Right-hand access model wiring landing points are shown here; left-hand access models will mirror this image.

NOTE: Right-hand access model wiring landing points are shown here; left-hand access models will mirror this image.

FIGURE 1.10
Adjusting the 230/208 VAC Transformer

230/208V 1 phase and 3 phase equipment use dual primary voltage transformers. All equipment leaves the factory wired on 240V tap. **It is very important that the correct voltage tap is used.** For 208V operation, reconnect from 240V to 208V tap. The acceptable operating voltage range for the 240 and 208V taps are: 240V Tap (253 – 216) and 208V Tap (220 – 197).

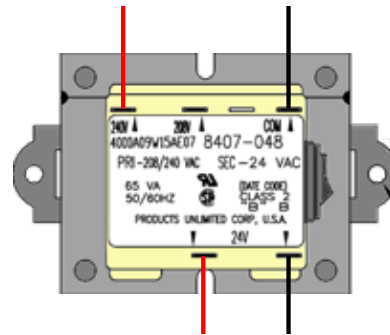
1. Verify incoming AC voltage: Multimeter set to VAC



Shelter supply breaker in ON position
 Bard system breaker in OFF position

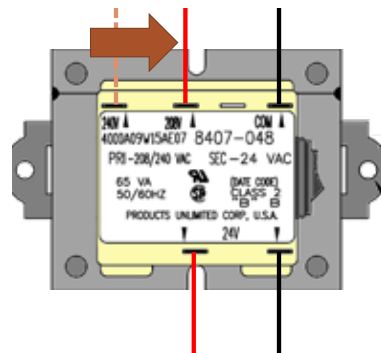
2. If incoming AC voltage is 220VAC or above...

...do not adjust transformer



3. If incoming AC voltage is below 220VAC...

...shut off AC breaker to unit
 and move factory "240V" wire to "208V" terminal



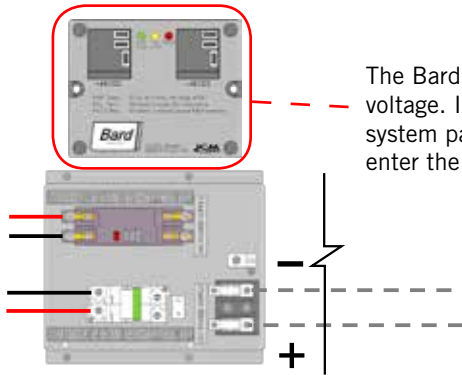
230V/208V Single Phase Voltage Range:
197VAC – 253VAC

230V/208V Three Phase Voltage Range:
197VAC – 253VAC
 (not shown)

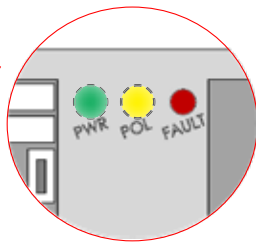
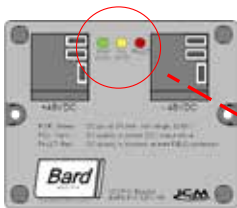
FIGURE 1.11
Bard Polarity-Voltage Monitor



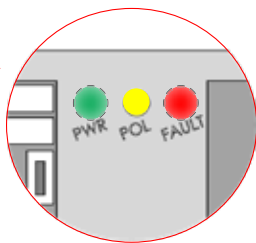
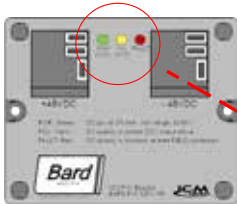
If the VDC wiring is not terminated correctly on the specific polarity-indicated terminals of the VDC terminal block, the VDC controls and motors will not activate and the wall-mounted unit will not function.



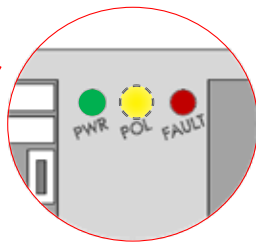
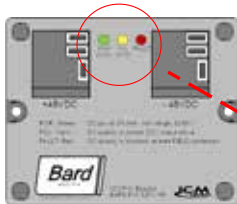
The Bard Polarity-Voltage Monitor continually monitors for correct polarity and voltage. If field wiring is connected improperly, or the voltage is outside of the system parameters, the Polarity-Voltage Monitor will not allow any VDC voltage to enter the system, protecting the internal controls and equipment.



When field wiring is correct in voltage and polarity, the green power (PWR) LED and yellow polarity (POL) LED will light, and system will operate normally.



If field wiring is incorrect in polarity, the red FAULT LED will light, and the monitor will not allow VDC voltage into the system.



If field wiring is correct in polarity but outside of the required 40VDC – 56VDC, the green PWR LED will not illuminate and the monitor not allow VDC voltage into the system.

If the Polarity-Voltage Monitor is showing a problem with polarity and/or voltage, see pages 41 and 42 of the Service section of this manual for instructions on checking VDC polarity and verifying incoming VDC voltage.

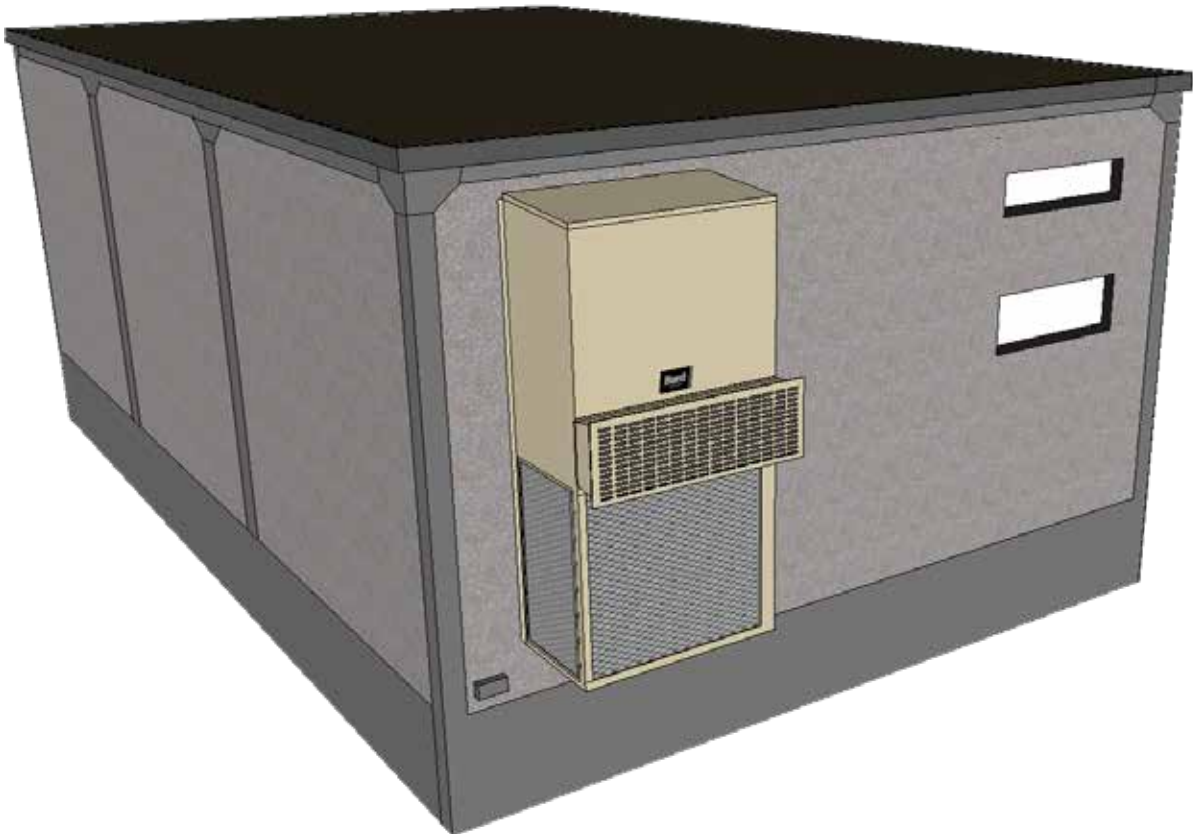
RUNNING IN STAND ALONE (ORPHAN) MODE

With both AC and DC breakers turned on, each D-Series wall-mount system has the capability to run without the controller attached—this feature is called Stand Alone or Orphan Mode, and it basically keeps the shelter between 50°F and 88°F by the use of the factory-installed return air sensor in each wall-mount unit.

During installation, this allows deactivation of one of the two existing, older wall-mount units, while keeping the shelter cool with the other unit still operating. Once the first of the two Bard wall-mount units is installed, Orphan Mode can be enabled early in the installation—keeping the climate inside the shelter stable and the installers comfortable while the remainder of the older equipment is removed and the second Bard wall-mount unit and controller are installed.

Additionally, should either or both D-Series wall-mount units lose communication with the controller (such as during maintenance), they will continue to serve the shelter's needs until a repair can be made.

See the LC Series controller manual for information on connecting the communication wiring from the controller to the two wall-mount units and operating the DC free cooling unit system.



SECTION 2:

SERVICE

INSTRUCTIONS

GENERAL REFRIGERANT INFORMATION

NOTICE

These units require R-410A refrigerant and polyol ester oil.

GENERAL

1. Use separate service equipment to avoid cross contamination of oil and refrigerants.
2. Use recovery equipment rated for R-410A refrigerant.
3. Use manifold gauges rated for R-410A (800 psi/250 psi low).
4. R-410A is a binary blend of HFC-32 and HFC-125.
5. R-410A is nearly azeotropic—similar to R-22 and R-12. Although nearly azeotropic, charge with liquid refrigerant.
6. R-410A operates at 40-70% higher pressure than R-22, and systems designed for R-22 cannot withstand this higher pressure.
7. R-410A has an ozone depletion potential of zero, but must be reclaimed due to its global warming potential.
8. R-410A compressors use polyol ester oil.
9. Polyol ester oil is hygroscopic; it will rapidly absorb moisture and strongly hold this moisture in the oil.
10. A liquid line dryer must be used—even a deep vacuum will not separate moisture from the oil.
11. Limit atmospheric exposure to 15 minutes.
12. If compressor removal is necessary, always plug compressor immediately after removal. Purge with small amount of nitrogen when inserting plugs.

TOPPING OFF SYSTEM CHARGE

If a leak has occurred in the system, Bard Manufacturing recommends reclaiming, evacuating (see criteria above) and charging to the nameplate charge. If done correctly, topping off the system charge can be done without problems.

With R-410A, there are no significant changes in the refrigerant composition during multiple leaks and recharges. R-410A refrigerant is close to being an azeotropic blend (it behaves like a pure compound or single component refrigerant). The remaining refrigerant charge in the system may be used after leaks have occurred. “Top-off” the charge by utilizing the pressure charts on the inner control panel cover as a guideline.

REMEMBER: When adding R-410A refrigerant, it must come out of the charging cylinder/tank as a liquid to avoid any fractionation and to insure optimal system performance. Refer to instructions for the cylinder that is being utilized for proper method of liquid extraction.

SAFETY PRACTICES

1. Never mix R-410A with other refrigerants.
2. Use gloves and safety glasses. Polyol ester oils can be irritating to the skin, and liquid refrigerant will freeze the skin.
3. Never use air and R-410A to leak check; the mixture may become flammable.
4. Do not inhale R-410A—the vapor attacks the nervous system, creating dizziness, loss of coordination and slurred speech. Cardiac irregularities, unconsciousness and ultimately death can result from breathing this concentration.
5. Do not burn R-410A. This decomposition produces hazardous vapors. Evacuate the area if exposed.
6. Use only cylinders rated DOT4BA/4BW 400.
7. Never fill cylinders over 80% of total capacity.
8. Store cylinders in a cool area, out of direct sunlight.
9. Never heat cylinders above 125°F.
10. Never trap liquid R-410A in manifold sets, gauge lines or cylinders. R-410A expands significantly at warmer temperatures. Once a cylinder or line is full of liquid, any further rise in temperature will cause it to burst.

R410-A REFRIGERANT CHARGE

This unit was charged at the factory with the quantity of refrigerant listed on the serial plate. AHRI capacity and efficiency ratings were determined by testing with this refrigerant charge quantity.

The pressure table found on the following page shows nominal pressures for the units. Since many installation specific situations can affect the pressure readings, this information should only be used by certified technicians as a guide for evaluating proper system performance. They shall not be used to adjust charge. If charge is in doubt, reclaim, evacuate and recharge the unit to the serial plate charge.

PRESSURE SERVICE PORTS

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. A pressure table covering all models can be found on page 23. It is imperative to match the correct pressure table to the unit by model number.

This unit employs high-flow Coremax valves instead of the typical Schrader type valves.

WARNING! Do NOT use a Schrader valve core removal tool with these valves. Use of such a tool could result in eye injuries or refrigerant burns!

To change a Coremax valve without first removing the refrigerant, a special tool is required which can be obtained at www.fastestinc.com/en/SCCA07H. See the replacement parts manual for replacement core part numbers.

**TABLE 2.1
Nominal Pressures**

Model	Return Air Temperature	Pressure	Air Temperature Entering Outdoor Coil, Degree °F										Capacitors	
			75	80	85	90	95	100	105	110	115	120	Part No.	Ratings
D25A/L	75° DB	Low Side	132	133	134	136	137	138	140	142	144	147	8552-050	1 Ø, 240V 40+15/370
	62° WB	High Side	292	308	327	347	369	392	417	445	474	505		
	80° DB	Low Side	141	142	143	145	146	148	150	152	154	157	8552-002	3 Ø, 240V 5/370
67° WB	High Side	299	316	335	356	378	402	428	456	486	518			
D28A/L	75° DB	Low Side	137	137	137	139	140	141	143	144	146	148	8552-055	1 Ø, 240V 40+10/370
	62° WB	High Side	279	299	321	342	366	389	413	439	464	491		
	80° DB	Low Side	146	146	147	149	150	151	153	154	156	158	8552-005	3 Ø, 240V 10/370
67° WB	High Side	286	307	329	351	375	399	424	450	476	504			
D35A/L	75° DB	Low Side	118	120	122	125	127	129	132	134	136	137	8552-052	1 Ø, 240V 45+15/370
	62° WB	High Side	327	349	371	396	421	448	475	504	533	565		
	80° DB	Low Side	126	128	131	134	136	138	141	143	145	147	8552-002	3 Ø, 240V 5/370
67° WB	High Side	335	358	381	406	432	459	487	517	547	579			
D36A/L	75° DB	Low Side	133	135	137	138	139	141	143	145	147	149	8552-079	1 Ø, 240V 45+10/370
	62° WB	High Side	313	327	342	361	382	406	432	461	492	527		
	80° DB	Low Side	142	144	146	148	149	151	153	155	157	159	8552-005	3 Ø, 240V 10/370
67° WB	High Side	321	335	351	370	392	416	443	473	505	540			
D42A/L	75° DB	Low Side	131	132	134	136	137	139	142	144	146	149	8552-079	1 Ø, 240V 45+10/370
	62° WB	High Side	315	331	348	368	388	410	435	461	489	520		
	80° DB	Low Side	140	141	143	145	147	149	152	154	156	159	8552-005	3 Ø, 240V 10/370
67° WB	High Side	323	339	357	377	398	421	446	473	502	533			
D48A/L	75° DB	Low Side	133	136	137	139	141	142	144	145	147	148	8552-089	1 Ø, 240V 70+10/370
	62° WB	High Side	325	341	360	379	401	424	449	477	505	535		
	80° DB	Low Side	142	145	147	149	151	152	154	155	157	158	8552-005	3 Ø, 240V 10/370
67° WB	High Side	333	350	369	389	411	435	461	489	518	549			
D60A/L	75° DB	Low Side	129	130	132	133	134	136	137	137	139	140	8552-058	1 Ø, 240V 80+10/440
	62° WB	High Side	353	362	374	390	410	432	458	488	522	559		
	80° DB	Low Side	138	139	141	142	143	145	146	147	149	150	8552-005	3 Ø, 240V 10/370
67° WB	High Side	362	371	384	400	420	443	470	501	535	573			
D60A/L	85° DB	Low Side	143	144	146	147	148	150	151	152	154	155	8552-005	3 Ø, 240V 10/370
	72° WB	High Side	375	384	397	414	435	459	486	519	554	593		

Low Side Pressure ±4 PSIG
High Side Pressure ±10PSIG

**FIGURE 2.1
Refrigerant Sight Glass**

The refrigerant sight glass installed in this unit is not a charging indicator. The sight glass is for moisture reference only. If charge is in doubt, reclaim, evacuate and recharge the unit to the serial plate charge.



SEQUENCE OF OPERATION

D-SERIES WALL-MOUNT UNIT SEQUENCE OF OPERATION

Overview

This product is designed to function like a typical telecom air conditioning system with an outdoor air-cooling damper. However, the DC Free Cooling Unit system does have some special features, like a control board which allows for advanced alarming and a “DC Free Cooling” feature that allows for forced emergency ventilated cooling anytime “shore power” VAC power from the utility company is lost. The internal controls within this unit automatically recognize a loss of shore power, energizing the indoor blower motor and powering the actuator to open the damper to bring in outdoor air. The power utilized during this time is the stored battery power from the equipment shelter.

Indoor Blower

The indoor blower is a 48VDC motor, completely separate from the VAC circuit(s). For the blower to activate, two separate actions must take place:

1. 24VDC from terminal N07 (Blower Motor Start Relay)
2. 0-10VDC signal from terminal Y1 (Speed Voltage)

While the 24VDC from N07 will always stay the same, the 0-10VDC signal from terminal Y1 will vary depending upon the mode. See Table 2.2.

DC Free Cooling Damper

This controller is enabled for dewpoint control, specifically examining the combination of temperature and relative humidity to determine the proper control of cooling. The system will utilize free cooling when the following conditions are true:

1. The outdoor temperature is below 70°F
2. The dewpoint of the outdoor air is below 60°F
3. The outdoor humidity is below 80% RH
4. The indoor humidity is below 60% RH

To signal the 24VDC damper actuator to open, a 2-10VDC signal must come from the Y2 terminal. Additionally, while other modes get only a single speed from the indoor blower, free cooling mode will get two: one for outdoor air temperature above 40°F (faster), and another for those below 40°F (slower). See Table 2.2.

Cooling Call

When a call for cooling generates from the controller, the system will first determine which mode of cooling to employ based on the outdoor temperature, the outdoor humidity and the indoor temperature.

- If the outdoor temperature and humidity ratio are conducive to free cooling, the control board will send:
 1. 2-10VDC Signal from Y2 (Damper Signal)
 - Modulates damper to achieve 55°F at supply air temperature sensor
 2. 24VDC from terminal N07 (Blower Motor Start Relay)
 3. 0-10VDC signal from terminal Y1 (Speed Voltage)
- If the outdoor conditions are conducive to free cooling, but a 2nd stage cooling call is generated, the board will additionally add 24VAC signal from the N02 terminal to the CCM, activating the compressor. The damper will limit outdoor air to keep supply air temperature at 55°F.

TABLE 2.2
Blower Speed Voltage Chart

Model	Blower Only	Free Cooling Mode (CFM/VDC Speed Voltage)	Free Cooling Mode Below 40°F (CFM/VDC Speed Voltage)	Cooling (CFM/VDC Speed Voltage)	Electric Heat
D25A/D25L	Same as Free Cooling Mode	1500/6.0	900/2.0	900/2.0	1100/4.0
D28A/D28L			800/2.8	1100/3.8	1800/7.0
D35A/D35L			1100/3.0	1100/6.8	1100/6.8
D36A/D36L			800/2.8	1100/3.8	1800/7.0
D42A/D42L			950/3.1	1250/4.7	1800/7.0
D48A/D48L			1100/3.8	1600/6.3	1800/7.0
D60A/D60L			1100/3.8	1600/6.3	1800/7.0

- If conditions outside are not conducive to free cooling, the control board will send:
 1. 24VAC signal from NO2 to CCM (Compressor)
 2. 24VDC from terminal NO7 (Blower Motor Start Relay)
 3. 0-10VDC signal from Y1 (Speed Voltage)

Heating Call

When a call for heating generates from the controller, the control board will send:

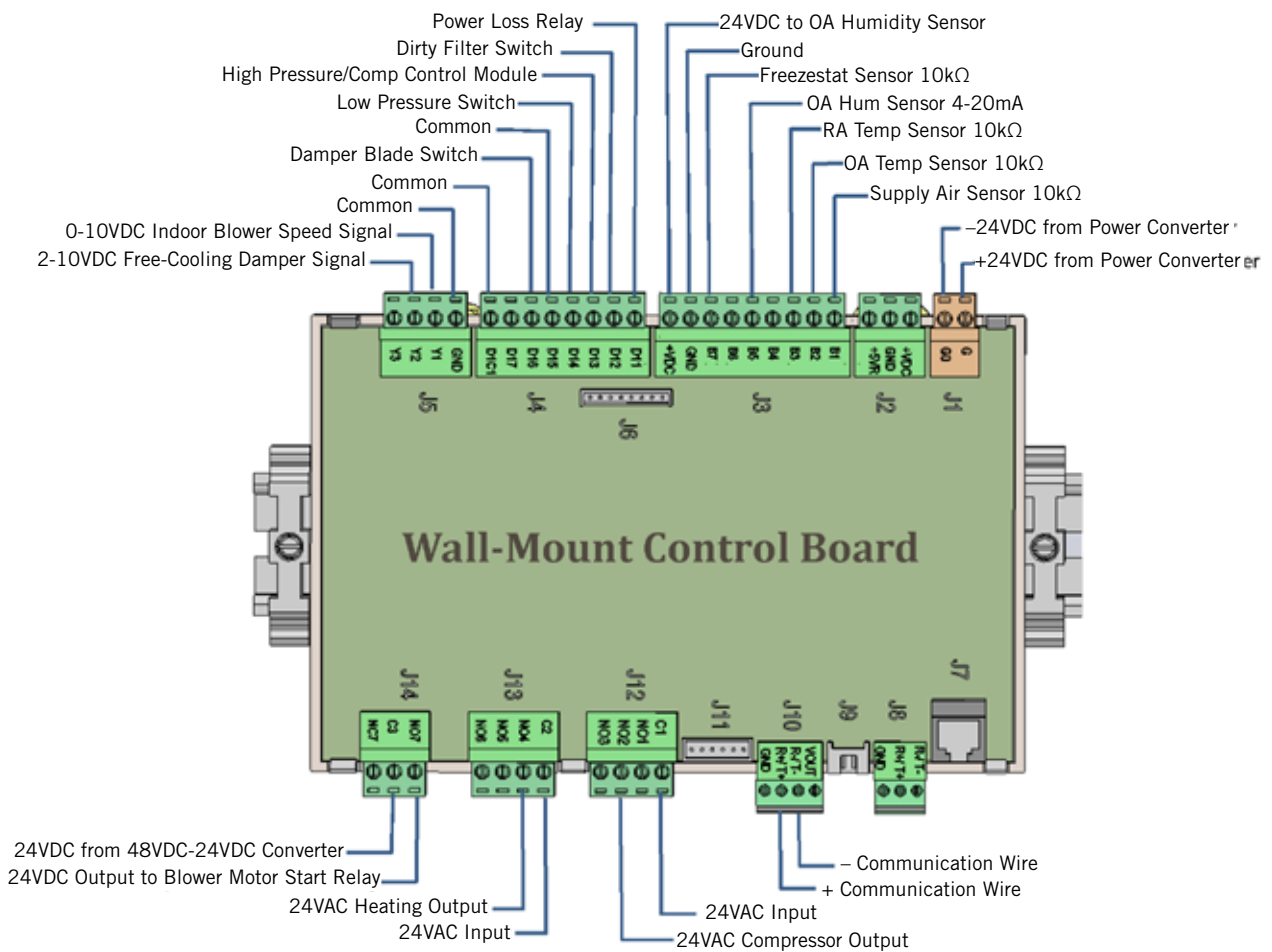
1. 24VAC signal from terminal NO4 to heat strip contactor.
2. 24VDC from terminal NO7 (Blower Motor Start Relay)
3. 0-10VDC signal from terminal Y1 (Motor Speed)

Loss of Utility Power

When AC power is lost to the unit (no shore power, no generator), the AC power loss relay will send a digital input to terminal DI 1, alerting the board. If the temperature outside is warmer than the shelter internal temperature, the units will remain static. If the temperature outside is cooler than the internal temperature and there is a generated cooling call, the control board will send:

1. 2-10VDC Signal from terminal Y2 (Damper Signal)
 - Modulates damper to achieve 55°F at supply air temperature sensor
2. 24VDC from terminal NO7 (Blower Motor Start Relay)
3. 0-10VDC signal from terminal Y1 (Motor Speed)

FIGURE 2.2
Wall-Mount Unit Control Board



Special Considerations

- Compressor Run Time – Once activated, the compressor will run for a minimum of 30 seconds, regardless of setpoint (control board programming)
- Compressor Off Time – Once deactivated, the compressor will not start again for a minimum of 2 minutes. This is controlled by the compressor control module (CCM).
- High Pressure Situation – The high pressure switch routes through the CCM, which allows one switch opening followed by a delay (soft lockout) of at least 2 minutes before trying again. If the switch is still open—or opens again on the same call—the CCM locks out the compressor and outdoor fan. Additionally, the CCM will send 24V to the high pressure alarm relay, which will then send a digital input to the DI 3 terminal.
- Low Pressure Situation – The low pressure switch is connected directly to DI 4:
 1. On a call for cooling, the board ignores the low pressure switch status for 2 minutes (OAT above 50°F) or 3 minutes (OAT below 50°F).
 2. If the switch is still open, the compressor will shut down and the controller will wait an additional 2 minutes.
 3. If the switch is still open, the controller will notify of an alarm and lock out the compressor. However, if the switch closes during this time, the compressor will start again and wait for 2 minutes (OAT above 50°F) or 3 minutes (OAT below 50°F).
 4. If the low pressure switch is open at this time, the compressor will lock out and the controller will notify of an alarm.
- High Temperature 2 Alarm – Should the shelter controller see 90°F, both free-cooling dampers will open (regardless of outdoor temperature) to cool the building.
- Smoke Alarm – Should the smoke detector send an alarm signal to the controller, all blower, compressor and ventilations functions cease.
- Hydrogen Alarm – Should the hydrogen detector send an alarm signal to the controller, both free cooling dampers will open (regardless of temperature) to dilute the shelter air.
- Freezestat – If the coil temperature is below 30°F for 120 seconds, the compressor will deactivate for 5 minutes, or until the sensor sees 55°F, whichever comes first.
- Generator Run – During generator operation, the system may limit compressor operation to only one unit providing that a specific jumper was removed from the LC controller terminal block and the alarm wires were connected to a generator-run relay (please refer to the Installation section of this manual regarding alarms and wiring).

FIGURE 2.3
TEC-EYE™ Display



ALARM KEY

Allows viewing of active alarms
Silences audible alarms
Resets active alarms

MENU KEY

Allows entry to Main Menu

ESCAPE KEY

Returns to previous menu level
Cancels a changed entry

UP KEY

Steps to next screen in the display menu
Changes (increases) the value of a modifiable field

ENTER KEY

Accepts current value of a modifiable field
Advances cursor

DOWN KEY

Steps back to previous screen in the display menu
Changes (decreases) the value of a modifiable field

TEC-EYE™ HAND-HELD DIAGNOSTIC TOOL

The microprocessor control used in this wall mount air conditioning system allows for complete control and monitoring through the use of the provided TEC-EYE™ hand-held monitor. This comprehensive service tool utilizes the latest in state-of-the-art technology including a large, easy-to-read backlit LCD graphic display.

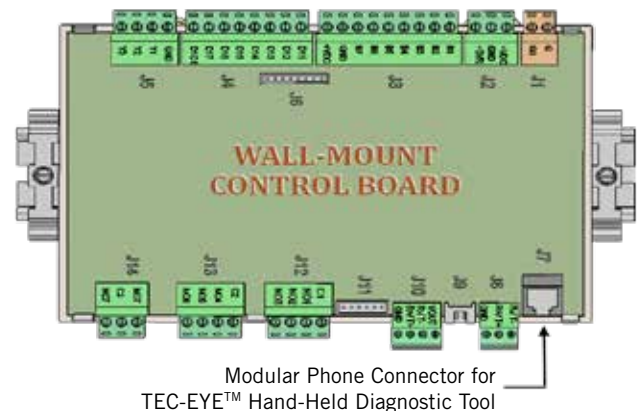
The menu driven interface provides users the ability to scroll through three menu levels: Info, Control and Service. The menus permit the user to easily view, control and configure the unit.

The controller is completely programmed at the factory; therefore, most applications will require no field set-up. However, the default setpoints and their ranges are easily viewed and adjusted from the TEC-EYE™ display. The program and operating parameters are permanently stored on FLASH-MEMORY in case of power failure. The controller is designed to manage temperature levels to a user-defined setpoint via control output signals to the wall mount air conditioning system.

The TEC-EYE™ connects to the wall-mount unit control board via an RJ11 modular phone connector as shown in Figure 2.4.

The TEC-EYE™ hand-held diagnostic tool should be stored somewhere inside the shelter, preferably close to the controller. The TEC-EYE™ has integrated magnets on the back of the tool, so it can be attached to the front, sides, bottom or top of the control box.

FIGURE 2.4
TEC-EYE™ Connection to Unit Control



TEC-EYE™ Menu Structure

- On/Off Unit
- Setpoints
- Clock/Scheduler
- Input/Output
 - Analog Inputs
 - Digital Inputs
 - Relay Outputs
 - Analog Outputs
- Alarm History
- Technician
 - Information
 - Working Hours
 - Service Settings
 - Control Loops
 - Probe Adjustment
 - Manual Management
 - Analog Inputs
 - Digital Inputs
 - Relay Outputs
 - Analog Outputs
- Factory
 - Configuration
 - I/O Configuration
 - Factory Settings

In addition to the menu structure above, there are also Status and Alarm screens.

TEC-EYE™ Acronyms

SAT – Supply air temperature
RAT – Return air temperature
OAT – Outdoor air temperature
OAH – Outdoor air humidity
Sp – Temperature setpoint
Space – Space temperature
U1 – Unit 1
U2 – Unit 2
F – Indoor blower status
D – DC free cooling damper position status
EM – Emergency ventilation mode
C1 – Compressor activate status
HT – Heater status
OA Dew Point – Calculated outdoor dew point
FC – DC free cooling status
RN – Component run time in minutes in last hour
ST – Number of start requests in last hour

Press the MENU key to access the Main Menu screen. Press the UP or DOWN keys to scroll through the available menus. When the desired menu is highlighted, press the ENTER key to access that menu. Press the ESCAPE key or MENU key to return to the STATUS screen from the Main Menu.

Status Screen

The STATUS screen is the default start-up screen and also the return screen after 5 minutes of no activity. The screen can be accessed any time by pressing the ESCAPE button repeatedly.

The STATUS screen displays the current date, time, return air temperature, supply air temperature, outdoor air temperature, outdoor humidity and dewpoint conditions. It also indicates the current system operating status for Unit 1 (U1) or Unit 2 (U2). The screen displays whether the blower is off or on and what percentage the damper is open.

FIGURE 2.5
TEC-EYE™ Status Display



For the following items, press the MENU key to access programming.

Executing a Run Test

Execute a run test on each unit to verify the equipment is functioning correctly.

1. Go to Technician menu, press ENTER key.
2. Press UP or DOWN arrow keys to get to Service Settings menu, press ENTER key.
3. Press UP or DOWN arrow keys to get to Control Loops menu, press ENTER key.
4. Cursor will be flashing in upper left corner of screen. Press DOWN arrow key to scroll through screens to Run Test.
5. Press ENTER key to scroll to Enable. Press UP or DOWN arrow keys to change No to Yes. Unit will begin the run test.

Run Test Approximate Timings (in Minutes)

Blower	On: 0:00
Damper	Open: 0:00 – 2:40
	Closed: 2:41 – 4:57
Compressor	On: 4:58
	Off: 6:00
Heat	On: 6:01
	Off: 7:10
Blower	Off: 8:19

Identifying a Unit Address

The unit address is located in the upper right hand corner of the TEC-EYE STATUS screen (see Figure 2.5). This is only visible on the STATUS screen. The STATUS screen can be accessed any time by pressing the ESCAPE button repeatedly.

The unit address is also visible by pressing the MENU key and navigating to ON/OFF Unit. It will be listed under Unit Address.

To change the unit address:

1. Go to Setpoints menu, press ENTER key.
2. Press UP or DOWN arrow keys to get to Fieldbus Address, press ENTER key. The wall-mount unit's current address value will display.

NOTE: This value can be changed if there was an error with the Auto Address sequence or the user would like to manually set the address of the unit.

Manual Override Outputs

Blower

1. Go to Technician menu, press ENTER key.
2. Go to Manual Management, press ENTER key.
3. Go to Relay Outputs, press the DOWN arrow to get to Blower Relay Output. Move the cursor to the selected choice by pressing the ENTER key. Press UP or DOWN arrow keys to change the Manual Relay and Manual Position to "ON."
4. Press ESCAPE key, go to Analog Outputs.
5. Go to Blower Motor Analog Output, press Enter key to move the cursor to Mode. Change to Hand by pressing the UP arrow key. Press ENTER key. Next change the Manual Value to test blower speed voltage for the unit model and press ENTER key. Refer to the unit blower speed voltages provided in Table 2.6 on page 40; do not exceed the maximum speed voltage (VDC) for the unit model.

DC Free Cooling Damper

1. Go to Technician menu, press ENTER key.
2. Go to Manual Management, press ENTER key.
3. Go to Analog Outputs, press ENTER key.
4. Press DOWN arrow key to scroll screens to Analog Output 2 Damper.
5. Press ENTER key to scroll to Mode line. Press DOWN key to change Auto to Hand.
6. Press ENTER key to scroll to Manual Value line; Press UP or DOWN arrow keys to change the manual value to a desired value (maximum is 10VDC) to perform damper test.
7. Verify damper operation.

Compressor

1. Go to Technician menu, press ENTER key.
2. Go to Manual Management, press ENTER key.
3. Go to Relay Output, press ENTER key.
4. Go to Relay Output Cooling Stage. Press UP or DOWN arrow keys to change Manual Relay to "ON"; press ENTER key. Press UP or DOWN arrow keys to change manual position to "ON" and press ENTER key.
5. Verify compressor is running.

Heat

1. Go to Technician menu, press ENTER key.
2. Go to Manual Management, press ENTER key.
3. Go to Relay Output, press ENTER key.
4. Go to Relay Output Heating, press ENTER key.
5. Press UP or DOWN arrow keys to change Manual Relay and Manual Position to "ON" and press ENTER key.
6. Verify heater "ON" status.

CAUTION

The Bard DC Free Cooling Unit System has been pre-programmed with what is widely considered to be the best settings for efficiency and operation. Any changes to internal programming through the LC Series Controller or the TEC-EYE™ not covered within this manual may cause the systems to operate improperly, cause internal damage to the HVAC units, cause the shelter to overheat or other very serious consequences. Although complete controller programming architecture for both the LC Controller and TEC-EYE™ has been provided, going outside the boundaries of what has been covered in this manual is not recommended.

COMPONENTRY SPECIFICATIONS

WARNING

Electrical shock hazard.

Disconnect both VAC and VDC power supplies before servicing.

Failure to do so could result in electric shock or death.

LOW PRESSURE SWITCH

Cut-out pressure: 40psi (+/- 4 psi)

Cut-in pressure: 55psi (+/- 4psi)

HIGH PRESSURE SWITCH

Cut-out pressure: 650psi (+/- 10 psi)

Cut-in pressure: 520psi (+/- 15psi)

LOW AMBIENT CONTROL

Modulating head-pressure control that allows full speed at pressures above 315psi. Below 315psi, the control will slow fan speed—following internal head pressures—until a minimum RPM is reached (approx 300 RPM). Below this point, the control will shut the fan completely off until internal pressures rise. The control is preset from the factory, but should adjustment become necessary, there is an adjustment screw located on the bottom of the control behind a weatherproof cap. One full turn clockwise equals approximately +48 psi.

REMOTE INDOOR TEMPERATURE SENSOR

White, decorative plastic casing, Bard logo, field-installed in shelter: 10k ohm resistance, see Table 2.3.

DISCHARGE TEMP SENSOR

4.75" stainless probe factory mounted in supply opening of wall-mount unit: 10k ohm resistance, see Table 2.3.

RETURN TEMPERATURE SENSOR

Exposed thermistor-element style with copper-coated steel clip, attached in return opening of wall-mount unit: 10k ohm resistance, see Table 2.3.

EVAPORATOR TEMP SENSOR (FREEZESTAT)

Exposed thermistor-element style with copper-coated steel clip, attached to evaporator coil of wall-mount unit: 10k ohm resistance, see Table 2.3.

OUTDOOR TEMPERATURE/HUMIDITY SENSOR

Gray, weather-proof octagonal case with dip tube, located in condenser section of wall-mount unit.

- Temperature sensor: 10k ohm resistance, see Table 2.3.
- Humidity sensor: 4-20mA.

COMPRESSOR CONTROL MODULE

Compressor protection device that has an adjustable 30-second to 5-minute timer (red-dial). This module features a delay-on-make for initial start-up (or anytime power is interrupted) for a minimum 2 minutes plus 10% of the red-dial setting. There is no delay during routine operation of the unit. The compressor control module (CCM) also monitors the high pressure switch, and will allow one automatic retry (after soft lockout delay) before disabling the compressor in a hard lockout (requires manual reset). If hard lockout does occur, the ALR terminal on the CCM will become active with 24V, which will power the high pressure relay within the wall-mount unit, breaking a digital input to the control board—signaling a high-pressure situation to the system.

PHASE MONITOR

Used only on 3-phase equipment, the phase monitor is a compressor protection device that will prohibit operation of the compressor if the device senses a possible reverse-rotation situation due to incorrect phasing. On a call for compressor (and only compressor), the device will check incoming phase, check for severe voltage imbalance and check for proper frequency. Under nominal conditions, a green LED light will show on the face of the monitor. If there is improper phasing, voltage imbalance or frequency deviation, the device will show a red LED light and prohibit compressor operation.

TRANSFORMER

75VA with external 4A circuit breaker, 230VAC/208VAC convertible. Directly feeds power loss relay in wall-mount unit during normal operation. Should loss of utility power occur, transformer failure or transformer external circuit breaker open, the loss of VAC power will cause the contacts within the power loss relay to open, interrupting a digital input to the control board—signaling a loss-of-power situation to the system.

TABLE 2.3
Temperature (F) vs. Resistance (R) of Temperature Sensor

F	R	F	R	F	R	F	R
-25.0	196871	13.0	56985	53.0	19374	89.0	7507
-24.0	190099	14.0	55284	52.0	18867	90.0	7334
-23.0	183585	15.0	53640	53.0	18375	91.0	7165
-22.0	177318	16.0	52051	54.0	17989	92.0	7000
-21.0	171289	17.0	50514	55.0	17434	93.0	6840
-20.0	165487	18.0	49028	56.0	16984	94.0	6683
-19.0	159904	19.0	47590	57.0	16547	95.0	6531
-18.0	154529	20.0	46200	58.0	16122	96.0	6383
-17.0	149355	21.0	44855	59.0	15710	97.0	6239
-16.0	144374	22.0	43554	60.0	15310	98.0	6098
-15.0	139576	23.0	42295	61.0	14921	99.0	5961
-14.0	134956	24.0	41077	62.0	14544	100.0	5827
-13.0	130506	25.0	39898	63.0	14177	101.0	5697
-12.0	126219	26.0	38757	64.0	13820	102.0	5570
-11.0	122089	27.0	37652	65.0	13474	103.0	5446
-10.0	118108	28.0	36583	66.0	13137	104.0	5326
-9.0	114272	29.0	35548	67.0	12810	105.0	5208
-8.0	110575	30.0	34545	68.0	12492	106.0	5094
-7.0	107010	31.0	33574	69.0	12183	107.0	4982
-6.0	103574	32.0	32634	70.0	11883	108.0	4873
-5.0	100260	33.0	31723	71.0	11591	109.0	4767
-4.0	97064	34.0	30840	72.0	11307	110.0	4663
-3.0	93981	35.0	29986	73.0	11031	111.0	4562
-2.0	91008	36.0	29157	74.0	10762	112.0	4464
-1.0	88139	37.0	28355	75.0	10501	113.0	4367
0.0	85371	38.0	27577	76.0	10247	114.0	4274
1.0	82699	39.0	26823	77.0	10000	115.0	4182
2.0	80121	40.0	26092	78.0	9760	116.0	4093
3.0	77632	41.0	25383	79.0	9526	117.0	4006
4.0	75230	42.0	24696	80.0	9299	118.0	3921
5.0	72910	43.0	24030	81.0	9077	119.0	3838
6.0	70670	44.0	23384	82.0	8862	120.0	3757
7.0	68507	45.0	22758	83.0	8653	121.0	3678
8.0	66418	46.0	22150	84.0	8449	122.0	3601
9.0	64399	47.0	21561	85.0	8250	123.0	3526
10.0	62449	48.0	20989	86.0	8057	124.0	3452
11.0	60565	49.0	20435	87.0	7869		
12.0	58745	50.0	19896	88.0	7686		

BATTERIES

Used in wall-mount unit and controller boards, flat-disk style BR2330 3V battery. Used only for time/date during complete power loss. Estimated lifespan 7-8 years.

48VDC TO 24VDC POWER CONVERTER

Used in both wall-mount units and LC-Series controller to change shelter-provided 48VDC to 24VDC power for control boards, relays, smoke detector and hydrogen detector: Phoenix Quint PS-Series. **NOTE: Output must be minimum 22.8 VDC to allow proper control board operation.**

OUTDOOR FAN MOTOR

Due to design considerations of the condenser section of the wall-mount unit, placement/clearance of the motor/fan blade is critical to heat dispersal. Should a change of motor or fan blade be necessary, please view Figure 2.6 for proper clearance adjustment.

DIRTY FILTER SWITCH

Located inside the blower compartment, this switch measures air pressure differential across the filter (see Figure 2.7). Manual reset only. Default setting: 0.8" static, 50% blocked filter (approximately).

INDOOR BLOWER MOTOR

Unlike most other system fan motors, this motor is a 48VDC motor, and is very specialized in application. Please see Table 2.4 (blower table).

PHOENIX ISOLATION RELAY: WALL-MOUNT UNIT

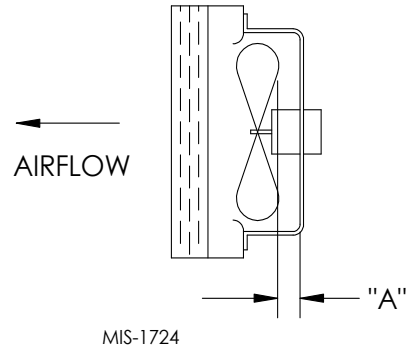
Green DIN-Rail mount isolation relay used in the wall-mount unit to isolate/filter 48VDC power, motor speed signal and ground from the control board: Phoenix Mini MCR-Style.

ZETTLER ISOLATION RELAYS: WALL-MOUNT UNIT

Black Zettler surface mount relays used in the wall-mount unit to isolate the start signal from:

- Power loss relay circuit (see Figure 2.8)
- High pressure relay circuit (see Figure 2.9)
- Blower motor start signal relay circuit (see Figure 2.10)

FIGURE 2.6
Fan Blade Setting



Model	Dimension A
All covered by this manual	1.75"

FIGURE 2.7
Dirty Filter Switch



TABLE 2.4
Indoor Blower Performance

MODEL	RATED ESP	MAX ESP	FREE COOLING CFM ABOVE 40°	FREE COOLING CFM BELOW 40° ①	RATED FULL LOAD COOLING CFM	ELECTRIC HEAT AIRFLOW
D25A/D25L	0.15	0.50	1500	800	800	1100
D28A/D28L	0.10	0.50	1800	800	1100	1800
D35A/D35L	0.15	0.50	1500	800	1100	1100
D36A/D36L	0.15	0.50	1800	800	1100	1800
D42A/D42L	0.20	0.50	1800	950	1250	1800
D48A/D48L	0.20	0.50	1800	1100	1600	1800
D60A/D60L	0.20	0.50	1800	1100	1600	1800

① LC Series controller derives at this decision point and switches the indoor motor speed. The damper actuator will then adjust to still yield a 55°F supply air temperature.

FIGURE 2.8
Power Loss Relay Circuit

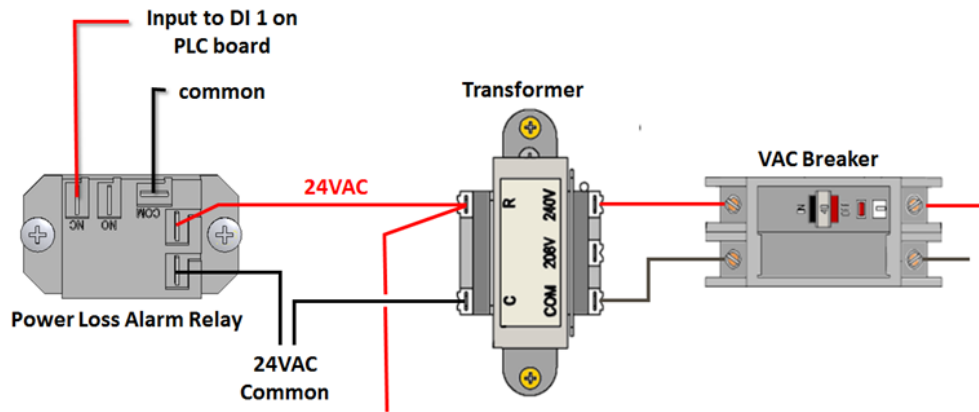


FIGURE 2.9
High Pressure Relay Circuit

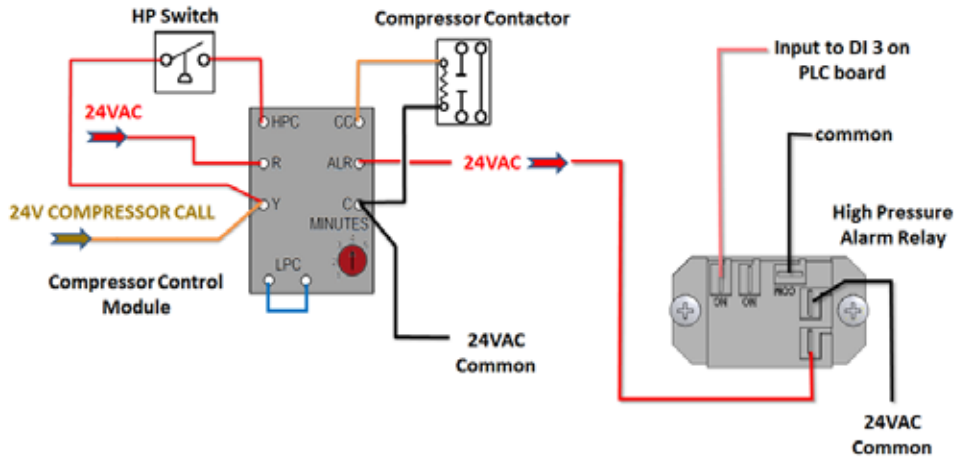


FIGURE 2.10
Blower Motor Start Relay Circuit

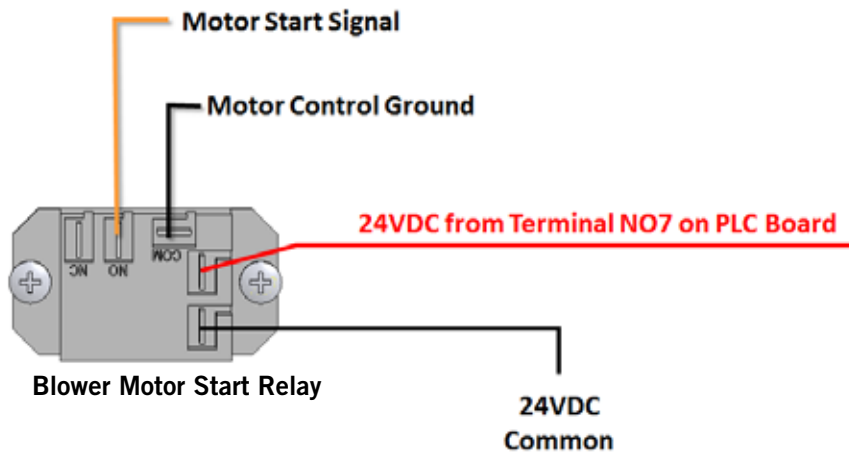
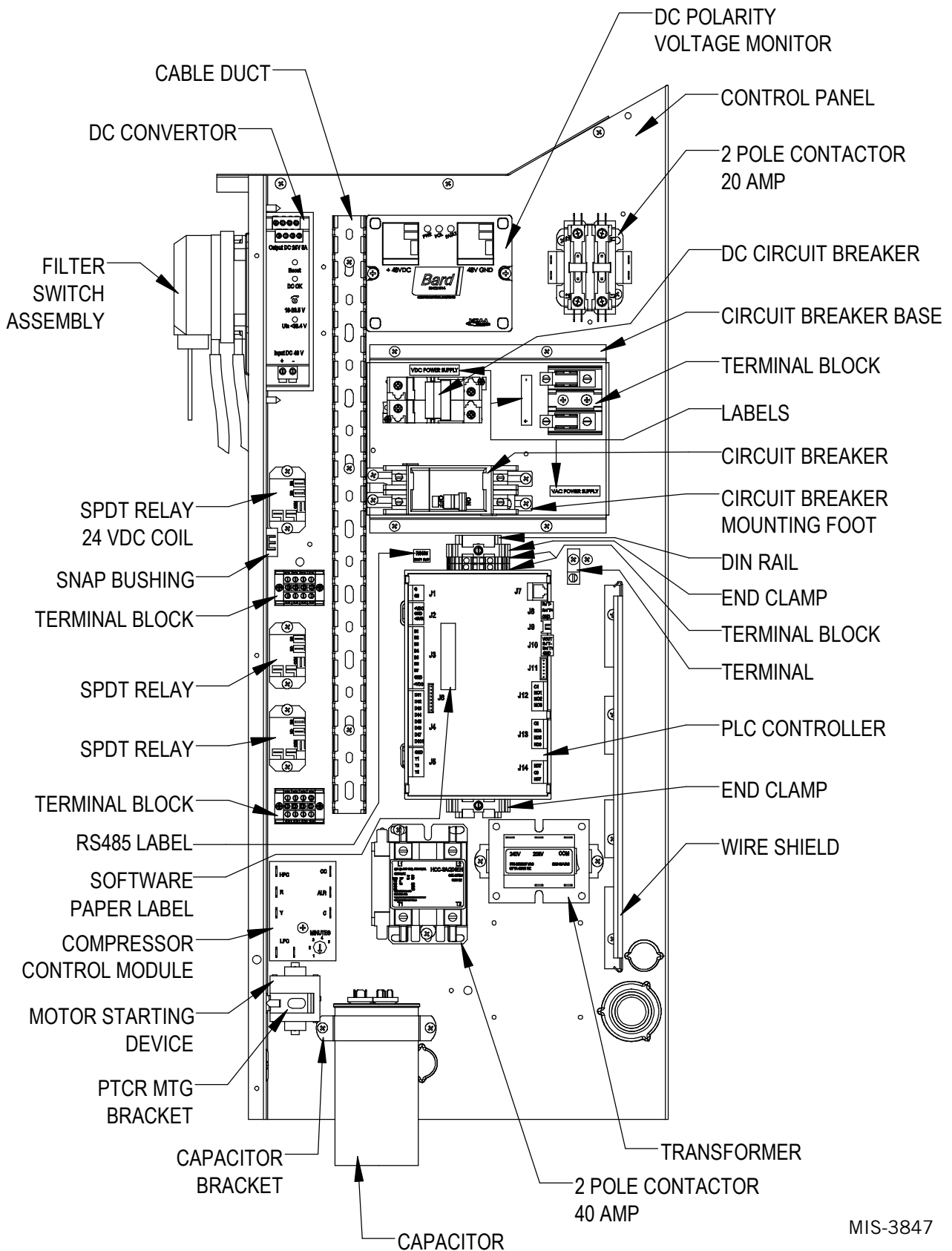
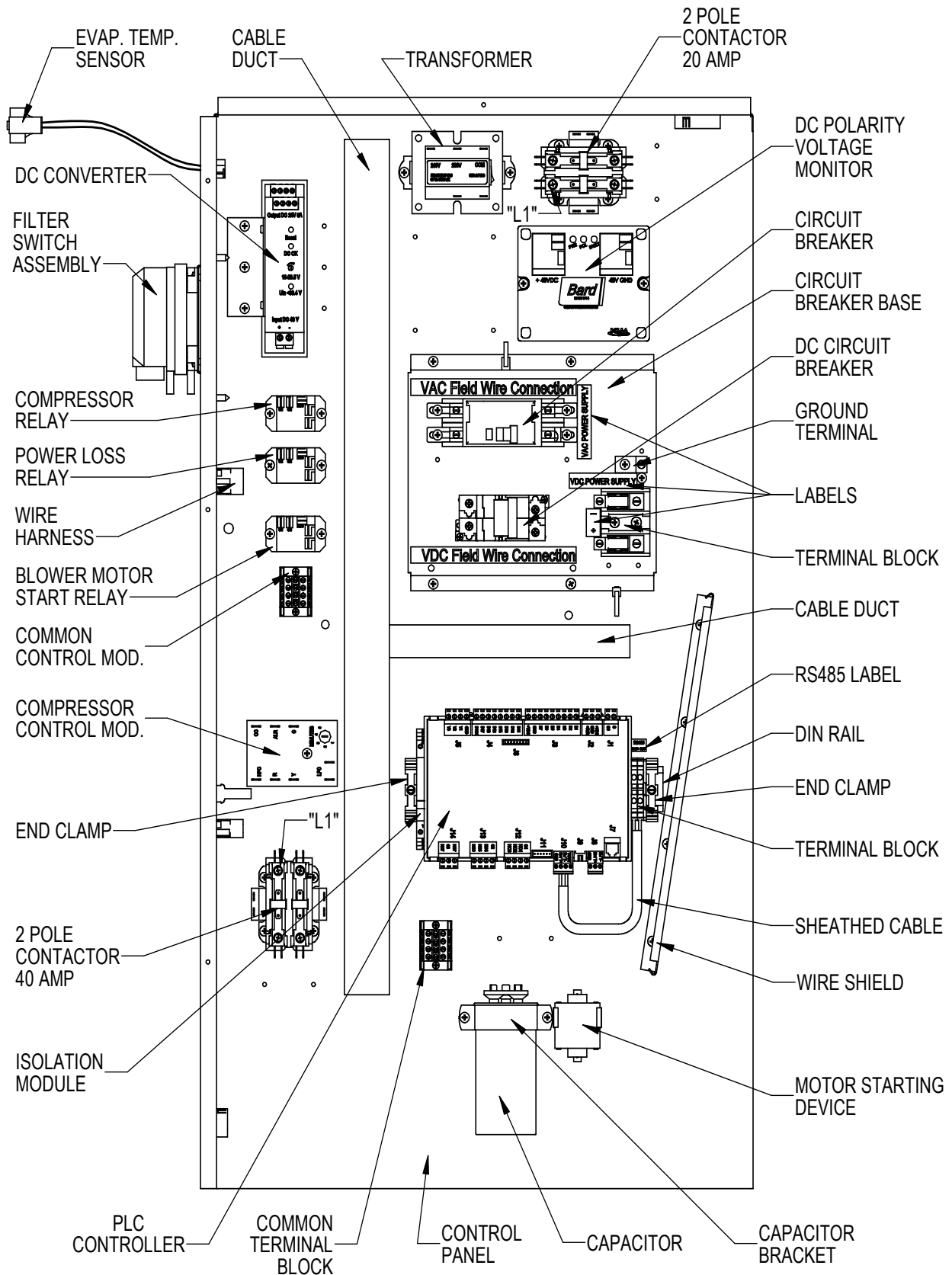


FIGURE 2.11
D25A/L, D35A/L Unit Control Panel



MIS-3847

FIGURE 2.12
D28A/L, D36A/L, D42A/L, D48A/L, D60A/L Unit Control Panel



MIS-3671

FIGURE 2.13
D25A/L, D35A/L Unit Wiring Diagram

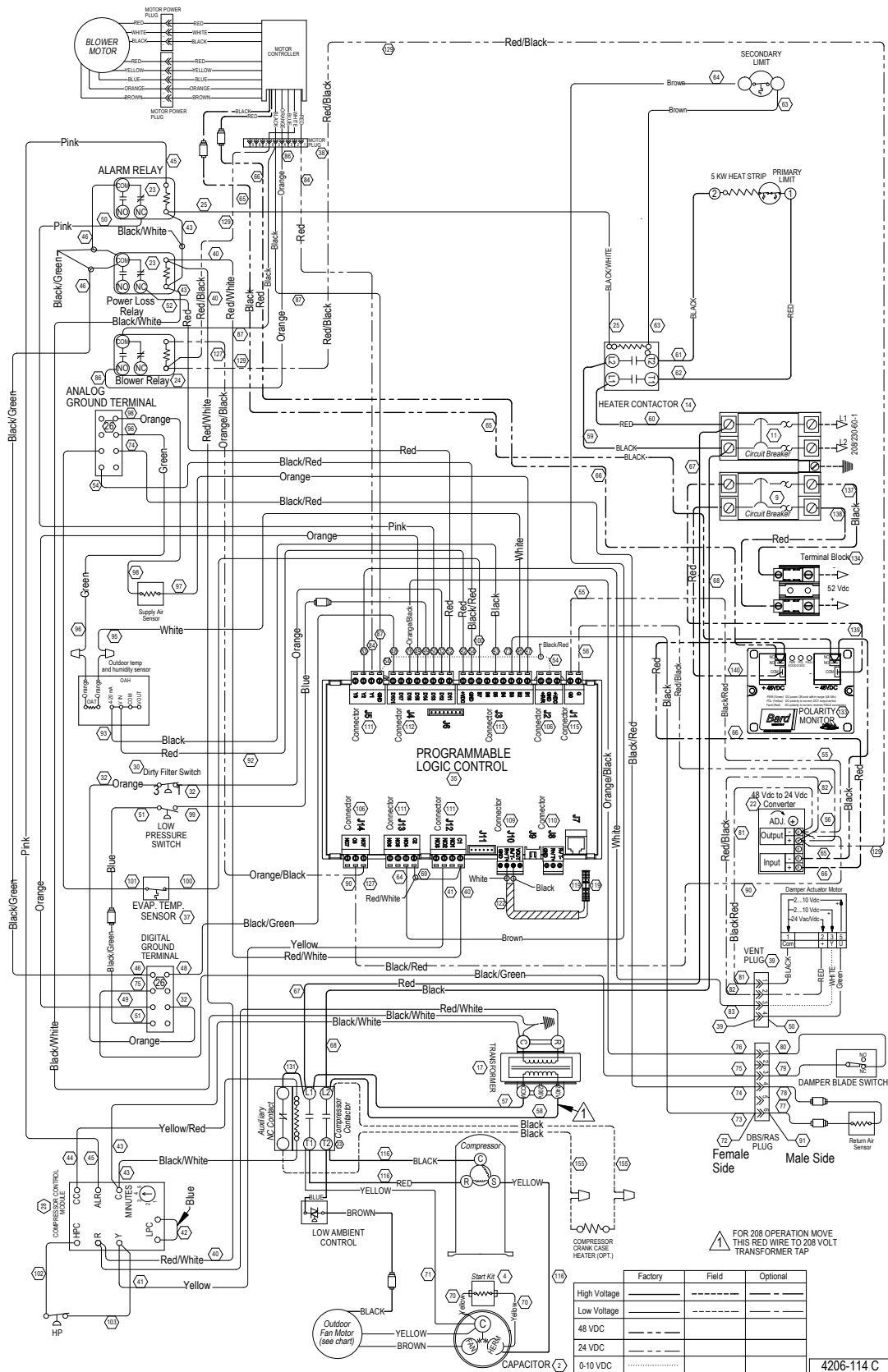
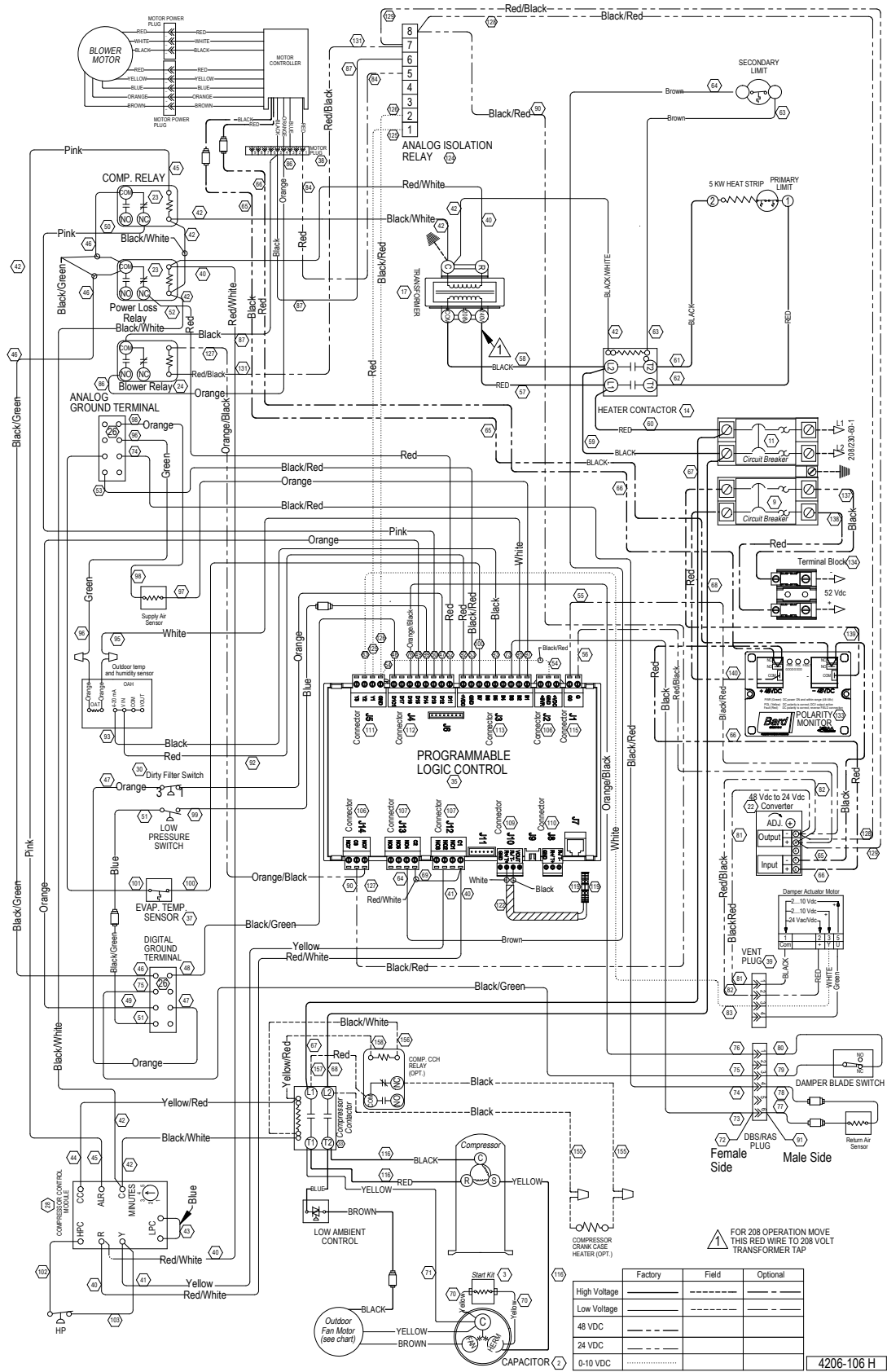


FIGURE 2.14
D28A/L, D36A/L, D42A/L, D48A/L, D60A/L Unit Wiring Diagram



	Factory	Field	Optional
High Voltage			
Low Voltage			
48 VDC			
24 VDC			
0-10 VDC			

4206-106 H

MAINTENANCE AND TROUBLESHOOTING

STANDARD MAINTENANCE PROCEDURES

WARNING

Electrical shock hazard.

Disconnect both VAC and VDC power supplies before servicing.

Failure to do so could result in electric shock or death.

CAUTION

Cut hazard.

Wear gloves to avoid contact with sharp edges.

Failure to do so could result in personal injury.

1. Disable system from LC controller (see controller manual).
2. Turn off both AC and DC breakers at wall-mount units.
3. Check inlet sides of condenser and evaporator coils for obstructions/debris—clean if necessary using a quality manufactured coil cleaning product specific for the evaporator or condenser coil.
 - Condenser coil: Remove the fan shroud/motor/motor bracket as an assembly from the condenser section. This will give clear access to the inlet side of the coil for cleaning. Follow the coil cleaner manufacturer's directions for necessary safety gear and precautions, as well as for application and use. More than one application may be necessary. Rinse thoroughly.
 - Evaporator coil: Remove the evaporator section panel and apply specific evaporator cleaner directly to the inlet side of coil, being very careful not to overspray into insulation or surrounding panels and wiring. Residual cleaner and dissolved debris should drip into the drain pan and leave the unit through the condensate hose. More than one application may be necessary. Rinse thoroughly.
4. Manually spin fan and blower motors to ensure they turn freely. All motors are permanently lubricated, so no oil is necessary.
5. Inspect free cooling damper actuator and linkage.
6. Install new air filter; check for additional filter grilles internal to the structure.
7. Inspect the control panel of the system.
 - Look for insect or rodent activity and remove any nesting materials.
 - Manually push contactor closed, observe for movement—contactor points should have minimal discoloration, no spalling or other signs of arcing. Replace if doubtful.
 - Check field and factory wiring for tightness and look for signs of overheating (discoloration of terminals or wire insulation).
8. Ensure that supply and return registers are not obstructed, and more importantly, are not recycling the air to one another. Adjust supply louvers if necessary to direct discharge air away from any direct route to the return grille.
9. Re-assemble wall-mount unit and turn breakers back on.
10. Enable system from LC controller (see controller manual).
11. Repeat steps for second wall-mount unit.

SPECIFIC TROUBLESHOOTING – 48VDC Blower Motor

To troubleshoot the 48VDC blower motor, check for proper voltage and commands to the motor controller from the wall-mount unit. Under a command for blower,

disconnect the 9-pin Molex plug connecting the motor control to the wall-mount unit control wiring harness (this Molex is located in the chassis wall of the control panel) and test for the items in Table 2.5 (see Figure 2.15 below and Figures 2.16 and 2.17 on page 40).

TABLE 2.5
Troubleshooting the 48VDC Indoor Blower Motor

Motor Controller Molex Plug	Color	Function	Description of Application
1	Red	SPEED INPUT	0-10 VDC input, varying voltage input between 0-10 VDC dictates the motor speed/CFM delivery
2			
3			
4	Orange	RUN	Start Command – a contact closure between this wire and the control ground (Pin 5) will issue and order for the motor to start.
5	Black	CONTROL GROUND	Control Ground for both start-stop function and speed control voltage
6			
7	Red	52 VDC (+)	"+" VDC power supplied to motor
8			
9	Black	52 VDC (-)	"-" VDC power supplied to motor

FIGURE 2.15
Troubleshooting Motor Power Supply

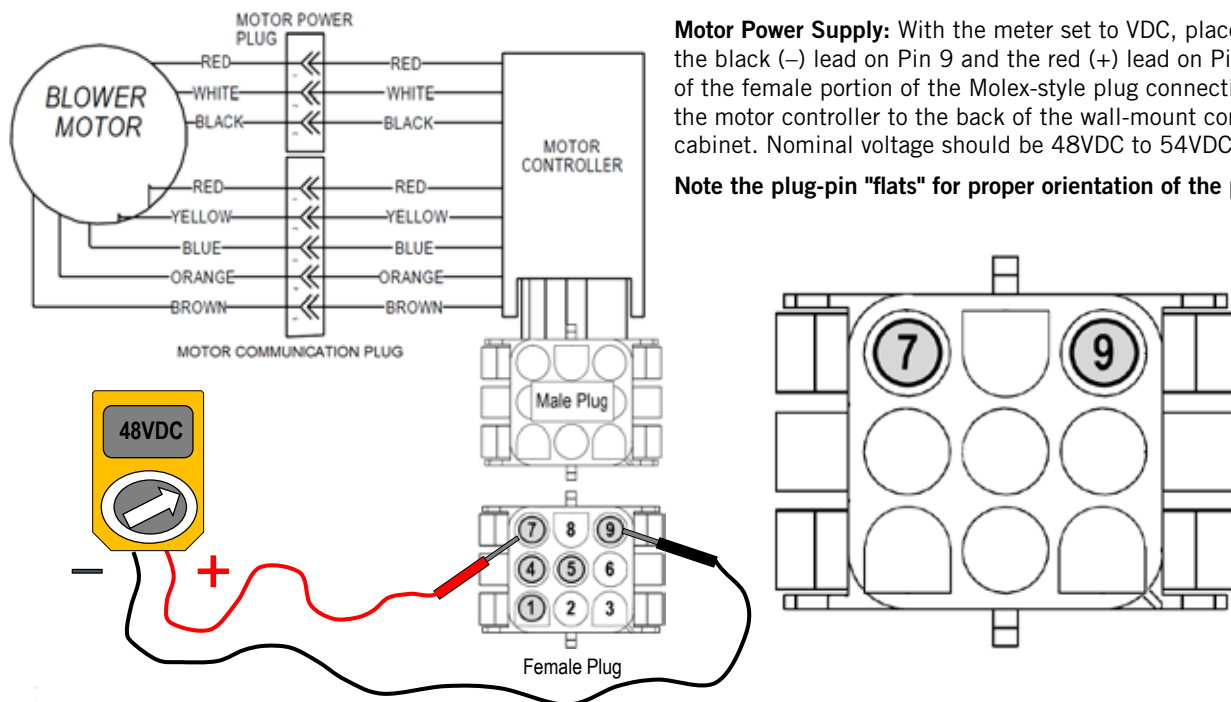
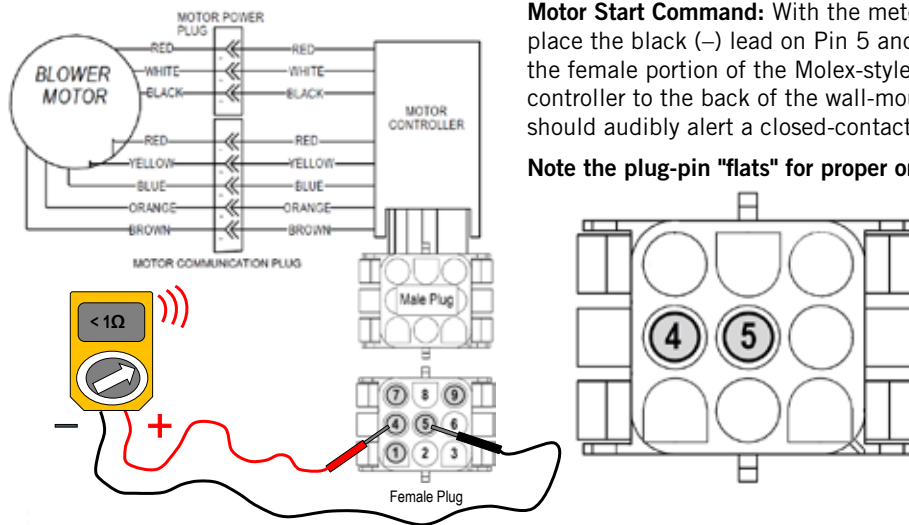


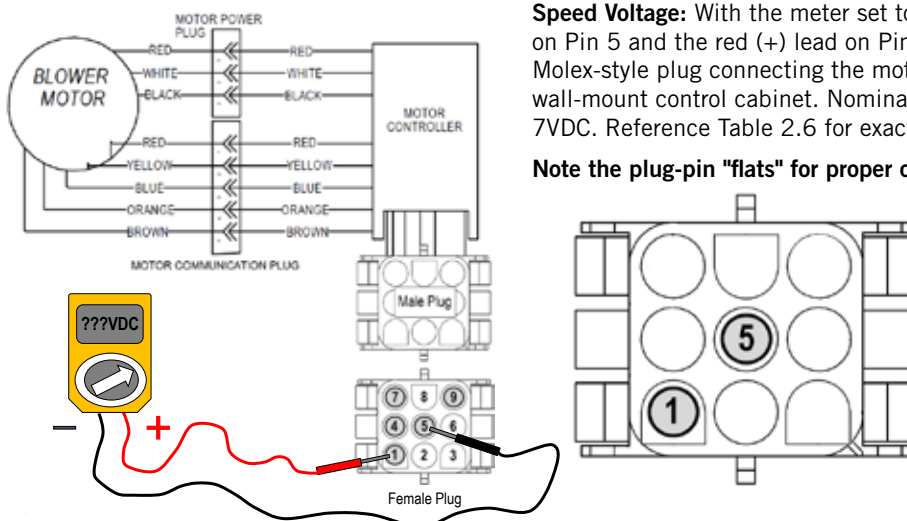
FIGURE 2.16
Troubleshooting Motor Start Command



Motor Start Command: With the meter set to Continuity Beeper, place the black (-) lead on Pin 5 and the red (+) lead on Pin 4 of the female portion of the Molex-style plug connecting the motor controller to the back of the wall-mount control cabinet. Meter should audibly alert a closed-contact condition.

Note the plug-pin "flats" for proper orientation of the plug.

FIGURE 2.17
Troubleshooting Speed Voltage



Speed Voltage: With the meter set to VDC, place the black (-) lead on Pin 5 and the red (+) lead on Pin 1 of the female portion of the Molex-style plug connecting the motor controller to the back of the wall-mount control cabinet. Nominal voltage should be 2.8VDC to 7VDC. Reference Table 2.6 for exact voltage.

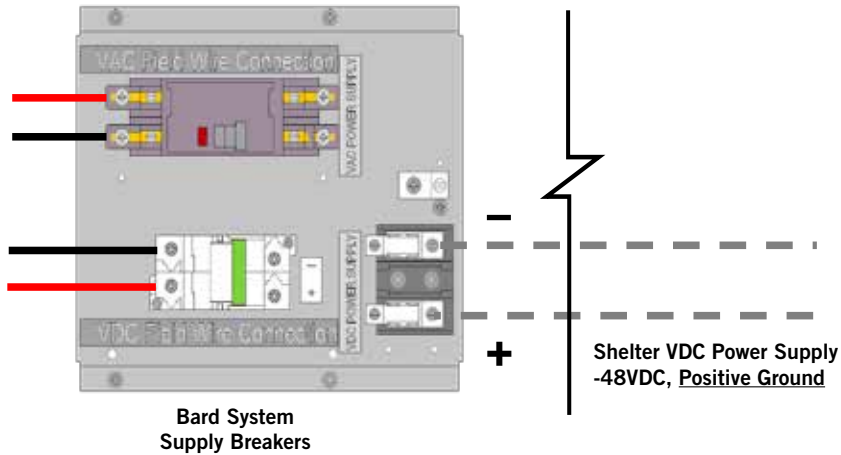
Note the plug-pin "flats" for proper orientation of the plug.

TABLE 2.6
Blower Speed Voltage Chart

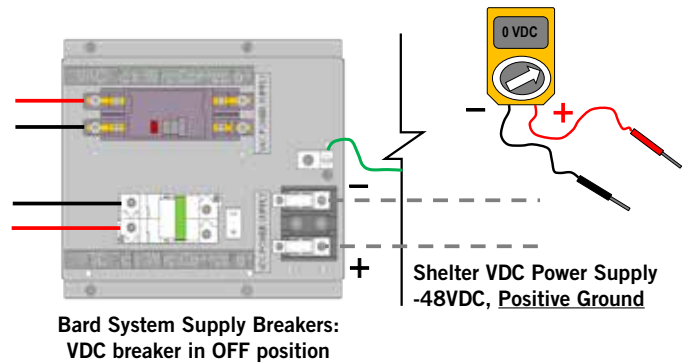
Model	Blower Only	Free Cooling Mode (CFM/VDC Speed Voltage)	Free Cooling Mode Below 40°F (CFM/VDC Speed Voltage)	Cooling (CFM/VDC Speed Voltage)	Electric Heat
D25A/D25L	Same as Free Cooling Mode	1500/6.0	900/2.0	900/2.0	1100/4.0
D28A/D28L			800/2.8	1100/3.8	1800/7.0
D35A/D35L			1100/3.0	1100/6.8	1100/6.8
D36A/D36L			800/2.8	1100/3.8	1800/7.0
D42A/D42L			950/3.1	1250/4.7	1800/7.0
D48A/D48L			1100/3.8	1600/6.3	1800/7.0
D60A/D60L			1100/3.8	1600/6.3	1800/7.0

FIGURE 2.18
VDC Polarity Check

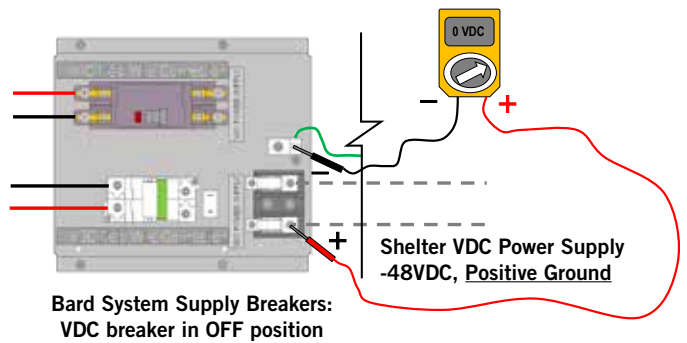
If the VDC wiring is not terminated correctly on the specific polarity-indicated terminals of the VDC terminal block, the VDC controls and motors will not activate and the wall-mounted unit will not function.



Step 1
Multimeter set to VDC:
Display reveals "0" voltage potential



Step 2
Multimeter set to VDC:
Positive-to-ground reveals
"0" voltage potential



Step 3
Multimeter set to VDC:
Negative-to-ground reveals
"-48" voltage potential

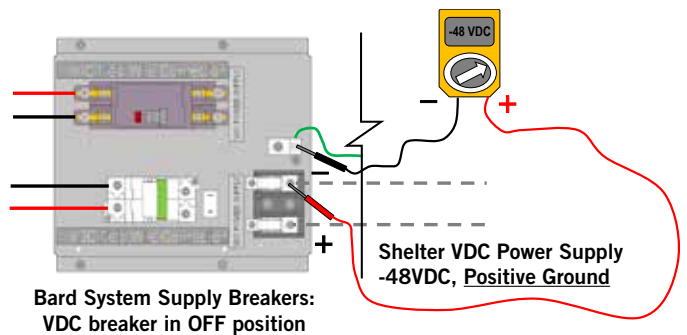
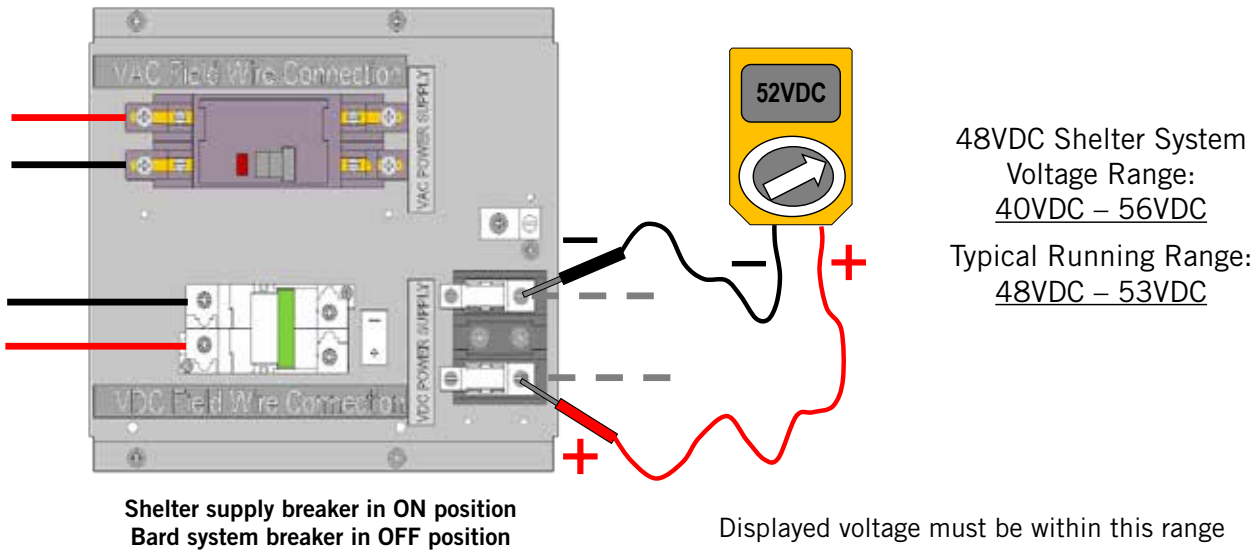


FIGURE 2.19
Verifying Incoming Voltage: VDC

Multimeter set to VDC



TROUBLESHOOTING WALL-MOUNT UNIT ALARMS

In the event that a problem is encountered with a wall-mount unit, the TEC-EYE™ hand-held tool may be used to diagnose the cause. If the problem can't be resolved using these guidelines, contact the BARD Technical Service Department at 419.636.0439 for assistance.

Signal	Description	Possible Cause	Component to Check	Recommended Action	Device Actions
Low Pressure Alarm	Alarm is activated when a low pressure event is present in the refrigeration system and the compressor is running.	Lack of refrigerant	Run the unit and check if the low pressure value is in the normal range.	Charge appropriate amount of refrigeration.	Compressor/ Condensor Fan: Off
		The switch is defective.	Check if the pressure switch is OK.	If defective, replace.	
		Check if the connection to the corresponding input terminal is ok or if the controller board is defective.	Check if the connection is OK. Check is the controller board is OK.	Reconnect the cables. If the controller board is defective, replace.	
High Pressure Alarm	If the alarm activates once or twice in an hour, it is reset automatically. If it occurs three times in an hour, the compressor and condenser fan are locked.	Abnormal site condition	Check open door or for abnormal site condition. Check if the high pressure value is in the normal range.	Clean the condenser.	Compressor/ Condensor Fan: Off
		Condenser fan has failed. The condenser fan speed controller has failed.	Check the condenser fan status while the high pressure is outside the normal setting.	Replace the condenser fan. Replace the condenser low ambient (fan speed) controller.	
		The switch is defective.	Check if the high pressure switch is OK.	If defective, replace.	
		Check if the connection to the corresponding input terminal is ok or if the controller board is defective.	Check if the connection is OK. Check is the controller board is OK.	Reconnect the cables. If the controller board is defective, replace.	
Landline/Shore/ Prime Power Outage	Alarm is reset automatically.	Primary power has gone off.			Indoor Blower: On Compressor/ Condensor Fan: Off Heat: Off Damper: On
Dirty Air Filter Alarm	The alarm is a warning to check the filter. Alarm can only be reset manually.	Filter is clogged.	Check if the filter is dirty.	Clean or replace the filter.	
		Check if the connection to the corresponding input terminal is OK or if the controller board is defective.	Check if the connection is OK.	Reconnect the cable. If the controller board is defective, replace.	
		The value set for the differential air pressure switch is too low.	Check the differential air pressure switch value.	Correct the value of the switch to standard value.	
DC Free Cooling Damper Fails to Open Alarm	Alarm is reset automatically.	DC free cooling damper fails to open.	Check the damper linkage. Check to see if anything is in the way of the damper.		Indoor Blower: On Damper: Off

TROUBLESHOOTING WALL-MOUNT UNIT ALARMS (CONT.)

Signal	Description	Possible Cause	Component to Check	Recommended Action	Device Actions
DC Free Cooling Damper Fails to Close Alarm	Alarm is reset automatically.	DC free cooling damper fails to close.	Check the damper linkage. Check to see if anything is in the way of the damper.		Indoor Blower: On Damper: Off
Communication Failed Alarm	Alarm is reset automatically.	Communication is lost with the LC Series main controller.	Check the RS485 port. Check for damage to the communications cable between the controllers.	Reconnect the communications cable. If the controller board RS485 port is defective, replace.	
Supply Air Temperature Sensor Failed Alarm (B01)	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	Check the supply air temperature sensor wiring. Check temperature vs. resistance of temperature sensor (see Table 2.3 on page 31).	Replace the supply air temperature sensor.	
Outdoor Temperature Sensor Failed Alarm (B02)	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	Check the outdoor temperature sensor wiring. Check temperature vs. resistance of temperature sensor (see Table 2.3 on page 31).	Replace the outdoor temperature sensor.	
Outdoor Humidity Sensor Failed Alarm (B05)	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	Check the humidity sensor wiring.	Replace the humidity sensor.	
Return Air Temperature Sensor Failed Alarm (B03)	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	The alarm is activated if the sensor is faulty, a sensor wire is loose or an out-of-range value is read.	Check the return air temperature sensor wiring. Check temperature vs. resistance of temperature sensor (see Table 2.3 on page 31).	Replace the return air temperature sensor.	

NEED ASSISTANCE?

This document contains the most current product information as of this printing. For the most up-to-date product information, go to www.bardhvac.com where there are links to product specifications, installation instructions, replacement parts manuals and wiring diagrams. Should any assistance be required during the installation or servicing of this product, contact the Bard Technical Service Department at 419.636.0439.

SECTION 3:

APPENDIX

WALL-MOUNT UNIT ARCHITECTURE

CAUTION: The Bard DC Free Cooling Unit System has been pre-programmed with what is widely considered to be the best settings for efficiency and operation. Any changes to internal programming through the LC Series controller or the TEC-EYE™ not covered within this manual may cause the systems to operate improperly, cause internal damage to the HVAC units, cause the shelter to overheat or other very serious consequences. Although complete controller programming architecture for the wall-mount unit controller has been provided, going outside the boundaries of what has been covered in this manual not recommended.

Screen	Menu Item	Range	Default Value	Description
MAIN STATUS SCREEN				
The Status screen is the default screen on startup, and anytime more than 5 minutes has elapsed from last change. (Use UP/DOWN keys to scroll)				Displays current data
	RAT		°F	Current return air temperature
	SAT		°F	Current supply Air temperature
	OAT		°F	Current outdoor air temperature
	OAH		%	Current outdoor air humidity
	Dewpoint		°F	Current temperature of dewpoint
	Blower	Off/On		Displays status of blower
	Damper		%	Displays percentage of current opening
	Master Control		Master Control	Current operational status, "Running Stand Alone" if communication lost
	Status		Unit On	D-Series controller board is currently active, "Off by Keyboard" if disabled by TEC-EYE™
MAIN MENU				
Main Menu screen(s) allows access to operational programming, access by pressing MENU key at any time. (MENU key to enter, use UP/DOWN keys to scroll)				
ON/OFF UNIT				
	Unit Address		1	Physical address of controller
	Power by Display	On/Off	On	
	Status		Blower	"OFF by Keyboard" system has been turned off at controller
End of ON/OFF UNIT				
SETPOINTS		All setpoint changes are limited to 60 minutes		
	Cooling Setpoint	65°F – 90°F	77°F	
	Heating Setpoint	52°F – 75°F	52°F	
	Heating Stg. Diff.	1°F – 5°F	2°F	
	Setpoint			Heading
	Stage 1 Differential On	-99 – 99	11	Differential that stage 1 cooling activates
	Stage 1 Differential Off	-99 – 99	-3	Differential that stage 1 cooling deactivates
	Stage 2 Differential On	-99 – 99	13	Differential that stage 2 cooling activates
	Stage 2 Differential Off	-99 – 99	-3	Differential that stage 2 cooling deactivates
	Stage 3 Differential On	-99 – 99	15	Differential that stage 3 cooling activates
	Stage 3 Differential Off	-99 – 99	-3	Differential that stage 3 cooling deactivates
	FreeCool	55°F, 57°F, 59°F, 61°F	55°F	

Screen	Menu Item	Range	Default Value	Description
	DC OA-Return Diff.	0°F – 99.9°F	7°F	
	Supply Temp Low Limit	28°F – 65°F	35°F	
	Differential	0°F – 99.9°F	20°F	
	Damper Time	0-999	150 seconds	Time allotted before damper fail is realized
	Runtest Time	0-999	60 seconds	
	Freeze Temp Low Limit	0°F – 99.9°F	30°F	Temperature sensed by Freezestat which initiates compressor shutdown
	Reset Temperature	0°F – 99.9°F	55°F	Temperature sensed by Freezestat which cancels compressor shutdown
	Reset Time	0-999	300 seconds	Time allotted which will also cancel compressor shutdown
	Blower Settings			
	Continuous	None/Both/Lead	Lead	
	Blower Speeds			
	Heat	0.0 – 7.6V	7.0V	Control voltage supplied from wall-mount unit control boards to blower in heat
	Econ	0.0 – 7.6V	7.0V	Control voltage supplied from wall-mount unit control boards to blower in regular DC free cooling
	Econ Low Temp	0.0 – 7.6V	3.8V	Control voltage supplied from wall-mount unit control boards to blower in low ambient condition DC free cooling
	Full Load	0.0 – 7.6V	6.3V	Control voltage supplied from wall-mount unit control boards to blower in mechanical cooling
	Low Pressure Setup			
	Outside Setpoint	0°F – 99.9°F	55°F	Temperature at which control separates two (2) different low pressure situations
	Differential	0°F – 9.9°F	5°F	This differential applies to the outside setpoint
	Above Setpoint Delay	0-999	120 seconds	Any low pressure situation above the outside setpoint will be delayed 120 seconds before an alarm is initialized
	Below Setpoint Delay	0-999	180 seconds	Any low pressure situation below the outside setpoint will be delayed 180 seconds before an alarm is initialized
	Time btwn 2 1p	0-999	15 minutes	
	Fieldbus Address	0-999	11	
	Compressor Timers			
	Minimum Off	0-999	0	Once stopped, the compressor remains inactive for this period of time
	Minimum On	0-999	30 seconds	Once started, the compressor remains on for this period of time
	Comp Stage Delay	0-999	0	Minimum run time for first stage of two-stage compressors

WALL-MOUNT UNIT ARCHITECTURE (CONT.)

Screen	Menu Item	Range	Default Value	Description
	Modulating Setup			
	Damper			
		DIR/REV Both		
	Cntrl: DIR P+1	P/P+I/PID		
	Band	0-999	75	
	Deadband	99.9	0	
	Int.	0-999	120 seconds	
	Minimum	0-999	0	
	Maximum	-1000 – 1000	1000	
	Period	500 – 9999mS	500mS	
End of SETPOINTS				
	CLOCK/SCHEDULER			
	Clock			
	Time			
	Date		(Current date)	
	Hour	1:00 – 24:00	(Current time)	
	Day	Mon. – Fri.	(Current day of week)	
	Daylight Savings Time	Enable/Disable	Enable	System clock will follow DST Protocol, "Disable" if desired
	Transition Time	0-240	60 minutes	
	Start:	First, Second, Third, Fourth, Last	Last	
		Sunday – Saturday	Sunday	
		January – December	March	
		0:00 – 12:00	2:00	
	End: F in at 0.00 - 12.00	irst, Second, Third, Fourth, Last	Last	
		Sunday – Saturday	Sunday	
		January – December	October	
		0:00 – 12:00	3:00	
End of CLOCK/SCHEDULER				
	INPUTS/OUTPUTS			
	Analog Inputs			
	Supply Air Temp Input B001		(Current SAT)	
	Outdoor Air Temp Input B002		(current OAT)	
	Return Air Temp Input B003		(Current RAT)	

Screen	Menu Item	Range	Default Value	Description
	Outdoor Humidity Input B005		(Current %RH)	
	Freezestat Input B007		(Current Freezestat temp)	
	Digital Inputs			
	Power Loss DI 1 Status		Open	
	Filter Switch DI 2 Status		Open	
	High Pressure Switch DI 3 Status		Open	
	Low Pressure Switch DI4 Status		Open	
	Blower DI 5 Status		Open	
	Damper Switch DI 6 Status		Open	
	Relay Outputs			
	Cooling Stage 1 Relay 2 Status		Off	
	Cooling Stage 2 Relay 3 Status		Off	
	Heating Relay 4 Status		Off	
	Blower Relay 7 Status		Off	
	Analog Outputs			
	Analog Output 1 Blower Motor		0.00vdc	
	Analog Output 2 Damper		2.70vdc	
End of INPUTS/OUTPUTS				
	ALARM HISTORY			
	020: Damper Close Fail			
	Supply Air			
	Outdoor Air			
	Return Air			
	Outdoor Humidity			
	Blower Speed			
	Damper Position			
End of ALARM HISTORY				
	TECHNICIAN			
	Information			
	Bard Code	-3276.8 – 3276.7	Unit Controller	
	Version	0-99	1.20	
	Bios	0-99	6.33	
	Boot	0-99	4.05	
	FLSH 2048	9999		Internal memory specifications
	RAM 512	999		
	OMB	0-9		

WALL-MOUNT UNIT ARCHITECTURE (CONT.)

Screen	Menu Item	Range	Default Value	Description
	T memory writes	0-32767		
	4.8 cycle/s	0-9999		
	Power Cycle Status			
	Last On Time	0-99		
	Last Off Time	0-99		
	Length Time Off	0-32767		
	Days: ### Hrs: ### Min: ###	32767/32767/ 32767		
	Working Hours			
	Run Hours	-3276.8 – 3276.7		
	Compressor			
	Run Hours	-3276.8 – 3276.7		Hours of operation
	Num Starts	-3276.8 – 3276.7		Number of starts
	Compressor Full Load			
	Run Hours	-3276.8 – 3276.7		Hours of operation
	Num Starts	-3276.8 – 3276.7		Number of starts
	Free Cool			
	Run Hours	-3276.8 – 3276.7		Hours of operation
	Num Starts	-3276.8 – 3276.7		Number of starts
	Heat			
	Run Hours	-3276.8 – 3276.7		Hours of operation
	Num Starts	-3276.8 – 3276.7		Number of starts
	Blower			
	Run Hours	-3276.8 – 3276.7		Hours of operation
	Num Starts	-3276.8 – 3276.7		Number of starts
	Service Settings			
	Control Loops			
	Modulating Setup Damper			
	Input	0-999		
	Output	0-9	0	
	Setpoint	0-99.9	55	
	Band	1.0 – 999.9	75	
	Integration Time	1-999	120	
	Delays			

Screen	Menu Item	Range	Default Value	Description
	Damper Alarm Delays			
	Fail to Open	0 – 999s	20s	
	Fail to Close	0 – 999s	300s	
	Freezer Start	0 – 999s	120s	
	Freecoll Cp	0 – 999s	90s	
	Run Test			
	Run Test Time	0 – 999s	60s	
	Enable	Yes/No	No	
	Language			
	Language	0-1	English	
	Probe Adjustment			
	Analog Inputs			
	SAT Input B001			
	Offset	-9.9 – 9.9	0	
	Value	-3276.8 – 3276.7		
	OAT Input B002			
	Offset	-9.9 – 9.9	0	
	Value	-3276.8 – 3276.7		
	RAT Input B003			
	Offset	-9.9 – 9.9	0	
	Value	-3276.8 – 3276.7		
	Outdoor Air Humidity Input B005			
	Offset	-9.9 – 9.9	0	
	Value	-3276.8 – 3276.7		
	Freezestat Input B007			
	Offset	-9.9 – 9.9	0	
	Value	-3276.8 – 3276.7		
	Manual Management			
	Analog Inputs			
	Supply Air Temp			
	Manual Control B001	Off/On	Off	On to manually change temperature seen by controller
	Manual Position	-1000 – 1000	0	Degrees of change in sensor for manual control
	Value		(Temp + Value)	Current temperature plus the value in manual position
	Outdoor Air Temp			
	Manual Control B002	Off/On	Off	On to manually change temperature seen by controller

WALL-MOUNT UNIT ARCHITECTURE (CONT.)

Screen	Menu Item	Range	Default Value	Description
	Manual Position	-1000 – 1000	0	Degrees of change in sensor for manual control
	Value		(Temp + Value)	Current temperature plus the value in manual position
	Return Air Temp			
	Manual Control B003	Off/On	Off	On to manually change temperature seen by controller
	Manual Position	-1000 – 1000	0	Degrees of change in sensor for manual control
	Value		(Temp + Value)	Current temperature plus the value in manual position
	Outdoor Humidity			
	Manual Control B005	Off/On	Off	On to manually change temperature seen by controller
	Manual Position	-1000 – 1000	0	Degrees of change in sensor for manual control
	Value		(% RH + Value)	Current %RH plus the value in manual position
	Freeze			
	Manual Control B007	Off/On	Off	On to manually change temperature seen by controller
	Manual Position	-1000 – 1000	0	Degrees of change in sensor for manual control
	Value		(Temp + Value)	Current temperature plus the value in manual position
	Digital Inputs			
	Power Loss			
	Manual DI 1	Off/On	Off	"On" to allow artificial manipulation power loss input
	Manual Position	Closed/Open	Closed	Change to "Open" to artificially create power loss input
	D1 Status			Current status of power loss input (closed means no input)
	Filter Switch			
	Manual DI 2	Off/On	Off	"On" to allow artificial manipulation filter switch input
	Manual Position	Closed/Open	Closed	Change to "Open" to artificially create filter switch input
	D2 Status			Current status of filter switch input (closed means no input)
	High Pressure Switch			
	Manual DI 3	Off/On	Off	"On" to allow artificial manipulation of high pressure switch input
	Manual Position	Closed/Open	Closed	Change to "Closed" to artificially create high pressure input
	D3 Status			Current status of high pressure input (open means no input)

Screen	Menu Item	Range	Default Value	Description
	Low Pressure Switch			
	Manual DI 4	Off/On	Off	"On" to allow artificial manipulation of low pressure switch input
	Manual Position	Closed/Open	Closed	Change to "Closed" to artificially create low pressure input
	D4 Status			Current status of low pressure input (open means no input)
	Blower Status			
	Manual DI 5	Off/On	Off	"On" to allow artificial manipulation of blower status input
	Manual Position	Closed/Open	Closed	Change to "Closed" to artificially create blower status input
	D5 Status			Current status of blower status input (open means no input)
	Damper Switch			
	Manual Status DI 6	Off/On	Off	"On" to allow artificial manipulation of damper switch status input
	Manual Position	Closed/Open	Closed	Change to "Closed" to artificially create damper switch status input
	D3 Status			Current status of damper switch status input (open means no input)
	Relay Outputs			
	Cooling Stg 1			
	Manual Relay 2	Off/On	Off	"On" to allow artificial manipulation of cooling stage 1 relay action
	Manual Position	Off/On	Off	Change to "On" to artificially force cooling stage 1 relay
	Relay 2 Status	Off/On	Off	Current status of cooling stage 1 relay (off means no relay action)
	Cooling Stg 2			
	Manual Relay 3	Off/On	Off	"On" to allow artificial manipulation of cooling stage 2 relay action
	Manual Position	Off/On	Off	Change to "On" to artificially force cooling stage 2 relay
	Relay 3 Status	Off/On	Off	Current status of cooling stage 2 relay (off means no relay action)
	Heating			
	Manual Relay 6	Off/On	Off	"On" to allow artificial manipulation of heating relay action
	Manual Position	Off/On	Off	Change to "On" to artificially force heating relay
	Relay 6 Status	Off/On	Off	Current status of heating relay (off means no relay action)
	HVAC 2 Fail Alarm			
	Manual Relay 4	Off/On	Off	
	Manual Position	Off/On	Off	
	Relay 4 Status	Off/On	Off	

WALL-MOUNT UNIT ARCHITECTURE (CONT.)

Screen	Menu Item	Range	Default Value	Description
	Blower			
	Manual Relay 7	Off/On	Off	"On" to allow artificial manipulation of blower relay action
	Manual Position	Off/On	Off	Change to "On" to artificially force blower relay
	Relay 7 Status	Off/On	Off	Current status of blower relay (off means no relay action)
	Analog Outputs			
	Analog Output 1			
	Blower Motor			
	Mode	Hand/Auto	Auto	
	Manual Value	0.0 – 10.0vdc	0vdc	
	Output	0.0 – 10.0vdc		
	Analog Output 2			
	Damper			
	Mode	Hand/Auto	Auto	
	Manual Value	0.0 – 10.0vdc	0vdc	
	Output	0.0 – 10.0vdc		
End of TECHNICIAN				
	FACTORY			
	Initialization			
	Passwords			
	Insert new passwords			
	User		2000	
	Technician (PW1)		1313	
	Factory (PW2)		9254	
	Configuration			
	Temperature Units	°F/°C	°F	
	Pressure Units	psi/bar	psi	
	Force Clock Enable	Yes/No	Yes	
	Clock Mode	24h/12h	24 hour	
	Disable Buzzer	Yes/No	Yes	
	Startup Delay	0s – 9999s	1 second	
	Enable Unit			
	by digit input	On/Off	On	
	by supervisor	On/Off	Off	
	by pLAN network	On/Off	On	
	by schedule	On/Off	Off	
	Analog Input Fitering			
	Enable	No/Yes	No	
	Input 1	4s – 256ms	19 seconds	
	Input 2	4s – 256ms	19 seconds	
	Input 3	4s – 256ms	19 seconds	

Screen	Menu Item	Range	Default Value	Description
	Input 4	4s – 256ms	19 seconds	
	Input 5	4s – 256ms	19 seconds	
	Factory Settings			
	Manual Control Reset			
	Enable	Yes/No	Yes	
	Time	0m – 500m	60m	
	Local Setpoint Reset	0m – 180m	60m	
	PW/Return Delay	0s – 9999s	300s	
	I/O Configuration			
	Analog Inputs			
	Supply Air Temp			
	Enable B001	On/Off	On	
	Resolution	Normal/High Res.		
	Type	Ohm x5, Ohm x1, NTC, PT1000, 0-1VDC, 0-10VDC, 4-20mA, On/Off, 0-4VDC, NTC HT, 50T90, 10T170, nu10, SPKP00B7T0, nu12, nu13	Normal Ohm x5	
	Minimum	-3276.8 – 3276.7	0.0	
	Maximum	-3276.8 – 3276.7	100.0	
	Offset	-3276.8 – 3276.7	0.0	
	Value	-3276.8 – 3276.7		
	Supply Air Temp			
	Input B001	###		
	Out of Range Alarm			
	Power Delay	0s – 999s	5 Seconds	
	Run Delay	0s – 999s	5 Seconds	
	Units	Pressure/ Temperature/ Other		
	Outdoor Air Temp			
	Enable B002	On/Off	On	
	Resolution	Normal/High Res.		

WALL-MOUNT UNIT ARCHITECTURE (CONT.)

Screen	Menu Item	Range	Default Value	Description
	Type	Ohm x5, Ohm x1, NTC, PT1000, 0-1VDC, 0-10VDC, 4-20mA, On/Off, 0-4VDC, NTC HT, 50T90, 10T170, nu10, SPKP00B7T0, nu12, nu13	Normal Ohm x5	
	Minimum	-3276.8 – 3276.7	0.0	
	Maximum	-3276.8 – 3276.7	100.0	
	Offset	-3276.8 – 3276.7	0.0	
	Value	-3276.8 – 3276.7		
	Outdoor Air Temp			
	Input B002			
	Out of Range Alarm			
	Power Delay	0s – 999s	5 Seconds	
	Run Delay	0s – 999s	5 Seconds	
	Units	Pressure/ Temperature/ Other	Temperature	
	Return Air Temp			
	Enable B003	On/Off	On	
	Resolution	Normal/High Res.		
	Type	Ohm x5, Ohm x1, NTC, PT1000, 0-1VDC, 0-10VDC, 4-20mA, On/Off, 0-4VDC, NTC HT, 50T90, 10T170, nu10, SPKP00B7T0, nu12, nu13	Normal Ohm x5	
	Minimum	-3276.8 – 3276.7	0.0	
	Maximum	-3276.8 – 3276.7	100.0	
	Offset	-3276.8 – 3276.7	0.0	
	Value	-3276.8 – 3276.7		
	Return Air Temp			
	Input B003			
	Out of Range Alarm			

Screen	Menu Item	Range	Default Value	Description
	Power Delay	0s – 999s	5 Seconds	
	Run Delay	0s – 999s	5 Seconds	
	Units	Pressure/ Temperature/ Other	Temperature	
	Outdoor Humidity			
	Enable B005	On/Off	On	
	Resolution	Normal/High Res.		
	Type	Ohm x5, Ohm x1, NTC, PT1000, 0-1VDC, 0-10VDC, 4-20mA , On/Off, 0-4VDC, NTC HT, 50T90, 10T170, nu10, SPKP00B7T0, nu12, nu13	Normal 4-20mA	
	Minimum	-3276.8 – 3276.7	0.0	
	Maximum	-3276.8 – 3276.7	100.0	
	Offset	-3276.8 – 3276.7	0.0	
	Value	-3276.8 – 3276.7		
	Outdoor Humidity			
	Input B005			
	Out of Range Alarm			
	Power Delay	0s – 999s	5 Seconds	
	Run Delay	0s – 999s	5 Seconds	
	Units	Pressure/ Temperature/ Other		
	Freeze			
	Enable B007	On/Off	On	
	Resolution	Normal/High Res.		
	Type	Ohm x5, Ohm x1, NTC, PT1000, 0-1VDC, 0-10VDC, 4-20mA , On/Off, 0-4VDC, NTC HT, 50T90, 10T170, nu10, SPKP00B7T0, nu12, nu13	Normal 4-20mA	
	Minimum	-3276.8 – 3276.7	0.0	

WALL-MOUNT UNIT ARCHITECTURE (CONT.)

Screen	Menu Item	Range	Default Value	Description
	Maximum	-3276.8 – 3276.7	100.0	
	Offset	-3276.8 – 3276.7	0.0	
	Value	-3276.8 – 3276.7		
	Outdoor Humidity			
	Input B007			
	Out of Range Alarm			
	Power Delay	0s – 999s	5 Seconds	
	Run Delay	0s – 535s	5 Seconds	
	Units	Pressure/ Temperature/ Other	Pressure	
	Digital Inputs			
	Power Loss Switch			
	Enable Channel 1	On/Off	On	
	Action	Closed/Open	Closed	
	Delay	0s – 999s	0 Seconds	
	Status			
	Filter Switch			
	Enable Channel 2	On/Off	On	
	Action	Closed/Open	Closed	
	Delay	0s – 999s	1 Second	
	Status			
	High Pressure Switch			
	Enable Channel 3	On/Off	On	
	Action	Closed/Open	Open	
	Delay	0s – 999s	0 Seconds	
	Status			
	Low Pressure Switch			
	Enable Channel 4	On/Off	On	
	Action	Closed/Open	Open	
	Delay	0s – 999s	0 Seconds	
	Status			
	Blower Status			
	Enable Channel 5	On/Off	On	
	Action	Closed/Open	Closed	
	Delay	0s – 999s	0 Seconds	
	Status			
	Damper Switch			
	Enable Channel 6	On/Off	On	
	Action	Closed/Open	Closed	
	Delay	0s – 999s	0 Seconds	

Screen	Menu Item	Range	Default Value	Description
	Status			
	Relay Outputs			
	Cooling Stage 1			
	Enable	No/Yes	Yes	
	Channel	2		
	Direction	N.O./N.C.	N.O.	
	Status		Off	
	Cooling Stage 2			
	Enable	No/Yes	Yes	
	Channel	3		
	Direction	N.O./N.C.	N.O.	
	Status		Off	
	Heating			
	Enable	No/Yes	Yes	
	Channel	4		
	Direction	N.O./N.C.	N.O.	
	Status		Off	
	Blower			
	Enable	No/Yes	Yes	
	Channel	7		
	Direction	N.O./N.C.	N.O.	
	Status		Off	
	Analog Outputs			
	Blower Motor			
	Enable	Yes/No	Yes	
	Channel	1/0	1	
	Action	Direct/Reverse	Direct	
	Minimum	0 – 10v	0v	
	Maximum	0 – 10v	10v	
	Damper			
	Enable	Yes/No	Yes	
	Channel	2/0	2	
	Action	Direct/Reverse	Direct	
	Minimum	0 – 10v	2.7v	
	Maximum	0 – 10v	10v	
	Factory Settings			
	Damper Delay Test			
	Enable	Yes/No	Yes	
	Voltage	0 – 10v	2.5v	
	Time	0s – 999s	30 seconds	
	Blower Status Switch			
	Minimum Off	0s – 999s	45 seconds	

WALL-MOUNT UNIT ARCHITECTURE (CONT.)

Screen	Menu Item	Range	Default Value	Description
	Unit Controller			
	Serial Number	000000000000000		Wall-mount unit serial number
	Model Number	60 X		Wall-mount unit model number
<i>End of FACTORY</i>				