

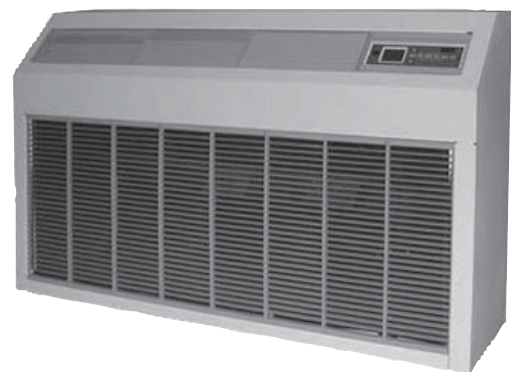


UNHV

Variable Speed Ductless Split System Air Handler

Straight Cool / Heat Pump Nominal Capacities					
UNHV09	UNHV12	UNHV18	UNHV24	Units	
9,000	12,000	18,000	24,000	Btuh	COOL
2.6	3.5	5.3	7.0	kW	
8,800	10,000	18,000	21,000	Btuh	HEAT
2.5	2.6	5.0	5.6	kW	

Installation, Operation and Maintenance Manual



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P/N# 240009098, Rev. C [08/08/2012]

EMI  **Ductless**

Comfort Where It Counts.



An ISO 9001-2008 Certified Company

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Check our website frequently for updates: www.enviromaster.com

Information and specifications outlined in this manual in effect at the time of printing of this manual. Manufacturer reserves the right to discontinue, change specifications or system design at any time without notice and without incurring any obligation, whatsoever.

RECEIVING INFORMATION

**Shipping damage MUST be reported to the carrier IMMEDIATELY.
Examine exterior.**

Remove cover and examine compressor and piping for signs of damage.

General Information

Installation shall be completed by qualified agency. Retain this manual and warranty for future reference.

Installer review this manual to verify unit has been installed correctly. Run unit for one complete cycle to verify proper function.

To obtain technical service or warranty assistance during or after installation, contact your local representative.

Visit our web site www.enviromaster.com for local representative listing.

For further assistance call 1-800-325-5479.

When calling for assistance, please have following information ready:

Model Number _____

Serial Number _____

Date of installation _____

IMPORTANT SAFETY INFORMATION

All field wiring shall conform to requirements of authority having jurisdiction or in absence of such requirements:

- United States - National Electrical Code, ANSI/NFPA 70
- Canada - CSA C22.1 Canadian Electrical Code Part 1.

WARNING

Fire and electrical shock hazard. Improper assembly and/or installation could result in death or serious injury. Read this manual and understand all requirements before beginning installation.



**Become Familiar With Symbols
Identifying Potential Hazards.**

DANGER

Indicates a hazardous situation which, if not avoided, WILL result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information which should be followed to ensure proper installation and operation.

Safety Information

- Installation by qualified personnel.
- Turn off electrical supply before servicing unit.
- Inspect all parts for damage prior to installation and start-up.

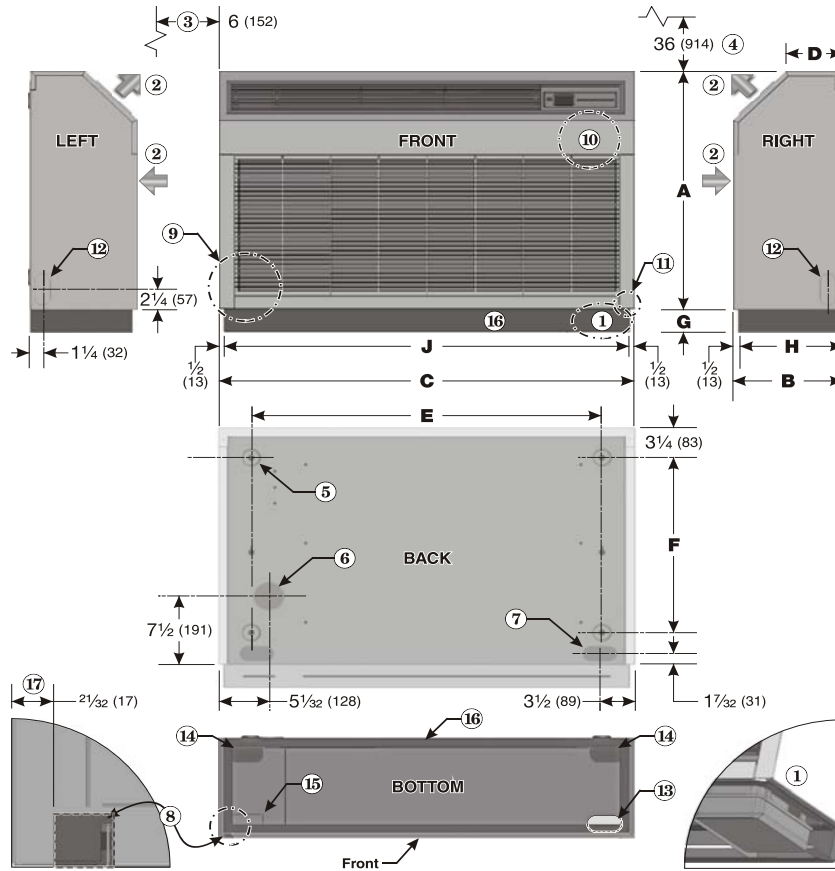
Do not use unit if it has damaged wiring, is not working properly, or has been damaged or dropped.

- Connect to properly grounded electrical supply with proper voltage as stated on rating plate.
- Have proper over-current protection (i.e. time- delay fuse/HACR Breaker) as listed on Rating Plate.
- Connect unit to properly grounded electrical supply. Do not fail to properly ground this unit.
- Check the rating plate on the unit before installation to verify voltage shown is same as electric supply to the unit. Rating plate is located on top panel only.
- Tampering voids all warranties.

WARNING

Tampering with this unit is dangerous and could result in serious injury or death. Do not modify or change this unit.

Figure 1 - Dimensions, Openings And Knockouts



DIMENSIONS — Inches (mm)									
Model	A	B	C	D	E	F	G	H	J
UNHV09/12	26" (660)	11" (279)	41 1/2" (1054)	5 1/2" (140)	35" (887)	19 3/16" (487)	2 1/2" (64)	10 7/16" (265)	40 1/2" (1029)
UNHV18/24	26" (660)	11" (279)	51 1/2" (1308)	5 1/2" (140)	45" (1141)	19 3/16" (487)	2 1/2" (64)	10 7/16" (265)	50 1/2" (1283)

- Optional condensate pump floor mount location (requires toe kick kit).
- Supply and return air flow directions.
- Minimum clearance for air flow and access — BOTH sides of cabinet.
- Minimum clearance — insure minimum clearance of 36" (914 mm) above supply air outlet and in front of return air inlet for air flow and access.
- Clearance holes (4) for securing unit to wall or ceiling, using appropriate hardware 11/16" diameter.
- Knockout, 3" (76 mm), for optional customer supplied/installed fresh air intake device.
- 1 5/8" x 3 3/8" knockout each side of rear panel for refrigeration tubing, condensate drainage and/or power.
- Opening, 7/8" x 7/8" bottom right front corner of cabinet, for condensate drain tube routing when unit is ceiling mounted
- Refrigeration and condensate draining connections are located in this area
- Electrical connections are located in this area
- Location of item 7, above
- 1 5/8" x 3 3/8" knockout each side panel for refrigeration tubing, condensate drainage and/or power
- 1 5/8" x 3 3/8" knockout at bottom left front for refrigeration tubing, condensate drainage and/or power, used when unit is ceiling mounted. Pump kit riser flanges do not interfere with knockouts.
- 1 5/8" x 3 3/8" knockouts at bottom left rear each side for refrigeration tubing, condensate drainage and/or power; pump kit riser flanges do not interfere with knockouts.
- 1 5/8" x 3 3/8" knockout at bottom right front for refrigeration tubing, condensate drainage and/or power, most often used when unit is ceiling mounted; pump kit riser flanges do not interfere with knockouts
- Optional toe kick — with 1" bottom flange; recessed 1/2" on front and sides, flush at rear.
- Distance from side of cabinet to 7/8" x 7/8" opening.

Product Description

- UNHV is available as (DX) direct expansion straight cool or heat pump.
- Unit is equipped with unit mounted infrared compatible controls which support 24V Wired Wall Controller operation. Optional handheld remote is available.
- Heat pump models provide up to 24,000 Btuh of cooling and 21,000 Btuh of heating. Electric heat options are available for up to 5 kW of supplemental heat.

Can be matched with EMI's:

- Single-zone condensing units — S1HV 09-24.
- Condensers include common discharge port.
- Heat pump circuits include common suction port.

Controls And Components (Factory-Installed Or Supplied)

- Single unit-mounted control package, configurable to either unit mount or remote Wired Wall Controller operation.
- Unit mount control can be used in cooling only, cooling with electric heat, heat pump, or heat pump with second stage electric heat applications.
- Operational range set point temperature adjustable between 55°F (13°C) and 90°F (32°C) in one-degree increments.
- Infrared-compatible controller allows use of IR hand held controller.
- Operation modes include Heat, Cool, Dry, Fan and Auto Change-over.
- Fan Operation – Auto/On. High, Medium or Low speed fan.
- Fan Purge – Fan remains on for 60 seconds after Heat/Cool call is dropped. (Auto mode only)
- Room air sampling — Selectable time intervals insure fan will cycle on periodically, in Auto Fan Mode.
- Selectable Fahrenheit (°F) or Celsius (°C) temperature scale.
- Dry mode – Operates cooling and electric heat simultaneously to remove humidity.
- Anti-Short Cycle Compressor Protection.
- Minimum ON time for heating and cooling eliminates room temperature droop and system short cycling.
- Freeze Protection – Prevents air handlers freeze up.
- Test operation – Allows testing after installation. Runs at

rate condition speeds for set-ups and charging.

- Non-volatile back-up memory maintains control settings for indefinite period during power outage. When power is restored equipment resumes operation after three-minute compressor time delay.
- 7-day programmable with copy feature.
- Filter change indicator: Timer indicates when filter should be cleaned.
- Integral condensate pump safety-switch connection microprocessor monitors condensate pump safety switch and displays error code when fault occurs. (Only with optional condensate pump).
- CEC (California Energy Commission) compliant.
- Condensate drain pan over flow protection.

Cabinet Features:

- Accessible, washable, reusable, nylon mesh filter.
- Access to piping connections and condensate pump allow installation with unit mounted in place.
- Condensate drain pan constructed of galvanized steel (G90U), anti-corrosion coating.

Optional Equipment

- Condensate pump (field installed only).
- 24V Wired Wall Controller.
- Electric heat with automatic reset high temperature cutout and redundant high temperature fuse link (when heat option is selected, factory installed only).

Installer Supplied Items

- Low voltage wiring (18 AWG minimum required).
- High voltage power supply wiring.
- Mounting screws and fasteners.
- Condensate piping.
- Refrigerant piping (if not supplied). **Both tubes need to be insulated.**
- Refrigerant (for interconnect charge) R410A.

GENERAL PRODUCT INFORMATION

Installation Considerations

- Determine best location for mounting unit for room air circulation.
- Locate outdoor and indoor units as close together as possible.
- Determine wiring, drainage and piping placement.
- Insure interconnect tubing is within listed limits. See Table 1.

Table 1 - Tubing Specifications - Both Tubes Insulated

S1CV/ S1HV or Model	Max. Length Equivalent Feet	Max. Lift	Max. Trap Height	Liquid Line	Suction Line
		"H"	"P"	O.D.	O.D.
09	100' (30 m)	35' (11 m)	20' (6 m)	1/4"	1/2"
12				1/4"	1/2"
18				3/8"	5/8" *
24				3/8"	5/8" *

* Bush down at air handler

- Position unit as close as possible to center (left-to-right) of wall. Grille on unit front must be accessible for servicing.

Condensate Pump Kit Option

- Verify condensate pump purchased with unit See Table 2.
- Floor-mounted units with floor-mounted condensate pump optional toe kick kit. See Table 2.

Optional Toe Kick Kit

- For floor-mounted UNHV units use optional toe kick kit. See Table 3.
- Toe kick kit is required if floor mounting a condensate pump under floor-mounted UNHV air handler.

Site Preparation

- Mount unit to vertical surface plumb and level to prevent unit vibration and potential noise.
- Mount unit directly to smooth surface such as wallboard or similar material.
- Mounting to masonry block wall, provide smooth barrier between unit and masonry block surface to absorb potential vibration and prevent formation of condensation on the wall.
- Unit can be suspended from ceiling using threaded rods.

NOTICE

If excessive noise or vibration from unit mounted to masonry block wall, verify unit is plumb and level. If noise or vibration persists, contact distributor.

Table 2 - Condensate Pump Kits, UNHV 09-24

Floor-Mounted Units		
Air Handler	208/230v	115v
09 / 12	550001727	550001728
18 / 24	550001727	550001727
Toe kick kit is required when condensate pump is mounted below floor-mounted air handler.		
Ceiling-Mounted Units		
Air Handler	208/230v	115v
09 / 12	240006200	240006199
18 / 24	240006200	240006199

Table 3 - Toe Kick Kits

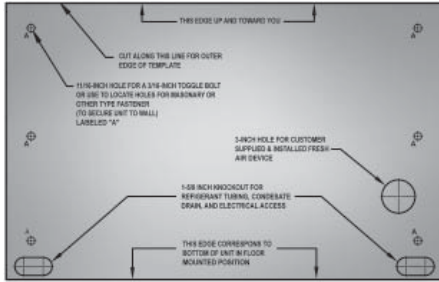
Air Handler	Part number
09 / 12	550001785
18 / 24	550001786
Required when condensate pump is mounted below floor-mounted air handler.	

Table 4 - Drain Pan Extension Kits

Ceiling Mounted Units	
Air Handler	Kit #
09/12	550001915
18 / 24	550001916
Recommended when unit is ceiling mounted	

Unit Mounting Instructions

- Optimal unit location:
 - Locate unit in area with unrestricted air flow to the space.
 - Unit may be recessed into wall or ceiling by no more than 5½" (140mm).
- Use cardboard template provided in packaging to mark where piping, electrical wiring and condensate drain should penetrate wall or ceiling.



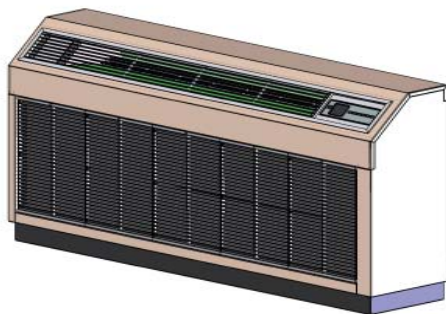
- See Figure 1, Page 5 for locations of cabinet openings and knockouts.
- New construction - Piping may be roughed in before wallboard or panels are placed. PVC pipe (3" or 4" I.D.) may be used as pipe chase.

Figure 2 - Mounting Options

Ceiling Mounted



Wall Mounted

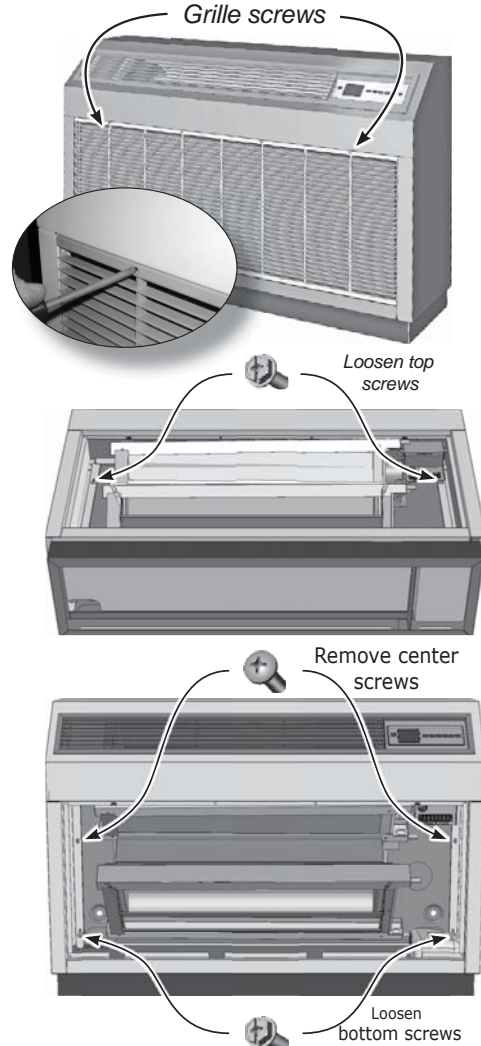


NOTICE

Do not install unit in location where curtains or drapes obstruct supply air grille. This may cause air to recirculate without cooling the room, and may result in premature system failure.

- Determine appropriate hole size. Cut through wall or ceiling.
- Remove return air grille by removing screws on front of grille. Lift grille off. See Figure 3.
- Remove rest of painted cabinet. See Figure 3:
 - Completely remove center screws.
 - Loosen (do not remove) four remaining screws (5/16" slotted hex) so there is approximately 1/2" between screw head and keyhole slot. Reach through front of unit to access screws as shown.
 - Leaving loosened screws on unit will make reinstalling the cabinet easier.
 - If unit is recessed into wall or ceiling it may be necessary to completely remove all screws.
 - Slide painted cabinet upward until keyhole slots clear screws. Lift off.

Figure 3 Removing Front Grill



Unit Mounting Instructions

⚠ WARNING

Electrical shock hazard. Replace all panels after installation or servicing. Panels must remain on unit at all time while powered and in operation. Failure to do so could result in death or serious injury.

Ceiling Mounting

Threaded rods may be inserted through mounting holes to suspend unit from ceiling supports. Verify unit is mounted to support its' weight. See Figure 4.

Wall Mounting

Secure unit to wall with wood screws or anchors for masonry using mounting holes located in back panel of unit. See Figure 5.

Figure 4 Ceiling Mounting

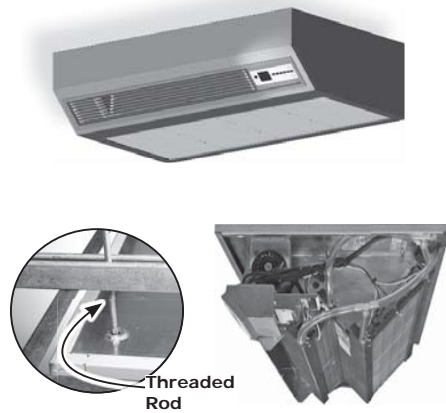
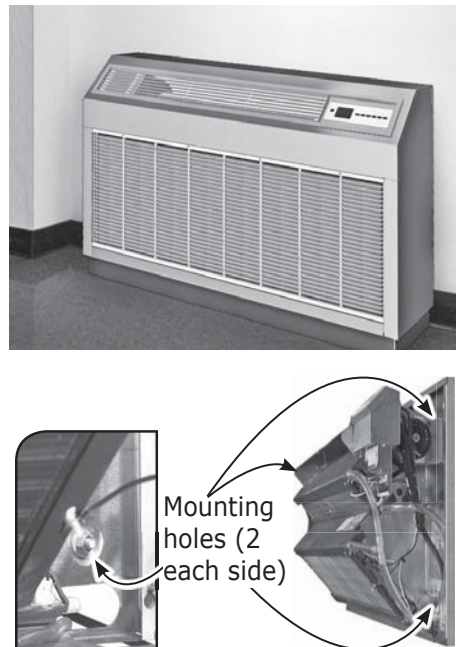


Figure 5 Wall Mounting



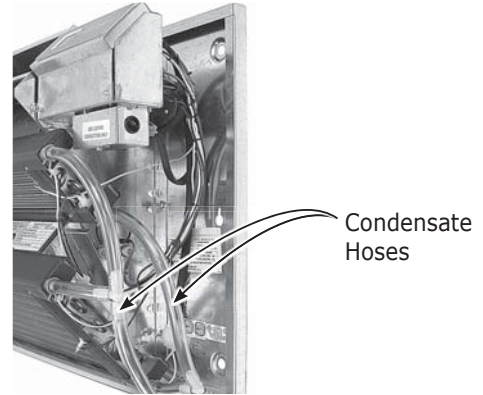
CONDENSATE PIPING

UNHV is supplied with two ½" I.D. flexible PVC hoses for connection to copper or plastic condensate drain pipe work.

- Each drain line is labeled and plugged at the factory.
- Unplug appropriate line and connect to condensate drain.
- Consider following information when installing UNHV:
 - A. Install with highest point in condensate hose at unit's drain pan. Insures proper drainage.
 - B. Slope condensate hose down in the direction of water flow with minimum gradient of 1" (5mm) per 10' (1m). There must not be any uphill gradients.
 - C. When multiple units are connected to common condensate drain, insure drain is large enough to handle volume of condensate from all units. Recommend having air vent in condensate hose to prevent air locks.
 - D. If using accessory condensate pump, follow pump manufacturer instructions.

Use condensate hose tie downs in ceiling mount applications.

Figure 6 Condensate Piping



Condensate hose tie down and knock-out for ceiling mount application



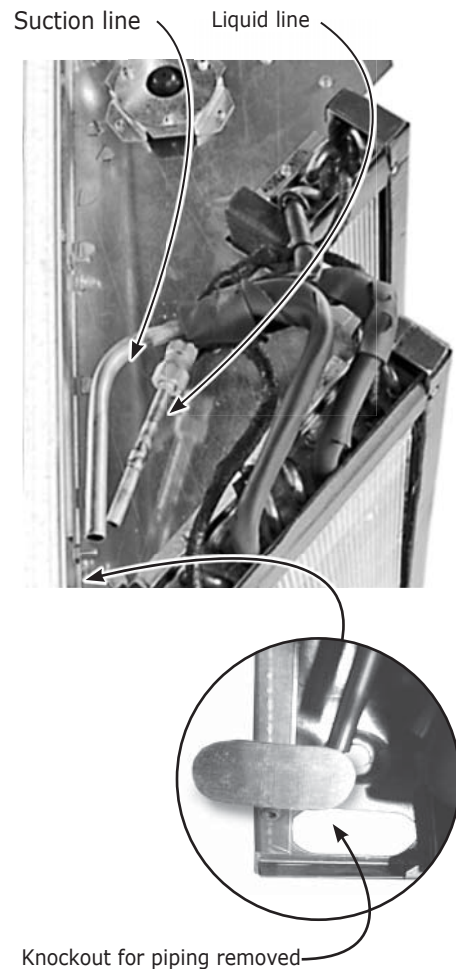
Condensate hose label (floor mount shown)

Two sets of labeled condensate hoses, floor or ceiling mount. Check the label to ensure correct hose is used for the application.

Piping Preparation

- Avoid piping on wet and rainy days.
- Use only clean, refrigeration-grade copper tubing.
- Use tubing benders to guard against kinking.
- Verify no burrs remain on fittings.
- Cap ends of lines until ready for connections. Verify plastic end caps remain in place when inserting through wall openings.
- Insulate both lines.
- Isolate tubing from transmitting vibration to building or unit and avoid contact with sharp edges.
- Wrap refrigeration valves with wet rag "heat sink" to protect valves while brazing. See Figure 9, Page 12
- DO NOT use suction line size larger than condenser service valve connection. This can harm compressor. Install reducer, when used, only at air handler connection.
- Mount and level per instructions. See "UNIT MOUNTING" on page 8.
- See Figure 7 locations of piping connections in UNHV unit.

Figure 7 Refrigerant Connections



See Figure 1, Page 5 for locations of all knockouts and openings in the cabinet.

Line Sizing

1. Size lines per Table 12, Page 39.
2. Match suction line size with condenser service valve connection.
 - When matching UNHV18 or 24 with 18,000 or 24,000-Btuh condenser, use 5/8" suction line, with reducer installed at indoor connection.
3. Changes in diameter of tubing must be made at indoor connection. Line-set diameter is determined by condenser service valve size.

Refrigerant Piping

1. Clean the ends of tubing and insert into fittings. See Figure 8.
2. Protect valves by wrapping with a wet rag "heat sink" before brazing. See Figure 9.
3. Use a shield to protect the paint as shown in Figure 9. (The shield can be made from scrap metal.)
4. Braze tubing into fittings.

Pressure test all field installed piping with nitrogen. Using suitable vacuum pump, evacuate tubing and indoor unit to 500 microns or less, with service valves remaining front seated (closed).

Figure 8 Clean ends of tubing

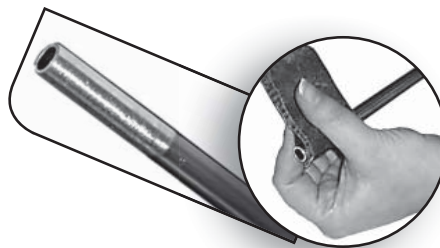
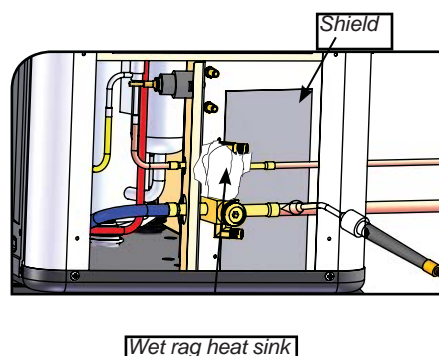


Figure 9 Place Wet Rag "Heat Sink" Over Valves Plus A Sheet Metal Shield To Protect Paint



NOTICE

Pressure test all field installed piping with nitrogen. Using suitable vacuum pump, evacuate tubing and indoor unit to 500 microns or less, with service valves remaining front seated (closed).

Refrigerant Processing

1. Attach manifold set, vacuum pump, & Micron Gauge. See Figure 10.
2. Evacuate line to 500 microns or less to insure all moisture has been removed and there are no leaks. See Figure 11.
 - A. Evacuate
 - B. Pressurize with 100psi N2 or Nitrogen
 - C. Evacuate again
 - D. Charge with R410A
3. Verify evacuation and leak free joints. Back-seat valves (counter-clockwise) to open and allow factory charge to fill lines and indoor unit. See Figure 13.

Refer to refrigerant charge table for specified charge.

4. Charge to proper weight. Charge based on feet of interconnect. **Only add/remove R410A in liquid form.** See Table 5, Page 14.
5. Install all panels removed to this point. Panels are required for proper air flow.

All systems require field charge adjustments. Refer to "Refrigerant Charge Tables" for proper weight charge and Operation Charts for proper system pressures and temperatures at different outdoor conditions. Sub-cool should be used for final system charge.

Charge with dial-a-charge or weighed in with scale.

NOTICE

It is illegal to discharge refrigerant into the atmosphere. Use proper reclaiming methods & equipment when installing or servicing this unit.

Units are delivered pre-charged with refrigerant for condenser coil and air handler. Charging of field installed piping is required. Refer to refrigerant charge table for proper amount to be added for applications interconnect piping. Unit service valves are solid brass, for sweat connections.

- Measure all heat pump saturated suction pressures at *Common Suction Port* not vapor service valve.
- *Common Suction Port* includes pressure drop and temperature increase through reversing valve resulting in more accurate and complete system charge.
- Port may also be used to charge system in heating mode when both sides of line set are at high system pressures or to determine saturated evaporator pressure while in heating mode.

Figure 10 Manifold Set Connections At Unit

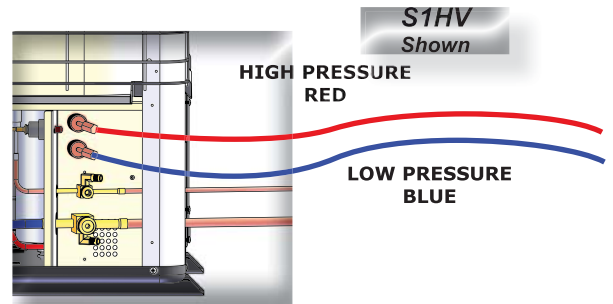
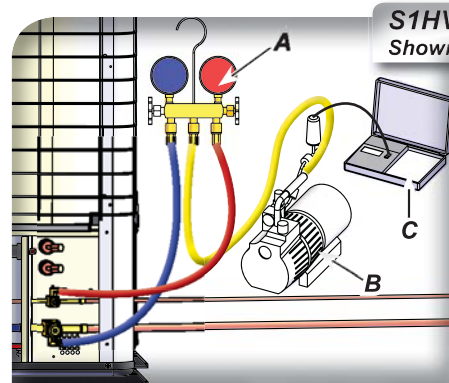


Figure 11 Manifold Set Up For Evacuation



A Manifold
B Vacuum pump
C Micron gage

Figure 12 Charging

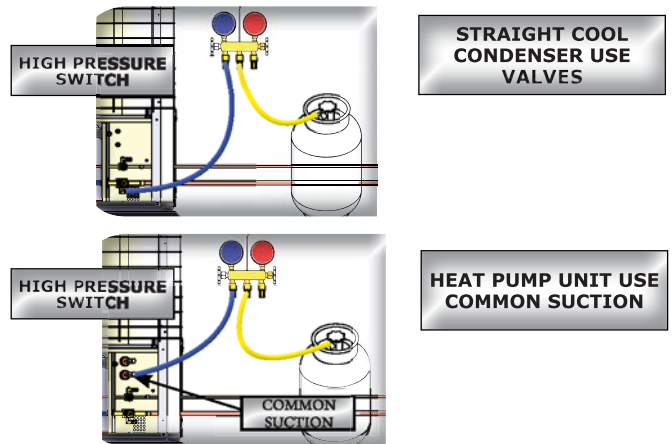
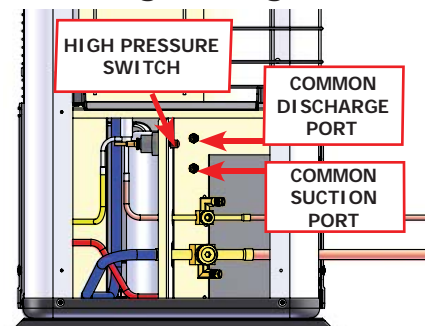


Figure 13 Common Suction, Common Discharge, & High Pressure Switch



REFRIGERANT PROCESSING

Use following example to find charge adjustment and system charge for any air handles and tubing length.

$$\begin{aligned}\text{Line Adjustment} &= (\text{Line Charge/FT}) \times \text{Line Length} \\ \text{System Total} &= \text{Factory Charge} + \text{Line Adjustment}\end{aligned}$$

Round to nearest ounce and allow for gauges and hoses.

Table 5 - S1CV / S1HV R410A Refrigerant Charge Table

Condenser	Wall Unit Pairing	Line Charge Per Foot	Factory Charge
S1CV9000	UNHV09	.25 oz./ft 23 g/m)	39.5oz (1120g)
S1CV2000	UNHV12	.25 oz./ft 23 g/m)	39.5oz (1120g)
S1CV8000	UNHV18	.64 oz./ft 59 g/m)	54.0oz (1531g)
S1CV4000	UNHV24	.64 oz./ft (59 g/m)	54.0oz (1531g)
S1HV9000	UNHV09	.25 oz./ft (23 g/m)	39.5oz (1120g)
S1HV2000	UNHV12	.25 oz./ft 23 g/m)	39.5oz (1120g)
S1HV8000	UNHV18	.64 oz./ft (59 g/m)	54.0oz (1531g)
S1HV4000	UNHV24	.64 oz./ft (59 g/m)	54.0oz (1531g)

Site Preparation For Wiring

Electrical wiring must be in accordance with all electrical codes. In absence of such requirements to the National Electrical Code (NEC).

⚠ WARNING

Electrical shock hazard. Turn OFF electrical power supply before making electrical connections. Failure to do so could result in death or serious injury.

1. Check unit rating plate for circuit ampacity and breaker or time delay fuse size. Use only HACR type breakers. Select proper wire for ampacity rating.
2. Each unit must have separate branch circuit protected by time delay fuse or breaker. Refer to unit rating plate for proper wire and breaker or time delay fuse size.
3. Inspect existing wiring for any defects such as cut or frayed wires. Replace if any such wiring is found.
4. See Figure 14 for electrical panel location.

Units rated 208/230V, primary side of transformer is factory wired for 230V.

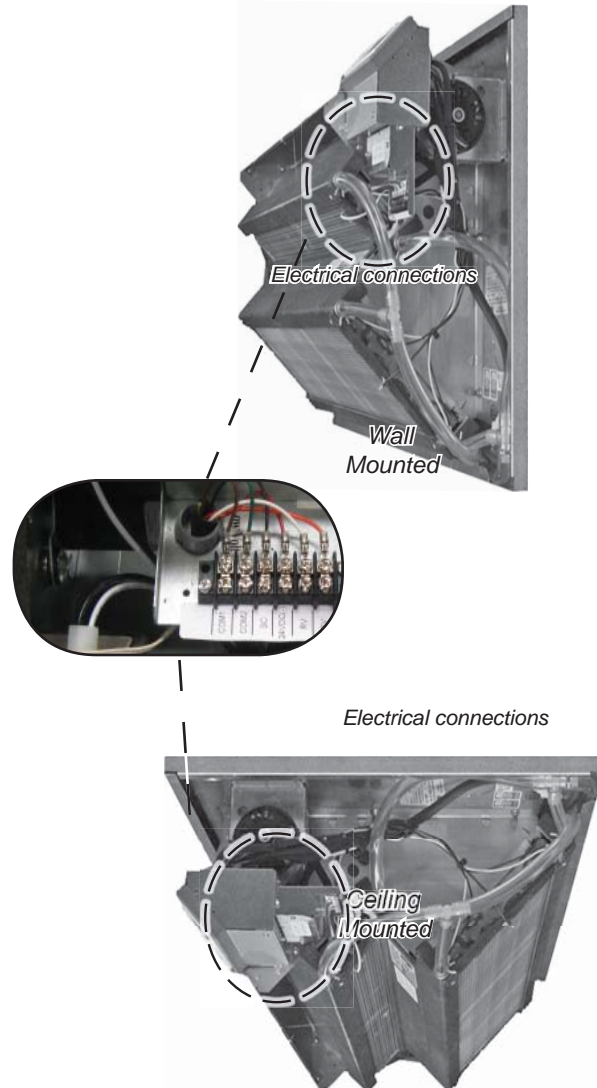
For 208V power supply, transformer tap must be changed from orange to red.

Refer to wiring diagram located inside of left end cap of unit.

Connect Wiring

1. Remove painted cabinet and air handler mounted as described in "UNIT MOUNTING" on page 8. Locate control box (upper right corner of unit).
2. Remove screw on front of control box to access High and Low wiring.

Figure 14 Electrical Connections



High Voltage Electrical Wiring

1. Remove control box cover screws to access high voltage wiring compartment. See Figure 15 and Figure 16
2. Refer to wiring diagram to connect power wire to Black L1 and Red L2 at power connector location.
3. Connect ground wire to ground lug or lead at same location in control box.

Terminate ALL unused wires with wire nut or crimp connector.

Low Voltage Electrical Wiring

All low voltage interconnect wiring must be at least 18 AWG.

24V control transformer is located in air handler.
Provides low voltage control power to both air handler and condenser.

Figure 15 Remove Control Box Cover Screws To Access High Voltage Wiring Compartment

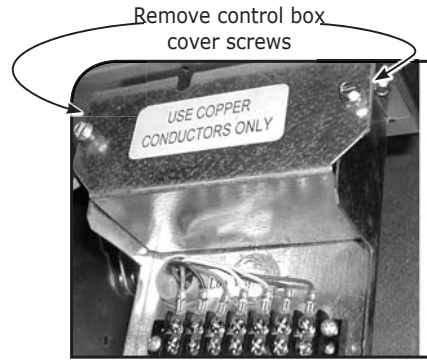


Figure 16 High Voltage Connections

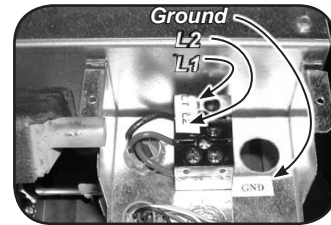
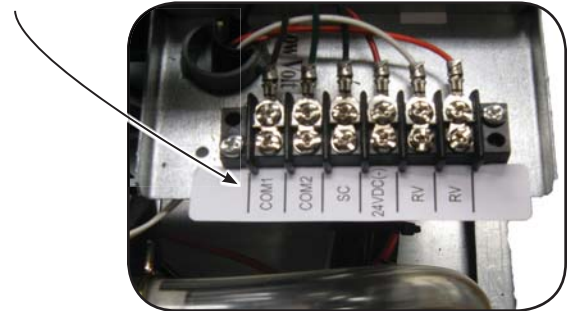


Figure 17 Low Voltage Connections

Low voltage connections



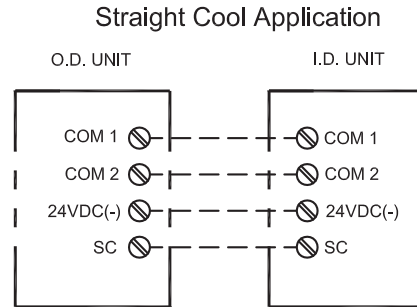
Units With Or Without Heat

All low voltage interconnect wiring must be at least 18 AWG.

Cooling Only Connection

- Cooling only units utilize four (4) low voltage interconnecting wires between the indoor and outdoor units.
- Connect each wire [COM1, COM2, SC, and 24 VDC (-)] to same named terminal indoor and outdoor. See Figure 18.
- Protect other unused wires or terminals, such as both RV, with wire nut from making contact with junction box or other metal surfaces.

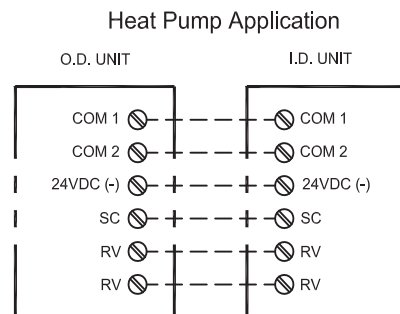
Figure 18 Unit-Mounted Controls — Cooling Only



Heat Pump Connection

- Heat Pump systems utilize six (6) low voltage interconnecting wires between indoor and outdoor units.
- Each wire [COM1, COM2, SC, 24 VDC (-), RV, and RV] should connect to same named terminal indoor and outdoor. See Figure 19.
- RV signal is alternating current, as long as both indoor RV connections are connected to outdoor RV connections system will function correctly.
- The other four (4) wires are polarized and must be connected to matching terminal.

Figure 19 Unit-Mounted Controls — Heat Pump Connection



Wired Wall Controller

- Low voltage interconnect wiring must be at least 18 AWG.
- Unit mount control — If control configured for unit mount DO NOT connect Wired Wall Controller to unit.
- 24V control transformer is located in air handler unit. Provides low volt control power to both air handler and condenser.

Optional Wired Wall Controller Connection

Controller utilizes polarized four (4) conductor connector which plug into mating connector located in low voltage connection box.

System recognizes thermostat when plugged in and power is applied to UNHV. See Figure 21, Page 19.

- Controller is shipped with 15 foot long umbilical cable, may require additional extension cable (part number 240009319) to reach indoor low voltage connection box.
- One additional 15 foot cable may be daisy chained, total of 2 cables or 30 feet of interconnect cable.
- Do not splice cables together on site.

Hand held remote is required to enter Test Mode. Wired wall control has limited capabilities for technician testing.

Heat Pump Applications

- Heat pump operation requires connection of 2 RV terminals between outdoor unit to indoor unit. See Figure 22, Page 19. Reversing valve is energized in cooling mode for models S1HV, heat pump condensers.

Heat pumps only: Two-stage heating requires combination of heat pump condenser and indoor unit equipped with optional electric heater. The indoor electric heater will energize as second stage heat source and during defrost mode for heat pump models.

Finishing

Insure any unused wires are insulated with wire nut to prevent contact with junction box or other metal surfaces. Once all electrical connections are made replace control box cover.

Figure 20 Replace Cover Box

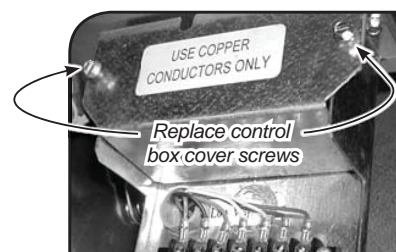


Figure 21 Wired Wall Controller Configuration — Cooling Only

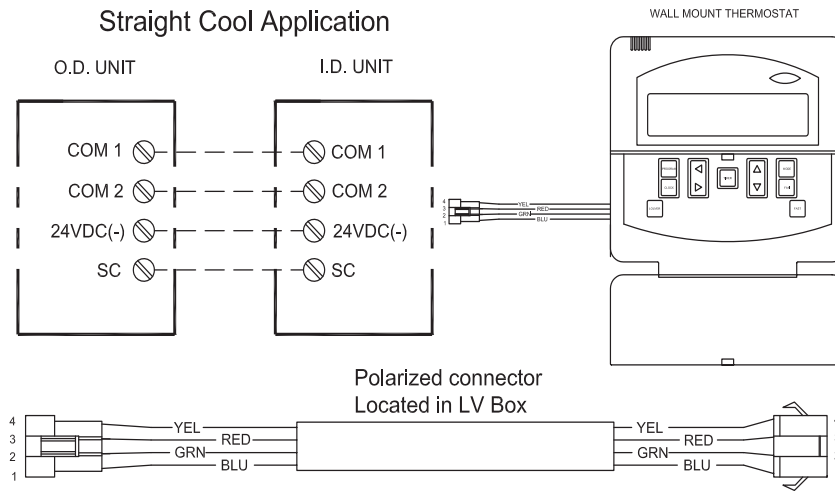
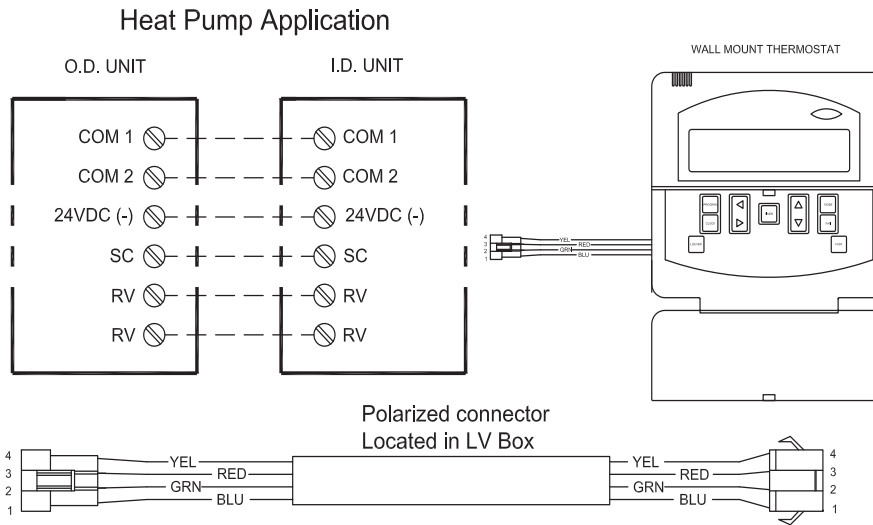


Figure 22 Wired Wall Controller Configuration — Heat Pump



Re-Assemble Cabinet

Verify system is leak-free and all piping has been properly installed before reassembling cabinet.

See Figure 23.

1. Slide cabinet slotted holes over upper and lower cabinet screws. (If cabinet is recessed into wall or ceiling, cabinet cannot slide, replace screws after cabinet is in position.)
2. Loosely tighten upper screws.
3. Loosely tighten 2 lower cabinet screws.
4. Insert and tighten center screws.
5. Tighten all six screws to secure cabinet.

See Figure 24.

1. Replace grille.
2. Verify filter is in place on back of grille.

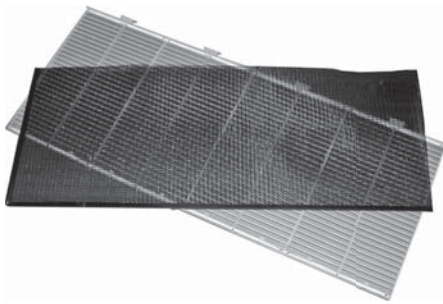


Figure 23 Replace (Tighten) Top, Bottom And Center Cabinet Screws

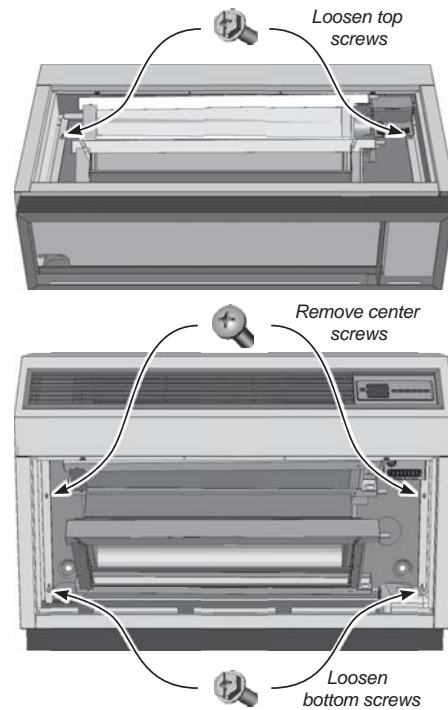
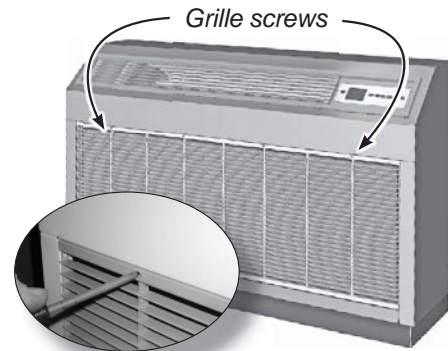


Figure 24 Replace The Filter And Grille



S1CV / S1HV IOM's Sequence of Operation

- EMI Series condensers are designed to operate with EMI Series air handlers.
- Systems can be configured as either single source power (air handler without electric heat fed from condenser) or double sourced power where each component receives power independently protected by field service HACR fuse/breaker. See unit name plate for the correct HACR fuse/breaker, breaker type and size.
- Outdoor and indoor units are connected to each other through low volt interconnect wiring. 24V transformer located in indoor unit provides low volt power.
- Indoor set point temperature range is adjustable between 55° and 90°F (13 – 32°C) in one degree increments.
- Controls store configurations and settings in non-volatile memory, not lost in power outage with selectable re-start feature.

Straight cool condensers are designed to operate as single stage DX cooling unit.

Heat pump condensers are designed to operate as single stage DX cooling and heating system.

Two stage heating, air handler must be equipped with optional electric heat.

Proper system operation requires condenser to be matched with appropriate indoor unit using either standard handheld remote or optional wired Wired Wall Controller.

Heat pump condensers utilize reversing valve to provide reverse cycle (heating) operation.

Outdoor unit acts as either condenser or evaporator providing cooling or heating to indoor space based on mode of operation and ambient conditions.

Reversing valve is energized for Cooling Mode operation.

Should reversing valve fail to actuate, system will default to Heating Mode of operation.

S1CV / S1HV Condenser Operation

- When indoor control is placed in Cooling Mode, with set point temperature below room temperature, compressor, outdoor fan, and indoor blower energize.
- Anti-short cycle timer (ASCT) prevents compressor from re-starting for three minutes.
- When indoor control is placed in Heating Mode, with set point temperature above room temperature, compressor, outdoor fan and indoor blower energize. Anti-short cycle timer (ASCT) prevents compressor from re-starting for three minutes.
- Heat pump defrost control is designed to keeping outdoor coil free from frost and ice buildup. Through control of reversing valve, compressor speed, outdoor fan speed, and indoor optional electric heat. Defrost is initiated when outdoor coil sensor has accumulated 90 minutes of compressor run time with coil operating below 30°F (-1.1°C). When coil sensor reaches 60°F (15.5°C), due to either defrost cycle or increase in ambient temperature, timer is reset to zero (0) minutes.
- Upon defrost initiation, reversing valve shifts to Cooling Mode with outdoor fan Off, indoor blower and optional electric heat (if available) On. Hot gas from compressor melts frost and ice on outdoor coil and electric heat tempers indoor air, until outdoor coil sensor reaches 60°F (15.5°C) or 10 minutes has elapsed. System reverts to normal heat pump operation. Defrost times vary depending on outdoor temperature, wind, and moisture conditions.
- In Cooling Mode reversing valve is energized at all times. When air handler calls for cooling, if compressor is not in ASCT, it will start softly then increase speed as necessary to balance indoor cooling load with outdoor ambient, while minimizing number of compressor starts and stops. Actual compressor speed is based on room temperature differential, indoor fan speed, and compressor rated frequency parameters. Minimum compressor run times and indoor coil freeze protection are in place whenever compressor runs in Cooling Mode. Condenser mounted Electronic Expansion Valve (EXV) continuously adjusts refrigerant flow to maintain 15°F (8.3°C) superheat at compressor. Expanded refrigerant froth travels through small diameter tube of line set to air handler where heat is transferred into refrigerant. Once refrigerant evaporates, super-heated vapor returns to condenser via large diameter tube. Refrigerant expansion occurs in outdoor unit, both tubes in line set require insulation.

CONDENSER OPERATION

- As temperature of indoor space moves closer to set point compressor, indoor, and outdoor motors adjust speeds to reduce rate of indoor temperature change and avoid passing set point. As temperature of indoor space moves farther from set point compressor, indoor, and outdoor motors adjust to increase rate of indoor temperature change and remain close to set point. System tries to remain running, minimizing the number of start / stop cycles. This provides the most uniform space conditioning comfort levels and best overall system efficiency.
- In Heating Mode reversing valve is de-energized, except during defrost. When air handler calls for heating, if compressor is not in ASCT, it will start softly then increase in speed as necessary to balance indoor heating load with outdoor ambient, while minimizing compressor starts and stops. Actual compressor speed is based on room temperature differential, indoor fan speed, and compressor rated frequency parameters. Minimum compressor run times and outdoor coil defrost are in place whenever compressor runs in Heating Mode. Condenser mounted Electronic Expansion Valve (EXV) continuously adjusts refrigerant flow to maintain 15°F (8.3°C) superheat at compressor. Refrigerant vapor travels through large diameter tube of line set to air handler where heat is transferred into air. Once refrigerant is condensed, sub-cooled liquid returns to condenser via small diameter tube.
- As temperature of indoor space moves closer to set point compressor, indoor, and outdoor motors adjust speeds to reduce rate of indoor temperature change and avoid passing set point. As temperature of indoor space moves farther from set point compressor, indoor, and outdoor motors adjust to increase rate of indoor temperature change and remain close to set point. If system has optional electric heat, and heat pump alone (stage 1) can not reduce set point differential, optional electric heat energizes (stage 2) of heat. System tries to remain running, minimizing number of start / stop cycles. Providing uniform space conditioning levels and best overall system efficiency.

Unit Operation is dependent on room temperature. It may be necessary to warm room before testing unit's cooling abilities.

Before Starting The Unit

Become familiar with outdoor unit's start-up instructions for specific requirements and procedures.

1. Remove any tools or other obstructions.
2. Verify filter is in place.
3. Verify unit is level and plumb.
4. Separate any refrigerant lines that contact each other.
5. Replace cabinet and grille front of unit.
6. Test each power and circuit connection before powering up system.
7. Configure controller. See Figure 25, Page 24.
8. Make set-up adjustments as needed. Use Test mode if desired to reduce start-up time.
9. Use unit-mounted electronic controller to start system.
10. Connect wired wall control wiring (if used) after initial start-up.
11. Cycle unit several times in each mode to insure system and components operate correctly.

Controller Operation

- Controller operates unit in cooling, heating (when equipped) dry or auto changeover mode.
- Setpoint temperature is either manually set or allowed to follow pre-programmed (7-day) settings. See Table 6, Page 26.
- Controller provides diagnostics with annunciation and includes sensors to prevent short cycling and other benefits as explained on Page 34.
- Adjust and configure unit using IR Hand Held remote control. See "Wired Wall Control Operation" on page 32.
- Unit operates with either hand held remote or wired Wired Wall Controller. Figure 26, Page 25.

Wired Wall Controller Operation

See "Wired Wall Control Operation" on page 32. for setup and operation when using wired wall control.

Figure 25 Hand Held Remote Operation





POWER	Press to turn unit on or off. Press and hold for 2 seconds to transmit all settings to unit-mounted controller
MODE	Press to toggle through operating modes – Cool, Heat, Auto changeover, Dry or Fan modes.
CLOCK	Normal operation – hold for 3 seconds to enter Set Time mode; press again to finish and exit. In programming mode – press to enter the previous selection.
LOUVER	Press to toggle motorized louver on or off.
	Normal operation – press to increase the setpoint temperature. Configuration, Set Time or Programming mode – press to increase the setting.
	Normal operation – press to decrease the setpoint temperature. Configuration, Set Time or Programming mode – press to decrease the setting.
FAN	Press to toggle between fan modes – High, Med, Low or Auto
PROG	Normal operation – Press to toggle between manual operation and Pre-programmed (7-day) run mode. Configuration, Set Time or Programming mode – press to enter the next selection.
TIMER	Press to toggle Timer mode on/off.
TEST	While in Heating or Cooling mode, press for 5 seconds to enter test mode. Intended for service only. Holds the unit at a fixed speed.
FAST	While in Heating or Cooling, press for 5s enters Turbo mode for 30m.
MODE+PROG	With unit in OFF mode – Press and hold for 5 seconds to enter Configuration mode; press again to exit.
PROG + CLOCK	With unit in OFF mode – Press and hold for 5 seconds to enter Configuration mode; press again to exit.
FAN + PROG	Press and hold 3 seconds to enter 7-Day Programming mode; press again to exit.
FAN + PROG	With unit in 7-Day Programming mode – Press and hold 3 seconds to copy the settings for the selected day to all other days.
Note: Motorized louver not available in Cassette 09/12	

Figure 26 Wired Wall Control



Wired Wall Control Operation

Wired Controller Button Selections	
POWER	Press to turn unit on or off.
MODE	Press to toggle through operating modes — Cool, Dry, Fan, Heat or Auto Changeover
CLOCK	Normal operation — hold for 3 seconds to enter Set Time mode; hold again for 3 seconds to exit. In programming mode — press to enter the previous selection
LOUVER	Press to toggle motorized louver on or off. (See Note)
UP ARROW	Normal operation - press to increase the setpoint temperature. Configuration, Set Time or Programming modes - press to increase the setting
DOWN ARROW	Normal operation — press to decrease the setpoint temperature. Configuration, Set Time or Programming mode — press to decrease the setting
LEFT ARROW	Press for the previous item selection
RIGHT ARROW	Press for the next item selection
FAN	Press to toggle between fan modes — High, Med, Low or Auto.
PROGRAM	Normal operation — Press to toggle between manual operation and Pre-programmed (7-day) run mode. Configuration, Set Time or Programming mode
TIMER	Press to toggle Timer mode on/off
TURBO	While in Heating or Cooling, press for 5s enters Turbo mode for 30m
MODE + PROGRAM	With unit in OFF mode — Press and hold for 5 seconds to enter Configuration mode; press and hold for 5 seconds again to exit
PROGRAM + CLOCK	Press and hold 3 seconds to enter 7-Day Programming mode; press and hold for 3 seconds again to exit
FAN + PROGRAM	With unit in 7-Day Programming mode — Press and hold 3 seconds to copy the settings for the selected day to all other days
Display	
Mode	COOL, DRY, FAN, HEAT, AUTO

Table 6 7-Day Programming Options For CAHV

Item	Setting	Values	Overview
<p>To access: Press and hold PROGRAM and CLOCK buttons simultaneously for 3 seconds; use arrow keys to select position; save selection and exit by repeating the button press.</p> <p>Quick copy — Hold FAN and PROGRAM buttons for 3 seconds to copy current day's settings to all other days.</p> <p>Navigating through settings: Press PROGRAM to move to the next setting or CLOCK to move to the previous setting; to change values, use the UP and DOWN keys; when value is reached, move to the next setting using the PROGRAM or CLOCK button; values are stored on exit from programming mode.</p>			
7-Day programming (use Table 6, Page 37 to record settings)	Day of week	Mon, Tue, Wed, Thu, Fri, Sat, Sun	The louver is closed when the fan is off.
	Period of day	Morning Day Evening Night	The periods provide four time settings to initiate a change in cooling/heating setpoints. They allow adjustments for setback (such as night setback, daytime setback and occupied settings for residential applications). Set the hour/minute for each time as well as the cooling and heating setpoints below.
	Hour	0–12 a 0–12 p	Set the time to begin the period.
	Minute	0–59	
	Cooling setpoint	55–90 F	The unit will default to this setpoint when set to Cooling in pre-programmed run mode.
	Heating setpoint	55–90 F	The unit will default to this setpoint when set to Heating in pre-programmed run mode.
	Auto setpoint	55–90 F	The unit will default to this setpoint when set to Auto in pre-programmed run mode. (The unit will auto changeover between heating and cooling.)

SETTING THE CONTROLLER

Table 7 Configuration Mode For UNHV Air Handlers

Item	Dis-play	Possible Value (flashing)	Overview	Factory Settings	
To access: Press MODE and PROG together for 5 seconds, repeat to exit; automatically exits after 20 seconds idle					
Temperature Setting scale	01 F-C	F C	Fahrenheit Celsius	F	Select temperature scale for display and operating settings.
Heat source	02 HEAT	ON OFF	Available Not available	See Note 3	Set this to ON if the unit is equipped with the electric heater option. The electric heater is required for DRY mode operation and for automatic changeover operation.
Heat pump (see Note 1)	03 H-P	ON OFF	Available Not available	OFF	Set this to ON if the unit is built for heat pump operation and connected to an appropriate compressor unit.
Auto changeover differential (ACO) (see Note 2)	04 d-b	2 3 4 5 6	2° – 6°	2°	Auto changeover automatically operates the unit in heating or cooling based on room temperature versus setpoint. This setting is the dead band temperature: Cooling is on while room temperature is at setpoint PLUS dead • band. Heating is on while room temperature is at setpoint MINUS dead • band. Example: setpoint = 68°F, dead band is 3°F — cooling is on with • room temperature at or above 71°F — heating is on with room temperature at or below 65°F.
Check filter time	05 F:Lt	2 5 7 10 12	250 hours 500 hours 750 hours 1000 hours 1250 hours	10	Set this time for automatic notice of time to change the filter. At the end of the time period, the control will display a FILTER CHECK warning. This warning will also appear if four evaporator freeze-ups should occur in a 24-hour period.
Room air sampling	06 A:r	0 (OFF) 5 10 15 20	Disabled 5 minutes 10 minutes 15 minutes 20 minutes	15	During stand-by periods, room air sampling causes the fan to cycle on For short period of 60 sec at the time interval specified here. This ensures the unit's temperature sensor will see an accurate sampling of room air (avoiding comfort problems due to stratification).
Auto Re-Start after power outage	07 A-P	ON OFF	Enabled Disabled	ON	Set to ON for the unit to automatically restart after a power outage. Set to OFF for the unit to remain off after a power outage.
<p>Note 1 Setting 03, Heat pump, is SKIPPED if setting 02, Heat source, is OFF.</p> <p>Note 2 Setting 04, Auto changeover, is SKIPPED if setting 03, Heat source, is OFF.</p> <p>Note 3 Factory setting is ON if electric heat is installed in unit, or OFF if electric heat is not installed</p>					

Table 8 Programming Schedule (When Using 7-Day Programming)

	Morning			Day			Evening			Night		
	Auto	Heat	Cool	Auto	Heat	Cool	Auto	Heat	Cool	Auto	Heat	Cool
Monday	Time	:		Auto	:		Auto	:		Auto	:	
	Temp											
Tuesday	Time	:		Auto	:		Auto	:		Auto	:	
	Temp											
Wednesday	Time	:		Auto	:		Auto	:		Auto	:	
	Temp											
Thursday	Time	:		Auto	:		Auto	:		Auto	:	
	Temp											
Friday	Time	:		Auto	:		Auto	:		Auto	:	
	Temp											
Saturday	Time	:		Auto	:		Auto	:		Auto	:	
	Temp											
Sunday	Time	:		Auto	:		Auto	:		Auto	:	
	Temp											

To copy the settings from any day to the entire week:

- 1) Select the day to be copied.
- 2) Simultaneously press the "FAN" and "PROG" buttons for three seconds.

When power is first applied to control or after power outage there is three (3) minute delay before compressor or electric heat will energize. Protects unit from short cycling due to loss of power.

ON/OFF

Pressing ON/OFF button once will switch unit either on or off.

- In OFF mode:
- In ON mode:
 - Cool
 - Heat
 - Auto (Auto changeover — cool/heat)
 - Dry
 - Fan

Modes

MODE button allows selection of mode of operation, Cool, Heat, Auto changeover (ACO), Dry or Fan mode. In Fan mode either HIGH or LOW will be displayed on HHR (Hand Held Remote). See Figure 25, Page 24.

Fan Operation

Indoor unit utilizes three-speed motor with four operational fan modes.

FAN button allows selection of desired fan setting in all modes except Dry mode.

- HHR indicates fan speed selection.
- Dry mode fan speed remains constant at Low speed.
- While unit is in Fan mode, Auto is by-passed and only High, Medium, or Low speeds are available.

Fan Speeds

High, Medium and Low are constant fan settings. Fan operates continuously regardless of set point or room temperatures. Auto mode is for automatic cycling fan operation.

Auto fan mode can only be selected if unit is in Heat, Cool or Auto changeover modes.

- In Auto Fan mode fan cycles with call for Heat or Cool.
- Fan speed is determined by microprocessor and speed adjustment is made according to room and setpoint temperatures.
- Fan will stay on for additional 60 seconds to purge unit of any residual energy.

Room Air Sampling

If room air sampling feature has been enabled in configuration, after the fan has been off for selected time, it will cycle on for 60 second sample. See Table 7, Page 27.

- Unit circulates room air to remove any temperature stratification so microprocessor can determine accurate room temperature.
- After 60 second air sample time has elapsed, and if setpoint temperature remains satisfied, fan cycles off.

Cool Mode

For cooling operation turn unit on via ON/OFF button.

- Select Cool mode via MODE button.
- Room temperature and set point temperature are displayed.
- Setpoint temperature can be changed with each successive press of Up or Down arrow buttons or by holding button in. Holding button in will change temperature rapidly.

Place setpoint temperature below room temperature.

- Compressor starts and cooling continues for minimum of 2 minutes and as long as setpoint remains below room temperature.
- Once room temperature is satisfied for at least 6 seconds and two 2 minute minimum run time has elapsed compressor will cycle off.
- Fan will operate as described in Fan operation.

Once compressor is switched off, or after power outage, there is 3 minute delay before compressor will re-start.

Optional ELECTRIC HEAT Operation

(Non heat pump condenser units only and UNHV)

For operation with electric heat only, control must first be configured properly — heat source ON, heat pump OFF). See Table 7, Page 27.

For electric heat operation, first turn unit on via ON/OFF button.

- Select Heat mode via MODE button.
- Room temperature and setpoint temperature are displayed.
- Press either Up or Down arrow buttons to change setpoint temperature.
- Setpoint temperature changes one degree with each successive press of Up or Down arrow buttons. Holding button in will change temperature rapidly.

Place setpoint temperature above room temperature.

- Electric heat energizes and heating continues as long as setpoint remains above room temperature.
- When room temperature has been satisfied for at least 60 seconds and 2 minute minimum time has expired, electric heat switches off.
- Fan operates as described in Fan operation, page 29.

Optional HEAT PUMP WITH ELECTRIC HEAT (Two-stage heating)

For heat pump operation with electric heat control must be configured properly (Heat source ON, heat pump ON). See Table 7, Page 27.

For heat pump operation with backup electric heat, turn unit on via ON/OFF button.

- Select Heat mode via Mode button.
- Room temperature and setpoint temperature are displayed.
- Press Up or Down arrow buttons to change setpoint temperature.
- Setpoint temperature will change by 1 degree with each successive press of Up or Down arrow buttons. Holding the button in will change temperature rapidly.

Place setpoint temperature above room temperature by 1 degree.

- Compressor starts and heating continues for minimum of 2 minutes and as long as setpoint remains above room temperature.
- When room temperature has been satisfied for at least 60 seconds and minimum on time has elapsed, compressor switches off.
- Fan operates as described in Fan operation, page 29.

Place setpoint temperature above room temperature by at least 2 degrees.

- Compressor starts, electric heat also energizes after 30 second delay, thus two-stage heating.
- Electric heat runs for minimum of 2 minutes until deviation between room temperature and setpoint temperature is less than 2 degrees.
- Electric heat will switch off and heat pump (compressor) takes over heating demand.
- Electric heater will not re-start until 3 minute delay has elapsed.
- Once room temperature is satisfied and 2 minute minimum run time has elapsed, compressor cycles off.
- Compressor will not re-start until 3 minute delay has elapsed.
- Fan operates as described in Fan operation, page 29.

DRY mode

For Dry mode operation unit should have electric heater. Control must be configured properly (Heat source ON).

See Table 7, Page 27

Dry mode removes humidity from the air while maintaining setpoint temperature.

- This is done by energizing the compressor in cooling with the electric heater.
- Dry mode will not maintain specific humidity level.
- Unit should be equipped with optional electric heat element, but will work without electric heat.

For Dry Mode operation, first turn unit on via ON/OFF button.

- Select Dry mode via MODE button.
- Room temperature and setpoint temperature will be displayed.
- Press Up or Down arrow buttons to change setpoint temperature.
- Setpoint temperature changes by 1 degree with each successive press of Up or Down arrow buttons. Holding button in changes temperature rapidly.

Place setpoint temperature at desired room temperature.

- Depending on difference between room temperature and setpoint temperature compressor and/or heat source energize.
- If room temperature and setpoint temperature are same, compressor operates in cooling and electric heat energizes.
- Should room temperature fall below setpoint temperature by 2 degrees, compressor stops and heating continues to boost room temperature back up to setpoint temperature.
- If room temperature rises above setpoint temperature by 2 degrees, heating stops and cooling continues to bring room temperature back down to setpoint temperature.

- Fan operates continuously at low speed while in Dry mode.
- In order to prevent short cycling, there is 2 minute minimum on time for both cooling and heating. Minimum off time is 3 minutes.
- There is a 30 second delay between start of compressor and start of heat source.

Auto Changeover Operation

For Auto changeover mode (ACO), unit must have heat source, control must be configured properly, heat source ON. See Table 7, Page 27.

Auto changeover mode automatically operates either cooling or heating.

- Control selects heating or cooling operation depending on setpoint temperature, room temperature and differential setting selected in configuration. Table 7, Page 27.

For Auto Changeover mode, turn unit on via ON/OFF button.

- Select Auto mode via Mode button.
- Room temperature and setpoint temperature are displayed.
- Press either Up or Down arrow buttons to change setpoint temperature. Setpoint temperature changes by 1 degree with each successive press of Up or Down arrow buttons. Holding button in changes temperature rapidly.

Place setpoint temperature below room temperature by dead band amount selected in configuration mode.

- Compressor starts, unit runs cooling operation as described under Cool mode, page 29.
- If set point temperature is above room temperature by dead band amount selected in configuration, unit will run heating operation as described in heating mode on page 30.

Manual Run Mode

Normal operating (non pre-program run) mode. Settings for temperature, mode and fan speed are selected by user and will not change. The word PROGRAM does NOT display on HHR.

Pre-Programmed Run Mode

Feature allows setpoint temperature to be changed according to pre-programmed set point and time of day settings.

- Setpoint and time settings are programmed into control through 7-day programming setup. See Table 6, Page 26.
- Pre-programmed run mode can be entered from Cool, Heat or Auto modes only.
- Pre-programmed run mode cannot be entered from Dry or Fan modes.
- Pressing PROG button momentarily enters or exits pre-programmed run mode.
- PROGRAM appears in HHR display.
- Setpoint changes to programmed setting at time selected.

WIRED WALL CONTROL OPERATION

When power is first applied to control or after power outage there is 3 minute delay before compressor or electric heat energize. This is to protect unit from short cycling due to loss of power.

FAN Operation

Indoor unit utilizes 3 speed motor.

- Unit controller FAN button allows selection of desired fan speed setting (High, Medium or Low).
- Wired wall controller controls call-for-fan operation (On or Off).

After room temperature has been satisfied and call for fan has been removed, indoor fan remains on for additional 60 seconds. This increases efficiency by pulling remaining energy from the unit.

Optional wired wall controllers are equipped with AUTO/ON fan switch.

- When switch is placed in ON position, indoor fan runs continuously.
- When switch is in AUTO position, indoor fan cycles with call for heating or cooling.

COOLING Operation

Optional wired wall controller controls call for cooling operation (On or Off).

After connecting thermostat to unit, place system switch in Cool mode.

- Adjust set-point temperature below room temperature.
- Compressor and fan motors start and cooling begins.

Place set-point temperature above room temperature.

- Outdoor condenser stops.
- Fan operates as described in FAN operation.

Once cooling has cycled off or following power outage, compressor does not start for at least 3 minutes (short-cycle protection).

ELECTRIC HEAT Operation

Optional wired wall control operation with electric heat, control must be configured properly. "Wired Wall Control Heat source ON". See Table 7, Page 27.

Wired Wall Controller controls call for electric heat operation (On or Off).

After connecting controller to unit, place system switch in Heat mode.

- Adjust set-point temperature above room temperature.
- Electric heat energizes with indoor fan motor.
- Heating continues so long as set-point remains above room temperature.

Place set-point temperature below room temperature.

- Electric heater will switch off and indoor fan remains on for additional 60 seconds.

Once heating has cycled off or following power outage, heating does not start for at least 3 minutes (short-cycle protection).

Optional Heat Pump With Electric heat (Two-stage Heating)

Optional wired wall controller operation for two stage heating including heat pump condenser and indoor electric heat, control must be configured properly. Wired Wall Control, heat source ON". See Table 7, Page 27.

Wired Wall Controller controls call for electric heat operation (On or Off).

After connecting controller to unit, place system switch in Heat mode.

- Adjust set-point temperature above room temperature. Compressor and fan motors start and heating begins.
- Electric heat will energize when deviation between room temperature and set point temperature is high enough to call for second stage heating.

Place set-point temperature below room temperature.

- Outdoor condenser and electric heat stop while indoor fan remains on for additional 60 seconds.

Once heating has cycled off or following a power outage, heating does not start for at least 3 minutes (short-cycle protection).

Short Cycle Protection (ASCT)

Electronic control incorporates anti-short-cycle timer (ASCT) feature designed to protect compressor from short cycling. ASCT is activated immediately following off cycle of outdoor unit. Once room temperature is satisfied and outdoor unit switches Off, ASCT will not allow outdoor unit to restart until 3 minute time period has elapsed. Feature prevents compressor and heat source from rapid restarts. Once switched off, or following power outage, compressor or heat source does not restart for minimum of 3 minutes.

Staggered Start Protection

Designed for systems with electric heat, in heat pump and dry modes staggered-start feature prevents compressor and electric heater from starting simultaneously. There is 30 second delay between start of compressor and start of electric heater while in Dry mode and Heat pump mode.

Minimum Run Time

Minimum on time prevents compressor or heat source from cycling off prematurely. Minimum ON time for both compressor and electric heat is 2 minutes.

Drain Pan Sensor

Drain pan sensors monitor condensate level in each of unit's drain pans. Should water in either pan reach critical level, monitor automatically signals main control unit. Microprocessor switches off condensing unit for minimum of 3 minutes and until fault condition has been cleared, to prevent further condensate production. Fault code, flashes on controller's LED display, automatically reset once fault condition is cleared.

Annunciation

Unit is equipped with annunciation feature — controller will beep, providing user with audio feedback confirming the microprocessor has received its commands.

Memory Backup

In event of power failure control retains all of it's settings, including mode of operation. When power is restored, control returns to mode of operation that it was in prior to power failure, after 3 minute time delay.

CONTROLLER FAULT CONDITIONS

Table 9 Trouble Codes

Failure Type/ Location	Run LED	Alarm LED- Number of Flashes	Fault Condition	Description
Indoors	Off	1	Dirty filter	Clean filter, press warning/clear filter button
	Off	2	Drain pan condensate fault	Condensate, check for drain blockage or pump failure
	Off	3	EPROM failure	Check indoor EPROM
	Off	4	Failure for ambient temperature detection	Check ambient temperature sensor
	Off	5	Failure for coil temperature detection	Check coil temperature sensor
	Off	6	Communication failure between indoor/ outdoor	Check for loose/broken connection, check transformer
Outdoor	On	1	Failure for EPROM	EPROM check outdoor EPROM
	On	2	IPM Protection (component on heat sink)	Replace heats ink
	On	3	Over-current protection	Current exceeds maximum level or module failure. Check
	On	4	Outdoor control communication failure	Check OD control wires and connectors
	On	5	Compressor overload protection	Module failure, replace
	On	6	Voltage too high or low	Incoming voltage too high/low
	On	7	Compressor blocked/stopped	Module failure, replace
	On	8	Discharge temperature too high	Discharge temperature too high, check system air flow
	On	10	Condenser coil temperature too high or low	Check system air flow and sensor
	On	11	Suction temperature too high or low	Check system air flow and module
	On	12	Outdoors ambient temperature too high or low	Check outdoor ambient temperature sensor
	On	13	Discharge temperature fault too high or low	Failure for sensor or circuit detection
	On	15	Communication failure (indoor or outdoor)	Check wires, connectors, transformer
	On	18	Compressor position lost, unknown	Module failure, replace
	On	19	Compressor position check failure	Module failure, replace
Outdoor	On	20	Indoor coil temperature too high	Indoor coil temp too high in heating or module failure
	On	21	Evaporator coil freeze	Indoor coil temp too low in cooling or module failure
	On	22	High pressure switch open	Check, reset high pressure switch
	On	24	Compressor-over current protection	Module failure, replace
	On	25	Phase over-current protection	Phase over-current for compressor. Failure of sampling
	On	26	Module reset	Module fault. Reset incoming field power

1. Indoor fault, warning LED flashes 1-6, other LED's off.

2. Outdoor fault, outdoor LED flashes 1-26 times. Indoor run LED turns on and indoor warning LED flashes 1-26 times.

3. While EEPROM failure on Indoor unit, all 4 lights flash.

⚠ WARNING

Electrical shock hazard. Before removing access panels, verify all power is disconnected from the unit. Failure to follow these instructions could result in death or serious injury.

Have service performed by a qualified service agency. Annual system check is recommended.

Clean The Filter

Clean filter as needed to insure operating efficiency. Follow procedure listed below.

Filter must be cleaned regularly — Allowing dust to collect on the filter results in reduction of air flow, causes unit to lose efficiency, condition will cause unit to malfunction.

Clean filter monthly or when it is visibly dirty.

1. Remove return air grille. See Figure 27.
2. Open two clips at base of filter. Carefully pull filter out. Place filter on flat surface. See Figure 28.
 - A. Vacuum, use brush attachment and vacuum all visible dirt. See Figure 29.
 - B. Garden hose, hose thoroughly. Let filter dry before replacing.
3. Replace filters, clips and front grille before operating unit.

⚠ WARNING

DO NOT operate unit without filter and front grille in place.

4. Vacuum dust from return air grille and coil surface when cleaning filter. See Figure 30.
5. Wipe chassis with damp cloth when needed. See Figure 31.

Figure 27 Remove The Front Grille

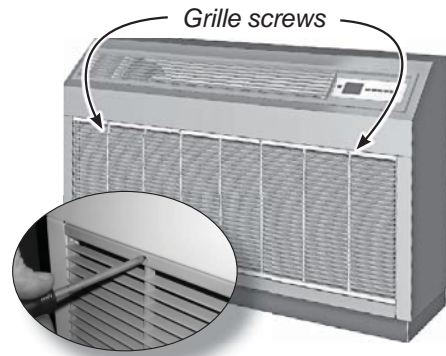


Figure 28 Filter And Grille

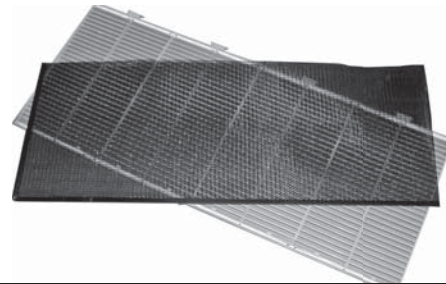


Figure 29 Cleaning With A Vacuum



Figure 30 Replace Filters And Grille Before Operating The Unit



Figure 31 Clean Front Grille And Coil With A Vacuum



⚠ WARNING

Electrical shock hazard. Before removing access panels or control covers, verify all power is disconnect all high volt power supplies to both the indoor unit and outdoor unit. Failure to do so could result in injury or electric shock.

Have service performed by a qualified service agency. Annual system check is recommended.

Troubleshooting Wiring - refer to wiring diagram supplied equipment. See See "Electrical Wiring" on page 15.

- Wiring diagram is located on inside surface of left end cap.
- If you are unable to locate the wiring diagram, please call technical service at (800) 228-9364. Have full model and serial number available prior to calling.

Wiring Requirements

EMI Ductless Series air handlers are designed to operate with EMI Ductless Series condensers.

- Air handler (indoor unit) and condenser (outdoor unit) can be independently connected to electrical service panel and protected by separate time delay fuse or HACR breakers. See unit name plate for correct breaker type and size.
- Indoor and outdoor units are connected to each other via 24V interconnect wiring.
- Transformer provides low volt power source for controls. Interconnect wire should be at least 18 AWG.
- Refer to unit wiring diagram for interconnect diagram that matches your system.

Power Supply Check

When troubleshooting first check the rating plate for proper field voltage and breaker size.

Use a voltmeter to check incoming power supply to verify it agrees with rating plate.

- Incoming power must not exceed nameplate voltage.
- Incoming power must not be below minimum voltage stated on rating plate (197V for units rated 208/230V).

Very low voltage power — place voltmeter across low volt terminals SC and 24VDC(-) at indoor unit. Voltage should be 24V.

Test Mode

Test mode is available for hand held control configuration only. Use of test mode aids in functional check of unit.

Low Voltage Controls — Cooling-Only Units

Cooling-only units utilize 4 low volt interconnecting wires between indoor unit, and outdoor.

Air handlers with unit-mounted controls require contacts wired to same name indoors and outdoors, COM1, COM2, SC, and 24DC(-). COM1 and COM2 carry serial digital communications between indoor and outdoor units. The SC and 24VDC(-) carry Direct Current power not Alternating Current.

Interconnect Wiring

See "Electrical Wiring" on page 15 for interconnect wiring diagrams for both unit mounted and optional wired wall control.

Checking voltage can be accomplished at either indoor or outdoor unit.

24V transformer located in indoor air handler unit provides low volt control power to both indoor air handler and outdoor condenser between SC and 24VDC(-) terminals. This is DC voltage, use proper scale on the meter.

Electric heat applications

Units with electric heat utilize control relay located on air handlers control board in control box.

As safety feature, auto-reset limit switch located on heater end plate or on heater assembly interrupts power to heater should overheat condition occur.

Each electric heat assembly is equipped with one-time fuse link. Should electric heat temperatures rise above auto resetting limit switch, non-resetting, one-time fuse link opens and heater remains off. To restart, new fuse link is required.

5 kw = 22.3 Amps

3 kw = 13.5 Amps.

Low voltage controls —Optional Heat Pump With Electric Heat Applications

Heat pump units with electric heat utilize up to 6 interconnecting wires between indoor, and outdoor.

Air handlers using hand held controls require contacts wired to same name indoors and outdoors, COM1, COM2, SC, 24VDC(-), RV and RV. COM1 and COM2 carry serial digital communications between indoor and outdoor units. SC and 24VDC(-) carry Direct Current power, not Alternating Current. RV and RV carry 24 volt alternating current to reversing valve, which is non-polarized.

Interconnect Wiring

See "Electrical Wiring" on page 15 for interconnect wiring diagrams, for optional wired wall control.

Checking voltage can be accomplished at either indoor or outdoor unit.

A 24V transformer located in indoor air handler unit provides low volt control power to both indoor air handler and outdoor condenser between SC and 24VDC(-) terminals. This is DC voltage use proper scale on the meter.

Cooling

EMI heat pump systems utilize Reversing Valve energized in Cooling mode and de-energized in Heating mode. When 24 Volts AC exists between RV and RV (either indoors or outdoors) system is in cooling mode. As long as system is in Cooling mode, 24 Volt power exists between RV and RV terminals. When zero (0) Volts AC exists between RV and RV, system is either in Heating mode or there is open circuit to reversing valve in Cooling mode.

- EMI heat pump systems utilize a reversing valve is that is energized in the cooling mode.
- It should remain energized constantly as long as the indoor unit or thermostat remains in cooling mode.

Heating

Heat pump systems accommodate two-stage heating when optional electric heater is present in combination with heat pump condenser. First stage consists of heat pump alone and second stage consists of heat pump and electric heat both operating simultaneously.

To verify heating operation, place Amp meter on indoor incoming power line. Mode should be heating, with thermostat set 1 degree above current room temperature.

Compressor starts and delivers heat to conditioned space, Amp meter registers fraction of Amp (blower motor only).

- Set thermostat 2 degrees continues to run delivering heat to conditioned space, and electric heat energizes.
- Amp meter reads 7 to twenty 23 Amps at 230 Volts AC depending on electric heater capacity and line voltage supplied to air handler.

Electric Heat Applications

Units with electric heat utilize control relay located on the air handlers control board in the control box.

Auto-reset limit switch located on heater end plate or on heater assembly interrupts power to heater should over-heat condition occur.

Each electric heat assembly is also equipped with one-time fuse link. Should electric heat temperatures rise above auto resetting limit switch, non-resetting, one-time fuse link opens and heater remains off. To restart, new fuse link is required.

5 kw = 22.3 Amps

3 kw = 13.5 Amps

Units With Condensate Pumps

EMI air handlers are available with optional condensate pump. Condensate pumps are recommended when it is not possible to gravity drain condensate from indoor unit.

Maximum lift for pumps will vary. Consult pump instructions for maximum lift.

Condensate generated by air handlers will collect in pump's reservoir.

- When water level is high enough, pump motor energizes clearing water from the reservoir.
- If water exceeds either drain pan upper limit or condensate pump reservoir's upper limit, compressor shuts down, preventing generation of additional condensate.

Q: The condenser will not start although indoor unit appears normal. What should I do?

A: Check Breaker

Q: How long will the fan run?

A: While the unit is in cooling or heating and auto fan mode is selected, Fan speed is determined by microprocessor, speed adjustment is made according to room and set-point temperatures. Fan switches to High speed when room temperature deviates by more than 1 degree from setpoint. Fan will switch to Low speed if deviation is 1 degree. When room temperature reaches setpoint temperature heat/cool call is dropped. Fan stays on for additional 60 seconds to purge unit of any residual energy. If High or Low is selected fan will operate continuously regardless of set point or room temperatures.

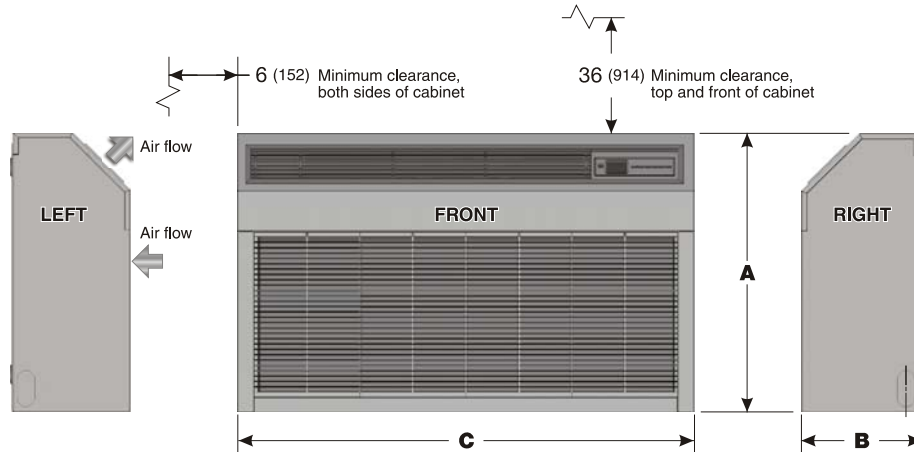
Q: What causes my indoor unit to freeze-up?

A: Units are equipped with freeze protection to prevent freeze up from occurring. If freeze up does occur check the following.

- Check freeze sensor is located in lowest part of coil. Generally this is where freeze up begins.
- Check freeze sensor is inserted fully and snug in coil fin. If not another location may need to be selected. Take care not to insert sensor directly into coil tube, insert sensor between two tubes.
- Check indoor air filter. Check coil is clean. If dirty, clean using appropriate coil cleaner or mild detergent.
- Is equipment being operated in cooling mode when outdoor temperatures are below 32°F? If it yes, have condenser fitted with low ambient control so proper system pressures are maintained.
- Does system have proper refrigerant charge? System low on refrigerant can cause air handler freeze-up. Contact a qualified refrigeration service technician to check system charge. Refrigerant charge information can be found in Installation, Operation and Maintenance Manual for outdoor condensing unit.

SPECIFICATIONS AND DIMENSIONS

Figure 32 Dimensions And Shipping Weights — Inches (mm) And Pounds (Kg)



Model	A	B	C	Shipping weight
	Height	Depth	Length	Pounds
UNHV09 UNHV12	26 (660)	11 (279)	41½ (1054)	95 (43)
UNHV18 UNHV24	26 (660)	11 (279)	51½ (1308)	116 (53)

Table 10 Discharge Air Speed And Flow @ 230 Vac / Sound Values

Model	High speed CFM (l/s)	Medium speed CFM (l/s)	Low speed CFM (l/s)	Coil	FPM (m/s)	Throw feet (m)	Observed sound values (dBA)
UNHV 09–12	425 (200)	400 (188)	375 (175)	Dry	900 (4.6)	15 (4.6)	51
UNHV 18-24	700 (350)	625 (300)	550 (250)	Dry	1,225 (6.2)	24 (7.3)	56

Table 11 UNHV Electrical Specifications

MODEL	VOLTS/HZ/PH	FAN RLA	HP	HEATER K.W.	AMPS	TOTAL AMPS	MIN VOLT	M.C.A.	HACR BRKR
UNHV 09/12	208/230/60/1	0.34	0.02	-	-	0.34	197	0.4	15
	208/230/60/1	0.34	0.02	3	13.04	13.38	197	16.7	20
UNHV 18/24	208/230/60/1	0.56	0.07	-	-	0.56	197	0.7	15
	208/230/60/1	0.56	0.07	3	13.04	13.6	197	17	20
	208/230/60/1	0.56	0.07	5	21.74	22.3	197	27.9	30

Table 12 UNHV Interconnecting Line Sizes

System capacity Btuh	Liquid O.D.	Suction O.D.	Condensate I.D.
UNHV 09	1/4"	1/2"	1/2"
UNHV 12	1/4"	1/2"	1/2"
UNHV 18	3/8"	5/8" *	1/2"
UNHV 24	3/8"	5/8" *	1/2"

* Suction connection size is 3/4" O.D. and must be bushed down at the UNHV 18/24 unit.

UNHV SYSTEM OPTIONS

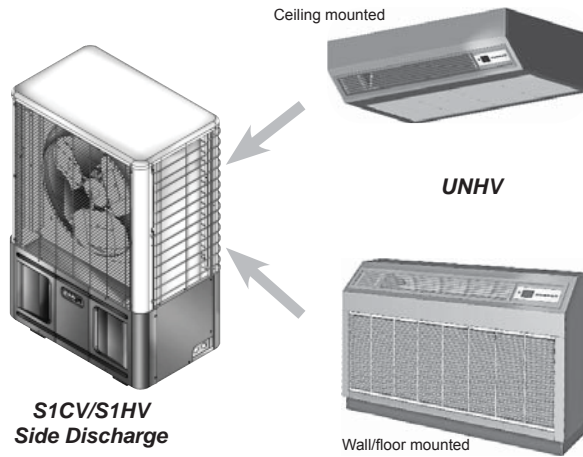


Table 14 Cooling System With Universal Units

Condenser	Wall Units	Btuh	SEER	SHR	EER	Ref.
S1CV9000	UNHV09	9,000	16.7	0.75	13.5	R410A
S1CV2000	UNHV12	12,000	17.0	0.66	12.0	R410A
S1CV8000	UNHV18	18,000	17.0	0.73	13.0	R410A
S1CV4000	UNHV24	24,000	17.0	0.67	11.0	R410A

Table 15 Heat Pump System With Universal Units

Condenser	Wall Units	Cooling Btuh	Heating Btuh	SEER	HSPF	SHR	EER	COP	Ref.
S1HV9000	UNHV09	9,000	8,800	16.7	8.2	0.75	13.5	3.2	R410A
S1HV2000	UNHV12	12,000	10,000	17.0	8.5	0.66	12.0	3.0	R410A
S1HV8000	UNHV18	18,000	18,000	17.0	9.5	0.73	13.0	3.5	R410A
S1HV4000	UNHV24	24,000	21,000	17.0	9.5	0.67	11.0	3.2	R410A

TEST UNIT PERFORMANCE DATA SHEET

NOTICE

Test Unit Performance Data sheet is provided for use by qualified service professional in event there is concern with unit. For our Technical Service Department to better serve you, please complete. Have this information ready when calling. It is important to include Model Number, Serial Number, and Date of installation. Call Technical Support Department @ 1-800-228-9364.

Model Number	Date:
Serial Number	Technician:
	Mode:
Indoor Section	Notes
Air handlers Entering Air - DB	
Air handlers Entering Air - WB	
Air handlers Leaving Air - DB	
Air handlers Leaving Air - WB	
Outdoor Section	
Entering Air	
Leaving Air	
Temperature Split	
Operating Pressures	
Compressor Suction - PSIG	
Compressor Discharge - PSIG	
Power Input	
Compressor - Volts	
Compressor - Amps	
OD Fan Motor - Volts	
OD Fan Motor - Amps	
ID Fan Motor - Volts	
ID Fan Motor - Amps	
Total Volts	
Total Amps	
Temperatures - Degrees F	
Compressor Suction	
Compressor Discharge	
Liquid Out Cond.	
Liquid before Expansion	
Suction out Air handlers	
Capacity Calculations	
DB - Temp Split at Air handlers	
Test Summary	
Compressor Superheat	
Sub Cooling	



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Fax: 1-800-232-9364

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