

**EMI**  *Ductless*

*Comfort Where It Counts.*



An ISO 9001-2008 Certified Company



## **WLHV**

### **Variable Speed Ductless Split System High- Wall Air Handlers**

Straight Cool / Heat Pump Nominal Capacities							
WLHV09	WLHV12	WLHV18	WLHV24	WLHV30	WLHV36	Units	
9,000	12,000	18,000	24,000	29,800	33,400	Btuh	COOL
2.6	3.5	5.3	7.0	8.7	9.8	kW	
8,800	10,000	18,000	21,000	26,000	26,400	Btuh	HEAT
2.6	2.9	5.3	6.2	7.6	7.7	kW	

### **Installation, Operation and Maintenance Manual**



#### **ECR International, Inc.**

2201 Dwyer Avenue,

Utica NY 13501

web site: [www.ecrinternational.com](http://www.ecrinternational.com)

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Check our website frequently for updates: [www.enviromaster.com](http://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](http://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.

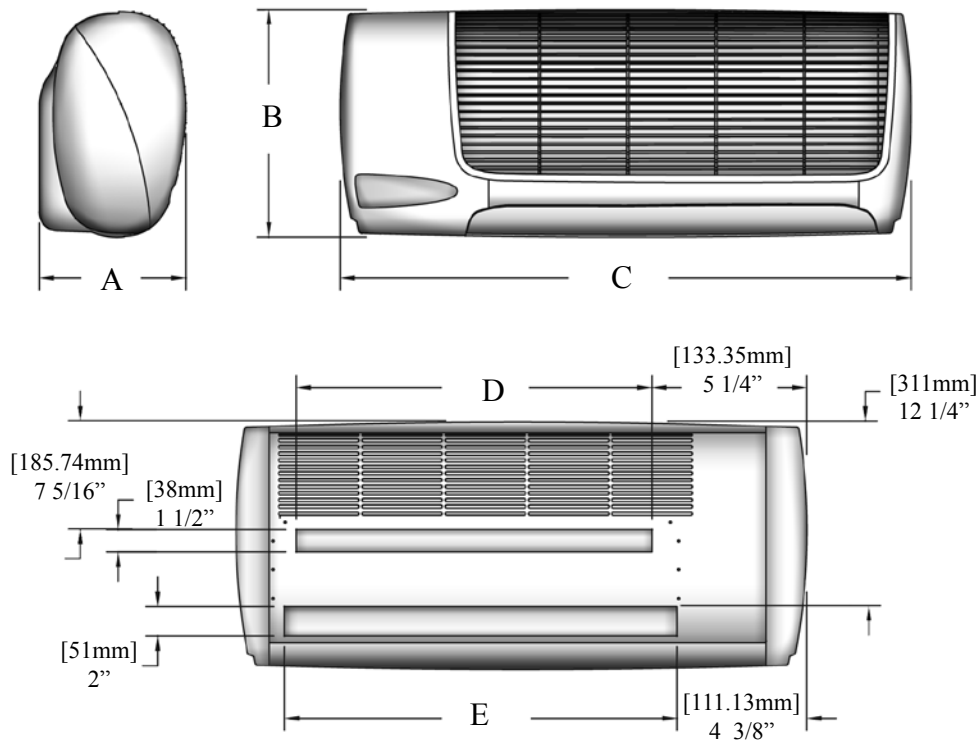
Do not use unit if it has damaged wiring, is not working properly, or has been damaged or dropped.

- 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 and Shipping Weight**



Model	A	B	C	D	E	Shipping weight
	Depth in (mm)	Height in (mm)	Length in (mm)	Mounting bracket clearance in (mm)	Tubing access clearance in (mm)	Pounds (kg)
WLHV09 WLHV12	9 7/8" (251)	15 1/4" (387)	38 1/2" (978)	24" (610)	26 1/2" (673)	60.3 (27.4)
WLHV18 WLHV24	9 7/8" (251)	15 1/4" (387)	48 1/2" (1232)	34" (864)	36 1/2" (927)	66.2 (30.0)
WLHV30 WLHV36	9 7/8" (251)	15 1/4" (387)	58 1/2" (1486)	44" (1118)	46 1/2" (1181)	90.1 (40.9)

### Product Description

- WLHV is available as (DX) direct expansion straight cool or heat pump.
- WLHV is equipped with unit mounted infrared compatible controls which support an optional wired wall thermostat operation. Handheld remote is supplied.
- Heat pump models provide up to 33,400 Btuh of cooling and 26,500 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 — S1CV / S1HV 09-36.
- Heat pump circuits include accurate common suction port.
- Condensers include common discharge port.

### Controls And Components (Factory-Installed Or Supplied)

- 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 or wired wall control.
- 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.
- Sweep or user selected stationary louver settings.
- 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.
- Horizontal discharge louver, constructed of high temperature ABS plastic, can be set to oscillate, or placed in six pre-set positions.
- Manually adjustable vertical discharge fins.
- Easy access to pipe chase area from cabinet bottom allows piping connections and condensate pump installation with unit wall mounted.

### Optional Equipment

- Condensate pump (field installed only).
- Wired wall control.
- 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 "H"	Max. Trap Height "P"	Liquid Line O.D.	Suction Line 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" *
30				3/8"	3/4"
36				3/8"	3/4"

\* Bush down at air handler

- Use dual point electrical connection with electric heat.
- Position unit as close as possible to center (left-to-right) of wall. Grille on unit front must be accessible for servicing.
- Allow for service and proper air distribution, position as close to center (left to right) of wall. Minimum distance from ceiling is stated on template provided with unit. Cabinet left and right end caps must be accessible for removal without obstruction. See Figure 2.

### Site Preparation

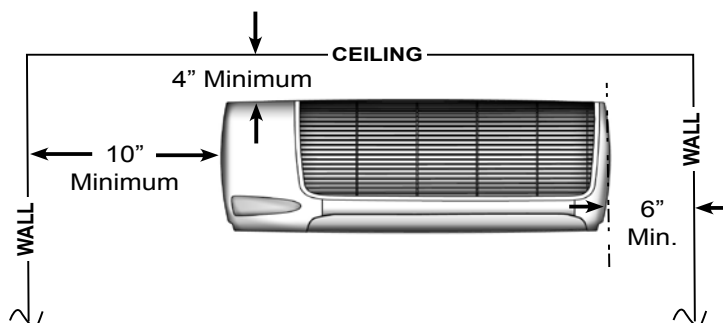
- Mount unit plumb and level to vertical surface to prevent unit vibration and noise.
- Mount unit directly to smooth surface such as wallboard or similar material.
- Mounting to masonry block wall, provide smooth barrier between unit and masonry block surface to absorb potential vibration and prevent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

### NOTICE

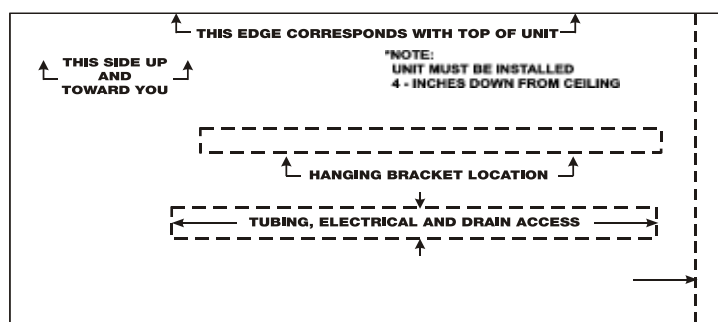
If excessive noise or vibration from unit mounted to masonry block wall, verify unit is plumb and level. If noise or vibration persists, contact distributor.

- Piping may be roughed in before wallboard or panels are placed in new construction. PVC pipe (3" or 4" I.D.) may be used as pipe chase.

**Figure 2 Minimum Service Clearances**



**Figure 3 Mounting Template**





## UNIT MOUNTING

### **⚠ 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.

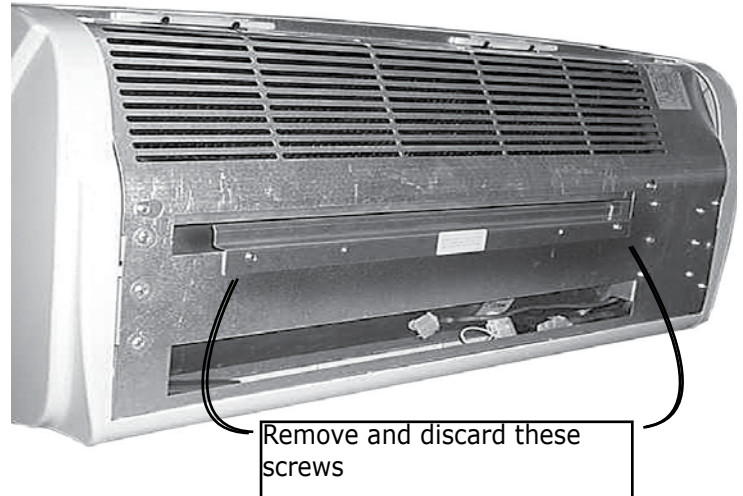
### **Unit Mounting Considerations**

1. Use template to mark where piping, electrical wiring and condensate drain should penetrate the wall. See Figure 3, Page 7.
2. Determine appropriate hole size. Cut through the wall.
3. Use supplied wall bracket. See Figure 4.
4. Secure bracket to wall with wood screws or masonry anchors. Insure bracket is mounted so it will support weight of unit. See Figure 5.
5. Mount unit to bracket. Align mounting slot on back of unit over the bracket, verify it fits properly. See Figure 6, Page 9.

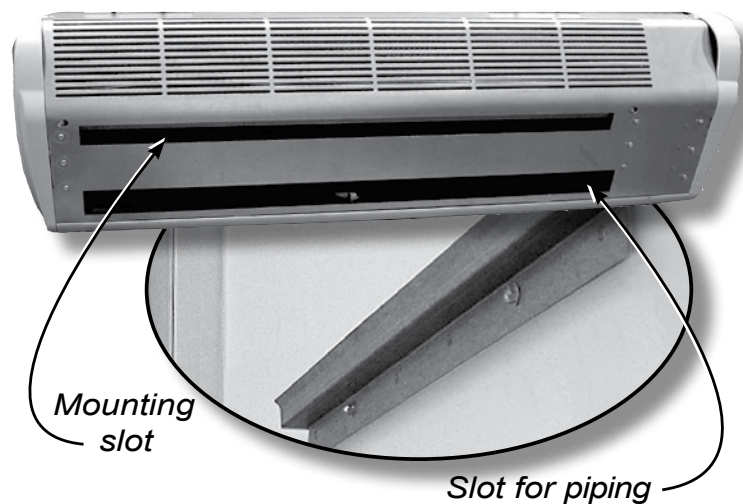
### **NOTICE**

Wall hanging bracket is not located in the center of the unit.

**Figure 4 - Wall Hanging Bracket**



**Figure 5 Removing Front Grill**

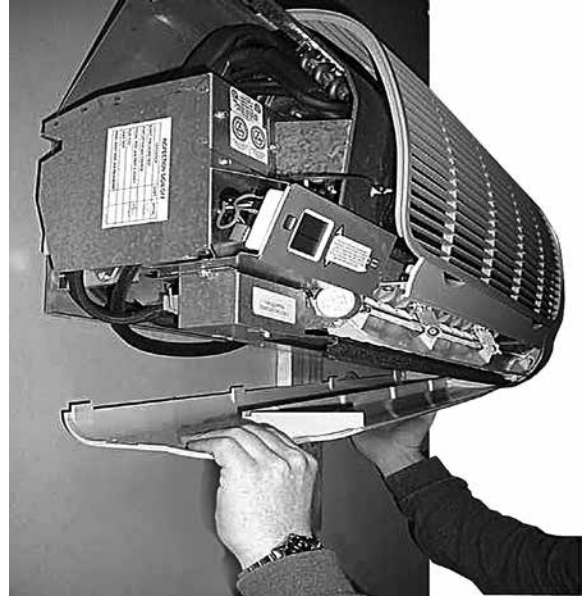




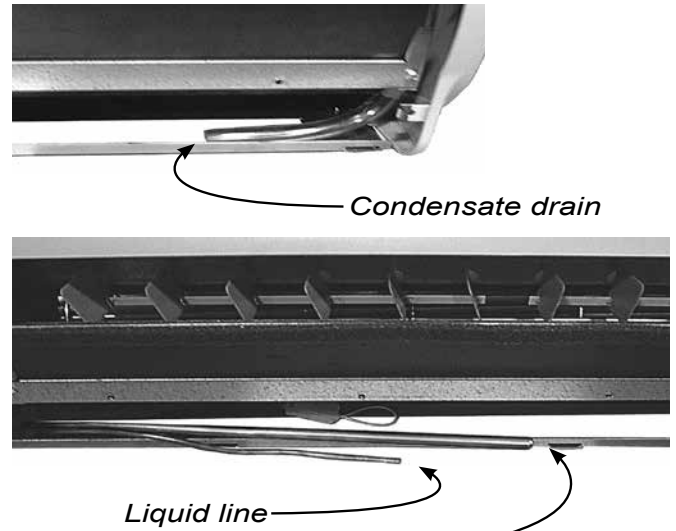
### Piping Preparation

- 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 10
- 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 Considerations" on page 8.
- Leave left end cap off of unit to allow removal of bottom panel.
- Remove screws on unit bottom. Remove bottom panel. See Figure 6.

**Figure 6 - Remove Bottom Panel**



**Figure 7 - Piping Connections**



**Suction line**  
(When a reducing bushing is required, install only here, at the indoor suction-line connection.)

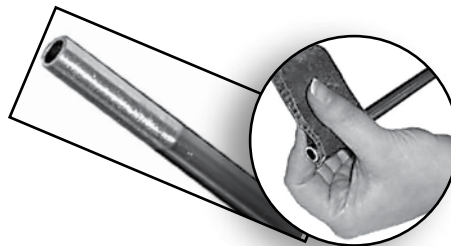
## Line Sizing

1. Size lines per Table 7, Page 36.
2. Match suction line size with condenser service valve connection.
  - When matching WLHV18 or 24 with 18,000 or 24,000-Btuh condenser, use 5/8" suction line, with reducer installed at indoor connection.

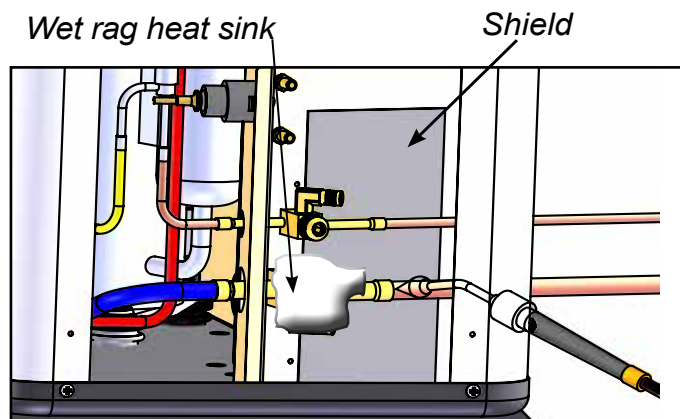
## Refrigerant Piping

1. Clean 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.
5. Install all panels removed to this point. Panels are required for proper air flow.
6. Both lines of line set must be insulated entire length with closed cell, foam tube insulation.
7. Connect outdoor unit according to instructions supplied with unit.
8. All horizontal piping runs must be level or sloped towards compressor without dips to trap oil.

**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 11.
2. Evacuate line to 500 microns or less to insure all moisture has been removed and there are no leaks. See Figure 12.
  - 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 2, Page 12.

All systems require field charge adjustments. Refer to "Refrigerant Charge Tables" for proper weight charge.

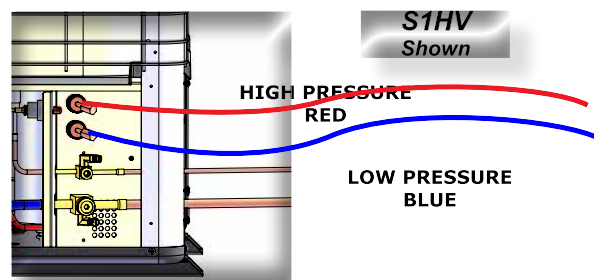
**Charge with dial-a-charge or weighed in with scale.**

### NOTICE

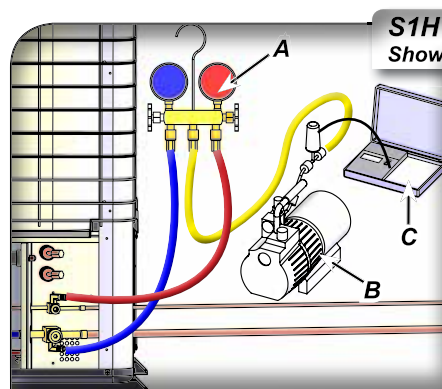
It is illegal to discharge refrigerant into the atmosphere. Use proper reclaiming methods & equipment when installing or servicing this unit.

- 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 11 - Manifold Set Connections At Unit**

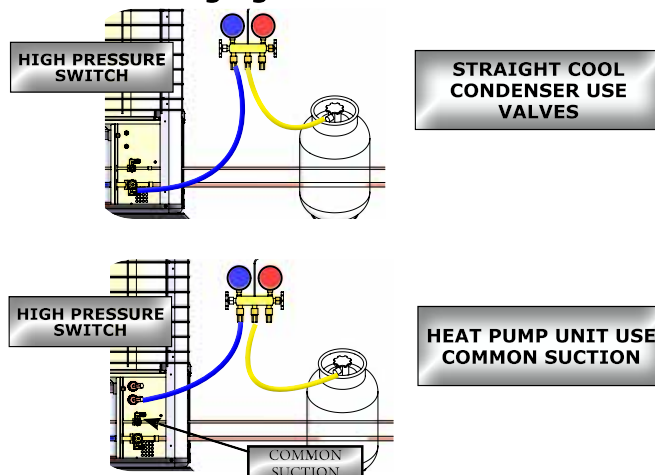


**Figure 12 - Manifold Set Up For Evacuation**

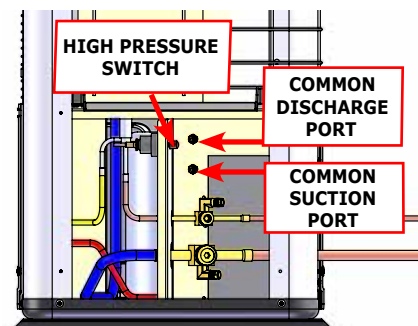


A Manifold  
B Vacuum pump  
C Micron gage

**Figure 13 - Charging**



**Figure 10 - 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.

Line Adjustment = (Line Charge/FT) x Line Length

System Total = Factory Charge + Line Adjustment

Round to nearest ounce and allow for gauges and hoses.

**Table 2 - S1CV / S1HV R410A Refrigerant Charge Table**

Condenser	Wall Unit Pairing	Line Charge Per Foot	Factory Charge
S1CV9000	WLHV09	.25 oz./ft 23 g/m)	39.5oz (1120g)
S1CV2000	WLHV12	.25 oz./ft 23 g/m)	39.5oz (1120g)
S1CV8000	WLHV18	.64 oz./ft 59 g/m)	54.0oz (1531g)
S1CV4000	WLHV24	.64 oz./ft (59 g/m)	54.0oz (1531g)
S1CV3000	WLHV30	.64 oz./ft (59 g/m)	90.0oz (2551g)
S1CV6000	WLHV36	.64 oz./ft (59 g/m)	90.0oz (2551g)
S1HV9000	WLHV09	.25 oz./ft (23 g/m)	39.5oz (1120g)
S1HV2000	WLHV12	.25 oz./ft 23 g/m)	39.5oz (1120g)
S1HV8000	WLHV18	.64 oz./ft (59 g/m)	54.0oz (1531g)
S1HV4000	WLHV24	.64 oz./ft (59 g/m)	54.0oz (1531g)
S1HV3000	WLHV30	.64 oz./ft (59 g/m)	90.0oz (2551g)
S1HV6000	WLHV36	.64 oz./ft (59 g/m)	90.0oz (2551g)

## 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. Remove left end cap of unit to access wiring diagram and electrical wiring. Remove three screws. See Figure 15.
5. Rotate louver down to expose third screw. See Figure 16
6. Slide left end cap off to expose control box. Locate wiring diagram on inside of end cap. See Figure 17.

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

Remove screw on front of control box to access high and low volt wiring. See Figure 18, Page 14.

## High Voltage Electrical Wiring

1. Refer to wiring diagram. Connect power wire to Black L1 and White wire L2 at power connector location. See Figure 18, Page 14.
2. Connect ground wire to ground lug or lead at same location in control box.
3. Terminate all unused wires with wire nut or crimp connector.

## Low Voltage Electrical Wiring

24V control transformer is located in the air handler providing low Volt control power to both air handler and condenser.

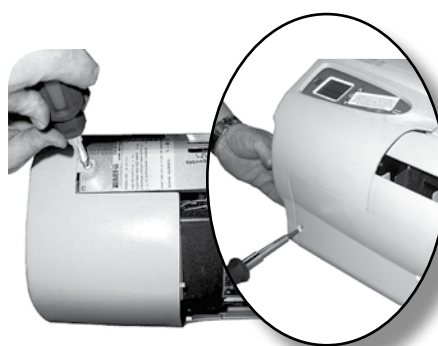
Low voltage interconnect wiring must be at least 18 AWG.

**Figure 14 - Before Removing End Cap**



Helpful Tip:  
Prior to removing end cap and bottom use small board to prop unit away from wall.

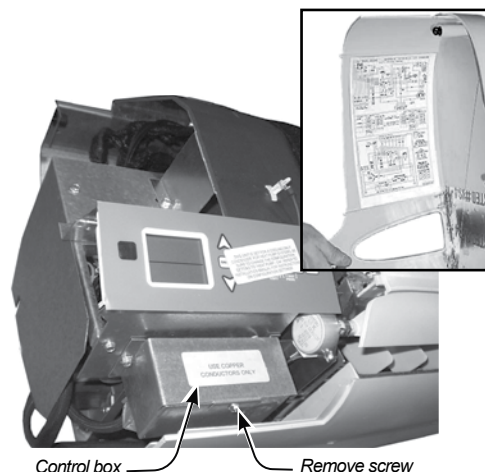
**Figure 15 - Removing End Cap**



**Figure 16 - Rotate Louver Down To Expose Screw**



**Figure 17 - Electrical Connection**



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

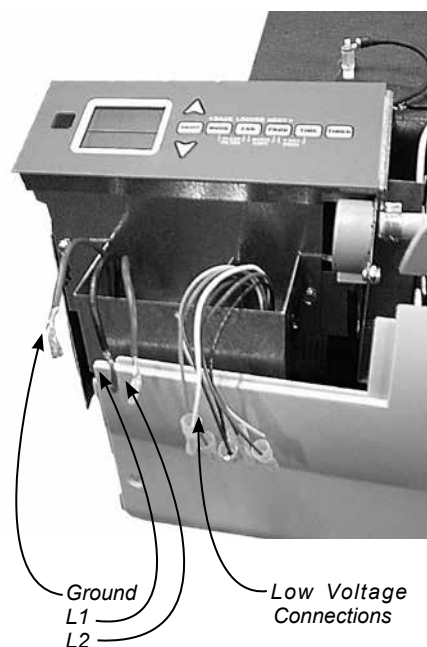
## Cooling Only Connection

- Cooling only units utilize four (4) low voltage interconnecting wires between indoor and outdoor units.
- Connect each wire [COM1, COM2, SC, and 24 VDC (-)] to same named terminal indoor and outdoor. See Figure 19.
- Protect other unused wires or terminals, such as both RV, with wire nut from making contact with junction box or other metal surfaces.

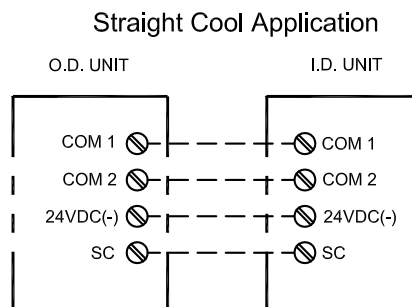
## Heat Pump Connection

- 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 and Figure 20.
- 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.

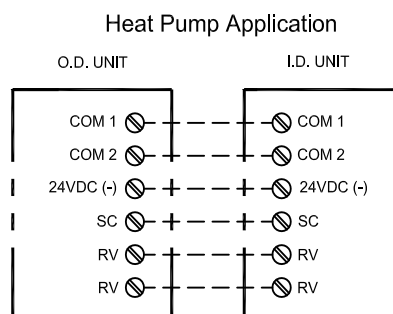
**Figure 18 Wiring Connections**



**Figure 19 - Unit-Mounted Controls — Cooling Only**



**Figure 20 - Unit-Mounted Controls — Heat Pump Connection**





### Optional Wired Wall Mounted Thermostat Connection

Thermostat 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 WLHV. See Figure 22 and Figure 23 page 16.

- Thermostat is shipped with 15 foot long 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 slice cables together on site.

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

### Heat Pump Applications

**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.

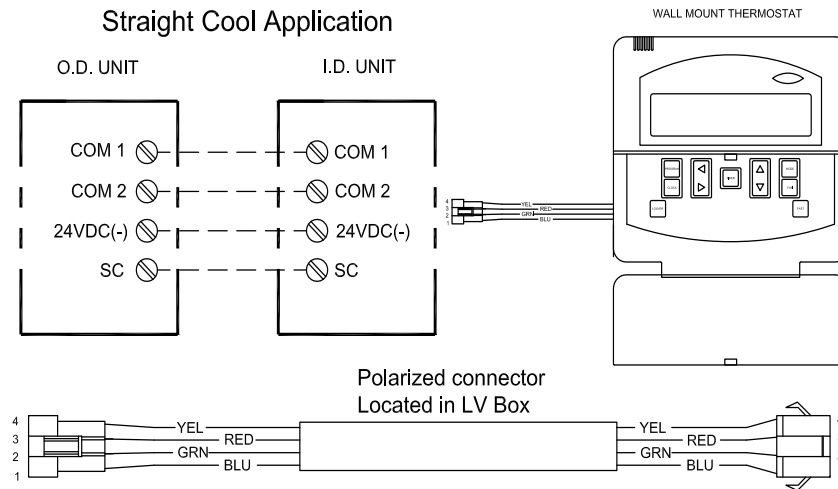
**Figure 21 - Low Voltage Box**



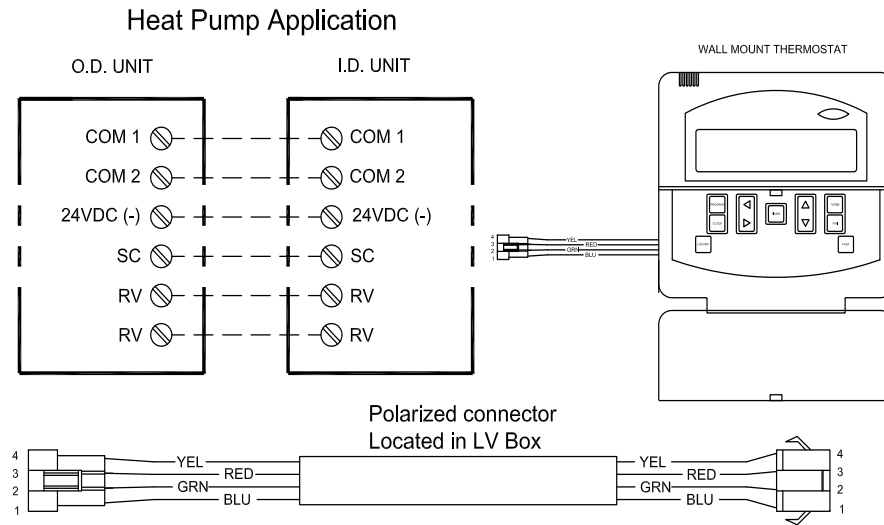
*Control Box* — *Replace Screw*



**Figure 22 - Wall-Mounted Thermostat Configuration — Cooling Only**



**Figure 23 - Wall-Mounted Thermostat Configuration — Heat Pump**



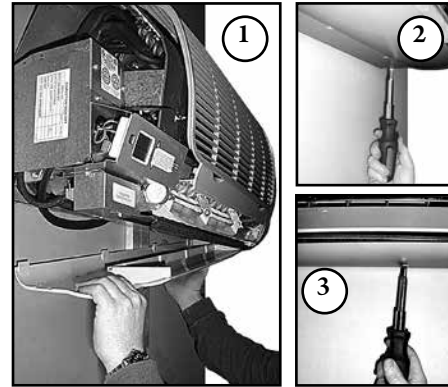
### Assemble Cabinet

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

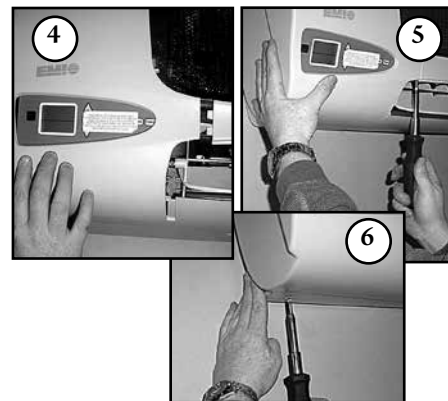
#### Assemble Cabinet

1. Replace bottom panel. See Figure 24.
2. Fasten right end cap using Phillip head screw.
3. Replace and tighten remaining screws across bottom panel.
4. Replace left end cap. See Figure 25.
5. Tighten screw on right when end cap is properly seated.
6. Tighten bottom end cap screw.
7. Replace grille. See Figure 26.
8. Tighten top screw on left end cap.

**Figure 24 - Replace Bottom Panel**



**Figure 25 - Replace Left End Cap**



**Figure 26 - Replace Grille**



### S1CV / S1HV 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 wall thermostat.

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.
- 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, 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 28, Page 22.
8. Make set-up adjustments as needed. Use Test mode if desired to reduce start-up time.
9. Use hand held remote controller to start system.
10. Connect wall thermostat 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 Figure 3, Page 24.
- Controller provides diagnostics with annunciation and includes sensors to prevent short cycling and other benefits as explained on Table 5, Page 31.
- Adjust and configure unit using IR Hand Held remote control. See "Wall Control Operation" on page 22.
- Unit operates with either hand held remote or wired wall control. Figure 27, Page 21.
- Before operating the unit, use information in (Figure 28, Page 22) and (Figure 29, Page 23) to configure and set up controller.

### Wired Wall Control Operation

See "Wall Thermostat Operation" on page 29. for setup and operation when using wall thermostat.

**Figure 27 - Hand Held Remote Operation**


<b>POWER</b>	Press to turn unit ON or OFF. Press and hold 2 seconds to transmit all settings to unit-mounted controller.
<b>MODE</b>	Press to toggle through operating modes — Heat, Cool, Auto Changeover, Dry or Fan.
<b>CLOCK</b>	Normal operation — hold 3 seconds to enter Set Time mode; press again to finish and exit. In programming mode — press to enter previous selection.
<b>LOUVER</b>	*Press to toggle motorized louver on or off.
<b>UP</b>	Normal operation — press to increase setpoint temperature. Configuration, Set Time or Programming mode — press to increase setting.
<b>DOWN</b>	Normal operation — press to decrease setpoint temperature. Configuration, Set Time or Programming mode — press to decrease setting.
<b>FAN</b>	Press to toggle between fan modes — High, Med, Low or Auto.
<b>PROGRAM</b>	Normal operation — Press to toggle between manual operation and Pre-programmed (7 - day) run mode. Configuration, Set Time or Programming mode — press to enter next selection.
<b>TIMER</b>	Press to toggle Timer mode on/off.
<b>TEST</b>	While in Heating or Cooling mode, press 5 seconds to enter test mode. Intended for service only. Holds unit at a fixed speed. See Table 4
<b>FAST</b>	While in Heating or Cooling, press 5 seconds enters Turbo mode for 30 minutes.
<b>MODE + PROGRAM</b>	With unit in OFF mode — Press and hold 5 seconds to enter Configuration mode; press again to exit.
<b>PROGRAM + CLOCK</b>	With unit in OFF mode — Press and hold 5 seconds to enter Configuration mode; press again to exit.
<b>FAN + PROGRAM</b>	With unit in 7-Day Programming mode — Press and hold 3 seconds to copy settings for selected day to all other days.

## WIRED WALL CONTROL

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

**Figure 28 - Wired Wall Control**





## SETTING THE CONTROLLER

**Figure 29 - 7-Day Programming Options For CAHV**

Item	Setting	Values	Overview
<p><b>To access:</b> Press and hold PROGRAM and CLOCK buttons simultaneously 3 seconds; use arrow keys to select position; save selection and exit by repeating button press.</p> <p><b>Quick copy</b> — Hold FAN and PROGRAM buttons 3 seconds to copy current day's settings to all other days.</p> <p><b>Navigating through settings:</b> Press PROGRAM to move to next setting or CLOCK to move to previous setting; to change values, use UP and DOWN keys; when value is reached, move to next setting using PROGRAM or CLOCK button; values are stored on exit from programming mode.</p>			
<b>7-Day Programming</b> (See Table 4, Page 25 to record settings)	Day of week	Mon, Tue, Wed, Thu, Fri, Sat, Sun	Louver is closed when fan is off.
	Period of day	Morning Day Evening Night	Periods provide four time settings to initiate change in cooling/heating setpoints.  Allow adjustments for setback (such as night setback, daytime setback and occupied settings for residential applications).  Set hour/minute for each time as well as cooling and heating setpoints below.
	Hour	0–12 a 0–12 p	Set time to begin period.
	Minute	0–59	
	Cooling setpoint	55–90 F	Default setpoint when set to Cooling in pre-programmed run mode.
	Heating setpoint	55–90 F	Default setpoint when set to Heating in pre-programmed run mode.
	Auto setpoint	55–90 F	Unit default setpoint when set to Auto in pre-programmed run mode. (Unit auto change over between heating and cooling.)

## SETTING THE CONTROLLER

**Table 3 - Configuration Mode For WLHV Air Handlers**

Item	Display	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>					

## SETTING THE CONTROLLER

**Table 4 - Programming Schedule (When Using 7-Day Programming)**

		Morning			Day			Evening			Night		
		Auto	Heat	Cool	Auto	Heat	Cool	Auto	Heat	Cool	Auto	Heat	Cool
<b>Monday</b>	Time		:			:			:			:	
	Temp												
<b>Tuesday</b>	Time		:			:			:			:	
	Temp												
<b>Wednesday</b>	Time		:			:			:			:	
	Temp												
<b>Thursday</b>	Time		:			:			:			:	
	Temp												
<b>Friday</b>	Time		:			:			:			:	
	Temp												
<b>Saturday</b>	Time		:			:			:			:	
	Temp												
<b>Sunday</b>	Time		:			:			:			:	
	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.

## HAND HELD CONTROLLER OPERATION

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.

### Pointing The Remote

Point remote toward air handler's infrared receiver window when entering commands. Air handler responds with beep indicating it has successfully received transmitted information.

### Synchronization

Occasions when remote and cassette's main control board mode synchronization or are not in the same mode may happen if commands are entered into remote when not pointed at air handler.

To re-synchronize:

- Enter any command into remote while pointing at air handler's infrared receiver window.
- Alternatively, hold POWER/SEND button two seconds, all optional remote's settings are transmitted. Air handler responds with beep, indicating it received transmitted information.

### Temperature Indication

Room temperature displayed on remote is temperature at remote.

Microprocessor control located in cassette does not read remote's temperature — it uses sensor located in return air of cassette.

Warming or cooling of remote alone does not effect operation of air handler. Air handler will react to its local temperature sensing element and setpoint selected and transmitted by remote.

### Transmission Limits

Remote has transmission distance approximately 25-30 feet when perpendicular to face of air handler. Reception distance varies with angle of transmission if not perpendicular. Reception distance may also vary depending on room lighting.

### Hibernate Mode

Remote enters hibernate mode and display goes dark if there is no activity on remote for ten minutes. Pressing any button awakens remote while in hibernate mode. Remote returns to mode it was in prior to entering hibernate mode.

### Power

Pressing POWER button momentarily switches unit either on or off.

1. OFF mode, LCD displays time of day and day of week.
2. ON mode, LCD displays room temperature, mode of operation Cooling, Heating, Auto (Auto changeover), Dry or Fan mode.
3. ON mode, setpoint temperature displays momentarily with push of any button except POWER button.
4. Remote transmits all infrared hand held controller information to air handler when POWER is held down for two (2) seconds.

### Mode

Heating, Auto Changeover (Auto) or Dry modes do not display if Heat Source is set to OFF in Configuration mode.

MODE button allows selection of mode of operation — Cooling, Heating, Auto Changeover (ACO), Dry or Fan mode.

Fan mode either HIGH, MEDIUM or LOW appears on LCD.

### Fan Operation

Indoor unit utilizes three-speed motor with four operational fan modes — High, Medium, Low, and Auto.

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

**Dry** mode, fan operates constantly at low speed. LCD indicates fan speed selection.

High, Medium, and Low are constant fan settings. Fan operates continuously, regardless of setpoint or room temperatures.

**Auto** fan mode is for auto ramping of fan speeds.

1. Auto fan mode can only be selected if unit is in Heating, Cooling or Auto Changeover modes.
2. Auto fan mode, speed is determined by microprocessor.
  - a. Speed adjustment is made according to room and setpoint temperatures.
  - b. Fan switches to High speed when room temperature deviates by more than two degrees from setpoint.
  - c. Fan switches to Low speed if deviation is one degree or less.

### Louver Operation

Louver can be set to oscillate during fan operation or open to fixed setting.

"Lou" is displayed for two seconds along with "ON" or "OFF" to indicate louver setting has been changed when LOUVER is pressed.

## Cooling Mode

For cooling operation, turn unit on via POWER button.

1. Select Cooling mode via MODE button.
2. Room temperature and set point temperature are displayed.
3. Setpoint temperature changes by one degree with each successive press of UP or DOWN ARROW buttons. Holding button in changes temperature rapidly.
4. Place setpoint temperature below room temperature.
5. Three (3) minutes after turning on power, compressor starts and cooling continues for minimum of two (2) minutes and continues cooling as long as setpoint remains below room temperature.
6. Cooling LED illuminates as long as unit is calling for cooling.
7. Once room temperature is satisfied for at least sixty (60) seconds and two (2) minute minimum run time has elapsed compressor cycles off.
8. Fan operates as described in Fan Operation see pg. 30. Once cooling has cycled off or following power outage, compressor does not restart for at least three (3) minutes (anti-short-cycle timer).

## Heating Mode

### Optional Electric heat operation (Air Conditioning unit outdoors)

For operation with optional electric heat control must be configured properly (Heat Source – ON, Heat Pump – OFF. See Table 3, pg. 24.

For electric heat operation, turn unit on via POWER button.

1. Select Heating mode via MODE button.
2. Room temperature and setpoint temperature are displayed.
3. Press either UP or DOWN ARROW buttons to change setpoint temperature.
4. Setpoint temperature changes one degree with each successive press of UP or DOWN ARROW buttons. Holding button down will changes temperature rapidly.
5. Place setpoint temperature above room temperature.
6. Electric heat energizes and heating continues as long as setpoint remains above room temperature.
7. Heating LED illuminates as long as unit is calling Heating mode.
8. When room temperature is satisfied for sixty (60) seconds and two (2) minute minimum on-time has expired, electric heat switches off.
9. See Fan Operation, see pg. 30.

### Optional Heat Pump Without Electric Heat (Heat Pump Unit Outdoors)

EMI heat pumps are intended to operate **with** indoor air handler, with optional electric heat.

If indoor air handler **without electric heat** is matched with heat pump condenser, system will deliver cold air during defrost.

Heat pump operation without electric heat control must first be configured properly. See Heat Source – ON, Table 3, pg. 24 , Heat Pump – OFF Table 3, pg. 24.

Turn unit on via POWER button for heat pump operation.

1. Select Heating mode via MODE button.
2. Room temperature and setpoint temperature is displayed.
3. Press either UP or DOWN ARROW buttons to change setpoint temperature.
4. Setpoint temperature changes by one degree with each successive press of UP or DOWN ARROW buttons. Holding button down will changes temperature rapidly.
5. Place setpoint temperature above room temperature.
6. Three (3) minutes after turning power on, outdoor unit energizes in heat pump mode. Heating continues as long as setpoint remains above room temperature.
7. Heating LED illuminates as long as unit is calling for heat.
8. When room temperature has been satisfied for at least sixty (60) seconds and two (2) minute minimum on-time has expired, compressor will switch off.
9. See Fan Operation. see pg. 39.

### Optional Heat pump with Electric heat (2-stage heating)

For heat pump operation with electric heat control must first be configured properly. See Heat source – ON, Heat pump – ON Table 3, pg. 24.

Heat pump operation with optional electric heat, turn unit on via POWER button.

1. Select Heating mode via MODE button.
2. Room temperature and setpoint temperature are displayed. Press either UP or DOWN ARROW buttons to change setpoint temperature.
3. Setpoint temperature changes by one degree with each successive press of UP or DOWN ARROW buttons. Holding button down changes temperature rapidly.
4. Place setpoint temperature above room temperature by one degree. Three minutes after turning on power compressor starts and heating continues for minimum of two (2) minutes and as long as setpoint remains above room temperature.
5. Heating LED illuminates as long as unit calls for Heating mode.

6. When room temperature has been satisfied for at least sixty (60) seconds and two (2) minute minimum on-time has elapsed, compressor switches off.
7. See Fan Operation see pg. 30.
8. Place setpoint temperature above room temperature by at least two (2) degrees.
9. Compressor starts and, electric energizes after thirty (30) second delay, thus two-stage heating.
10. Electric heat runs for minimum of two (2) minutes and until deviation between room temperature and setpoint temperature is less than two (2) degrees.
11. Electric heat switches off and heat pump (compressor) takes over heating demand.
12. Electric heater does not restart until three (3) minute delay has elapsed.
13. When room temperature is satisfied and two (2) minute minimum run time has elapsed, compressor cycles off.
14. Compressor does not restart until three (3) minute delay has elapsed.
15. See Fan Operation, see pg. 30.

### DRY mode

For Dry mode operation unit should have electric heater. Control must be configured properly (Heat source ON). See Table 3, Page 24.

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, 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 Mode

Auto Changeover mode (ACO), unit must have heat source. Control must first be configured properly, Heat source – ON. See Table 3, pg. 24.





Auto Changeover mode, cassette will operate in either Cooling mode or Heating mode. Control selects mode of operation dependent upon setpoint temperature, room temperature and differential setting selected in Configuration mode.

Auto Changeover mode, turn unit on via POWER button.

1. Select Auto mode via MODE button.
2. Room temperature and setpoint temperature are displayed.
3. Press either UP or DOWN ARROW buttons to change setpoint temperature.
4. Setpoint temperature changes one degree with each successive press of UP or DOWN ARROW buttons. Holding button down changes temperature rapidly.
5. Place setpoint temperature below room temperature by auto change over differential amount selected in Configuration mode.
6. Compressor starts, unit runs cooling operation as described in Cooling mode.
7. If setpoint temperature is above room temperature by auto change over differential amount selected in Configuration mode, unit runs heating operation as described in Heat mode.

### Set Time Mode

Clock used by 7-day programming mode.

1.  CLOCK button is used to enter or exit Set Time mode.
2. Set Time mode can be entered while control is in any mode, including Off mode.
3. To enter Set Time mode, press  CLOCK button for three (3) seconds.
4. Pressing PROGRAM  button advances to next item.
5. Order is (1) Day of week, (2) Hour and (3) Minute.
6. Time of day and day of week are changed using UP or DOWN ARROW buttons.
7. When  CLOCK button is pressed again or left idle for twenty (20) seconds, control saves new settings and returns to previous mode.

***Unit will not automatically adjust for Day Light Savings time.***

### 7-Day Programming Mode

7-day Programming mode is used to store settings for Pre-Programmed Run mode.

1. When unit is in either Off or On mode, 7-Day Programming mode can be entered by pressing PROGRAM ➡ + ⬅ CLOCK buttons simultaneously for three (3) seconds.
2. When PROGRAM ➡ + ⬅ CLOCK buttons are pressed simultaneously again or left idle for twenty (20) seconds, control saves new settings and returns to previous interface mode.
3. While in 7-Day Programming mode, words "7-DAY PROGRAM" are displayed on LCD.
4. Use UP or DOWN ARROW buttons to change time, temperature or period settings.
5. Use ⬅ CLOCK or PROGRAM ➡ buttons to select mode to be changed.
6. Settings can be entered for:
  - a. Day of week
  - b. Period of day
  - c. Hour
  - d. Minute
  - e. Cooling setpoint temperature
  - f. Heating setpoint temperature
  - g. Auto setpoint temperature.

### Quick Copy

Quick copy is feature of 7-Day Programming mode, used to copy settings of any day to rest of week.

While in 7-Day Programming, select day to be copied. Press FAN + PROGRAM ➡ buttons simultaneously for three (3) seconds. Selected day is copied to rest of week.

### Manual Run Mode

Normal operating non Pre-Programmed Run mode. Settings for temperature, mode and fan speed are selected by user and do not change with time. Word "PROGRAM" does NOT display on LCD.

### Pre-Program Run Mode

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

Setpoint and time settings are programmed into control through 7-Day Programming mode.

1. Pre-Programmed Run mode is entered from Cooling mode, Heating mode or Auto mode only.
2. Pre-Programmed Run mode cannot be entered from Dry or Fan modes.
3. Pressing PROGRAM ➡ button momentarily enters or exits Pre-Programmed Run mode.
4. The word "PROGRAM" appears in LCD display.
5. The setpoint changes to programmed setting at selected time.

To use Pre-Programmed Run mode enter program settings through 7-Day Programming mode.

1. Select mode of operation (Cooling, Heating, Auto) and press PROGRAM ➡ button to enter Pre-Program Run mode.
2. As time passes, setpoint temperature is selected according to time of day and 7-Day Program settings.
3. To override setpoint while in Pre-Programmed Run mode, adjust temperature using UP or DOWN ARROW buttons. Override setting will remain in effect until next scheduled event. (Morning, Day, Evening, Night) Setpoint is value selected in 7-Day Programming mode.

### Clean Filter Alarm

Cassette controller indicates when scheduled filter cleaning is required by flashing Timer/Alarm LED. During normal operation, microprocessor keeps track of units run time.

1. Timer/Alarm LED flashes four times to indicate filter needs to be cleaned.
2. Clean filter time is selected through Configuration mode.
3. Available settings are 250, 500, 750, **1000**, and 1250 hours. Default in **Bold**.
4. If coil freeze condition is detected four times within 24-hour period, Clean Filter Alarm appears.

After filter maintenance has been performed, press Mode & Fan button for three (3) seconds. Control responds with beep to indicate timer has been reset.

### Sleep Timer

Sleep timer feature allows user to switch unit off using preset timer. When control is in On mode, pressing TIMER button enters or exits Sleep.

### Timer Mode (Hand Held or Wall Thermostat).

When in Sleep Timer mode, word "TIMER" appears on LCD display. Unit continues to operate for thirty (30), minutes, then switches off. No adjustment.

To turn unit back on, press POWER button momentarily.



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 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.

### COOLING Operation

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

After connecting control to unit, place system 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 controller operation with electric heat, control must be configured properly. "Remote Thermostat ON, heat source ON". See Table 3, Page 24.

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

After connecting thermostat 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 thermostat operation for two stage heating including heat pump condenser and indoor electric heat, control must be configured properly. "Remote Thermostat ON, heat source ON". See Table 3, Page 24.

Wired wall controller controls call for electric heat operation (On or Off).

After connecting control 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 5 - Troubleshooting Codes**

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

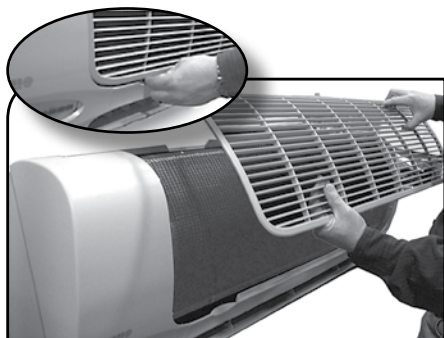
1. Lift front grille and remove. See Figure 30.
2. Open two clips at base of filter. Carefully pull filter out. Place filter on flat surface. See Figure 31.
  - A. Vacuum, use brush attachment and vacuum all visible dirt. See Figure 32.
  - B. Garden hose, hose thoroughly. Let filter dry before replacing.
3. Replace filters, clips and front grille before operating unit. See Figure 33.

## ⚠ WARNING

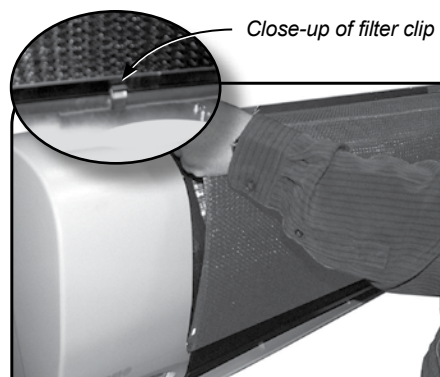
DO NOT operate unit without filter and front grille in place.

4. Vacuum dust from return air grille and coil surface when cleaning filter. See Figure 32.
5. Wipe chassis with damp cloth when needed. See Figure 34.

**Figure 30 - Remove Front Grille**



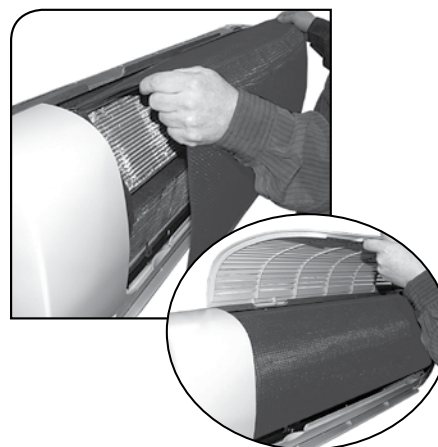
**Figure 31 - Filter And Grille**



**Figure 32 - Cleaning With Vacuum**



**Figure 33 - Replace Filters And Grille Before Operating The Unit**



**Figure 34 - Clean Front Grille And Coil With 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 "Electrical Wiring" on page 13. Wiring diagram is located on inside surface of left end cap.

**Wiring Requirements**

EMI Ductless Series air handlers will only 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 unit-mounted 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, outdoor and optional thermostat.

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**

Unit-mounted controls see pages 14 and 15.

Wired wall controller applications see Figure 22, Page 16.

**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.

**Electric Heat Applications**

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

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., new fuse link is required to restart.

5 kw = 22.3 Amps  
3 kw = 13.5 Amps.  
1.5kw = 6.9 Amps

**Low voltage controls —Optional Heat Pump With Electric Heat Applications**

Heat pump units with electric heat utilize up to 6 low volt interconnecting wires between indoor, outdoor, and (optional) thermostat.

24V transformer located in indoor air handler provides low volt control power to both air handler and condenser.

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 13 for interconnect wiring diagrams, both unit mounted and optional wired wall thermostat.

**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 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 temperature set 1° above current room temperature.

- Compressor starts and delivers heat to conditioned space, Amp meter registers fraction of Amp (blower motor only).
- Set temperature 2° 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 overheat 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: 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 setpoint 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

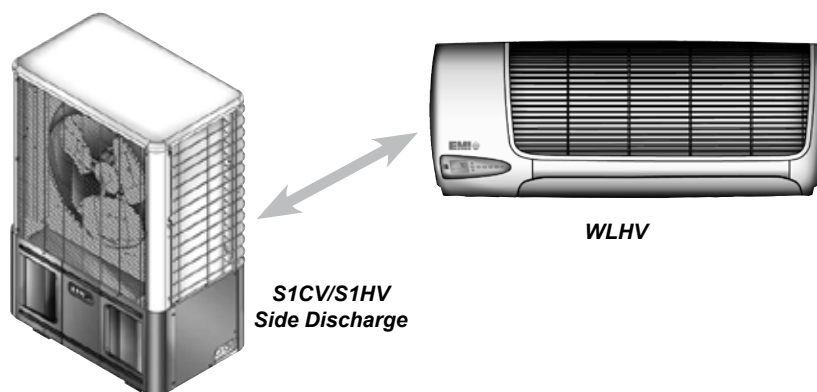
**Table 6 - WLHV Electrical Specifications**

MODEL	VOLTS/HZ/PH	FAN RLA	HP	HEATER K.W.	AMPS	TOTAL AMPS	MIN VOLT	M.C.A.	HACR BRKR
<b>WLHV 09/12</b>	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
<b>WLHV 18/24</b>	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
<b>WLHV 30/36</b>	208/230/60/1	0.80	0.10	–	–	0.8	197	1	15
	208/230/60/1	0.80	0.10	5	21.74	22.5	197	28.2	30

**Table 7 - WLHV Interconnecting Line Sizes**

System Capacity Btuh	Liquid O.D.	Suction O.D.	Condensate I.D.
WLHV 09	1/4"	1/2"	1/2"
WLHV 12	1/4"	1/2"	1/2"
WLHV 18	3/8"	5/8" *	1/2"
WLHV 24	3/8"	5/8" *	1/2"
WLHV 30	3/8"	3/4"	1/2"
WLHV 36	3/8"	3/4"	1/2"
* Suction connection size is 3/4" O.D. and must be bushed down at WLHV 18/24 unit.			

## WLHV SYSTEM OPTIONS



**Table 8 - Cooling System With Wall Units**

Condenser	Wall Units	Btuh	SEER	SHR	EER	Ref.
S1CV9000	WLHV09	9,000	16.7	0.75	13.5	R410A
S1CV2000	WLHV12	12,000	17.0	0.66	12.0	R410A
S1CV8000	WLHV18	18,000	17.0	0.73	13.0	R410A
S1CV4000	WLHV24	24,000	17.0	0.67	11.0	R410A
S1CV3000	WLHV30	29,800	14.5	0.71	10.3	R410A
S1CV6000	WLHV36	33,400	14.0	0.67	9.0	R410A

**Table 9 - Heat Pump System With Wall Units**

Condenser	Wall Units	Cooling Btuh	Heating Btuh	SEER	HSPF	SHR	EER	COP	Ref.
S1HV9000	WLHV09	9,000	8,800	16.7	8.2	0.75	13.5	3.2	R410A
S1HV2000	WLHV12	12,000	10,000	17.0	8.5	0.66	12.0	3.0	R410A
S1HV8000	WLHV18	18,000	18,000	17.0	9.5	0.73	13.0	3.5	R410A
S1HV4000	WLHV24	24,000	21,000	17.0	9.5	0.67	11.0	3.2	R410A
S1HV3000	WLHV30	29,800	26,000	14.50	7.7	0.71	10.3	2.8	R410A
S1HV6000	WLHV36	33,400	26,400	14.0	7.7	0.70	9.0	2.95	R410A





Phone: 1-800-228-9364  
Fax: 1-800-232-9364

2201 Dwyer Avenue,  
Utica NY 13501