



# CAHV

## Variable Speed Cassette Ductless Split System Air Handlers

Straight Cool / Heat Pump Nominal Capacities

CAHV09	CAHV12	CAHV18	CAHV24	CAHV30	CAHV36	Units	
9,000	12,000	18,000	24,000	30,000	35,600	Btuh	COOL
2.6	3.5	5.3	7.0	8.8	10.4	kW	
8400	8800	17000	19000	29000	29000	Btuh	HEAT
2.5	2.6	5.0	5.6	8.5	8.5	kW	

## Installation, Operation and Maintenance Manual



**EMI**  *Ductless*

*Comfort Where It Counts.*



An ISO 9001-2008 Certified Company

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**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, explosion, 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.
- Check rating plate on unit before installation. Verify voltage shown is same as electric supply to 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.

### **Product Description**

- EMI Cassette Air handlers are available in three cabinet sizes with six output capacities from 9,000–35,600 Btuh.
- Features include condensate pump with safety switch and 36" (0.9 m) lift, measured from base or bottom of unit, fresh air inlet, branch duct knockouts, and motorized air vanes (models 18 thru 36).
- Factory installed electric heat option. No field installed electric heat kits are available.
- Cassette air handler accepts optional wired wall control.
- Designed for low noise levels, easy installation, easy maintenance and slim line fascia, insure minimum intrusion into the conditioned environment.
- Cassette air handlers produce system SEER's exceeding 14.

### Standard Features

#### CAHV units

- Remote or optional wired wall control is required to adjust settings and configure controller.
- When operated by optional wired wall control, controller offers most functions. Hand held controller is required for "Test" mode.

#### Materials of Construction

- Galvanized steel cabinet with fire-resistant thermal and acoustic foam insulation.
- Light grey high-impact ABS fascia.
- Expanded polystyrene drain pan with tough, fire-retardant thermoplastic liner.

#### Air Systems

- Fans are backward-curved impeller centrifugal design; dynamically and statically balanced; and mounted on integral mounting rails.

Single-fan models 9 thru 24 and dual fan models 30, 36 are designed with fire-retardant plastic or aluminum impellers.

Multispeed motors are enclosed type with thermal protection and sealed lifetime bearings.

- User accessible permanent, washable filter.
- Branch duct knockouts on three sides for remote discharge locations; using no more than two non-adjacent sides.
- Fresh air intake capability on three sides of cabinet; only two on models 9-12.
- Four plastic air vanes, motor driven with auto sweep or fixed position stop setting on models 18 - 36. Models 9-12 are equipped with manually-adjusted air vanes.

#### Coil

- Coil is seamless, copper tubing, arranged in staggered configuration, with enhanced aluminum fins, tested to 700 psig.
- Tubes are mechanically expanded for secure bonding to fin shoulder.

#### Refrigeration Circuit

Condensing units equipped with Electronic Expansion Valve (EXV) and uses R410A refrigerant only.

#### Controls and Components - factory installed or supplied

- Connections for optional wired wall control.
- Custom control board featuring programmability, configuration, and multiple modes of operation.
- Controls also feature anti-short-cycle timer, post purge fan relay, and an on-board 30-amp electric heat relay.
- Condensate pump with 36" (0.9 m) lift (measured from base of unit).
- 24V Transformer.

#### System Options

- Wired wall control.
- Electric Heat (@ 230V)
  - 1.5 kW — models 9-12
  - 3 kW — model 18 - 24
  - 5 kW — model 30 - 36

#### Electric Heat Option

EMI heat option - heat pumps are intended to operate with indoor air handler, with electric heat. If indoor air handler without electric heat is matched with heat pump condenser system delivers cold air during defrost.

#### Wired Wall Control Applications

- CAHV units allow, optional wired wall control operation.
- Obtain wired control through EMI only.

#### Mechanical Characteristics

- Metal framed filters are fitted, reusable and may be vacuum cleaned.

#### Condensate Pump

- Designed to carry water out of unit. Pump is fixed to mounting bracket which can be withdrawn from side of chassis and incorporates inspection hole which allows for visual check of pump during operation.
- Float switch stops cooling action, shuts off compressor if pump becomes blocked or fails.
- Pump total lift is 36" (0.9 m) or less measured from base or bottom of unit.

#### Air Vanes

- Air outlet vanes are manually adjustable on models 9 and 12. Electrically motor driven on models 18 thru 36.
- Motorized air vanes where fitted can be set to auto sweep or stopped in a fixed position.

#### Heating

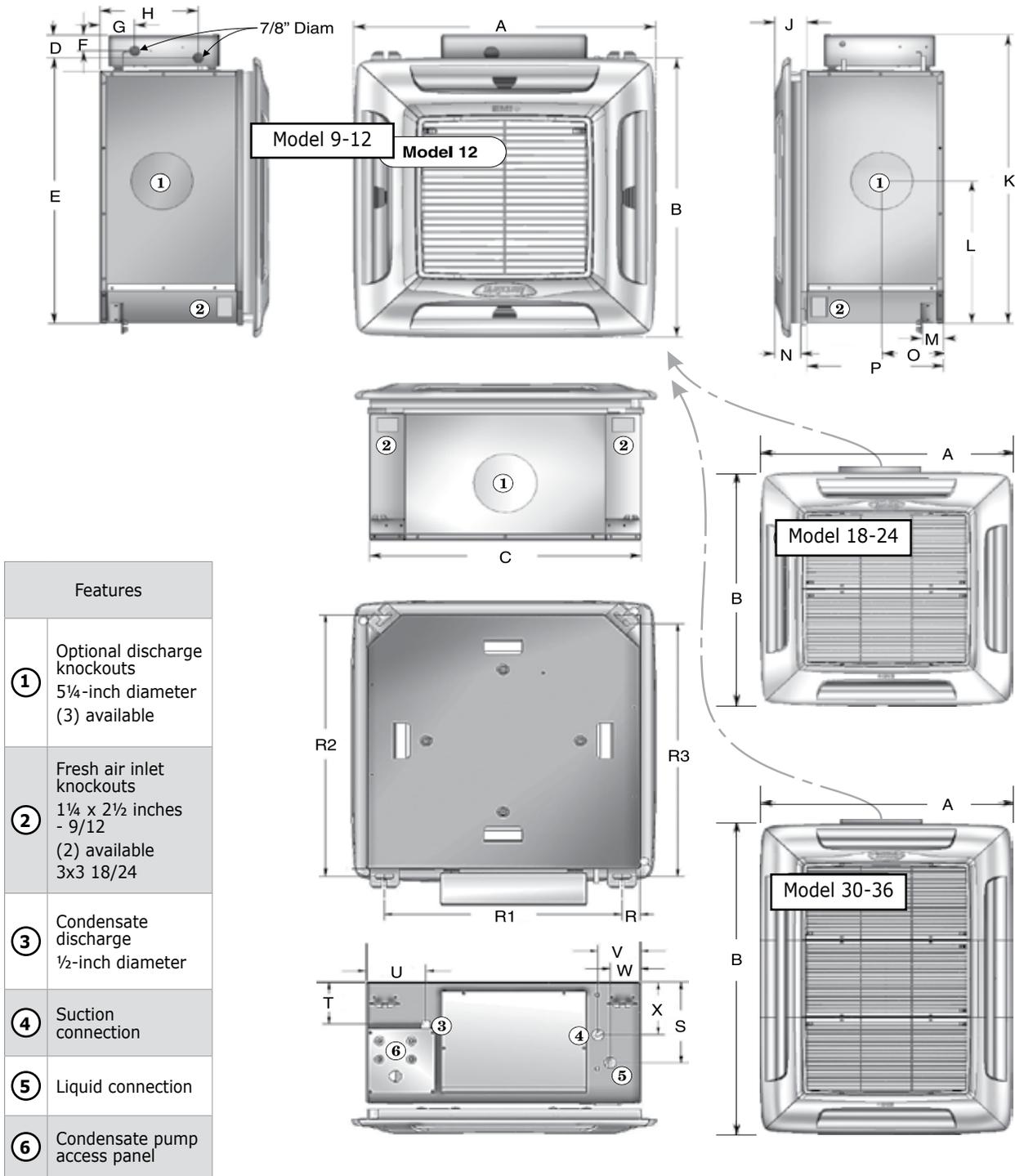
- Cassette may be fitted with optional electric heaters equipped with over-temperature limit switches. Consult factory for available models with electric heat.

#### Fresh Air Connection

- Fresh air may be introduced to unit by addition of ducts connected to fresh air knockouts on cassette case.
- Recommended maximum length is 10' (3m) of 4" (0.1m) diameter duct. Fresh air volume is approximately 7-10% of unit's published maximum air flow if more than 10% make up air is needed fresh air booster fan is required.
- Refer to Performance Data section of this manual for further information.
- Cassette is best installed in new construction or existing construction with suspended or false ceiling with enough clearance to accommodate concealing piping and electrical connections to unit.

## DIMENSIONAL/PHYSICAL DATA

**Figure 1 - Dimensions: Models 9, 12, 18, & 24 (see Table 1, Page 7)**



**DIMENSIONAL/PHYSICAL DATA**

**Table 1 Dimensions – Models 9, 12, & 24 (see Figure 1, Page 6)**

Dimension	Models 9 & 12		Model 18 & 24		Model 30 & 36	
	Inches	mm	Inches	mm	Inches	mm
<b>A</b>	25.00	635	37.00	940	37.00	940
<b>B</b>	25.00	635	37.00	940	49.26	1251
<b>C</b>	22.50	572	32.44	824	32.44	824
<b>D</b>	2.04	52	2.00	51	2.04	52
<b>E</b>	22.57	573	30.40	772	44.68	1135
<b>F</b>	1.41	36	1.41	36	1.41	36
<b>G</b>	2.88	73	3.65	93	3.65	93
<b>H</b>	8.13	207	8.90	226	8.90	226
<b>J (ref)</b>	2.67	68	3.38	86	3.38	86
<b>K</b>	25.86	657	35.61	904	47.78	1214
<b>L</b>	12.76	324	18.69	475	24.73	628
<b>M</b>	1.73	44	1.97	50	1.97	50
<b>N (ref)</b>	2.16	55	2.72	69	2.72	69
<b>O</b>	5.12	130	5.12	130	5.12	130
<b>P (ref)</b>	11.34	288	12.05	306	14.01	356
<b>R (typical)</b>	1.50	38	1.63	41	1.63	41
<b>R1</b>	19.50	495	29.19	741	29.19	741
<b>R2</b>	23.27	591	31.20	792	42.66	1084
<b>R3</b>	22.47	571	30.41	772	43.45	1104
<b>S</b>	7.19	183	6.87	174	6.87	174
<b>T</b>	3.73	95	2.58	66	4.98	126
<b>U</b>	4.88	124	5.50	140	5.47	139
<b>V</b>	3.50	89	4.93	125	5.00	127
<b>W</b>	2.50	64	3.97	101	4.00	102
<b>X</b>	4.69	119	4.37	111	4.37	111

## INSTALLATION CONSIDERATIONS

### Before Installing

- Determine best location for mounting unit for room air circulation.
- Locate outdoor and indoor units as close together as possible.
- Determine how power wires high and low-voltage, condensate drainage, and refrigerant piping may be run to and from unit.
- Insure interconnect tubing is within limits given in Table 2.

**Table 2 - Tubing Specifications**

S1CV or S1HV Model	Max. Length Equivalent feet	Max. Lift	Max. Trap Height	Liquid Line	Suction Line
		"H"	"P"	O.D.	O.D.
<b>09</b>	100' (30 m)	35' (11 m)	20' (6 m)	1/4"	1/2"
<b>12</b>				1/4"	1/2"
<b>18</b>				3/8"	*5/8"
<b>24</b>				3/8"	*5/8"
<b>30</b>				3/8"	3/4"
<b>36</b>				3/8"	3/4"

\*Bush to 5/8" @ Air Handler

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.

### Unpacking

Cassette fascia and main chassis are packaged together for increased protection.

### NOTICE

Do not throw template away with packaging.

1. Remove banding straps and lift cardboard lid.
2. Fascia is packed in bubble wrap on top of chassis. Fascia is not attached to chassis for shipping.
3. Cardboard template is between chassis and fascia.
4. Lift fascia and template from box and set aside.
5. Remove cassette chassis from box utilizing four corner brackets for lifting.
6. Do not use drain or refrigerant connections for lifting.
7. In order to protect fascia from dirt and damage return them to box until ready to install.
8. Do not throw away two polystyrene blanking-off pieces with packaging.

## MOUNTING THE UNIT

### Blanking off

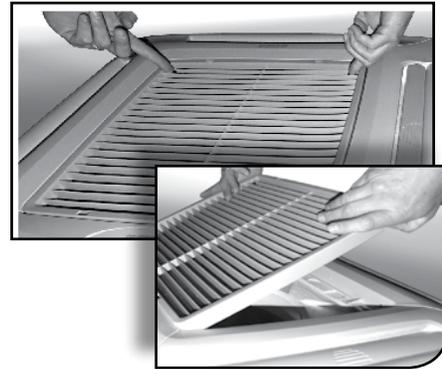
Fascia discharge slot(s) need blanking off when ducts are used to channel conditioned air to other areas.

- Position two polystyrene blanking off strips (provided) in fascia discharge slots to direct air to ducts.
- Up to two non-adjacent sides may be blanked off.

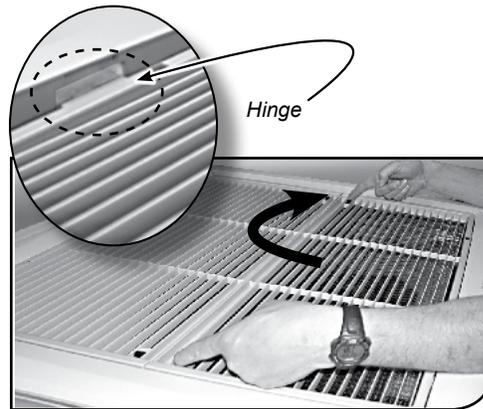
### If fascia discharge slot needs blanking off –

1. Remove inlet grilles and filters. See Figure 4 and Figure 2, Page 9.
2. Turn fascia over to expose polystyrene insulation. See Figure 3.
3. Push one polystyrene blanking-off pieces into recess in polystyrene fascia insulation.

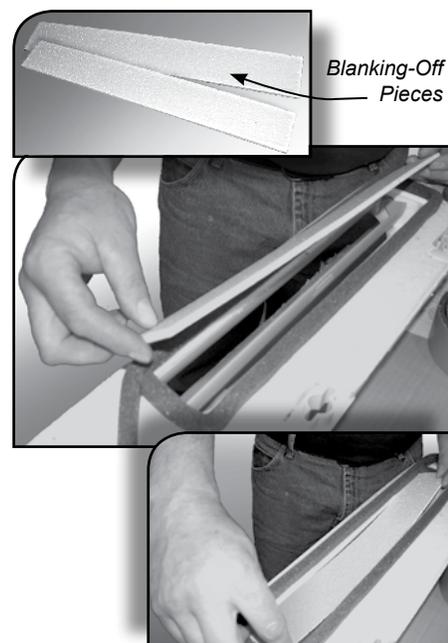
**Figure 4 Models 9–12 – One Grille & One Filter**



**Figure 2 - Model 18 - 24 – Two Hinged Grilles And Two Filters**



**Figure 3 - Applying Blanking-Off Pieces**



## MOUNTING THE UNIT

### Positioning

Select cassette installation position.

1. Pipe work, electrical connections, control box and condensate pump access panels should be readily accessible. Refer to cassette dimensions. See Figure 1, Page 6 and Table 1, Page 7.
2. Position unit at least 5 ft. (1.5m) from wall or similar obstruction.
3. Position unit as close to center of room as possible to insure even air distribution.
4. Position unit so discharge air does not blow directly on remote wall wired thermostat, if used.
5. Do not position unit directly above any obstructions.
6. Condensate drain should have sufficient fall — 1" per 10' (8 mm/m) in any horizontal run between cassette and drain.
7. Maximum condensate pump lift is 36" (0.9m) from bottom of unit.
8. Maintain minimum 1" (25.4mm) clearance above cassette depth and false ceiling for proper installation.

**Wired Wall Control** Optional wired wall control contact EMI for availability.

Locate optional wired wall mounted thermostat to insure good temperature control. Select installation position.

1. Position thermostat approximately 5 ft. (1.5m) above floor level.
2. Avoid external walls and drafts from windows and doors.
3. Avoid positioning near shelves and curtains as these restrict air movement.
4. Avoid heat sources (direct sunlight, heaters, dimmer switches, etc.)
5. Seal wiring holes in wall behind thermostat to avoid drafts.

### Ceiling Opening

#### NOTICE

Verify ceiling grid is supported separately from the cassette. Do not support ceiling by any part of cassette unit, fascia or any associated wiring or pipe work.

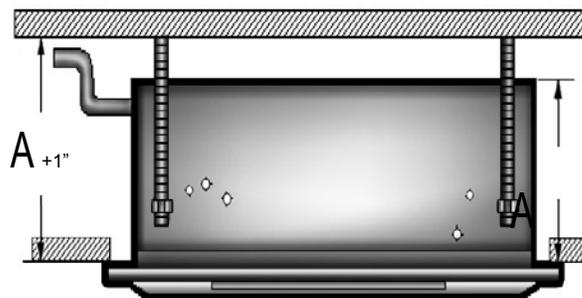
Cut opening in false ceiling with size. See Table 4.

**Table 4 - Ceiling Opening Sizes**

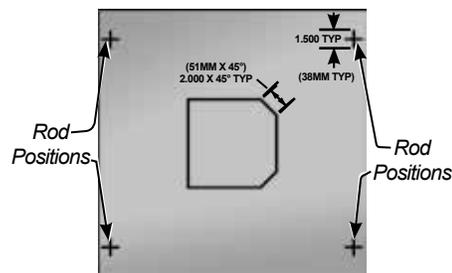
Model	Dimensions
<b>9 &amp; 12</b>	23 ¼" x 23 ¼" (591 x 591 mm)
<b>18 &amp; 24</b>	33 ⅞" x 33 ⅞" (860 x 860 mm)
<b>30 &amp; 36</b>	46" x 33 ⅞" (1168 x 860 mm)

**Figure 5 - Spacing Requirements**

**Dimension A + 1" = Minimum Space Above False Ceiling For Installation**



**Figure 6 - Ceiling Cutout/Rod Placement Template (Shipped With Unit)**



Model	Dimension A
<b>9 &amp; 12</b>	11.84" (0.3 m) min.
<b>18 &amp; 24</b>	12.55" (0.32 m) min.
<b>30 &amp; 36</b>	14.51" ( 0.37 m) min.

## Mounting Method

- In existing construction, remove enough ceiling panels to provide clearance space for mounting unit to ceiling joists.
- Before beginning installation, inspect unit location, test strength of ceiling joists to insure they will support unit weight.
- Determine mounting method:
  - A. Wooden beams use threaded rods, washers, and nuts to suspend support brackets.
  - B. Metal structures, secure threaded rods on an existing angle or install new support angle.
  - C. Newly built concrete slabs secure threaded rods with inserts and embedded bolts.
  - D. For previously built concrete slabs install hanging bolts with expansion anchor.
  - E. Follow local building codes for required safety cables, braces, etc.

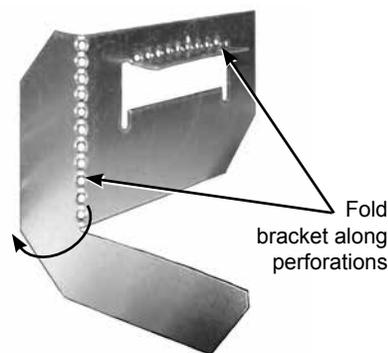
## Mounting

1. Use template to cut ceiling opening and determine rod positions. See Figure 6, Page 10.
2. Install hanger bolts using 3/8" (10 mm) all-thread rod at centers. See Figure 6, Page 10.
3. Prepare installation guides by folding metal bracket by hand along perforations. See Figure 7.
4. Lift cassette onto hanging rods.
5. Level at correct distance from ceiling with aid of installation guides. See Figure 8.
6. Secure unit in position with locknuts and washers on either side of cassette bracket.
7. Insure threaded rod does not protrude more than 2" (51mm) below mounting bracket. See Figure 9.

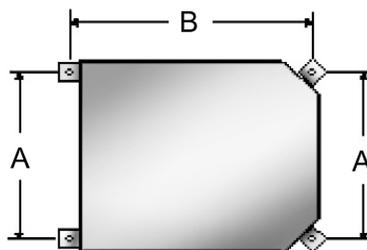
If ceiling is not level or even, it is important to install cassette level to insure correct pump operation and to maintain fan clearances.

Place carpenter's level on unit. Maximum slope of 1/8" (3mm) over length of chassis toward condensate drain is allowed. Slight discrepancy between cassette and ceiling will be taken up by fascia foam seal.

**Figure 7 - Mounting Brackets**

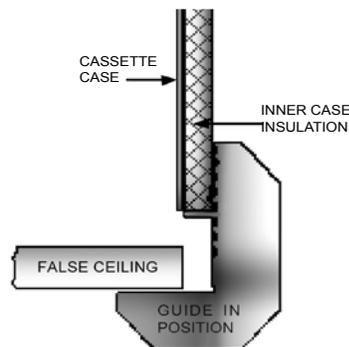


**Table 5 - Ceiling Rod Positions**

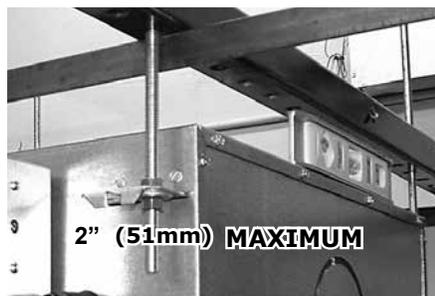


Model	Dimension A	Dimension B
9 & 12	19.50" (495 mm)	22.87" (581 mm)
18 & 24	29.19" (740 mm)	30.80" (782 mm)
30 & 36	29.19" (740 mm)	43.06" (1094 mm)

**Figure 8 - Positioning Installation Guides**



**Figure 9 - Threaded Rods Must Not Protrude More Than 2 Inches Below Mounting Brackets**



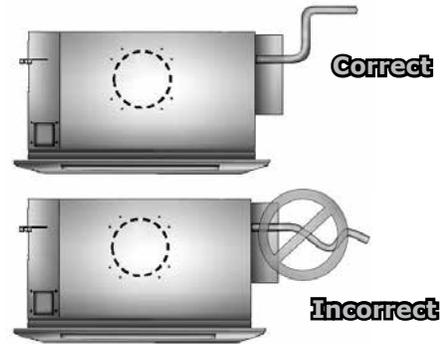
## CONDENSATE PIPING

Cassette is supplied with 1/2" I.D. flexible PVC hose for connection to copper or plastic drain piping.

### Cassette installation considerations

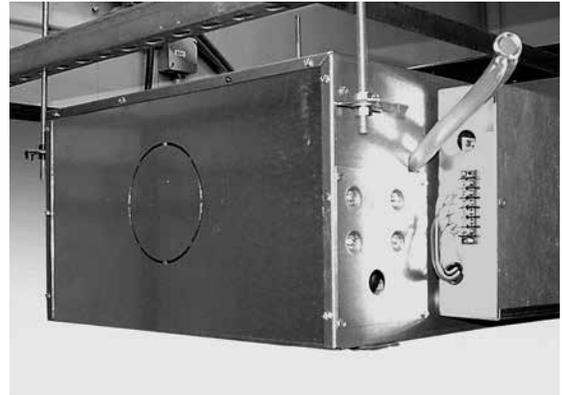
1. Maximum pump lift is 36" (0.9m) from base or bottom of unit.
2. Highest point in condensate piping should be as close to unit as possible. Prevents large volume of water draining back into unit when it is switched off.
3. Check valve at pump discharge to prevent water from draining back into unit. Piping technique minimizes issues should check valve become stuck open from airborne debris.
4. Slope condensate pipe-work downward from highest point in direction of water flow with minimum gradient of 1" per 10' (8mm/1m). No uphill gradients other than in first 18" (0.45m) of pipe-work from cassette.
5. When multiple cassettes are connected to common condensate drain, insure drain is large enough to handle total volume of condensate.
6. Drain line vent may be required to prevent siphoning of water from drain pan and associated noise.

**Figure 10 - Highest Point Of Condensate Piping Should Be As Close To Unit As Possible**



**Figure 11 - Condensate Drain**

*Condensate Drain Connection*



## DUCT CONNECTIONS

Attach branch duct and fresh air duct collars to cassette chassis using following steps.

Recommend install no more than 10 feet (3m) of branch duct or fresh air duct.

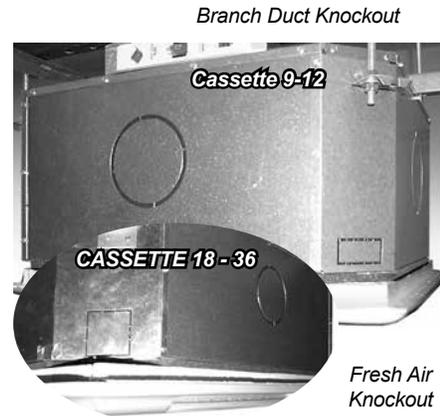
1. Locate knock-out holes. See Figure 12.

Number of knockouts vary with unit size.

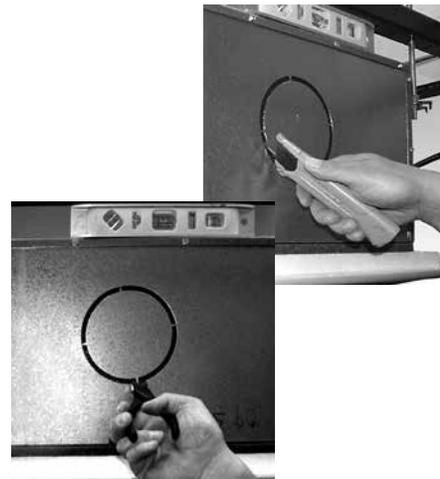
- Branch duct knock-outs are 5¼" (133mm) round.
- Fresh air knockouts are:
  - a. 1¼" x 2½" (32 x 64mm) rectangular models 9 & 12.
  - b. 3" (76mm) square models 18 thru 36

3. Cut black insulation around knock-out. See Figure 13.
4. Snip tabs holding knock-out in place.
5. Remove metal knock-out and black insulation behind it.
6. Attach field supplied duct collars to chassis using self-drilling screws.
7. Repeat above steps for remaining duct work.

**Figure 12 - Knockouts**



**Figure 13 - Cut Insulation And Snip Out Knockouts**



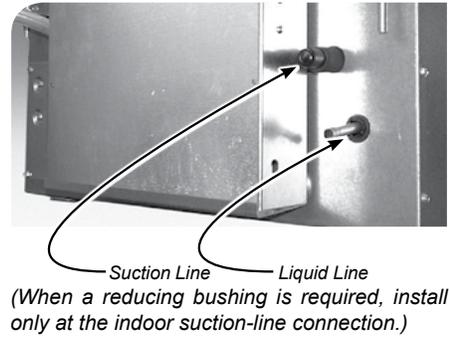
## Piping Preparation

- 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 31, Page 20.

## Refrigerant Piping

1. Clean tubing ends. Insert into fittings. See Figure 15.
2. Protect valves by wrapping with wet rag "heat sink" before brazing. See Figure 16.
3. Use shield to protect paint. Shield may be made from scrap metal. See Figure 14.
4. Braze tubing into fittings.
5. Install all panels removed to this point. Panels are required for proper air flow.

**Figure 14 - Piping Connections At Unit**

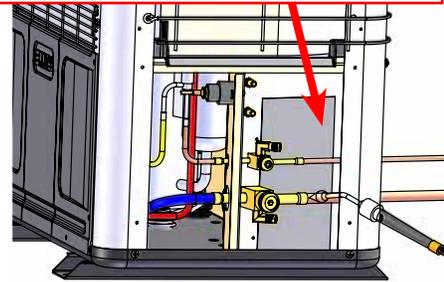


**Figure 15 - Clean Ends Of Tubing**

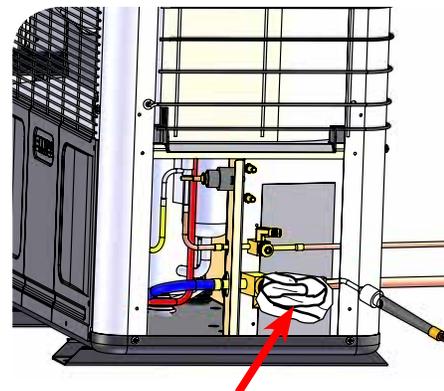


**Figure 16 - Wet Rag "Heat Shield Over Valves"**

Add heat shield behind valve when brazing to prevent damage to unit.



**Figure 17 - Make Shield To Protect Paint**



Add wet rag over valve to keep from melting internal valve components.

**Charging Unit**

1. Attach manifold set, vacuum pump, & micron Gauge. See Figure 18.
2. Evacuate line to 500 microns or less to insure all moisture has been removed and there are no leaks. See Figure 19.
  - Evacuate
  - Pressurize with 100psi N2 or Nitrogen
  - Evacuate again
  - 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 20.

**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 6, Page 16.
5. Refer to charts beginning on page 16 to “fine tune” the refrigerant charge to meet your conditions.

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.

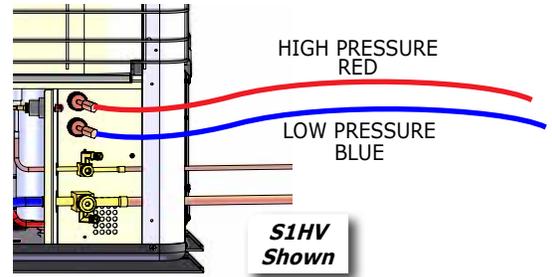
**Charging should be suitable charge weighed in with scale.**

**NOTICE**

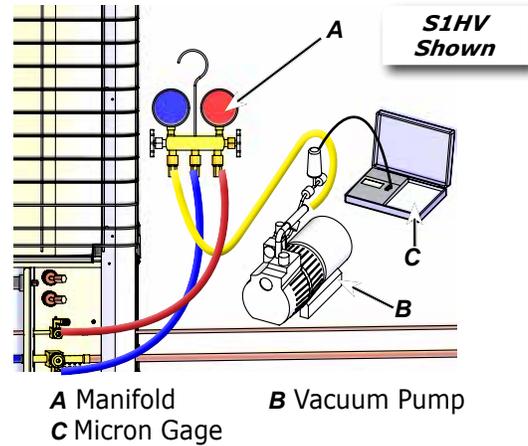
It is illegal to discharge refrigerant into the atmosphere. Use proper reclaiming methods & equipment when installing or servicing this unit.

- Measure all heat pump saturated suction pressures at the *Common Suction Port* not vapor Service Valve.
- *Common Suction Port* includes pressure drop and temperature increase through reversing valve resulting in a 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.

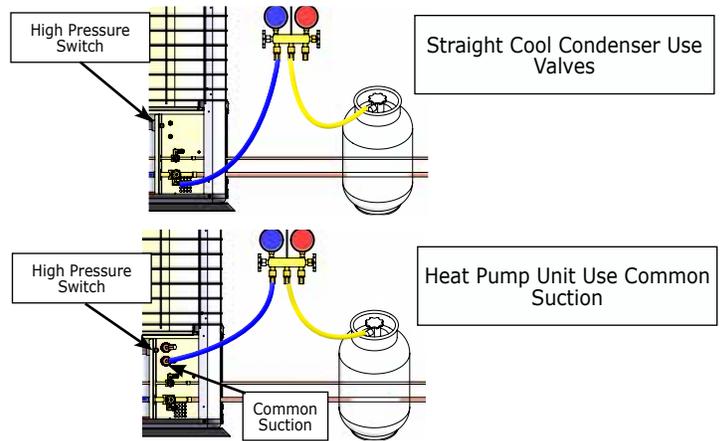
**Figure 18 - Manifold Set Connections At Unit**



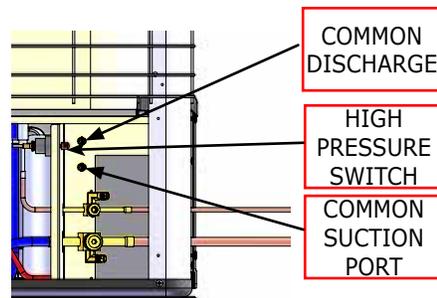
**Figure 19 - Manifold Set Up For Evacuation**



**Figure 20 - Charging**



**Figure 21 - Common Suction, Discharge, and 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.

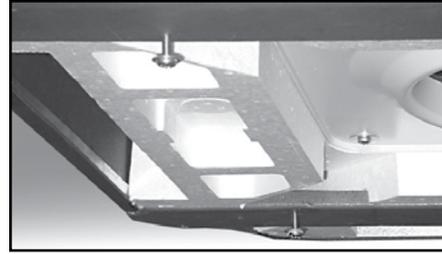
**Table 6 - S1CV / S1HV R410A Refrigerant Charge Table**

Condenser	Cassette Pairing	Line Charge Per Foot	Factory Charge
S1CV9000	CAHV09	.25 oz./ft (23 g/m)	39.5oz (1120g)
S1CV2000	CAHV12	.25 oz./ft (23 g/m)	39.5oz (1120g)
S1CV8000	CAHV18	.64 oz./ft 59 g/m)	54.0oz (1531g)
S1CV4000	CAHV24	.64 oz./ft (59 g/m)	54.0oz (1531g)
S1CV3000	CAHV30	.64 oz./ft (59 g/m)	90.0oz (2551g)
S1CV6000	CAHV36	.64 oz./ft (59 g/m)	90.0oz (2551g)
S1HV9000	CAHV09	.25 oz./ft (23 g/m)	39.5oz (1120g)
S1HV2000	CAHV12	.25 oz./ft (23 g/m)	39.5oz (1120g)
S1HV8000	CAHV18	.64 oz./ft (59 g/m)	54.0oz (1531g)
S1HV4000	CAHV24	.64 oz./ft 59 g/m)	54.0oz (1531g)
S1HV3000	CAHV30	.64 oz./ft (59 g/m)	90.0oz (2551g)
S1HV6000	CAHV36	.64 oz./ft (59 g/m)	90.0oz (2551g)

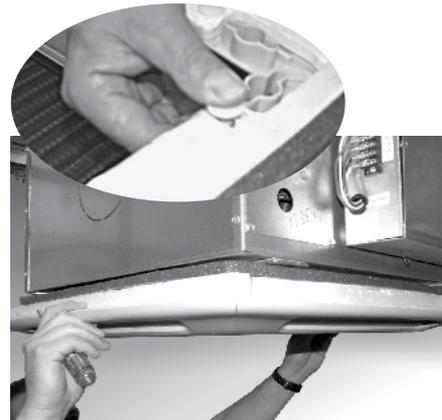
**Assembly Instructions**

1. To install the four fascia mounting bolts:
  - a. Locate supplied bolts and washers from kit bag.
  - b. Place washers on bolts.
  - c. Screw mounting bolt with washer into chassis leaving approximately 1" (25mm) to hang fascia.
2. Insure white panel fasteners holding fascia polystyrene are pushed firmly in, fasteners may have loosened in transit.
3. Lift fascia onto chassis mounting bolts. Align key hole brackets with mounting bolts. Slide fascia forward to lock into position.
4. On Cassette 18 - 24 units connect vane motor plug. Plug into socket connection on chassis.
  - a. Insure polarized connector (2 position) is in proper orientation and connected.
  - b. Route wires to prevent them from becoming trapped, cut, broken or chaffed.
5. Cassette models CAHV contain second cable connection to control box for infrared unit mount control.
6. Insure polarized (10 position) connector is in proper orientation and connected.
7. Route wires to prevent them from becoming trapped, cut, broken, or chaffed. See Figure 24.
8. Tighten fascia up to Cassette chassis. Verify a good seal is obtained between fascia and chassis, necessary to prevent recirculation.
9. With filter(s) in place, install inlet grille(s) onto fascia.

**Figure 22 - Mounting Bolts**



**Figure 23 - Push In White Panel Fasteners**

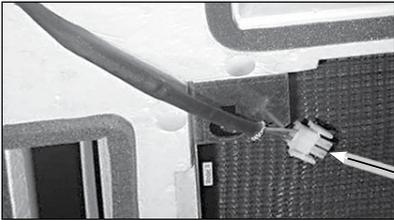


**Figure 24 - Wire Routing**



**Figure 25 - Connect Vane Motor Plug Into Socket On Chassis**

Female vane motor plug on chassis



Male Vane Motor Plug On Fascia

**Figure 27 - Secure Fascia To Chassis**



Do not over-tighten bolts could damage fascia and drain pan.

**Figure 28 - Adjust Louver Position 30° From Plumb**



**Figure 26 - Connect Infrared Unit Cable**



## General Electrical Requirements

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. Standard unit voltage is 208/230V (60Hz, 1Ph). Verify model's electrical requirements from rating plate.
2. Have wires capable of carrying maximum load current under non-fault conditions at stipulated voltages.
3. Avoid large voltage drops on cable runs, particularly in low-voltage wiring.
4. Use correct cable size to insure voltage drop of less than 1 volt in control wiring.
5. When refrigeration pipe work is complete electrical supply can be connected.
6. Low-voltage wiring must be at least 18 AWG.

### Connect Wiring

1. Loosen four screws on front of control box cover. Slide cover up and off to access high-voltage wiring. See Figure 29.
2. Rating plate is located on outside of control box cover.
3. Each unit must have separate branch circuit protected by fuse or breaker. Check rating plate for circuit ampacity and breaker or fuse size. Use only HACR type breakers. Select proper wire for ampacity rating.
4. Connect local disconnect switch within 3 feet of unit.

### High-Voltage Electrical Wiring

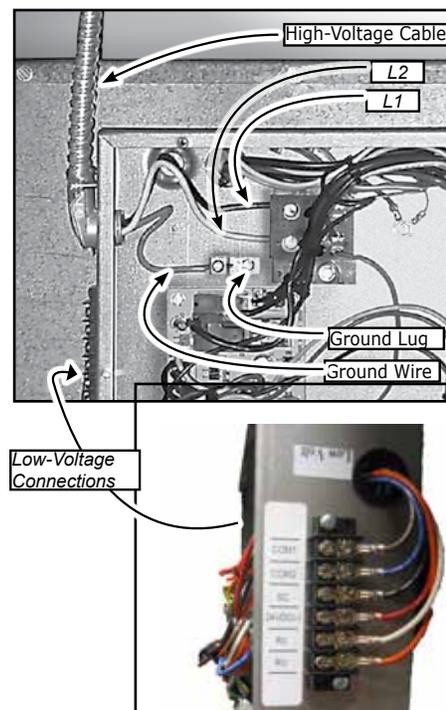
1. Inspect existing wiring for cut or frayed wires. Replace if found. See Figure 30.
2. Route cable through hole in control box for high-voltage electrical wiring. Connect power wire to L1 and neutral wire to L2 at power connector location.
3. Connect ground wire to ground lug or lead at same location in control box.

**Terminate ALL unused wires with wire nut or crimp connector.**

**Figure 29 - Remove Control Box Cover**



**Figure 30 - Electrical Connections**



## Low-Voltage Electrical Wiring

Low-voltage interconnect wiring must be 18 AWG.

1. Locate 24V control transformer in air handler. Provides low-voltage control power to both air handler and condenser. Low-voltage interconnect control wiring may vary depending on model selected.
2. Refer to wiring diagram for low voltage connection to appropriate terminals.
3. Replace control box cover with wiring diagram facing in after making all connections. Secure with four screws.

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

For 208V power supply, transformer tap must be changed from orange to red. Refer to the wiring diagram located on inside control box cover. See Figure 33.

### Cooling Only

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

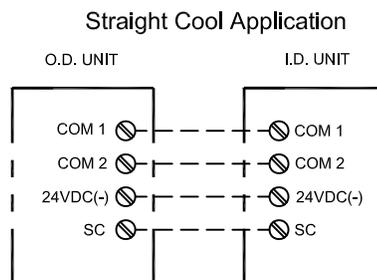
Each wire [COM1, COM2, SC, and 24 VDC (-)] connects to the same named indoor and outdoor terminal. See Figure 31.

Protect unused wires or terminals, such as both RV, by wire nut from making contact with junction box or other metal surfaces.

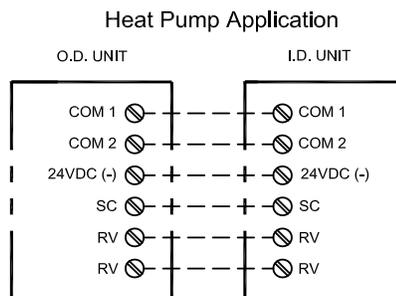
### Heat Pump Connection

- Heat Pump systems utilize 6 low voltage interconnecting wires between indoor and outdoor units.
- Each wire [COM1, COM2, SC, 24 VDC (-), RV, and RV] connect to same named terminal indoor and outdoor. See Figure 33.
- RV signal is alternating current, as long as both indoor RV connections are connected to the outdoor RV connections system functions correctly.
- The other four (4) wires are polarized and must be connected to matching terminal

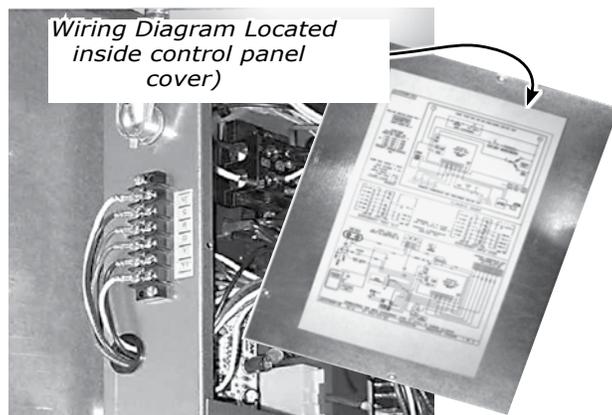
**Figure 31 - Unit-Mounted Controls – Cooling Only**



**Figure 32 - Unit-Mounted Controls – Heat Pump Connection, Two-Stage Heating**



**Figure 33 - Wiring Diagram Location**



### Optional Controller

#### EMI Wired control

EMI offers wired wall control compatible with EMI split system air handlers for variable speed condensers.

#### Fan Operation

Controls call for fan operation (On or Off).

After controller has been satisfied and call for heating or cooling has been removed, indoor fan remains on for additional 60 seconds. This increases efficiency by pulling remaining energy from unit.

Indoor unit utilizes 3 speed motor. Fan speed selection is made through fan button for wired controller Operation (High, Med, Low).

#### Cooling Operation

Wired wall controls call for cooling operation (On or Off).

Place system switch in Cool mode after connecting controller to unit.

- 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 will operate as described in FAN operation.

Compressor has two (2) minute minimum run and three (3) minute minimum "OFF".

### NOTICE

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

## OPTIONAL (CAHV) WIRED WALL CONTROLLER OPERATION

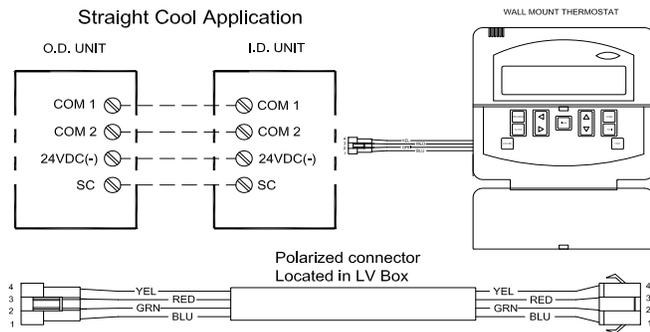
### Wall Mounted Control Configuration

Wall mounted control layout, see Figure 34 and Figure 35.

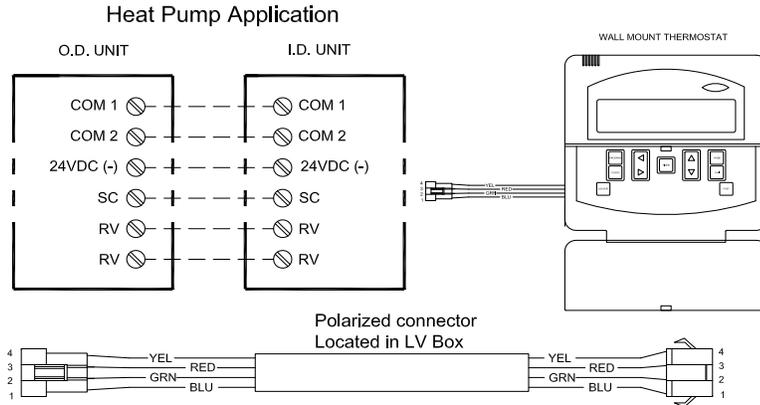
Low voltage interconnect wiring must be at least 18 AWG.

24V control transformer is located in air handler unit.  
Provides low volt control power to both air handler and condenser. Depending on models selected, interconnect control wiring may be effected.

**Figure 34 - Wall-Mounted Control Configuration – Cooling Only**



**Figure 35 - Wall-Mounted Control Configuration – Heat Pump**



### A/C Condenser With Electric Heat Operation

Configure wired wall controller operation with optional electric heat control - Heat Source ON.

Wired Wall controller's call for electric heat operation - (On or Off).

Place system switch in Heat mode after connecting thermostat to unit.

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

Place set-point temperature below room temperature. Electric heater switches off and indoor fan remains on for additional sixty (60) seconds.

### Optional Heat Pump With Electric Heat (Two-Stage Heating)

Control must be properly configured, Heat Source ON and Heat Pump ON for wired wall control operation of two-stage heating including heat pump condenser and optional indoor electric heat. See Figure 43, pg. 33.

Wired Wall controls call for electric heat operation (On or Off), and compressor (heat pump) heating. Place system in Heat mode after configuring wired wall control.

- Adjust set-point temperature above room temperature. Compressor and fan motors start and heating begins.
- Electric heat also energizes when deviation between room temperature and set point temperature exceeds 2°F (1°C for sixty (60) seconds) to call for second stage heating. A 1°F (0.5°C) difference between room conditioners & set point will only call 1st stage heat (HP Compressor)
- Place set-point temperature below room temperature.
- Outdoor condenser and electric heat stop while indoor fan remains on for additional sixty (60) seconds.

### NOTICE

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

### **WARNING**

Electrical shock hazard. Turn off power to indoor and outdoor units before proceeding. Failure to follow these instructions could result in death or serious injury.

### **CAHV Units**

- Set controller functions before proceeding with start-up.
- Follow instructions beginning on page 26.

### **Test Cooling Operation**

Operation of the unit depends on the room temperature. It may be necessary to warm the room before testing the unit's cooling abilities.

When power is first applied to the control or after a power outage there is a three (3) minute delay before the compressor or electric heat will energize. This is to protect the unit from short cycling.

### **Perform Complete Inspection**

#### **System Electrical Verification**

- Turn off all power to the indoor and outdoor units.
  - Remove any tools or other obstructions.
1. Inspect all electrical connections.
  2. Separate any lines that contact each other.
  3. Replace control panel cover, filters and grilles.
  4. Test each power and circuit connection before powering system.

#### **Perform Electrical Circuit Checks**

1. Turn cassette unit ON. Verify fan cycles correctly.
2. Models CAHV 18-24 only — Check motorized vane operation.
3. Units with electric heat, check operation of heating elements by setting system to heating mode. Adjust thermostat setpoint  $>2^{\circ}\text{F}$  ( $1^{\circ}\text{C}$ ) above room temperature.
4. Follow outdoor unit start-up procedure as directed in unit's instruction manual.
5. Turn power on to indoor and outdoor units.

### **Verify Condensate Pump Operation**

### ⚠ WARNING

Electrical shock hazard. Turn off power to indoor and outdoor units before proceeding. Failure to follow these instructions could result in death or serious injury.

1. Remove adjacent ceiling tile to access condensate pump cover panel.
2. Insert squeeze water bottle nozzle through opening in condensate pump access panel and fill drain pan. See Figure 36.
3. Adding water activates float switch and pump. Water must flow regularly when condensate pump is energized. If water does not, check pipe slope or see if there are any pipe restrictions.
4. Verify all covers, panels and filters are in place and discharge louvers are correctly positioned.

### NOTICE

Unit is equipped with safety switch. Pump is activated when condensate reaches critical level. Safety switch de-energizes compressor if water level becomes too high.

#### Check Cooling Operation

Cooling-only systems — Turn system power on and turn down system setpoint to activate compressor.

#### Check Heat Pump Operation

1. Heat pump systems — Turn system setpoint up to activate heat pump (compressor) operation.
2. Place system controls into heating mode, with setpoint 1°F above room temperature; or meeting requirements for 1st stage heating operation. Verify compressor start, noise, vibration, and overall system operation.
3. Change setpoint until 2nd stage of heat is called (>2°F (1°C) above ambient temperature).

***Two stage heating requires optional electric heat.***

**Figure 36 - Checking Condensate Pump Operation**



### **WARNING**

Electrical shock hazard. Turn off power to indoor and outdoor units before proceeding. Failure to follow these instructions could result in death or serious injury.

#### **Set Controller Configuration**

1. Review information in Figure 38, Page 29 through Figure 42, Page 32 for general operation of handheld remote or optional wired wall control.
2. See Figure 39, Page 30 for information on setting up control using handheld infrared remote. **Remote is a line-of-sight device, and must be pointed at receiver on unit-mounted display.**
3. Turn power on to indoor unit so control is operational.
4. Press and hold both MODE and PROGRAM buttons on remote for 5 seconds to enter **Configuration** mode. See Figure 42, Page 32.
5. Configure controller as shown in Figure 42, Page 32.
6. Complete configuration. Point remote toward cassette unit's display. Press and hold **power** button for 2 seconds. Information is transmitted from remote to cassette. Cassette responds with a beep, indicating it has received information. It is possible that information entered into remote may not have been received if remote was not pointed directly at the receiver.
7. Set time and 7-day program after start-up is complete, not at this time.

#### **Perform Electrical Circuit Checks**

1. Turn power on to cassette unit.
2. Verify fan and louver operation using handheld remote. See Figure 39, Page 30.
  - a. Verify fan can be set to high, medium, low and auto.
  - b. Verify louver can be set to run at full open or oscillation 18 thru 36.
3. Turn power on to indoor and outdoor units.

#### **Verify Compressor Operation – All Systems**

1. Place system controls into cooling mode, with setpoint below room temperature.
2. Verify compressor start up, noise, vibration, and overall system operation.
3. Place control setpoint above room temperature.
4. Verify compressor shuts down.
5. After blower post purge to completes, verify system shuts down properly.

#### **Verify Cooling-Only Operation**

1. This is cooling-only outdoor unit with *no heat source* in cassette (indoor) unit.
2. Set configuration for Heat Source OFF, Heat Pump OFF. See Figure 42, page 32.
3. Use remote to set MODE to Cool. See Figure 39, Page 30.
4. Use remote to adjust setpoint temperature below room temperature.
5. Verify compressor is operating. Verify supply air is cooler than room air.

#### **Verify Cooling - With Electric Heat**

1. This is cooling-only outdoor unit *with electric heat* option in cassette unit.
2. Set configuration for Heat Source ON, Heat Pump OFF. See Figure 42, Page 32.
3. Use remote to set MODE to Cool. See Figure 39, Page 30.
4. Use remote to adjust setpoint temperature below room temperature at cassette unit.
5. Verify compressor is operating. Verify supply air is cooler than room air.
6. Use remote to set MODE to Heat.
7. Use remote to adjust setpoint temperature above room temperature. Observe three (3) minute minimum time off.
8. Verify electric heaters are operational. Verify supply air is warmer than room air.
9. Use remote to enable auto changeover between heat/cool.

### **Verify Heat Pump Operation - *No Electric Heat***

1. This is heat pump outdoor unit *with no heat source* in Cassette (indoor) unit.
2. Set configuration for Heat Source OFF, Heat Pump ON. See Figure 42, Page 32.
3. Use remote to set MODE to Cool. See Figure 39, Page 30.
4. Use remote to adjust setpoint temperature below room temperature.
5. Verify compressor is operating. Observe three (3) minute minimum time off and two (2) minute minimum run times. Verify supply air is cooler than room air.
6. Use remote to adjust setpoint temperature above room temperature (at cassette unit).
7. Verify supply air is warmer than room air.

### **Verify Heat Pump Operation -*With Electric Heat Option***

1. This is heat pump outdoor unit *with optional electric heat source* in cassette (indoor) unit.
2. Set configuration for Heat Source ON, Heat Pump ON. See Figure 42, Page 32.
3. Use remote to set MODE to Cool. See Figure 39, Page 30.
4. Use remote to adjust setpoint temperature below room temperature.
5. Verify compressor is operating. Observe three (3) minute minimum time off and two (2) minutes minimum run time. Verify supply air is cooler than room air.
6. Use remote to adjust setpoint temperature 1°F above room temperature, or adjust enough to activate first stage heating.
7. Verify compressor is operating.
8. Verify supply air is warmer than room air.
9. Increase setpoint until second stage heating (electric heaters) activates (>2° (1°C)).

### **⚠ WARNING**

Electrical shock hazard. Verify all power is off from both indoor cassette unit and outdoor condenser unit before removing control box cover. Failure to follow these instructions could result in death or serious injury.

**Figure 37 - EMI Unit Mounted Controller Control Panel**

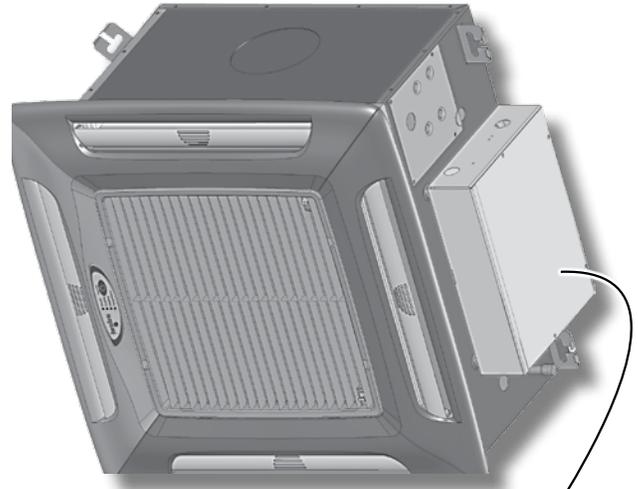
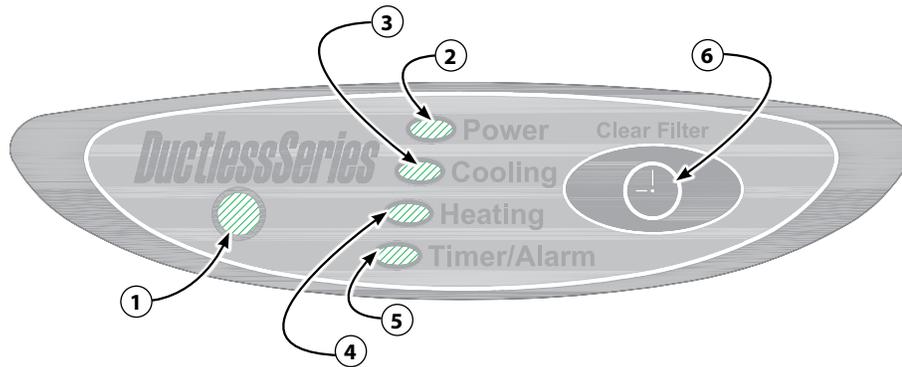


Figure 38 - Unit-Mounted Receiver — Chassis-Mounted Display



①	<b>Infrared Receiver Window</b>
②	<b>Power LED</b> Wired Wall Controller mode — on when power is applied to unit. Infrared Controller mode — on while cassette unit is in ON mode; off while unit is in OFF mode.
③	<b>Cooling LED</b> On when unit is in cooling operation.
④	<b>Heating LED</b> On during calls for heat.
⑤	<b>Timer/Alarm LED</b> On steady while unit is in Sleep Timer mode; flashes to indicate fault codes.
⑥	<b>Clear Filter Warning Button</b> Hold for 3 seconds to clear Clean Filter warning (indicated when Timer/Alarm LED, item 5, flashes 4 times)

FIGURE 39 - CAHV Microprocessor Controller — Infrared Remote Control

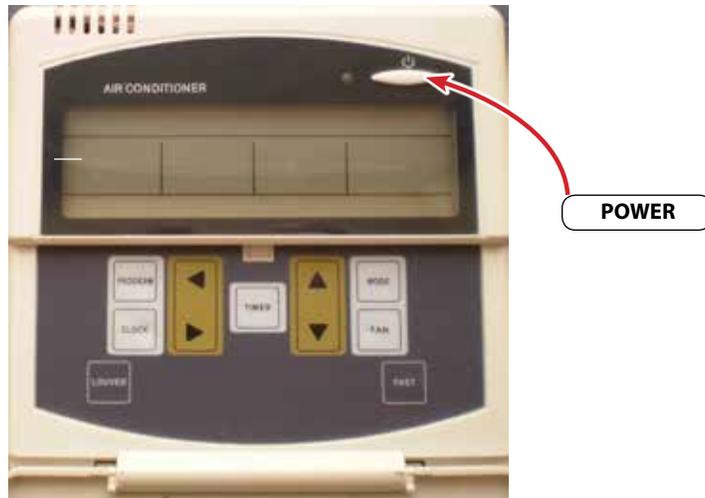


<b>POWER</b>	Press to turn unit ON or OFF. Press and hold 2 seconds to transmit all settings to unit-mounted controller.
<b>MODE</b>	Press to toggle through operating modes — Heat, Cool, Auto Changeover, Dry or Fan.
<b>CLOCK</b>	Normal operation — hold 3 seconds to enter Set Time mode; press again to 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 3 seconds to enter 7-day Programming; 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.
*Note: Motorized louver not available in Cassette 09/12	

## WIRED WALL CONTROL CONFIGURATION

**Figure 40 - Wired Wall Control Operation**

<b>Wired Controller Button Selections</b>	
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 3 seconds to enter Set Time mode; hold again 3 seconds to exit. In programming mode — press to enter previous selection
LOUVER	*Press to toggle motorized louver on or off.
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 previous item selection
RIGHT ARROW	Press for 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
FAST	While in Heating or Cooling, press for 5 seconds enters Turbo mode for 30 minutes
MODE + PROGRAM	With unit in OFF mode — Press and hold 5 seconds to enter Configuration mode; press and hold 5 seconds again to exit
PROGRAM + CLOCK	Press and hold 3 seconds to enter 7-Day Programming mode; press and hold 3 seconds again to exit
FAN + PROGRAM	With unit in 7-Day Programming mode — Press and hold 3 seconds to copy settings for selected day to all other days
<b>Display</b>	
MODE	COOL, DRY, FAN, HEAT, AUTO



**Figure 41 - 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>			
<p><b>7-Day Programming</b> (See Table 7, Page 34 to record settings)</p>	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

**Figure 42 - Configuration Mode for CAHV Air Handlers**

Item	Display	Possible Value (flashing)	Overview	Factory Settings	
To access: Press MODE and PROG together 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 to ON if unit is equipped with electric heater option. 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 to ON if unit is built for heat pump operation and connected to 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 unit in heating or cooling based on room temperature versus setpoint. Setting is 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 time for automatic notice of time to change filter. At end of time period, control displays FILTER CHECK warning. Warning also appears if four evaporator freeze-ups occur in 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 fan to cycle on for period of 60 seconds at time interval specified. Insures unit's temperature sensor senses 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 unit to automatically restart after power outage. Set to OFF for unit to remain off after power outage.

Note 1 Setting 03, Heat pump, is SKIPPED if setting 02, Heat source, is OFF.

Note 2 Setting 04, Auto changeover, is SKIPPED if setting 03, Heat source, is OFF.

Note 3 Factory setting is ON if electric heat is installed in unit, or OFF if electric heat is not installed

## SETTING THE CONTROLLER

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

	Morning			Day			Evening			Night		
	Auto	Heat	Cool	Auto	Heat	Cool	Auto	Heat	Cool	Auto	Heat	Cool
	:			:			:			:		
Monday	Temp			Temp			Temp			Temp		
	:			:			:			:		
Tuesday	Temp			Temp			Temp			Temp		
	:			:			:			:		
Wednesday	Temp			Temp			Temp			Temp		
	:			:			:			:		
Thursday	Temp			Temp			Temp			Temp		
	:			:			:			:		
Friday	Temp			Temp			Temp			Temp		
	:			:			:			:		
Saturday	Temp			Temp			Temp			Temp		
	:			:			:			:		
Sunday	Temp			Temp			Temp			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 cassette's infrared receiver window when entering commands. Cassette responds with beep indicating it has successfully received transmitted information. See Figure 38, Page 29.

### 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 cassette.

To re-synchronize:

- Enter any command into remote while pointing at cassette's infrared receiver window.
- Alternatively, hold POWER/SEND button two seconds. All optional remote's settings are transmitted to cassette. Cassette 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 Cassette. Cassette 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 Cassette. 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 cassette 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.

### 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. 39. 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 Figure 42, pg. 33.

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. 39.

#### 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 6, pg. 37 , Heat Pump – OFF Figure 42, pg. 33.

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 Figure 42, pg. 33.

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.

## HAND HELD CONTROLLER OPERATION

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. 39.
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. 39.

### 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 Mode

Auto Changeover mode (ACO), unit must have heat source. Control must first be configured properly, Heat source – ON. See Figure 42, Page 33.

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.

### Fan Operation

- Cassette unit utilizes 3 speed motor. In wired wall controller operation, fan speed selection can be made through Fan Button. See Figure 39, Page 30.
- Fan Button cycles through High, Medium, Low, & Auto.
- Wired wall controller call for fan operation (On or Off). After thermostat has been satisfied and call for heating or cooling has been removed, indoor fan remains on for additional 60 seconds increasing efficiency by pulling unit's remaining energy.

### Cooling Operation

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

1. After controller is connected, place system switch in Cooling mode.
2. Adjust setpoint temperature below room temperature.
3. Compressor and fan motors start and cooling begins.
4. Place setpoint temperature above room temperature. Outdoor condenser stops.
5. See Fan Operation pg. 39.

Once cooling has cycled off or following power outage, compressor will not restart for at least three minutes (anti-short-cycle timer).

### Reversing Valve

EMI outdoor heat pump unit's reversing valve is energized in Cooling mode.

### Electric Heat Operation *Without Heat Pump - Optional*

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

1. After connecting controller to unit, place system switch in Heating mode.
2. Adjust setpoint temperature above room temperature.
3. Electric heat energizes with indoor fan motor.
4. Heating continues as long as the setpoint remains above room temperature.
5. Place set-point temperature below room temperature.
6. Electric heater switches Off and indoor fan remains on for additional sixty (60) seconds.

Once cooling has cycled off or following power outage, compressor will not restart for at least three minutes (anti-short-cycle timer).

### Optional Heat Pump *With Electric Heat (Two-Stage Heating)*

Optional wired wall control controls call for electric heat operation (on or off).

1. After connecting optional wired wall control to unit, place system in Heating mode.
2. Adjust setpoint temperature above room temperature.
3. Compressor and fan motors start and heating begins.
4. 1°F difference between set point & room temperature calls 1st stage heat. > 2°F difference between set point & room temperature calls 2nd stage heat.
5. Place setpoint temperature below room temperature.
6. Outdoor Heat Pump unit and electric heat stop, indoor fan remains On for additional sixty (60) seconds.

### Clean Filter Alarm (Wall Thermostat Mode)

Cassette controller indicates when scheduled filter cleaning is required by flashing Timer/Alarm LED.

During normal operation, microprocessor keeps track of unit's run time.

- When clean filter time has elapsed, Timer/Alarm LED flashes four times to indicate filter needs to be cleaned.
- Clean filter time is selected through configuration menu. Available settings are 250, 500, 750, **1000**, and 1250 hours. Default in **Bold**.
- If coil freeze condition is detected four times within 24-hour period, Clean Filter Alarm appears on cassette display.

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

### Short Cycle Protection (ASCT)

- Anti-short-cycle timer (ASCT) is 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 does not allow outdoor unit to restart until 3 minute time period has elapsed.
- 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 three (3) minutes.

### Staggered Start Protection

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 compressor start 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 compressor and electric heat is two (2) minutes.

### Drain Pan Sensor

- Drain pan sensor monitors condensate level in drain pan. Should water reach critical level, monitor signals main control unit.
- Microprocessor switches off condensing unit until fault condition has been cleared, to prevent further condensate production.
- Fault code flashes on controller's LED and automatically resets when fault condition is cleared. See trouble code table, Table 7, Page 48.

### Annunciation

- Controller beeps, providing audio feedback confirming microprocessor has received its commands.
- Annunciation feature must be activated in configuration. Selections are OFF and ON.
- OFF - annunciation remains off.
- ON - annunciation beeps with push of any button in On mode or with push of ON/OFF button while in off mode.

### Memory Backup

Control retains all settings, including mode of operation in event of power failure.

When power is restored, control returns to mode of operation settings prior to power failure, after three (3) minute time delay.

## CAHV CONTROLLER FAULT CONDITIONS

**Table 8 CAHV Microprocessor Controller Fault Indications**

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

1. Clean air filter monthly.
  - a. Access filters by removing air intake access grilles. See Figure 43.
  - b. Remove filter by carefully twisting and lifting to clear retaining clips. See Figure 44.
  - c. Lift filter off grille. Place filter on flat surface and vacuum any dust and debris. Vacuum all filters and grills. Vacuum any accessible unit parts. See Figure 45.
  - d. Or use garden hose:
    - Wash grille and filter with hose.
    - Let filters and grilles dry before replacing.

### **⚠ WARNING**

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

- e. Replace filters, clips and front grille before operating unit. (Replace filters by sliding under retainer clips.)
- f. Wipe with damp cloth when needed. See Figure 46.

**Figure 43 Remove Grille**



**Figure 44 Remove Filter**



**Figure 45 Clean With Vacuum**



**Figure 46 Clean With Damp Cloth**



**⚠ 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.

**Wiring Diagram**

Troubleshooting indoor unit, see wiring diagram(s) supplied with equipment.

- Wiring diagram located on inside surface of control panel cover. See Figure 29, Page 19.
- Contact technical service (800) 228-9364 if unable to locate wiring diagram. Have full model and serial number available prior to calling.

**Wiring Requirements**

EMI air handlers are designed to operate with EMI condensers.

- Air handler (indoor unit) and condenser (outdoor unit) may 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.
- Use single point power if air handler does not have optional Electric Heat.
- Connect Indoor and outdoor units via 24V interconnect wiring. See Figure 30, Page 19 or Figure 31, Page 20
- Transformer provides low-voltage power source for controls. Interconnect wire should be at least 18 awg.
- See unit wiring diagram for interconnect diagram that matches your system.

**Power Supply Check**

Check rating plate for proper field voltage and breaker size. Use voltmeter to check incoming power supply. Verify power supply agrees with rating plate.

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

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

### Cooling-Only Units

- Cooling only units require 18 AWG low-voltage interconnecting wires between indoor and outdoor units.
- Interconnect cored is required between indoor unit and wired wall control.
- Refer to low-voltage interconnect diagram. See Figure 30, Page 19.

### Low Voltage Controls — Cooling-Only Units

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

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

### Interconnect Wiring

- Unit-mounted controls see Figure 30 and 31, Page 19.
- Wired wall controller applications see Figure 34 and 35, Page 22.

### Cooling

**Voltage Check** is accomplished at either indoor or outdoor unit.

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

### 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.
- Electric heat assembly is equipped with one-time fuse link. Should electric heat temperatures rise above auto resetting limit switch, non-resetting, one-time fusible link opens and heater remains "OFF".
- To restart, new fuse link is required. Do not replace fusible link with simple wire conductor.
- Following current values apply when unit is connected to 230V power supply. Values include fan motor current. If supply voltage is different, amperage changes.  
3kw = 13.5 Amps  
1.5kw = 6.9 Amps

### Low Voltage Controls Optional Heat Pump **With Electric Heat** Applications

Heat Pump systems utilize 6 low volt interconnecting wires between indoor, and outdoor.

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

- Air handlers 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.

### Heating

#### Interconnect Wiring

- Unit-mounted controls see Figure 30 and 31, Page 22.
- Wired wall controller applications see Figure 34 and 35, Page 22.

### Checking Voltage

**Voltage Check** is accomplished at either indoor or outdoor unit.

- 24V transformer located in indoor air handler provides low volt control power to both air handler and condenser between SC and 24VDC(-) terminals.
- This is DC voltage use proper scale.
- Reversing Valve is energized in Cooling mode and de-energized in Heating mode. When 24 Volts AC exists between RV and RV (indoors or outdoors) system is in cooling mode. In Cooling mode, 24 Volt power exists between the RV and RV terminals. When zero (0) Volts AC exists between RV and RV, system is in Heating mode or there is open circuit to reversing valve in Cooling mode.

### Heating

#### Two Stage Heating

Heat pump units 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.

1. Set mode at heating, with thermostat set 1° above current room temperature.
  - Compressor will start and deliver heat to conditioned space, Amp meter registers fraction of Amp (blower motor only).
2. Set thermostat 2° above current room temperature. Compressor continues to operate, delivering heat to conditioned space, electric heat will energize.
  - Amp meter now reads 7 to 13 Amps at 230 Volts AC dependent upon electric heater capacity and line voltage supplied to air handler.

#### Electric Heat Applications

Electric heat units utilize control relay located on circuit board in control box.

- Control calls for electric heat relay energizes Auto-reset limit switch located on heater end plate or on heater assembly interrupts power to heater if overheat condition occurs.
- Electric heat assembly is equipped with one-time fuse link. When electric heat temperatures rise above auto resetting limit switch, non-resetting, one-time fusible link opens heater remains "OFF".
- To restart, new fuse link is required. Do not replace fusible link with simple wire conductor.
- Following current values apply when unit is connected to 230V power supply.
- Values include fan motor current. If supply voltage is different, amperage changes.
  - 3kw = 13.5 Amps
  - 1.5kw= 6.9 Amps

Indoor unit contains electronic anti-short-cycle timer feature (ASCT) which prevents outdoor condenser from short cycling.

After control is satisfied there is a three (3) minute delay before condenser is allowed to restart.

Wired wall control is calling for cooling and ASCT delay has elapsed, 24 Vac can be measured between terminals:

#### Electric Heat (Optional)

Units with electric heat use control relay located on circuit board in control box. Thermostat is calling for electric heat relay energizes.

Check for electric heat operation, place wall thermostat in Heat mode with setpoint temperature above room temperature.

1. Place clamp-on type ammeter on one leg of incoming power supply.
2. Amp reading should correspond with values found in #3 below, when unit is working correctly.
3. The following current values apply when the unit is connected to a 230 Vac power supply. These values include fan motor current. If the supply voltage is different, this will affect the amp draw of the heater.
  - 3kw = 13.5 Amps
  - 1.5kw= 6.9 Amps
4. Verify electric heat relay by placing voltmeter across high-voltage relay output terminal and incoming power L2 terminal.
5. Reading is same as measured across incoming power supply if unit is working correctly.

Auto-reset limit switch is located on heater assembly.

1. Limit interrupts power to heater if over-temperature condition occurs.
2. Limit switch is equipped with one-time fuse link.
3. Should electric heat temperatures rise above auto resetting limit switch, non-resetting, one-time fuse link opens and heater remains off.
4. Limit switch assembly must be replaced if fuse link opens.

### **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.

#### **Checking Fuse Link**

To check if fuse link has failed requires an Ohmmeter reading across limit switch.

1. Disconnect all power to unit, disconnect wires from fuse link.
2. With an ohmmeter, check continuity across fuse link.
3. If fuse link is open, it must be replaced.

#### **Two-Stage Heating**

Two-stage heating combines heat pump and electric heat operation. Heat pump units require 18 AWG low-voltage interconnecting wire between indoor unit and condenser.

1. Adjust setpoint temperature above room temperature so first stage heating is activated, 1°F difference.
2. Compressor and fan motors start and heating begins.
3. Heating continues as long as setpoint temperature remains above room temperature.

Place setpoint further above room temperature to activate second stage heating. >2°F difference

1. Electric heat energizes with the compressor when deviation between room temperature and setpoint temperature is high enough to call for second stage heating.
2. Heating continues as long as setpoint temperature is above room temperature and thermostat is calling for second stage heating.
3. Stop heating operation by placing setpoint temperature below room temperature.
4. Outdoor unit and electric heat stop while indoor fan remains on for additional sixty (60) seconds.

Cassette operation can be controlled through optional wired wall controller or infrared handheld controller.

#### **Heat Pump Units, Model CAHV**

Heat pump units require 18 AWG minimum low-voltage interconnecting wire between indoor unit and outdoor units.

Terminals "RV" are required for heat pump operation. Reversing valve is energized in cooling.

#### **Checking Fuse Link**

To check if fuse link has failed requires Ohmmeter reading across limit switch.

1. Disconnect all power to unit, disconnect wires from fuse link.
2. With ohmmeter, check continuity across fuse link.
3. If fuse link is open, it must be replaced.

## FREQUENTLY ASKED QUESTIONS

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

**A:** At indoor control, verify control is in cooling and setpoint temperature is below room temperature. Use Voltmeter, check for 24VDC across 24VDC(-) and SC wires. If 24VDC is present check for wiring breaks or improper connections between indoor and outdoor units.

**A:** Manual reset high-pressure switch is located on high side of system on back panel above service valves. To reset, push red button in. If switch was tripped there will be click when it resets.

**A:** Cassette air handlers are equipped with internal condensate pump with high level safety switch. If condensate reaches critical level or if power is lost to indoor unit, safety circuit opens and low Volt power to condenser is removed. Check condensate pump for obstruction. Condensate pump assembly can be removed through side access panel. Inspect drain pan to determine if condensate is not being removed properly from unit, after removal condensate pump. Inspect all drain lines to insure there is no blockage preventing condensate removal.

**Q:** How long will fan run?

**A:** While unit is in cooling or heating and auto fan mode is selected, fan cycles with call for cooling or heating. Room temperature reaches setpoint temperature, heat/cool call is dropped, fan stays on for additional 60 seconds to purge unit of residual energy. Placing fan selection switch on wall mounted thermostat or hand held remote in High, Medium, or Low position will cause fan to run continuously regardless of set point temperature.

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

**A:** Air handler freeze up usually a symptom of another problem. Cassette air handler is equipped with freeze protection to prevent freeze up from occurring. If freeze up does occur then check following.

- Check freeze sensor is inserted fully and snug in coil fins. If it is 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. Should be clean and free of dirt. Dirty filter reduces airflow and efficiency. Check coil is clean. If coil is dirty it should be cleaned using appropriate coil cleaner or mild detergent.
- Equipment operating in cooling mode when outdoor temperatures are below 32°F (2°C)? If yes, condenser should be fitted with low ambient control so proper system pressures are maintained.

- Does system have proper refrigerant charge? System low on refrigerant can cause air handlers freeze-up. To check system charge you need to contact a qualified refrigeration service technician. Refrigerant charge information can be found in the Installation, Operation and Maintenance Manual for outdoor condensing unit. (S1CV/S1HV Family)

## SPECIFICATIONS

**Table 9 Electrical Specifications CAHV**

Model	Fan Motor			Elect Heat		Total AMPS	Min Volt	M.C.A.	HACR BRKR
	Volts/HZ/PH	RLA	H.P.	kW	AMPS				
CAHV09 / CAHV12	208/230/60/1	0.35	1/10	-	-	0.4	197	0.5	15
	208/230/60/1	0.35	1/10	1.5	6.52	6.9	197	8.6	15
	208/230/60/1	0.35	1/10	3.0	13.04	13.4	197	16.8	20
CAHV18 / CAHV24	208/230/60/1	0.55	1/8	-	-	0.6	197	0.7	15
	208/230/60/1	0.55	1/8	3.0	13.04	13.6	197	17.0	20
CAHV30 / CAHV36	208/230/60/1	0.5, 0.5	1/10, 1/10	-	-	1.0	197	1.2	15
	208/230/60/1	0.5, 0.5	1/10, 1/10	5.0	21.7	22.7	197	28.3	30

**Table 10 Technical Data**

Refrigerant Type	R410A		
CONNECTIONS	Model		
	9 & 12	18 & 24	30 & 36
Suction	1/2"	3/4" *	3/4"
Liquid	1/4"	3/8"	3/8"
Condensate Drain	1/2" I.D.	1/2" I.D.	1/2" I.D.
Branch Duct	5 1/4" Ø	5 1/4" Ø	5 1/4" Ø
Fresh Air Duct	1 1/4 x 2 1/2"	3" x 3"	3" x 3"
FILTRATION	Model		
	9 & 12	18 & 24	30 & 36
Type	Washable Mesh		
Quantity	1	2	3
Efficiency	80%		
CONDENSATE PUMP	Model		
	9 & 12	18 & 24	30 & 36
Maximum Head	36" (0.9 m) **		
Min. Flow Rate	2.5 GPH (9.5 l/h)		
*Must bush down to 5/8" interconnect for 18K and 24K systems.			
** Measured from bottom of unit.			

**Table 11 Discharge Air Volume (Dry Coil)**

Model	High Speed CFM (L/S)	Med Speed CFM (L/S)	Low Speed CFM (L/S)
9 & 12	380 (180)	355(169)	335 (158)
18 & 24	700 (330)	660(312)	620 (293)
30 & 36	1300 (614)	1220(576)	1160 (548)

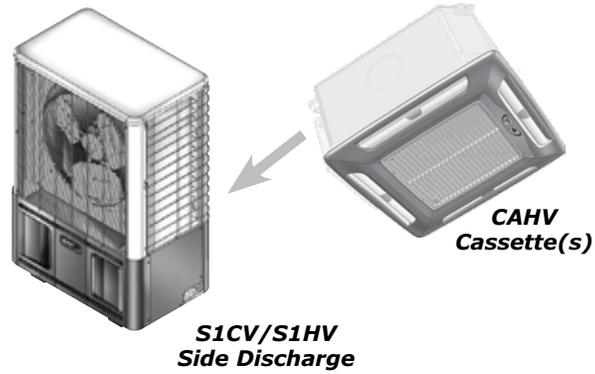
**Figure 47 Shipping Weights**

Model	Shipping weight – lbs (kg)
9 & 12	70 (31.8 kg)
18 & 24	108 (49.1 kg)
30 & 36	146 (66.4 kg)

**Figure 48 Indoor Sound Levels (dBa)**

Model	High Speed	High Speed	Low Speed
9 & 12	41	40	39
18 & 24	44	43	42
30 & 36	51	50	49

## SYSTEM PERFORMANCE



**Table 12 Cooling Systems CAHV**

Condenser	Cassette	Btuh	SEER	SHR	EER	Ref.
S1CV9000	CAHV09	9,000	15.0	.079	13.0	R410A
S1CV2000	CAHV12	12,000	15.8	0.69	12.0	R410A
S1CV8000	CAHV18	18,000	17.0	0.74	13.0	R410A
S1CV4000	CAHV24	24,000	17.0	0.66	11.0	R410A
S1CV3000	CAHV30	30,000	14.6	0.78	10.5	R410A
S1CV6000	CAHV36	35,600	14.25	0.74	9.9	R410A

**Table 13 Heat Pump Systems CAHV**

Condenser	Cassette	Cooling Btuh	Heating Btuh	SEER	HSPF	SHR	EER	COP	Ref.
S1HV9000	CAHV09	9,000	8,400	15.0	7.7	0.79	13.0	3.0	R410A
S1HV2000	CAHV12	12,000	8,800	15.8	7.7	0.69	12.0	3.0	R410A
S1HV8000	CAHV18	18,000	17,000	17.0	9.0	0.74	13.0	3.1	R410A
S1HV4000	CAHV24	24,000	19,000	17.0	9.0	0.66	11.0	3.0	R410A
S1HV3000	CAHV30	30,000	29,000	14.6	7.9	0.78	10.5	3.1	R410A
S1HV6000	CAHV36	35,600	29,000	14.25	7.9	0.74	9.9	3.1	R410A



**Notes**



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