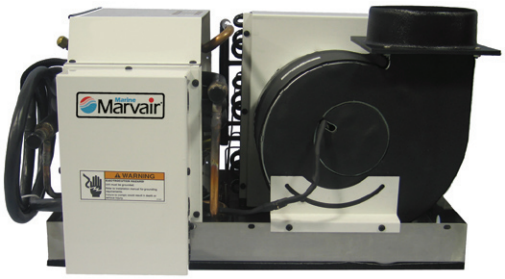
Reverse Cycle Self Contained and Split System Conditioners

Self-Contained Models SA/SP/SC 05-07-10-12-16-18-24 and
Split System Models CA, CP & CC (Compressor Section) and DEAH (Evaporator Section)

Installation & Service Manual



Self-Contained Unit

Split System Unit

CE

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09/09-7
Supersedes 10/01/07-6

Chapter 1

This is the safety alert symbol ⚠. When you see this symbol on the unit and in the instruction manuals be alert to the potential for personal injury. Understand the signal word DANGER, WARNING and CAUTION. These words are used to identify levels of the seriousness of the hazard.

⚠DANGER Failure to comply will result in death or severe personal injury and/or property damage.

⚠WARNING Failure to comply could result in death or severe personal injury and/or property damage.

⚠CAUTION Failure to comply could result in minor personal injury and/or property damage.

IMPORTANT is used to point out helpful suggestions that will result in improved installation, reliability or operation.

1.1 General Description

Self-Contained Units

The Marvair® line of reverse cycle air conditioners are self-contained, water-cooled units designed for use with either fresh or sea water. The SP models are built in seven sizes with capacities of 5,000, 7,000; 10,000; 12,000, 16,000, 18,000 and 24,000. BTUH. Both 115 volt and 230 volt models are available. S*B models have an electronic control board which allows the use of a multi-function controller. SA models use R-410A refrigerant, SP models use R-22 refrigerant and SC models use R-407c refrigerant.

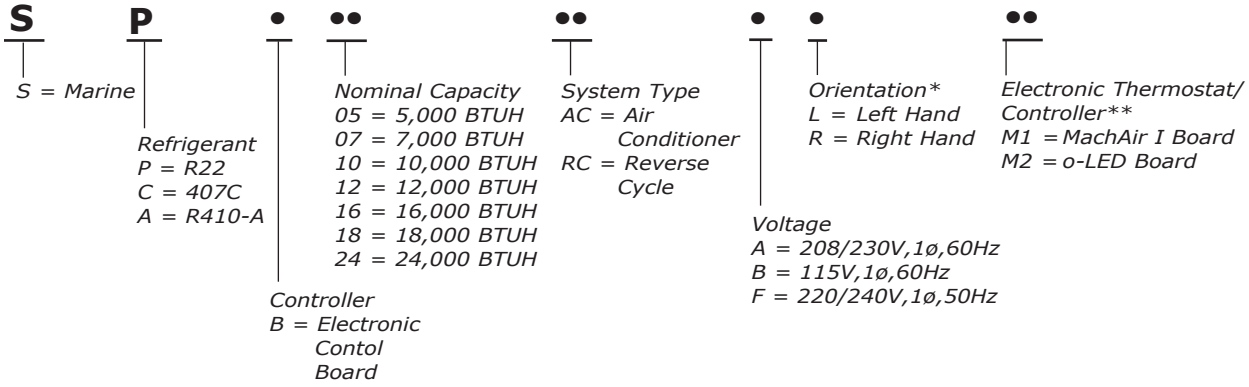
Split System Units

The split system air conditioners are comprised of two sections – the evaporator section or air handler and the condenser section or the compressor section. Split systems are built in capacities of 7,000; 10,000; 12,000; 16,000; 18,000 and 24,000 BTUHs. Both 115 volt and 230 volt units are available. CP* condensing sections use R-22 refrigerant; CC* units use R-407C refrigerant and CA models use R-410A refrigerant. The air handlers must be ordered by cooling capacity and voltage, but are not refrigerant specific. Multiple air handlers may be used with a single condensing section. For example, a 24,000 BTUH condensing section may be used with a single 24,000 air handler OR two 12,000 BTUH air handlers. Please consult the factory when using multiple air handlers.

The performance of the self contained and split system units are virtually identical. However, there are important differences in the installation. The units are designed for easy installation and years of reliable operation.

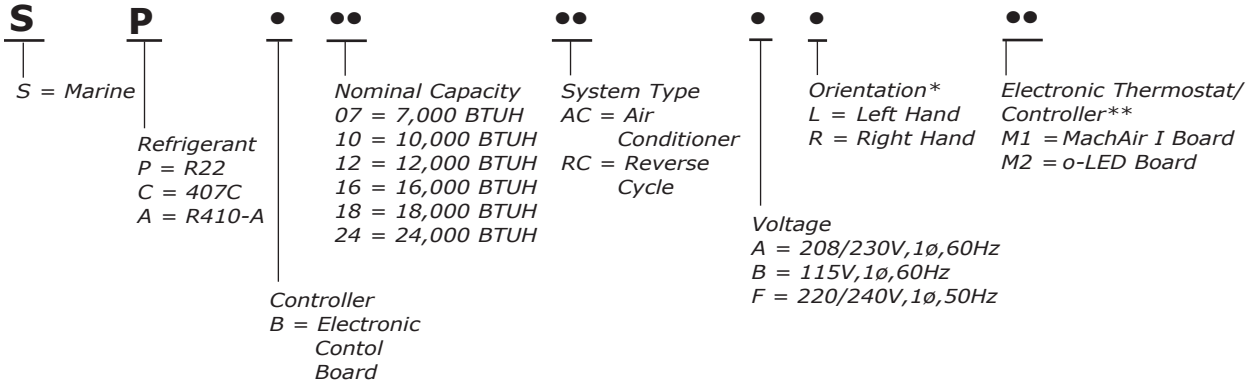
Please refer to the model ID chart below for a complete description of the models.

Model Identification - Self-Contained Units



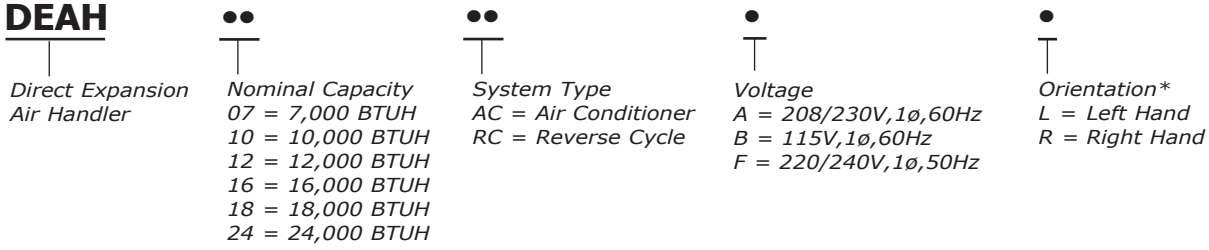
Note: 18,000 BTUH models are only available with 60Hz units.

Model Identification - Split System Condensing Section



Note: 18,000 BTUH models are only available with 60Hz units.

Model Identification - Split System Air Handler Section



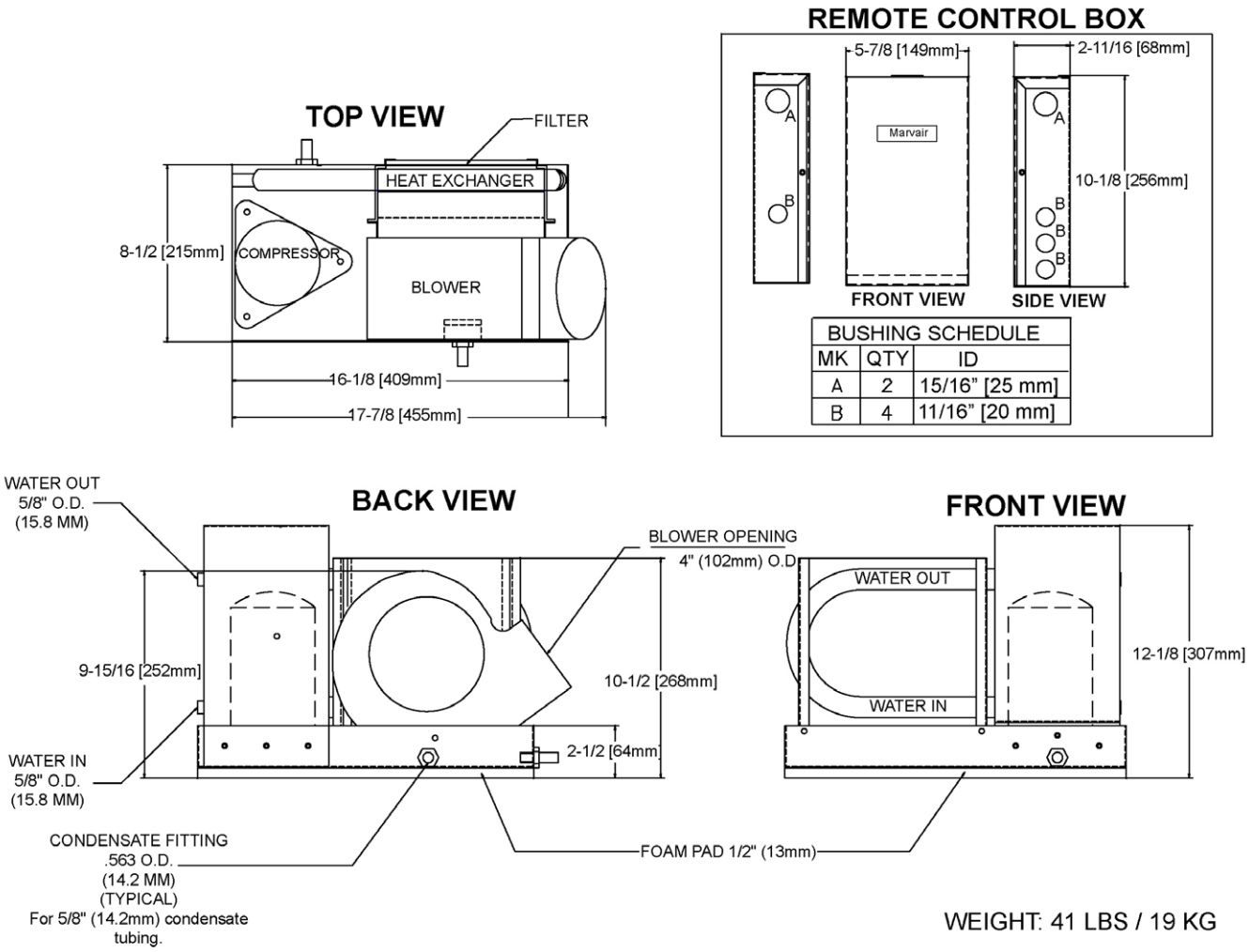
*When looking at the compressor from the end of the unit, if the coil is on your right side, the unit is a right handed unit. If the coil is on your left, it is a left handed unit.

1.2 Operating Range

The reverse cycle units are designed to operate over a wide variety of air and water temperatures. If you have a question about a specific operating condition, please contact the factory.

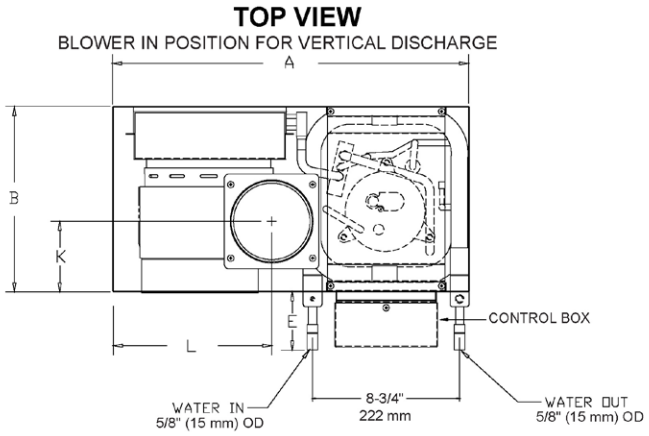
1.3 Dimensional Data – Self-Contained Reverse Cycle Air Conditioner

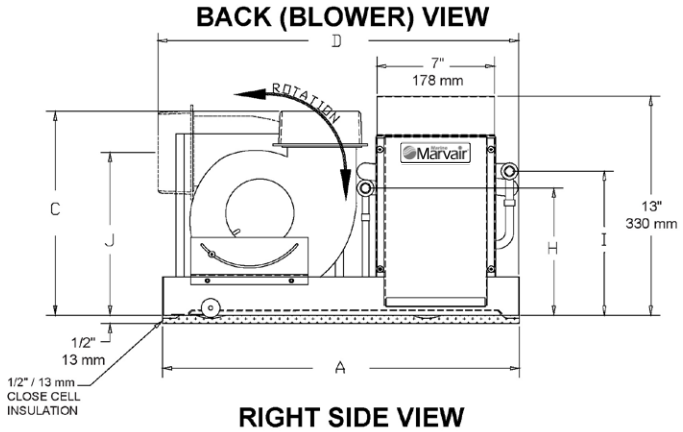
Self-Contained Models SP/SC/SA05

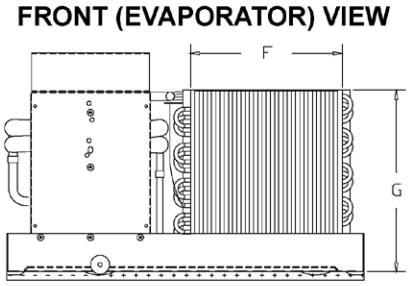


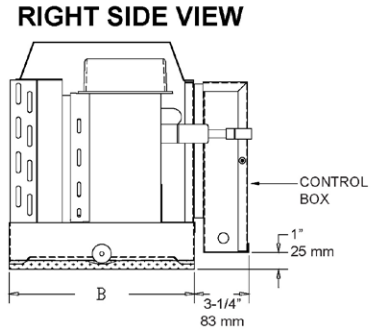
NOTE: THE ELECTRICAL CONTROL BOX FOR ALL 5,000 MODELS IS ALWAYS REMOTELY MOUNTED.

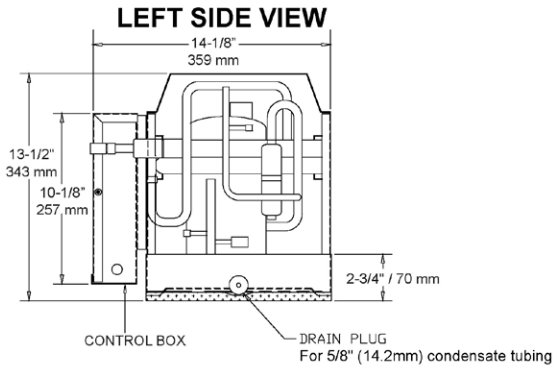
Self-Contained Models SP/SC/SA07-10-12-16-18







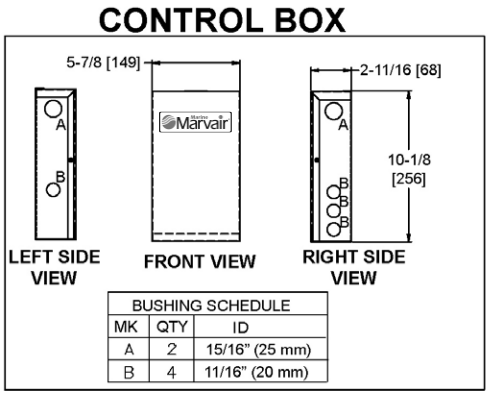


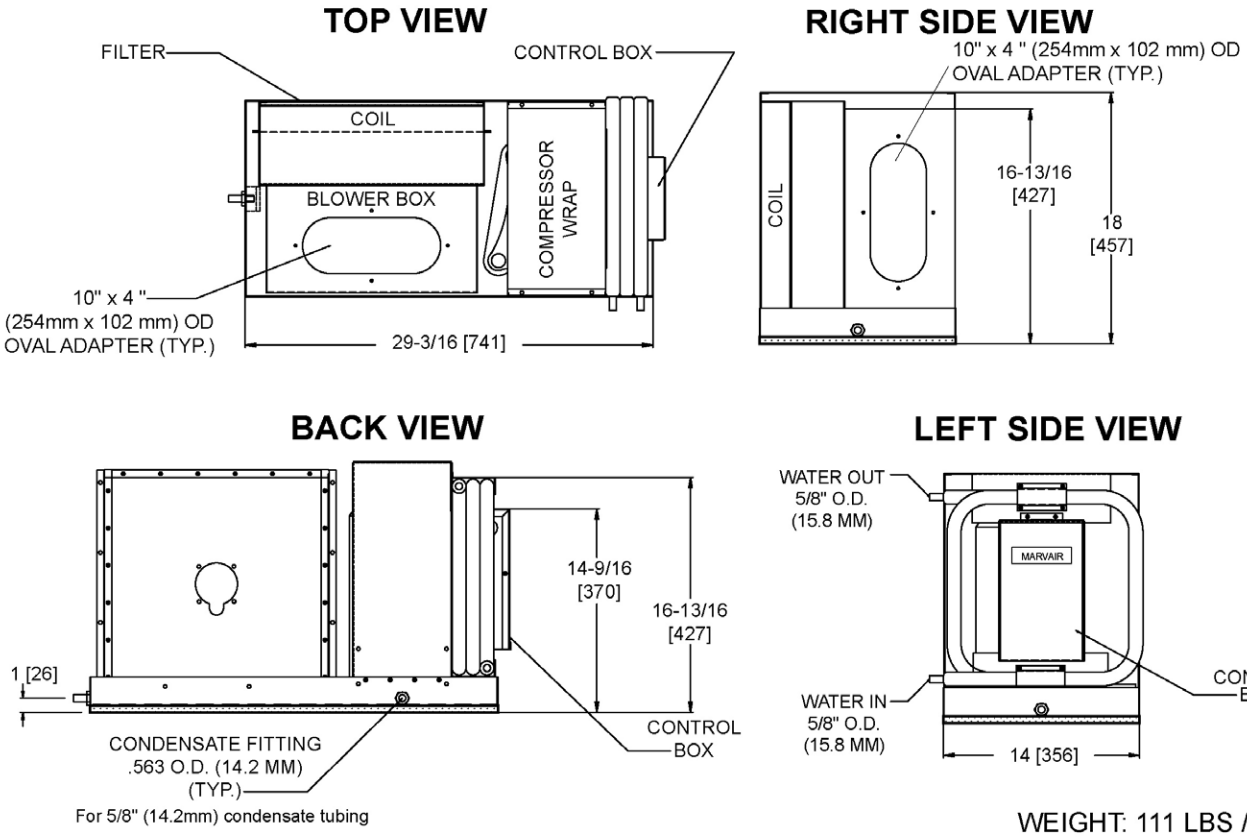


DIMS	SP07/SC07	SP10/SC10	SP12/SC12	SP16/SC16	SP18/SC18
A	21-1/4" (540mm)	22-7/8" (581mm)	22-7/8" (581mm)	23-3/4" (603mm)	23-3/4" (603mm)
B	11" (279mm)	11" (279mm)	11" (279mm)	11" (279mm)	11" (279mm)
C	12-1/4" (311mm)	13-5/8" (346mm)	13-7/8" (352mm)	13-5/8" (346mm)	13-5/8" (346mm)
D	22-3/8" (568mm)	24-1/2" (622mm)	24-3/4" (629mm)	25-3/4" (654mm)	25-3/4" (654mm)
E	3-1/2" (89mm)	3-3/8" (86mm)	3-3/8" (86mm)	3-3/8" (86mm)	3-3/8" (86mm)
F	9-1/8" (232mm)	11" (279mm)	11" (279mm)	11-1/2" (292mm)	11-1/2" (292mm)
G	10-7/8" (276mm)	13" (330mm)	13" (330mm)	13-1/8" (333mm)	13-1/8" (333mm)
H	7-1/2" (191mm)	7" (178mm)	7" (178mm)	6-3/4" (171mm)	6-3/4" (171mm)
I	9" (229mm)	9-3/4" (248mm)	9-3/4" (248mm)	9-3/8" (238mm)	9-3/8" (238mm)
J	10" (254mm)	10-3/4" (273mm)	10-3/4" (273mm)	10-1/2" (267mm)	10-1/2" (267mm)
K	4" (102mm)	3-1/2" (89mm)	3-1/2" (89mm)	3-1/2" (89mm)	3-1/2" (89mm)
L	9" (229mm)	10-3/8" (264mm)	10-3/8" (264mm)	10-1/8" (257mm)	10-1/8" (257mm)
WT.	55 Lbs (25 kg)	63 Lbs (29 kg)	66 Lbs (30 kg)	67 Lbs (30 kg)	68 Lbs

CONTROL BOX DIMENSIONS - 11 x 3-1/2 x 6-1/4"(279 x 79 x 159 mm)

Self-Contained Models SA24

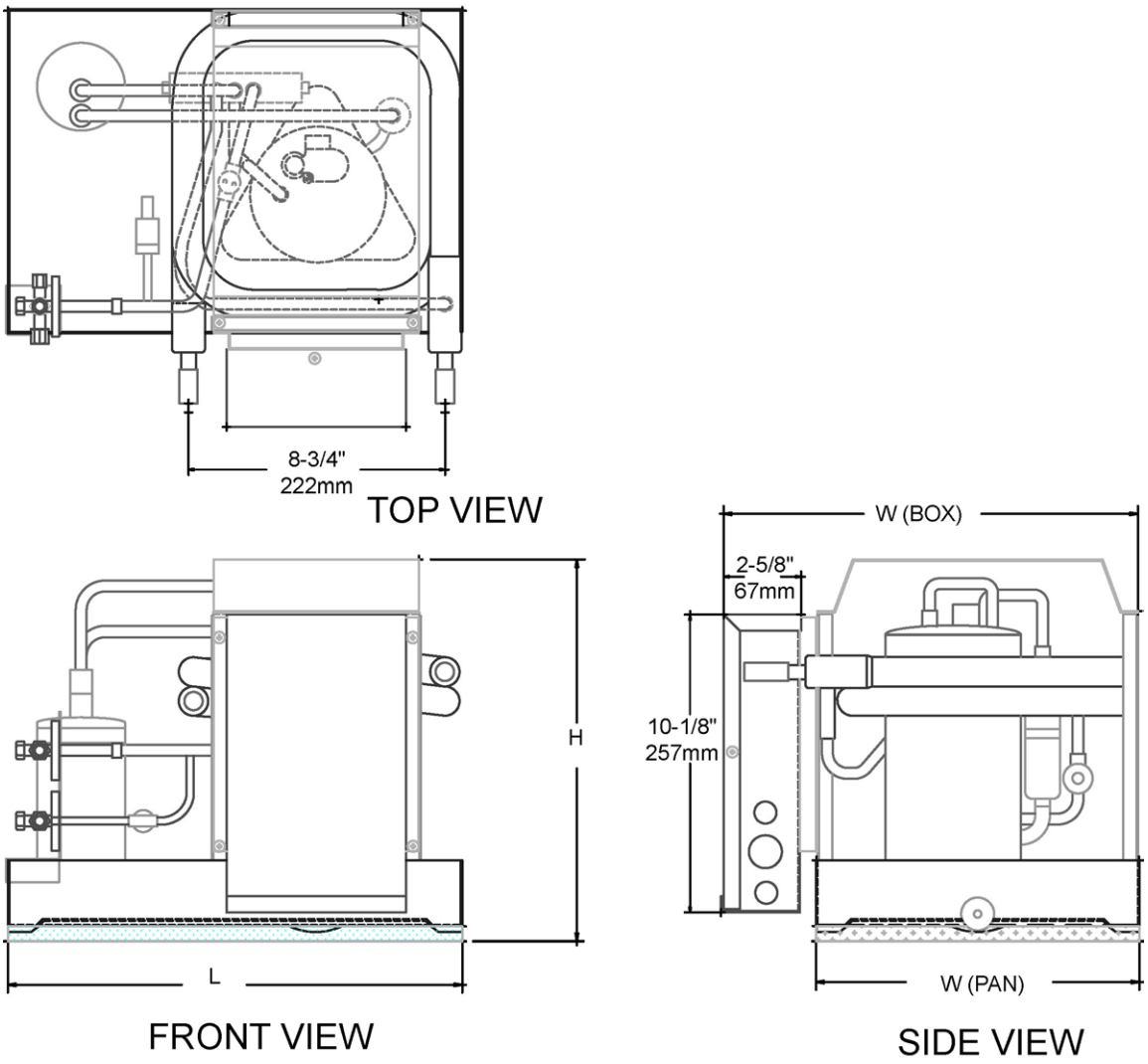




There are two conditioned air outlet openings, one on the top and one on the right side. Each opening is a 9-7/8" x 4" (251mm x 102mm) oval opening. An oval adapter, Marvair part number 91568, should be used as a transition to duct on each opening. This adapter has an outside diameter of 10" x 4" (254 mm x 102 mm). For optimum performance, both openings must be used. Insufficient air flow can cause ice to form on the evaporator coil in the cooling mode and premature activation of the circuit breaker in the heating mode.

Dimensional Data – Split System Reverse Cycle Air Conditioner

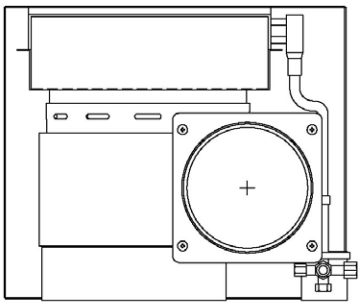
Split System Condensing Section Models 07-10-12-16-18



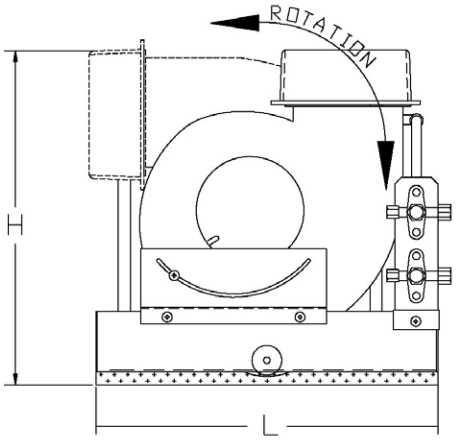
Model	Dimensions - inches (mm)				Weight Lbs(kg)
	H	L	W (Pan)	W (Box)	
07	13.13 (333)	15.50(394)	11.03 (280)	14.28(363)	42 (19)
10	13.13 (333)	15.50(394)	11.03 (280)	14.28(363)	48 (22)
12	13.13 (333)	15.50(394)	11.03 (280)	14.28(363)	48 (22)
16	13.13 (333)	15.50 (394)	11.03 (280)	14.28 (363)	49 (22)
18	13.13 (333)	15.50 (394)	11.03 (280)	14.28 (363)	49 (22)

Unit Capacity (Btu/Hr)	Refrigerant Conn. (Male Flare) - in(mm)	
	Liquid	Suction
7,000	1/4" (6.35)	3/8" (9.525)
10,000	1/4" (6.35)	3/8" (9.525)
12,000	1/4" (6.35)	3/8" (9.525)
16,000	1/4" (6.35)	1/2" (12.7)
18,000	1/4" (6.35)	1/2" (12.7)

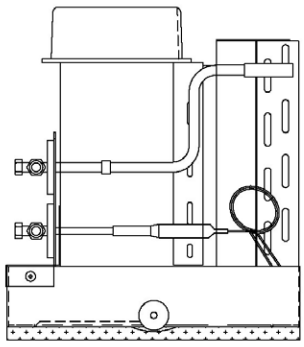
Split System Air Handler Models 07-10-12-16-18



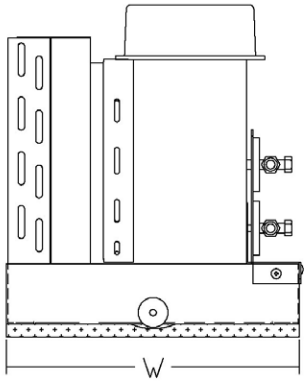
TOP VIEW



FRONT VIEW



SIDE VIEW

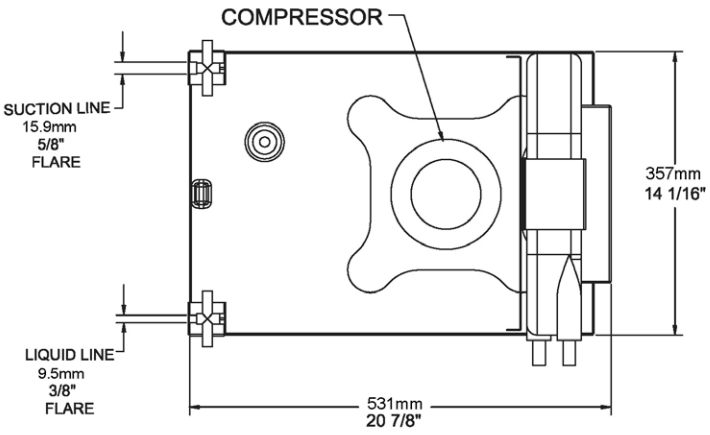


SIDE VIEW

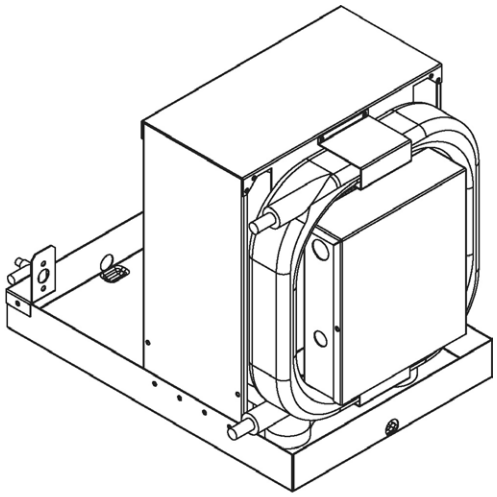
CONDENSATE FITTING
.563 O.D.
(14.2 MM)
(TYPICAL)
For 5/8" (14.2mm)
condensate tubing.

Model	Dimensions - inches(mm)			Weight Lbs(kg)
	H	L	W	
DEAH07RC	11.50 (292)	12.88 (327)	11.03 (280)	18(8)
DEAH10RC	13.50 (343)	14.88 (378)	11.03 (280)	20(9)
DEAH12RC	13.50 (343)	14.88 (378)	11.03 (280)	20(9)
DEAH16RC	13.50 (343)	15.38 (391)	11.03 (280)	23(10)
DEAH18RC	13.50 (343)	15.38 (391)	11.03 (280)	23(10)

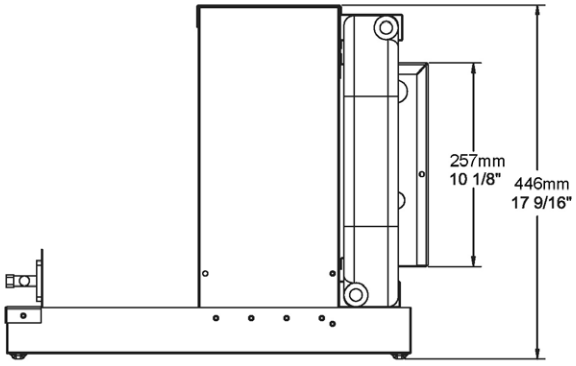
Split System Condenser Section – Model 24



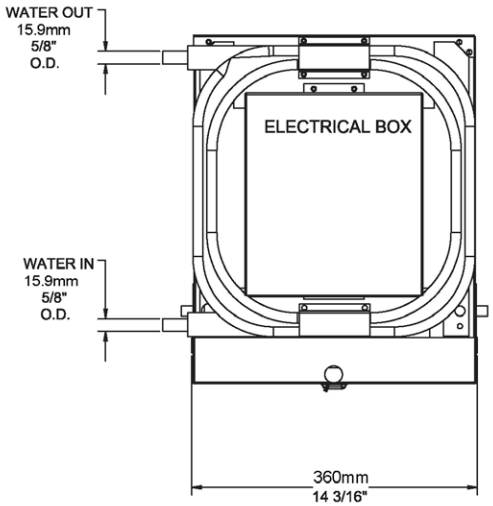
TOP VIEW



ISOMETRIC VIEW



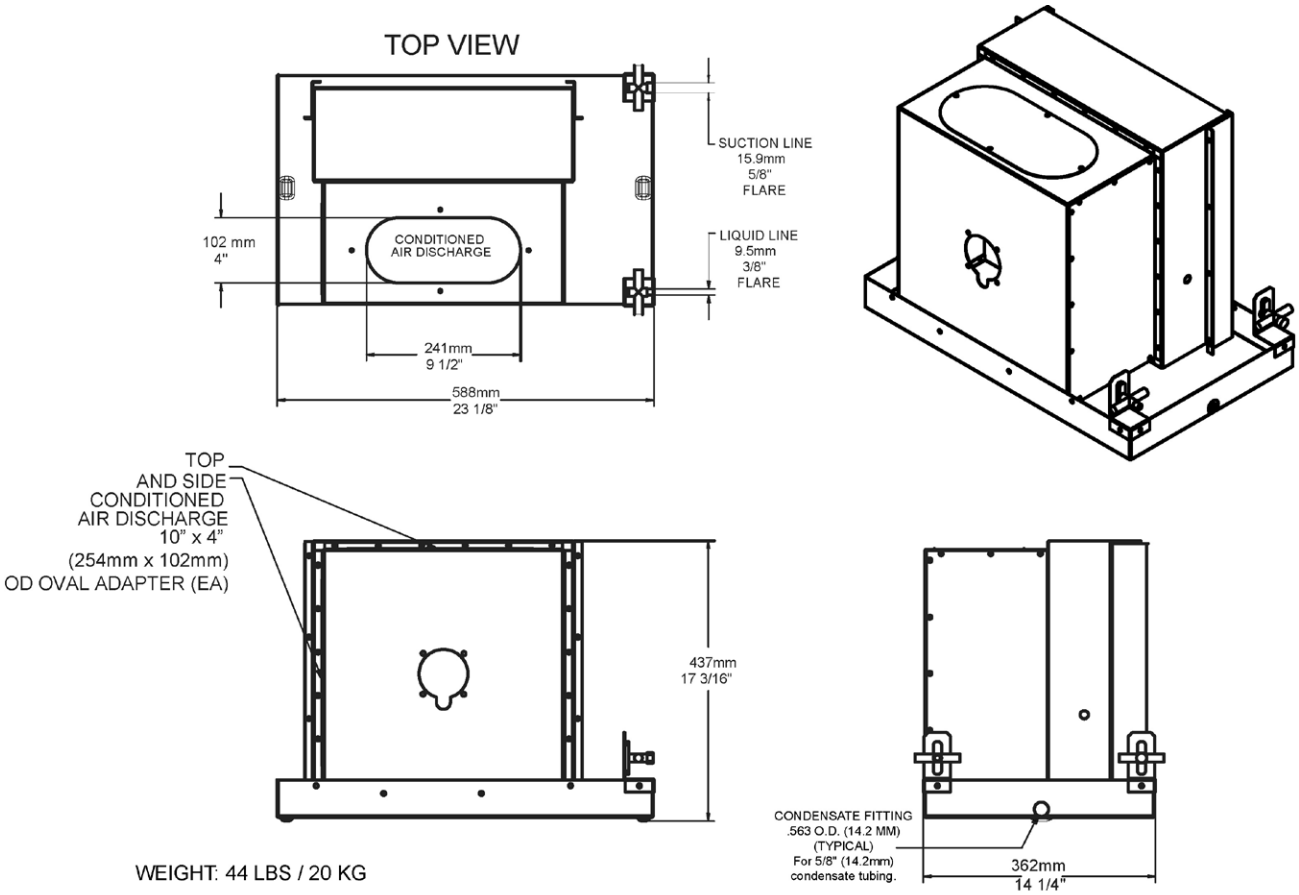
FRONT VIEW



SIDE VIEW

WEIGHT: 79 LBS / 36 KG

Split System Air Handler Section – Model 24



NOTE: There are two conditioned air outlet openings, one on the top and one on the right side. Each opening is a 9-7/8" x 4" (251mm x 102mm) oval opening. An oval adapter, Marvair part number 91568, should be used as a transition to duct on each opening. This adapter has an outside diameter of 10" x 4" (254 mm x 102 mm). For optimum performance, Marvair strongly recommends that both openings be used.

1.4 Standards & Codes

Various codes & standards published by organizations are referenced in this manual. Some of the organizations may be contacted in order to obtain complete copies of the code or standard.

American Boat & Yacht Council (ABYC)
613 Third Street, Suite 10
Annapolis, MD 21403
PH. (410) 990-4460
www.abycinc.org.

National Electric Code
National Fire Protection Association
1 Battery March Park
PO Box 9101
Quincy, MA 02269-9904

CE Directives

1.5 General Operation

The Marvair® reverse cycle air conditioner has both a heating and cooling mode of operation. It uses R-410A, R-22 or R-407c refrigerant in a conventional vapor compression cycle to transfer heat from the air in the boat to the water. In the cooling mode, a blower blows air through the indoor or evaporator coil. Liquid refrigerant passing through the evaporator is boiled into a gas by heat removed from the air. The warmed refrigerant gas enters the compressor where its temperature and pressure are increased. The hot refrigerant gas travels to the water coil or condenser where it is cooled by the water and condenses to a liquid. Liquid refrigerant is metered back into the evaporator coil to repeat the process.

In the heating mode, the process is reversed. A special reversing valve reverses the flow of the refrigerant throughout the system exchanging the roles of the condenser and evaporator. The refrigerant flows through the water or evaporator coil, picks up heat from the water and becomes a vapor. The vapor then enters the compressor where it is compressed to a higher temperature. It is then pumped to the indoor coil where the air moving across the coil picks up the heat and is blown into the room. The compressed refrigerant vapor condenses to a liquid as it gives up heat. Finally, liquid refrigerant flows into the capillary tubes into the indoor coil where the cycle is repeated.

The Marvair reverse cycle air conditioner is controlled by a display/controller mounted on a wall.

In the self- contained units, all the components are in a single package. In a split system, the compressor and the water coil are one unit, called the compressor or condensing section, and the air coil and the blower are in another, called the evaporator or blower section. Field installed copper refrigerant lines and control wiring connect the two units. Performance of the two units is virtually identical. However, there are important differences in the installation.

1.6 Standard Controls

A. **<u>High Pressure Switch.</u>** Located on the liquid refrigerant line, it is electrically connected to a lock-out relay which shuts the unit off if the refrigerant pressure rises above the pressure set point. See chart below for pressure set points of the various refrigerants. This protects the reverse cycle air conditioner if air flow is reduced or water flow is restricted.

The contacts on the high pressure switch close when the refrigerant pressure falls below the pressure set point. See chart below for pressure set points of the various refrigerants. The system must be checked for sufficient water flow in the cooling mode and air flow in the heating mode. See Section 4.16 – Fail Safe & Fault Handling Modes.

B. **<u>Low Pressure Switch.</u>** Located on the liquid refrigerant line, it is electrically connected to a lock-out relay which shuts the system off if the refrigerant pressure drops below the pressure set point. See chart on following page for pressure set points of the various refrigerants This protects the reverse cycle air conditioner if air flow is reduced in the cooling mode or water flow is restricted in the heating mode or there is a substantial loss of refrigerant.

The contacts on the low pressure switch close when the refrigerant pressure rises above the pressure set point. See chart below for pressure set points of the various refrigerants. See Section 4.16 – Fail Safe & Fault Handling Modes.

	R-22		R-407c		R-410A	
	Opens	*Closes*	*Opens*	*Closes*	*Opens*	*Closes*
Low Pressure	20 psig	45 psig	15 psig	30 psig	40 psig	60 psig
High Pressure	400 psig	300 psig	400 psig	300 psig	610 psig	420 psig

C. **Compressor time delay.** Prevents compressor from destructive short cycling by delaying the compressor from starting when compressor contactor is energized. For S*B models the delay is set at the factory from 10-15 seconds.

1.7 Sizing the Air Conditioner

Room	"K" Factor (USA)	"K" Factor (Metric)
Below decks with conditioned areas above and on three sides	7	250
Below decks with conditioned areas above and on two sides	12	425
Below decks	14	495
Galley	17	600
Above decks with large window areas	19	670
Above decks with large window areas and heavy outdoor traffic	21	740
Bridge or pilot house, all windows and heavy traffic	24	850

Calculation of BTU Load:

- Determine cubic feet or meters by multiplying height by width by length of area to be cooled.
- Determine BTUs by multiplying cubic feet or cubic meters by the "k" factor.

USA Example: Room is below deck with conditioned areas above and on three sides. Room dimensions are 7ft. high by 12 ft. wide by 15 ft. long

1. 1,260 ft^3 (7x12x15)
2. 1,260 ft^3 x 7 (k factor) = 8,820 BTU

Based upon a load of 8,820 BTUH, a 10,000 BTUH unit would be required

Metric Example: Room is below deck with conditioned areas above and three sides. Room dimensions are 213 cm high by 366 cm wide by 457cm long.

1. 35.63m^3 (213x366x457)
2. 35.63m^3 x 250 (k factor) = 8,908 BTU

Based upon a load of 8,908 BTUH, a 10,000 BTUH unit would be required

Chapter 2 - Installation

2.1 Equipment Inspection

Concealed Damage

2. Inspect all cartons and packages upon receipt for damage during transit. Remove shipping cartons and boxes and check for concealed damage. **Important: Keep unit upright at all times.** Inspect refrigerant circuit for fractures or breaks. The presence of refrigerant oil usually indicates a rupture in the refrigerant circuit.

Units that have been turned on their sides or upside down may have concealed damage to a compressor, other components or to the refrigerant system. If the unit is not upright when you receive it, immediately file a claim with the freight carrier for concealed damage and follow these steps:

1. Set unit upright and allow to stand for 24 hours with primary power turned OFF.
2. After 24 hours, connect power to unit.
3. Attempt to start the unit after 24 hours.
4. If the unit will not start or makes excessive noise, return the unit to the freight carrier.

2.2 Installation Requirements

⚠ WARNING

If the information in these instructions is not followed exactly, a fire, carbon monoxide poisoning or explosion may result causing property damage, personal injury or loss of life • Read all instructions carefully prior to beginning the installation. Do not begin installation if you do not understand any of the instructions. • Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. • Installation and service must be performed by a qualified installer, service agency in accordance with these instructions and in compliance with all codes and requirements of authorities having jurisdiction.

A. <u>Location Requirements</u>

- Do not install the Marvair® reverse cycle air conditioner in an engine room, the bilge or any areas where it may introduce deadly or noxious vapors into the boat's living space. Do not install the unit in any room or compartment that contains an internal combustion engine. Note: The compressor section of the split systems are ignition protected and may be located in an engine room. However, do not install the blower section in areas containing internal combustion engines, fuel tanks, LPG/CPG cylinders, regulators, valves or fuel line fittings.

- The condensate drain line must not terminate within three (3) feet of the exhaust of any engine or generator nor any room that contains an engine or generator. Under some circumstances, carbon monoxide can be pulled through the condensate tubing and introduced into the conditioned air.

- It is recommended not to install the reverse cycle air conditioner above an electronic or electrical panel, circuit breakers or anything electrical. If installed in this or an overhead location, a secondary drain pan should be used.
- Select a location for noise considerations. Putting the unit under a bunk may not be desirable for sound reasons. A better location may be at the bottom of a hanging locker. In some installation, acoustic baffles may be required.
- The Marvair® self-contained reverse cycle air conditioners do **NOT** meet Federal requirements for ignition protection. Never install the unit in areas containing internal combustion engines, fuel tanks, LPG/CPG cylinders, regulators, valves or fuel line fittings. Note: The compressor section of the split systems are ignition protected and may be located in an engine room. However, do not install the blower section in areas containing internal combustion engines, fuel tanks, LPG/CPG cylinders, regulators, valves or fuel line fittings.
- The unit must be installed in a space with sufficient clearance on all sides for proper air circulation and for services. A minimum of three (3) inches must be provided from the face of the air coil to any obstruction, wall or bulkhead. Sufficient air flow is critical to the proper operation of the unit.
- Before placing the unit(s) into the space, make certain that there is sufficient room for all duct work, condensate line connections, water in and out, electrical power connections and control power connections.
- The unit must be installed on level surface on a minimum of ½" plywood or equivalent.
- The condensate line must, at all times, be lower than the base pan.
- For optimum air circulation, it is good practice to install the supply air grilles near the top of the cabin and the return air grille near the floor. This normally provides good circulation of the conditioned air throughout the cabin. The location should provide easy access to the filter. If the filter is not readily accessible, it probably will not be changed, shortening the life of the unit and operating at less than designed performance.
- To save space & facilitate installation, the Marvair reverse cycle air conditioner has a detachable electrical box. The box can be mounted on the unit's water connection side, the return air side, above the compressor or remote from the unit.

B. Electrical Requirements

⚠ WARNING ELECTRICAL SHOCK HAZARD

Failure to follow safety warnings exactly could result in serious injury, death, and/or property damage. Turn off electrical power at fuse box or service panel BEFORE making any electrical connections and ensure a proper ground connection is made before connecting line voltage.

All electrical work must meet the requirements of all applicable codes and ordinances. Work should only be done by qualified persons.

If the wiring diagram that is on or was shipped with the unit is different from the one in this manual, refer to and use the wiring diagram that is on or was shipped with the unit.

1. **High Voltage Wiring (115V or 230V)**. The power supply must have the proper voltage, phase and ampacity for the selected model.

    a. Refer to the data label on the unit for field wiring requirements. The electrical data lists fuse and wire sizes for the unit.

    b. Each unit has a Minimum Circuit Ampacity (MCA). Field wiring must be used that is of sufficient size to carry that amount of current. Use copper conductors only. Refer to the National Electrical Code for complete current carrying capacity data on the various insulation grades of wiring materials.

    c. Power supply must be within allowable range of ±10% of rated voltage.

    d. The unit must be properly grounded to reduce the risk of shock or electrocution.

    e. A properly sized circuit breaker must be used. Information required to size the breaker is on the unit. The water pump does not require a separate breaker if there is only one reverse cycle air conditioner. However, the breaker must be sized for both the water pump and the Marvair® unit. A separate breaker is required for the water pump if multiple Marvair units are installed.

    f. Connections between the ship's alternating current grounding conductor and the ship's negative or bonding system must be made as part of the ship's wiring as per ABYC standard E-11 or equivalent.

    g. When servicing or replacing existing equipment that contains a chassis mounted ground lug, the service person or installed must verify the ship's wiring for the connection required in item f. above.

    h. All electrical connections must be made within the electrical junction boxes supplied with the unit. A terminal strip and/or electrical connectors are provided for component installation.

Electrical Data for Self-Contained Units – Models SP, 60Hz, R-22 Refrigerant

Model Number	Capacity (BTUH)	Voltage (VAC)	Freq. (Hz)	Run Amps	Starting Amps	Minimum Circuit Ampacity	Maximum Breaker (Amp)
SP*05B	5,000	115	60	5.33	18.7	6.5	10
SP*07B	7,000	115	60	6.67	23.4	8.1	15
SP*07A	7,000	230	60	3.4	11.8	4.1	10
SP*10B	10,000	115	60	7.5	26.4	9.1	15
SP*10A	10,000	230	60	5.0	17.5	6.1	10
SP*12B	12,000	115	60	9.8	34.5	12.0	20
SP*12A	12,000	230	60	5.3	18.6	6.5	10
SP*16B	16,000	115	60	12.0	42.0	14.6	20
SP*16A	16,000	230	60	6.8	23.6	8.2	15
SP*18B	18,000	115	60	16.0	56.1	19.6	30
SP*18A	18,000	230	60	8.0	27.9	9.7	15

Electrical Data for Self-Contained Units – Models SC, 50Hz, R-407c Refrigerant

Model Number	Capacity (BTUH)	Voltage (VAC)	Freq. (Hz)	Run Amps	Starting Amps	Minimum Circuit Ampacity	Maximum Breaker (Amp)
SC*05F	5,000	220	50	2.9	10.1	3.5	10
SC*07F	7,000	220	50	3.5	12.1	4.2	10
SC*10F	10,000	220	50	4.8	16.8	5.9	10
SC*12F	12,000	220	50	6.1	21.3	7.5	10
SC*16F	16,000	220	50	7.3	25.4	8.9	15

Electrical Data for Self-Contained Units – Models SAB24, R-410A Refrigerant

Model Number	Capacity (BTUH)	Voltage (VAC)	Freq. (Hz)	Run Amps	Starting Amps	Minimum Circuit Ampacity	Maximum Breaker (Amp)
SAB24RCF	24,000	220/240	50	13.3	16.0	16.5	25
SAB24RCA	24,000	208/230	60	14.3	19.2	17.7	30

2. **Bonding.** To prevent corrosion due to stray electrical current or voltage, all metallic parts in contact with water must be connected to the ship's bonding system. This includes the reverse cycle air conditioner, all pumps, metallic valves, fittings, strainers and thru-hulls. If any of these parts are isolated by PVC, vinyl, or rubber hoses, they must be individually bonded to the ship's bonding system. Failure to properly ground and bond the system will void the warranty.

2.3 Mounting of the Marvair® Reverse Cycle Air Conditioner.

Select a surface that is firm and level, with sufficient clearances. Mount the unit on a minimum of ½" plywood or equivalent. The unit will be secured to the surface with four hold down brackets. Secure the bracket with suitable fasteners; e.g., lag screws. Note: To facilitate installation, the hold down fasteners may be installed after all duct, water, condensate, and electrical connections are made.

2.4 Condensate Drains (Applies to all self contained units and the air handler section of all split units.)

⚠ WARNING CARBON MONOXIDE POISONING HAZARD

Failure to follow safety warnings could result in serious injury, death, or property damage.

The stainless steel base pan has multiple openings for condensate drains. It is highly recommended that two of the openings be utilized – one for back-up in case the other one becomes clogged or blocked. The other openings should be sealed and plugged. The SeaMach™ reverse cycle air conditioner can produce significant quantities of condensate that may cause extensive damage to the vessel if not disposed of properly.

A. Select the two openings that will NOT be used for condensate lines.

B. Plug and seal them.

C. Install the condensate drain fittings through the base pan. Make sure the fitting is water tight.

D. Attach a 5/8" ID reinforced hose to the hose barb and secure with two stainless steel hose clamps.

E. Route the condensate hose down from the Marvair reverse cycle air conditioner to a sump or to an overboard fitting. If the drain runs overboard, it must not be within three (3) feet from the exhaust from the engine or generator. Double clamp all connections.

F. If the condensate line is run through a room or compartment containing an engine or fossil fueled device, it is imperative that the line be air tight to prevent carbon monoxide other any other hazardous gases or vapors from being introduced into the conditioned air system.

2.5 Sea or Fresh Water System

Proper water flow is absolutely critical to the operation of the Marvair reverse cycle air conditioner. If the pipe is too small, back pressure is created causing a drop in water flow, even if the pump is correctly sized. If the piping is too large, the slow velocity of the water may cause silt build-up and barnacle growth inside the piping, eventually restricting water flow. See Fig. 3 - Recommended Pipe Sizes.

The best material for sea water piping and fittings is cupronickel. Suitable materials for piping are hi-grade bronze cupro-nickel and schedule 80 PVC pipe. Materials to avoid are yellow brass, copper, poor grades of aluminum, stainless steel or steel pipe. Use Teflon® tape or other appropriate sealant on all threaded fittings to prevent leaks.

When using a centrifugal pump, the Marvair® reverse cycle air conditioner must be higher than the thru-hull fitting, but lower than the heeled water line. The overboard fitting may be either higher or lower than the unit. The tubing must never have any loops or kinks. If there is any place that water can be trapped, damage may result during freezing temperatures. The pump and strainer must always be below the heeled water line since centrifugal pumps cannot pump air.

1. **Thru-hull fitting.** Install a scoop-type thru-hull fitting as close to the keel and as far below the water line as possible to eliminate any possibility of air entering the system. Do not share the thru-hull with any other device; i.e., an engine or generator. When using one thru-hull for multiple units, the thru-hull must be sized for proper water flow.

   The scoop-type thru-hull should face forward. On a fast planning board, locate the thru-hull at the transom to ensure water flow.

2. **Seacock.** A bronze, full flow seacock or ball valve should be installed directly onto the thru-hull fitting. The seacock must be closed to clean the strainer and in an emergency. Therefore, make it easily accessible.

3. **Strainer.** The strainer must be installed so that it is always below the water line and below the pump. It should be easily accessible for cleaning. Verify that the water flow is in the correct direction. Secure the strainer to a bulk head.

4. **Water Pump.** Centrifugal pumps cannot pump air; i.e., they are not self-priming. Therefore, they must be mounted so that they are below the heeled water line at all times. For service & maintenance, the pump should be easily accessible. The pump should be installed with the outlet pointed upward so that if air enters the system it can pass through the pump. The pump heads on some pumps can be rotated to allow for mounting on a vertical surface. Self-priming pumps are available if the pump cannot be installed below the water line.

5. **Manifolds.** When a water pump supplies water to two or more Marvair units, a manifold with balancing valves is required. It is mandatory when using a manifold that each unit have the correct water flow. See Figure 2 - Recommended Water Pipe Sizes. A manifold can also be used on the discharge of the Marvair units if a single overboard fitting is used.

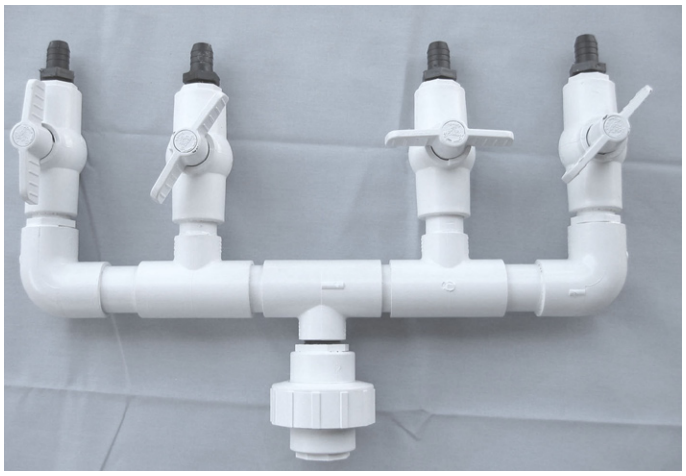


Figure 1. Pipe Manifolds

6. **Overboard Discharge.** The overboard discharge should be no more than 2" above the water line. This will minimize sound yet allow visual confirmation of water flow. If the overboard discharge fitting must be installed below the water line, a valve must be installed per ABYC standards.

Recommended Water Pipe Sizes		
Flow Rate (GPM)	Pump Inlet Pipe Size	Pump Discharge Pipe Size
1 through 4	5/8"	5/8"
4 through 7	¾"	5/8"
7 through 11	1"	¾"
11 through 15	1"	1"
15 through 20	1-1/4"	1"

Figure 2. Recommended Water Pipe Sizes

Figure 3 shows the minimum flow rate required, measured at the inlet to the unit, with 85ºF (29.4ºC) water of the various units.

Figure 4 shows the pump capacity, with no head, of pumps from Cal Pumps and March Manufacturing.

MINIMUM WATER FLOW* FOR REVERSE CYCLE SYSTEMS	
MODEL (BTUH)	**MINIMUM WATER FLOW AT THE UNIT**
5,000	1.4 GPM / 5.3 LPM
7,000	2.0 GPM / 7.6 LPM
10,000	2.9 GPM / 11.0 LPM
12,000	3.5 GPM / 13.3 LPM
16,000	4.7 GPM / 17.8 LPM
18,000	5.25 GPM / 19.9 LPM
24,000	7.0 GPM / 26.5 LPM
* Based upon 85°F (29.5°C) inlet water measured at the inlet of the unit.	

Figure 3. Water Flow Chart

MARCH PUMPS			
PUMP (GPH/LPH)	300/1,110	510/1,8600	1,800/6,600
MAX HT (FT/M)	13/2.7	19/4.3	41/9.0
CAL PUMPS			
PUMP (GPH/LPH)	375/1,421	860/3,2590	1,200/4,160
MAX HT (FT/M)	12.7/3.87	14/4.27	18/5.50

Figure 4. Pump Capacity, No Head

2.6 The Conditioned Air Duct & Grille System

⚠ MONOXIDE POISONING HAZARD

Failure to follow safety warnings could result in serious injury, death, or property damage. Do NOT operate in a corrosive atmosphere containing chlorine, flourine or any other damaging chemicals which could harm the unit and duct system, and permit spillage of combustion products into an occupied space

Inadequate air flow is a leading cause of complaints and can significantly shorten the life of the unit, The air distribution system must be engineered to ensure sufficient air flow throughout the system. This included proper duct sizing and sufficient open area on the supply and return grilles.

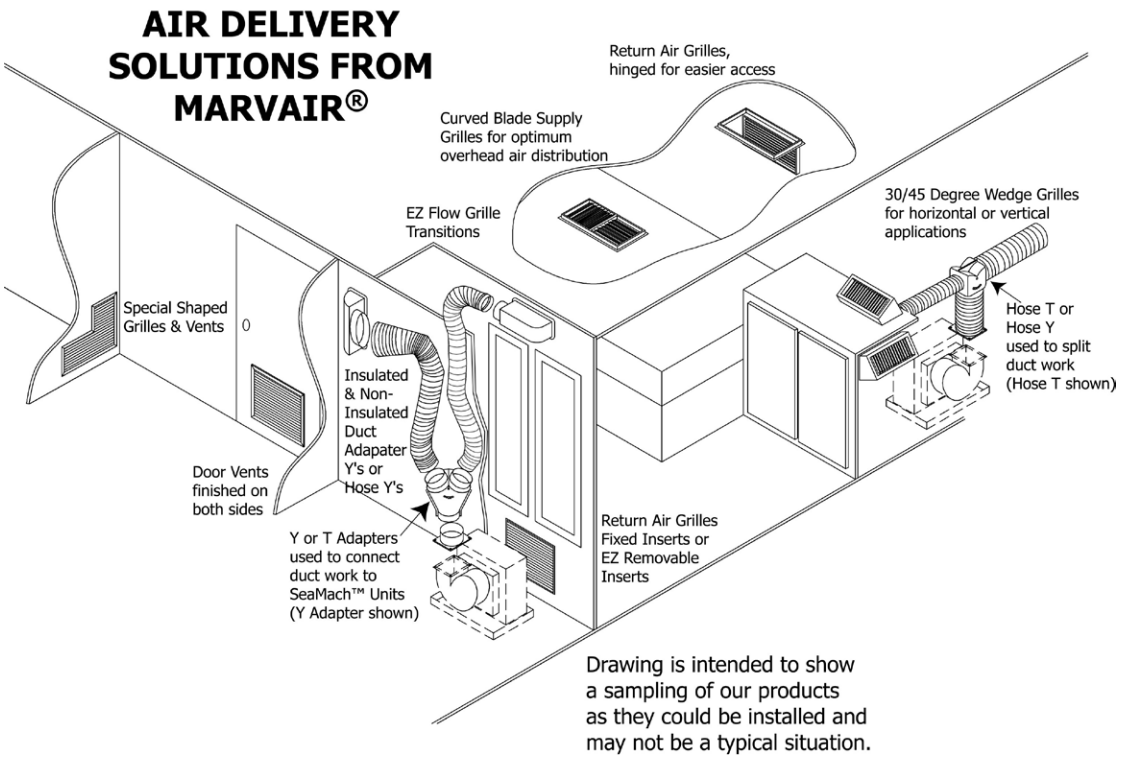


Figure 5. Typical Water & Air System Installation Schematic

Duct work guidelines

- Duct work must be firmly attached, secured and sealed to prevent air leakage.
- Use transition boxes and/or plenums with duct to split and route the conditioned air as required.
- When using insulated flexible duct, make sure that the inner duct is secured and sealed to an adapter before pulling the insulation over the connection
- Install the supply air grilles high on the cabin wall to create good air circulation.
- Stretch the duct tight in straight runs.
- Make the bends and turns as large as possible. Secure the duct so that is remains in its installed position.
- Always use insulated duct to prevent condensation.
- Insulate all transitions and plenums.
- If duct is in a storage or other high traffic area, protect it from being crushed by a shield or box.
- If the duct must be run through areas containing engines or fossil fueled devices, it is absolutely mandatory that the duct system be air tight to prevent carbon monoxide and any other hazardous gases or vapors from being introduced into the conditioned air system.

Blower Rotation. The blower in the unit is designed to be easily rotated by the installer to facilitate the connection of duct work. To rotate the blower, remove the screw that secures the plastic ring to the evaporator coil. Next, loosen the screw on the front face of the blower. Rotate the blower to the desired orientation, replace the screw in the blower ring and tighten the screw on the face of the blower.

Return Air Grilles. The return air grille should be located to ensure unimpeded air flow to the air coil on the reverse cycle air conditioner. The grille may be located on the opposite the coil provided there is a space around the unit for sufficient air flow. Maintain at least 4” between the grille and the Marvair® unit. For good air distribution throughout the cabin, the return grille should be located near the floor when the supply grilles are high on the cabin wall. The return air grille must have sufficient open air to permit adequate air to the indoor coil.

The Marvair reverse cycle air conditioner has a factory provided filter located in front of the air coil. If a return air filter grille is used, it is recommended that the filter on the unit be removed.

Supply Air Grille. The supply air grille must have sufficient open area to permit adequate air flow. To prevent short circuiting of the conditioned air, adjust the vanes of the supply grille so that the discharge air is not directed to the return air grille or to the thermostat/ controller.

Self Contained Unit or Air Handler	Nominal Air Flow CFM/m^3 per Hour	Minimum Opening for Return Air Grille (in^2/$cm^{2)}$	Minimum Opening for Supply Air Grille(s) (in^2/$cm^{2)}$	Minimum Hose Size (in/cm)	Marvair P/N for Blower to Hose Adapters	Outside Diameter of Hose Adapter (in/cm)
5,000	150/255	64/415	32/210	4/10.2	Not required. Blower has 4" (10.2cm) round diameter opening.	Not required. Blower has 4" (10.2cm) round diameter opening.
7,000	250/425	100/645	40/260	5/12.7	90134[1] (5" round hose adapter)	4-3/4" (12cm)
10,000	300/510	100/645	60/390	5 or 6*/ 12.7 or 15.2*	90134 (5" round hose adapter) or 90135[1] (6" round hose adapter)	4-3/4" (12 cm) or 5-3/4" (14.6 cm)
12,000	360/612	140/900	70/450	6/15.2	90135[1] (6" round hose adapter)	5-3/4" (14.6 cm)
16,000	385/654	168/1,110	84/540	6 or 7*/ 15.2 or 17.8*	90135 (6" round hose adapter) or 90136[1] (7" round hose adapter)	5-3/4" (14.6 cm) or 6-3/4" (17.15cm)
18,000	420/714	168/1,110	84/540	7/17.8*	90136[1] (7" round hose adapter)	6-3/4" (17.15cm)
24,000	700/1,190	240/1,550	192/1,240	8* or 10/ 20.3* or 25.4	90568[2] (8" oval hose adapter)	10" x 4" (25.4 x 10.2 cm)

* Use larger size if duct run is greater than 10 ft. (3 meters).
[1] Shipped standard with the unit.
[2]Two adapters are shipped with each two ton unit.

Figure 6. Grilles and Duct Information

Air Flow Noise. Air moving through duct work and across the blades in the grilles and louvers generates sound. The faster the air, the greater the sound. To keep sound to acceptable levels, the cross sectional area of the duct must be large enough to keep the velocity below 600 ft/min (3m/sec). Air flow faster than this is likely to cause noise complaints. The duct sizes in Figure 7 are the minimum size required to deliver the proper air flow without generating undue noise. Larger ducts will have less friction and less noise.

2.7 Electrical

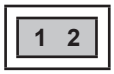
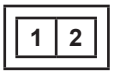
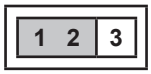
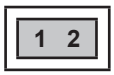
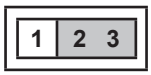
⚠ WARNING ELECTRICAL SHOCK HAZARD

Failure to follow safety warnings exactly could result in serious injury, death, and/or property damage. Turn off electrical power at fuse box or service panel BEFORE making any electrical connections and ensure a proper ground connection is made before connecting line voltage.

High Voltage. Prior to doing any work on the unit, turn the electrical power off at the breaker of fuse panel. Line voltage is hazardous and can kill you. All electrical work must meet the requirements of all codes and ordinances. All work should be done only by qualified persons. The power supply should have the proper voltage, phase and ampacity for the selected model. Refer to the data label on the unit. Each Marvair® reverse cycle air conditioner requires an

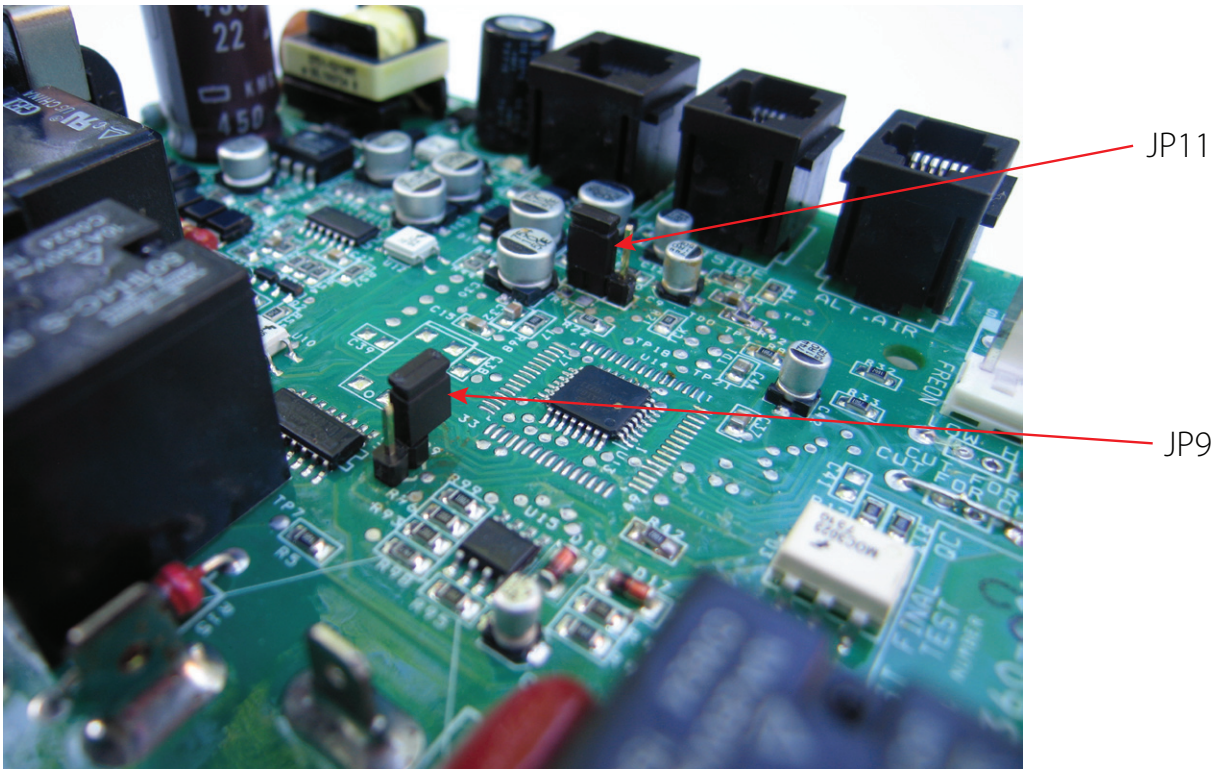
appropriately sized, dedicated circuit breaker. If there is only one unit, the water pump does not require a separate breaker, but the breaker must be sized for the combined load of the pump and the unit. If multiple units are supplied by a single pump, a pump relay will be required and will require a dedicated circuit breaker.

1. To facilitate installation, the Marvair® reverse cycle air conditioner has a detachable electrical box and a heavy duty multi-wire cable harness.. The box can be mounted on the unit's water connection side, the return air side, above the compressor or remote from the unit. Prior to placing the unit in the desired location, mount the control box in the preferred position. The electrical box can be mounted up to 5' from the unit.
2. Size the incoming power supply conductors according to the code requirements. Run the power conductors through the knockouts on the side of the electrical box. Use appropriate conduit and strain relief.
3. Connect the conductors to the input side of the terminal block.
4. Install the ground wire on the ground lug.
5. The Marvair reverse cycle air conditioner has a solid state control board located in the electrical box on the unit. This control board is compatible for use with either the o-LED display/controller or the MachAir I display/controller. The board is configured at the factory for the o-LED display/controller. To use the board with the MachAir I display/controller, two pins must be moved on the control board. The pins should be removed by hand; do not use pliers or a screw driver to remove the pins.
    1. Turn off the power to the Marvair unit at the breaker.
    2. Remove the cover to the electrical box.
    3. Carefully pull the two clips on JP11 & JP9 and move them to the position for use with the MachAir I display. Be careful not to bend the pins.
    4. Replace the cover to the electrical box.
    5. Turn the breaker on to power the unit. Proceed with the programming.

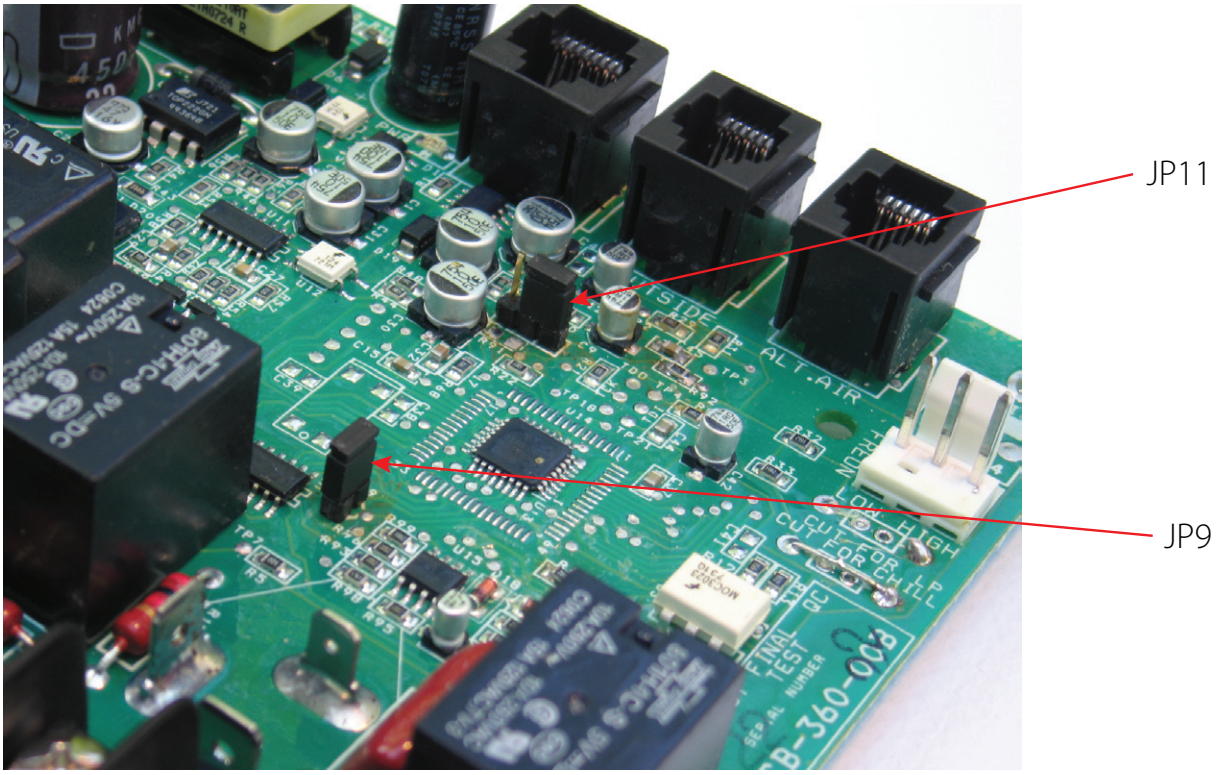
Product	Display/controller	JP8	JP9	JP11	JP7
Self-contained and split units	o-LED display (the Micro Air OLED, what we originally called the MachAir II) *Factory setting*	Jumper between 1 & 2 	No jumper between 1 & 2 	Jumper between 1 & 2 	Jumper must be cut
Self-contained and split units	MachAir I display (the Micro Air FX-Maxx)	Jumper between 1 & 2 	Jumper between 1 & 2	Jumper between 2 & 3 	Jumper must be cut

The Marvair unit and all metallic fittings in the water system that are isolated by rubber or vinyl hose must be individually bonded.

Pin configuration for use with the o-LED display/controller.



Pin Configuration for use with the MachAir I display/controller



2.8 Refrigerant Line Set and Charging (Split Systems only)

⚠ CAUTION

Keep refrigerant tubing clean prior to and during the installation.

Once the condensing section and the evaporator sections are located and secured, the two sections are ready to be connected and charged with refrigerate, using the refrigerant tubing sizes shown in Figure 8, "Refrigerant Line Sizes".

Condensing unit (BTUHs)	Shutoff valve Discharge Line	Shut off Valve Suction Line	0-24 ft.(0- 7.3m)		25-49 ft. (7.4-15m)	
			Liquid	Suction	Liquid	Suction
7,000	¼" flare	3/8" flare	¼"	½"	¼"	½"
10,000	¼" flare	3/8" flare	¼"	½"	5/16"	5/8"
12,000	¼" flare	3/8" flare	¼"	½"	5/16"	5/8"
16,000 & 18,000	¼" flare	½" flare	5/16"	5/8"	3/8"	5/8"
24,000	3/8" flare	5/8" flare	5/16"	5/8"	3/8"	¾"

Figure 7. Refrigerant Line Sizes

Insulate the vapor line with a minimum of ½" refrigerant pipe insulation to prevent condensation when in the cooling mode and heat loss in the heating mode. The insulation should be installed on the tubing prior to installation of the tubing and should run the entire length of the tube. The end of the tubing over which the insulation is being slipped should be covered to prevent any insulation or foreign material from entering the tube. When installing the tubing, be careful when bending the tubing to avoid any kinks. Secure the tubing as required (minimum every 3 ft.).

Line set installation

1. Tubing must be cut square. Make certain that it is round and free of burrs. Clean the tubing to prevent contaminants from entering the system.
2. Flare both ends of the tubing.
3. The evaporator section has a factory holding charge of nitrogen. Open the valves to release the nitrogen before connecting the tubing.
4. Connect the suction and discharge lines to the shut off valves on the condenser and the evaporator section.
5. Remove valve cap. Keep the cap in a clean place to ensure proper sealing and preventing contaminants from entering the system.
6. Place refrigerant gauges on the shut off valve on the condenser section. Insert sufficient refrigerant and check for leaks using soap suds or a liquid detergent. Bubbles indicate a leak. If a leak is found, repair before proceeding.
7. After determining that the refrigerant is leak free, release the refrigerant.
8. Connect a vacuum pump to the refrigerant gages and pull a vacuum to 29.99 In. Hg.
9. Close gauges and turn pump off.
10. Remove the large hex head cap on the liquid line and using a # 10 Allen wretch, turn the Counterclockwise until it stops. Repeat on suction line.
11. Replace the hex head caps. The unit is ready to be charged.

Add refrigerant using standard charging procedures.

2.9 Display/Controller Installation

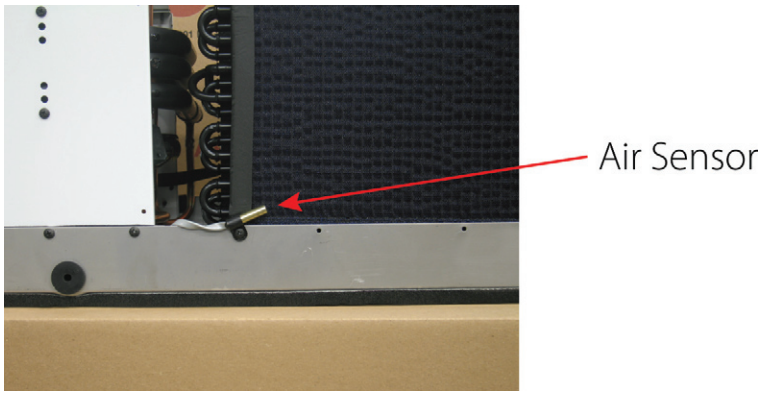
Marvair self contained and split systems air conditioners are built to operate with either the o-LED display/controller or the MachAir I display controller. Please refer to the instructions for the appropriate display/controller.

Chapter 3 – Display/Controllers

For split systems, the condenser section contains the control board for either the o-LED display/controller or the MachAir I display/controller. All evaporator sections (models DEAH) for the split systems can be used with either display/controller. Please refer to the appropriate section of this manual for programming & operating your thermostat. Determine which unit you have installed and proceed with the appropriate instructions for setting up the thermostat.

Self contained and split models using the o-LED and the MachAir I display/controller have an air sensor factory installed in front of the face of the evaporator coil. Make sure the sensor is oriented so that air will be pulled across the sensor. See photo below.

The end of the sensor cable should be plugged into the Alt air port on the control board. See drawing on page 36.



The solid state control board in the unit will operate either the o-LED or the MachAir I display/controller. The board is factory configured to operate the o-LED display/controller. If you have the MachAir I display two pins must be moved on the board. Refer to Chapter 2.7 for instructions on moving the pins. Before setting up either display/controller:

1. Turn the seacock valve to the open position.

2. If the water pump has a dedicated breaker, turn it on. Verify that water is being discharged overboard.

3. Turn on the circuit breaker to the Marvair unit.

3.1 Instructions for the o-LED Display/Controller

The Marvair o-LED digital display/controller operates onboard reverse cycle air conditioning equipment to provide room temperature control and humidity reduction. It allows for easy adjustment of fan speed, operating mode and temperature in a wide variety of applications. The o-LED digital display/controller is designed to operate with self contained and split type marine HVAC systems.

Standard Features:

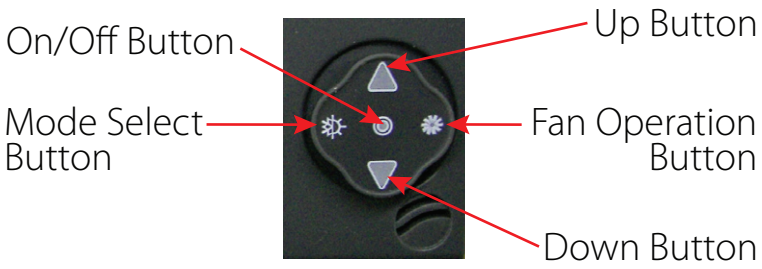
- High visibility Organic Light Emitting Diode display (OLED) offers superior visual characteristics compared to LCD displays.
- Variable brightness adjustment and automatic screen saver.
- Four position menu navigation switch featuring a joystick style interface with push on / push off control.
- Built in room temperature sensor.
- The display is compatible with Vimar and Gewiss frames.
- Visual symbols enable the viewer to see the operating status at a glance.
- Easily programmed for customized operation.
- Both automatic and manual six level fan speed adjustment.
- Built in options for fault protection for Voltage, Current and refrigerant pressure.
- De-icing cycle to prevent evaporator icing.
- Automatic moisture mode provides relative humidity control.
- Universal 115/230 VAC 50/60 Hz power supply.

Optional features include:
The following optional items can be added by simply plugging the device into the appropriate jack on the board and making the necessary programming changes.

- Outside air temperature sensor (no programming necessary).
- Alternate air sensor (no programming necessary).
- Pump sentry water sensor

Basic Operation

1. Applying power:
When power is first applied, the display will show the software revision, and then return to the last state the unit was in when power was removed.



2. Joystick operation:
The four position joystick may be tapped up, down, right, left or in the center to make changes to the operation of the control. Gently tap this switch to operate it. **Excessive force will damage the switch.**

3. Operating states:
The display operates in two operational states. In the *OFF* state, the temperature is displayed and only fan operation is available. In the *ON* state, the display shows the temperature set point, room temperature, fan, and valve status. Switch between these states by pressing and releasing the On/Off button.

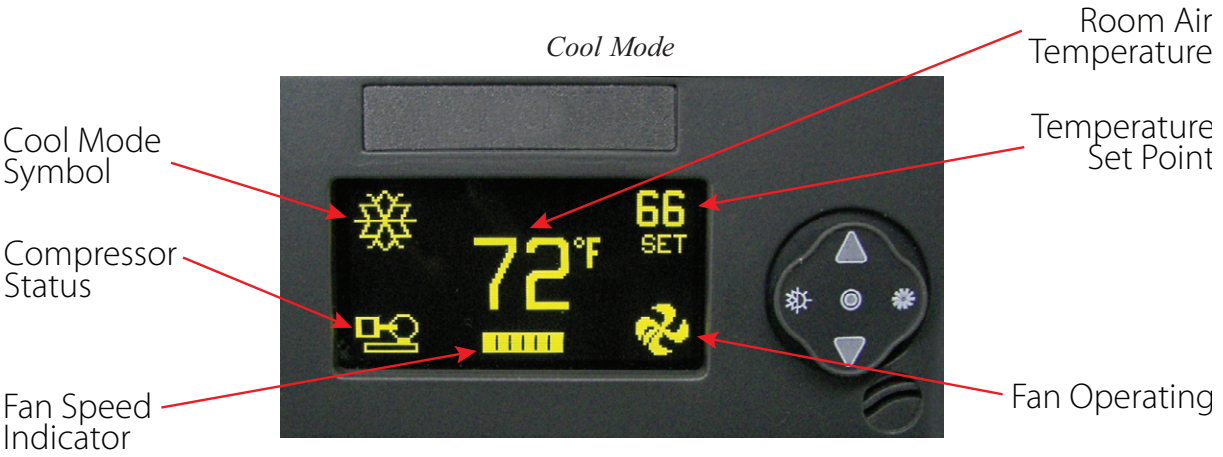
4. Symbol animation:
Some symbols on the display use animation to indicate operation of part of the system.

3.2 Operating Screens

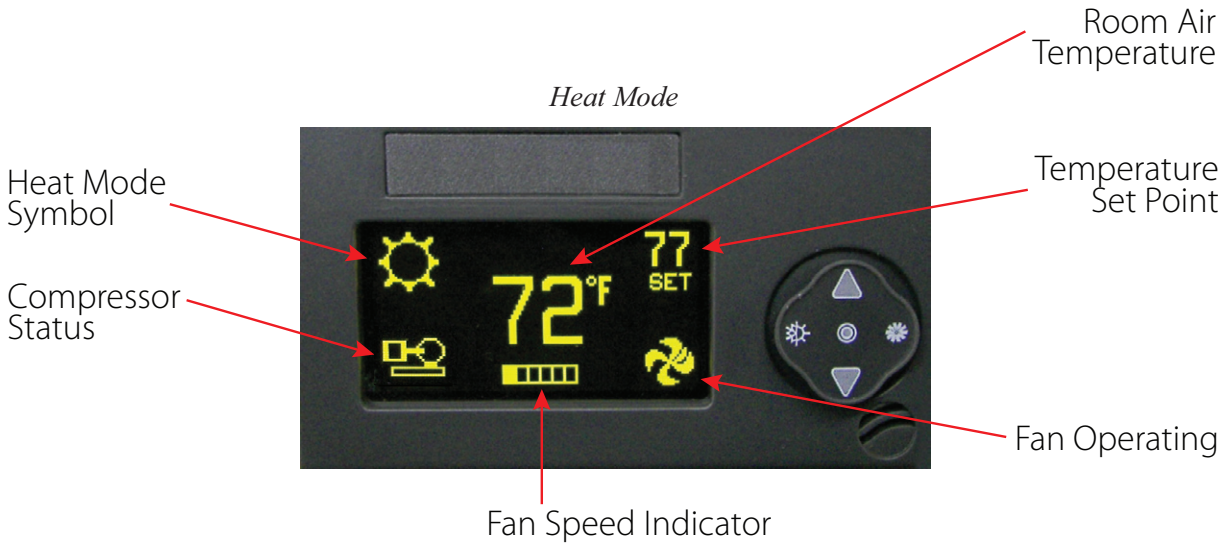
Screen Saver

Screen Saver
In screen saver, the display will appear dim and the information will scroll across the screen. Status symbols appear as needed and operation continues in the mode selected. The brightness of the screen in the screen saver mode can be changed in the program screen. See chart on page 32, parameter no. 4. To exit this mode, just tap any button.

Cool Mode

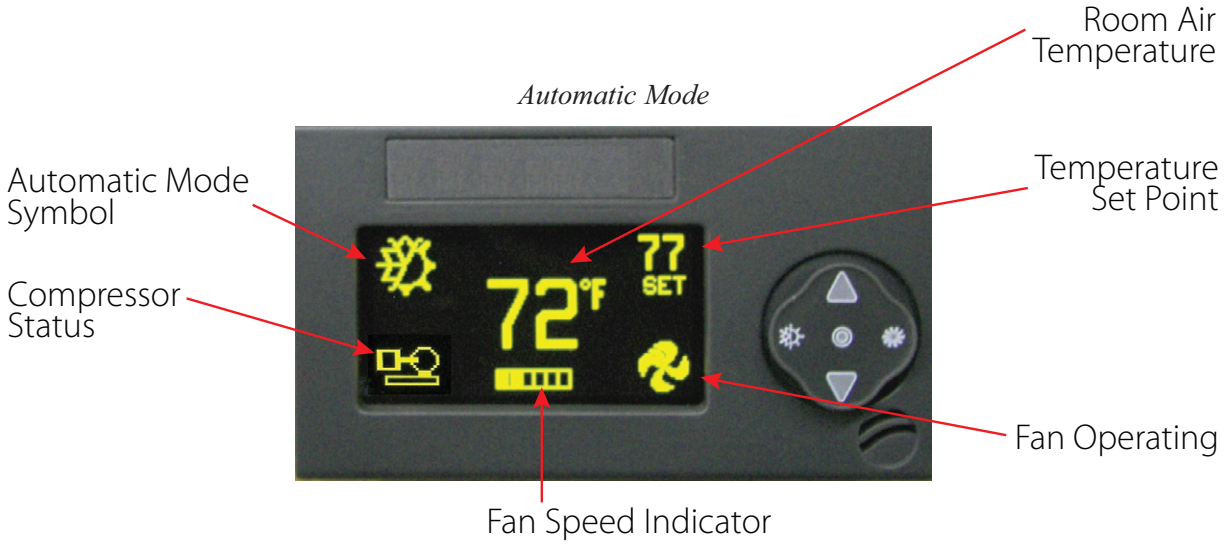


Cool mode
To select cooling only, tap the mode select button to scroll through the symbols in the top left of the display until the cool symbol appears. Set the desired room temperature by tapping the up or down button. The system will provide cooling as necessary. The compressor symbol will appear when system is cooling.



Heat mode

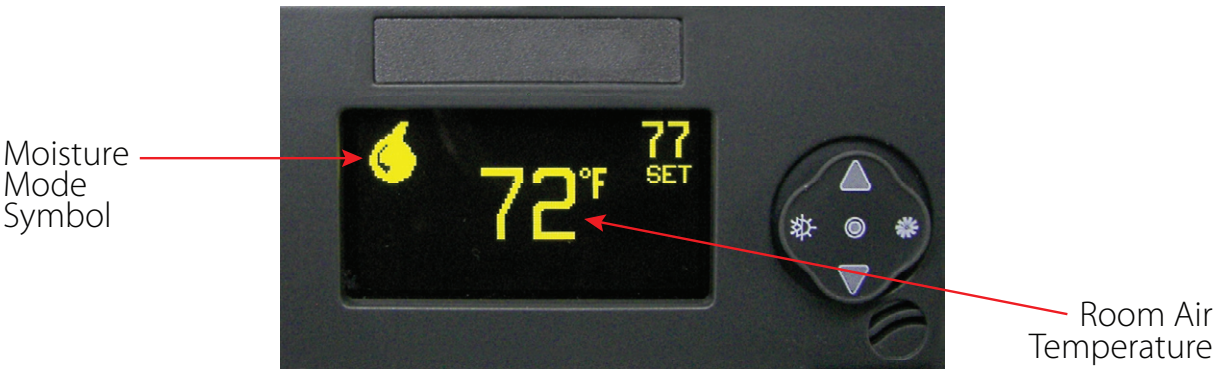
To select heating only, tap the mode select button to scroll through the symbols in the top left of the display until the heat symbol appears. Set the desired room temperature by tapping the up or down button. The system will provide heating as necessary. The compressor symbol will appear when the system is heating



Automatic Mode

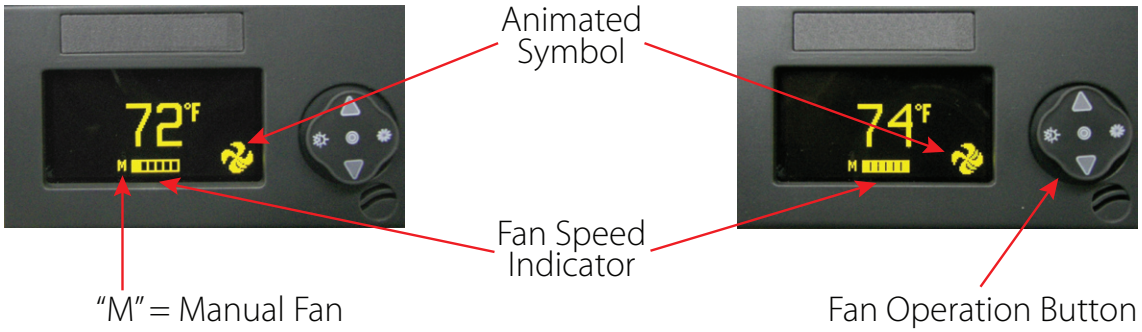
To select automatic mode, tap the mode select button to scroll through the symbols in the top left of the display until the automatic mode symbol appears. In this mode, the system will automatically maintain room temperature. Set the desired room temperature by tapping the up or down joystick button. When the system is operating, the appropriate symbol will appear in the lower left corner.

Moisture Mode



Moisture Mode
Select this mode to help control humidity in the room while the room is unoccupied. To select moisture mode, tap the mode select button to scroll through the symbols in the top left of the display until the moisture mode symbol appears. When the moisture mode is selected, the fan will run in low speed for 30 minutes. After 30 minutes, the compressor will start and run in the cooling mode until the room temperature drops (2ºC), but no longer than one hour. This cycle will be repeated every 6 hours. *Note: the Dehumidification mode will not start if the room temperature is less than 70ºF (20ºC).*

Manual Fan Low *Manual Fan High*



Operating the Fan:
Fan speed may be controlled automatically by room temperature or manually. Tap the joystick fan button to cycle through fan speeds and automatic operation. Manually selected fan speed is indicated with the M showing before the speed indicator. When the fan is automatically controlled, the M is not present. The fan may be controlled in the cool, heat, automatic modes as well as in the "Off" state to circulate room air. In the "Off" state, the fan speed can be adjusted and turned off if desired.

Manual fan speed operation is not available when the compressor is not running if the cycle fan option is set. Turn the unit off in this case and then manual fan operation may be used. Manual fan speed operation is also not available in moisture mode.

Outside Air Temperature
If the optional outside air temperature sensor is installed, the temperature set point in the upper right of the display will alternate with OAT showing outside air temperature.

Viewing System Status
In the ON state, press and hold the Mode select button for two seconds. The display will indicate AC line voltage, System current, AC Line frequency, and High and Low pressure switch status and condenser coil temperature if optional sensor is installed.

Failure codes
The following fault messages will be shown on the display in the event of a failure. Repeated faults are an indication of a problem and should be checked by a qualified service person.

HIGH REFRIGERANT PRESSURE
LOW REFRIGERANT PRESSURE
LOW AC VOLTAGE
SYSTEM OVER CURRENT
CHECK WATER PUMP
AIR SENSOR TROUBLE
LOCKOUT

3.3 Configurable Parameters

There are fifteen configurable parameters with their factory defaults described in this section. The table below defines the parameter descriptions along with the permitted values and default settings.

To enter the configuration mode first put the unit in the off state. Next press the following sequence of buttons: ***Mode, Up, Down, Mode***. Use the fan button to advance to the next parameter and the mode button to go back to the last parameter. Use the up and down buttons to change the parameters value. Exit the configuration mode when finished by pressing and releasing the On/Off button or wait 60 seconds for the display to exit.

	Description	Default	Value
1	Cycled fan	Continuous	Cycled or Continuous
2	Reverse fan in heat	Reverse	Reverse or Normal
3	System units	°F	°F or °C
4	Display brightness	15	4=Minimum 15=Maximum
5	Screen saver brightness	4	- and 1-8
6	Temperature calibration	0	Ambient +/- 10°F
7	Staging delay	15	5-135 Seconds
8	Failsafe Level	3	Off 1, 2, 3
9	Low AC line detection	Off	Off 75 to 100 (115VAC units) 175 to 200 (220 VAC units)
10	De-Ice time	Off	Off, 30 to 90 seconds
11	Pump sentry	Off	Off, 100°F to 150°F (37.8ºC to 65.6ºC)
12	Cycle pump	Cycle	Cycle or Continuous
13	Electric Heat	No Electric Heat	Electric Heat or No Electric Heat
14	Fan speed 1	30	30-90
15	Fan speed 2	35	30-90
16	Fan speed 3	40	30-90
17	Fan speed 4	45	30-90
18	Fan speed 5	55	30-90
19	Fan speed 6	85	30-90
20	Reset Parameters	No	No or Yes

3.4 Parameter description

1. **Cycled fan:** When set for cycled, the fan will operate on demand. When set for continuous, the fan will always run unless you turn the system off.
2. **Reverse fan in heat:** Fan speed will increase as the room temperature rises if this parameter is set for reverse. If set for normal, fan speed will decrease as room temperature rises. This parameter only works in heat mode and the fan must be set for automatic operation.
3. **System units:** Degrees Fahrenheit (°F) or degrees Celsius (°C) can be selected
4. **Display brightness:** Display brightness can be set from 4 to 15 to suit room lighting. Brightness will change as the number is changed.
5. **Screen saver brightness:** If set for (-) then a single bar (-) will blink sequentially in the four corners of the display. Number values from 1 to 8 can be set to suit room brightness and the unit will operated as described in the screen saver section.
6. **Temperature calibration:** This parameter allows the user to calibrate the room air temperature sensor. The room temperature will be displayed and can be adjusted +/-10 °F or +/-5°C
7. **Staging delay:** The compressor staging delay is provided for multi system installations where more than one system is operating from the same power source. Set the Staging delays at different intervals so only one compressor starts at a time when power is applied.
8. **Fail safe level:** There are four fail safe levels the controller can be set to operate: OFF, 1, 2, and 3. The default is 3.

Off	Do not detect or display any faults except air sensor failure
1	The controller will detect a fault but will not display the fault Operation will stop until the fault is cleared.
2	The controller will detect and display all faults. Operation will stop until the fault is cleared.
3	The controller will detect and display all faults. Operation will stop until the fault is cleared. After 4 faults the controller will LOCKOUT and prevent further operation

If LOCKOUT appears in the display, the unit must be turned off then on again with the Off/ On button.

9. **Low AC line detection:** When set, if the AC line voltage remains below the set value, the system will follow the action set by the failsafe level.
10. **De-Ice time:** When set, the system will perform the evaporator de-icing program
11. **Pump sentry:** This system can be equipped with an optional sensor to monitor the condenser coil temperature. If the temperature exceeds the set value, the failure will be handled according to the failsafe level. This failure will prompt the user to CHECK WATER PUMP. Plug the sensor into the Outside jack. Outside air temperature is not available when this option is used.
12. **Cycle pump:** When set for cycle, the pump will run on demand. When set for continuous, the pump will run continuously when the system is on.
13. **Electric heat/ No electric heat:** Set this parameter only if the system is equipped with an electric heater. *If the heater current will exceed 10 Amps, a contactor must be connected to the valve output to use this feature.*

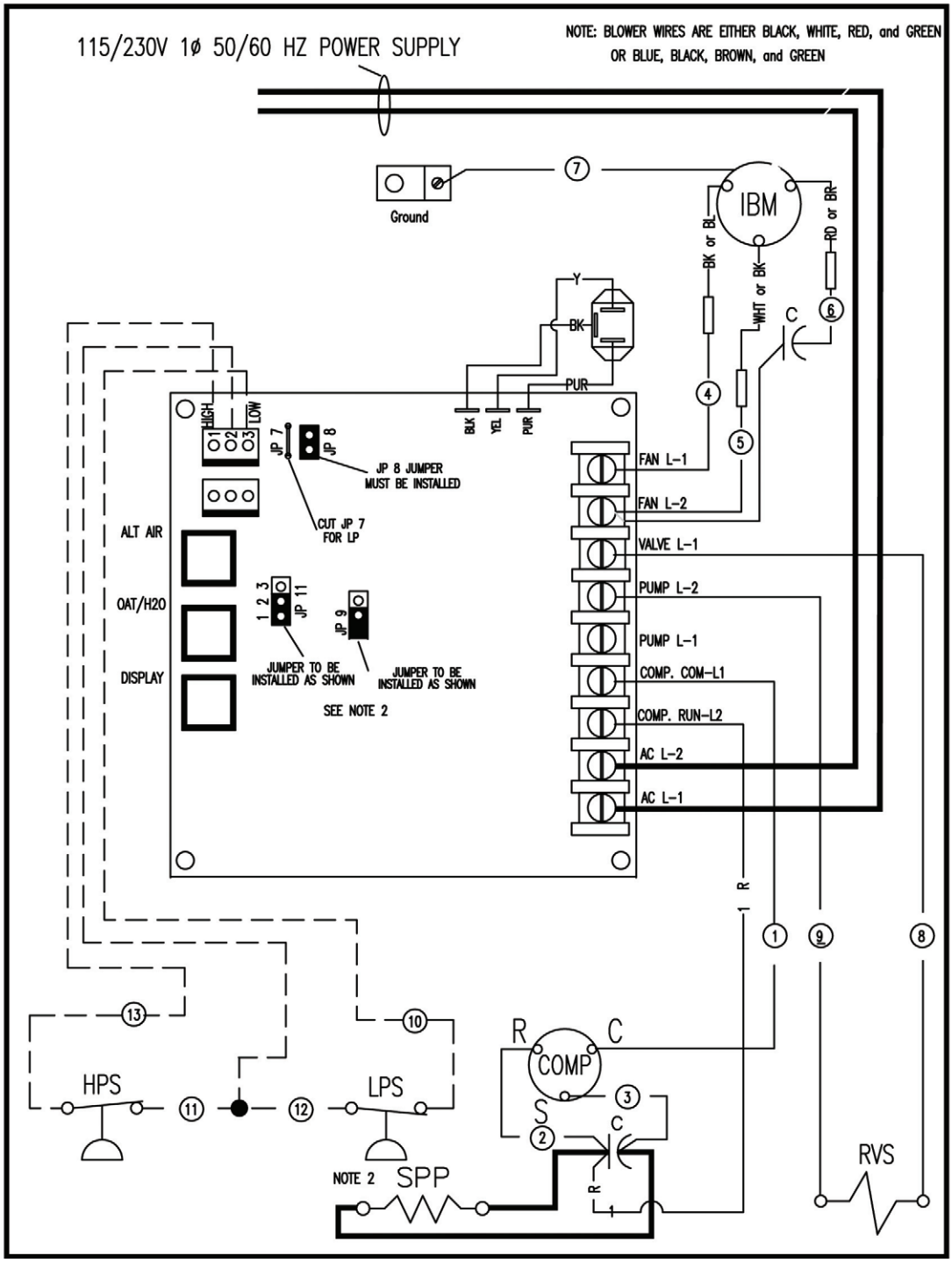
14-19. Fan speed 1-6: These parameters are used to optimize fan performance and should *be changed only by qualified service personnel.*

20. **Reset parameters:** To reset all parameters to factory defaults, select YES and then exit the program mode by pressing the joystick center button. The display will show EEPROM RESET then show the room temperature in the off mode.

3.5 Specifications

Set point range	55°F to 85°F (12.7°C to 29.4°C)
Ambient temperature range displayed	5°F to 150°F (-15ºC to 65.5ºC)
Sensor accuracy	2°F at 77°F (1.2ºC at 35ºC)
Low voltage limit 115 VAC units	75VAC
Low voltage limit 230 VAC units	175VAC
Line voltage limit	250VAC
Frequency	50 or 60 Hz

Fan output MAX	6 Amps
Valve output MAX	10 Amps
Pump output MAX	¼ HP at 115 VAC ½ HP at 230 VAC
Compressor output	1HP at 115 VAC 2HP at 230 VAC
Minimum operating temperature	0°F (-17.8ºC)
Maximum operating temperature	180°F (82ºC)
Maximum RH conditions	99% Non-condensing
Maximum length of the display cable	75 Feet (22.86 m)
Maximum length of the Outside air sensor cable	50 Feet (15.24 m)



Electrical Legend

C	Capacitor
COMP	Compressor
HPS	High Pressure Switch
IBM	Indoor Blower Motor
LPS	Low Pressure Switch
RVS	Reversing Vale Solenoid
SPP	Starter Pow-R-Pac

Color Code

BK	Black
BL	Blue
Y	Yellow
G	Green
GY	Gray
O	Orange
R	Red
BR	Brown
WHT	White

Notes

1. Field pump connection required at Terminals A1 and A2.
2. Optional starter Pow-R-Pac may be required in some applications
3. The system is factory configured for the o-LED display. To configure for the MachAir I, the JP9 pins must be jumpered and the JP11 jumper pins must be jumpered between pins 2 and 3.

3.6 Instructions for MachAir I Display/Controller

The MachAir™ I Controller and Display which has a universal power supply that operates on 115V or 240V and 50 or 60 Hz AC power.

Standard Features

- User friendly 6 button display panel requires no manual for basic operation
- Five-volt logic and micro controller located on the display
- 3-digit, 7-segment display panel indicates degrees Fahrenheit or Centigrade
- Paintable Face Plate Cover with recess for matching wall covering insert
- Automatic fan speed reduction as set point is approached
- Six (6) programmable manual fan speeds
- AC voltmeter to protect valuable electrical components
- 16 programmable parameters for custom installations
- High and low refrigerant pressure switch inputs
- Moisture Mode for controlling relative humidity
- De-Icing cycle to prevent evaporator coil icing
- Universal AC Power Supply
- Non-volatile memory retains settings without batteries
- Programmable display brightness control for night use

Optional Features

The following optional items can be added by plugging the device into the appropriate jack and making the necessary programming changes.

- Outside Air Temperature Sensor - No Programming Necessary
- Alternate Air Temperature Sensor - No Programming Necessary
- Custom Paintable Display Panels
- Pump Guard Water Sensor - Program Setting of P-8 is Required

This manual is intended to provide the information necessary to ensure proper installation and operation of MachAir Controller. Improper installation and/or misunderstood operating parameters will result in unsatisfactory performance and premature failure of the MachAir Controller.

Basic Operation

POWER BUTTON Press the **POWER button** once to toggle the unit to the "ON" mode. Press the **POWER button** again to toggle the unit to the "OFF" mode.

FAN SPEED BUTTON Press and release the **FAN SPEED button** to advance from "AUTO" to "MANUAL" fan operation. Press and release to increase the manual fan speeds, to settings "1 through 6". Press and release again, returns it to the "AUTO" fan mode. The selected fan mode is identified by the LED's for "AUTO" and "MANUAL".

UP BUTTON Momentarily press and the set point will appear in the temperature display. The set point increases one degree each time the **UP arrow button** is pressed and released.

DOWN BUTTON Momentarily press and release to display the set point. The set point is decreased one degree each time the **DOWN arrow button** is pressed and released.

MODE BUTTON The **MODE button** is used to select one of 4 Operating Modes. Press and release to advance to the next mode. Continue to press and release until the desired Operating Mode is reached. The mode selected is indicated by the Mode LED.

TEMP SELECT BUTTON Press and release to view the inside (supply) air temperature, outside (return) air temperature or set point. The appropriate LED will be lit indicating that temperature is being displayed.

THREE DIGIT DISPLAY The inside (supply) temperature is displayed whenever the control is turned on. The display provides a readout of the inside air temperature which is located in the supply duct.

HEAT MODE LED The **"HEAT"** mode LED is lit when Heating is selected.

COOL MODE LED The **"COOL"** mode LED is lit when Cooling is selected.

AUTO LED The **"AUTO"** mode LED is lit when the Automatic Heating or Cooling mode is selected. The control will automatically switch to heating or cooling when this mode is selected.

MOISTURE CONTROL LED The **"MOISTURE CONTROL"** LED is lit when Moisture Control is selected.

MANUAL FAN LED The **"MANUAL"** Fan Speed LED is lit when the fan speed has been manually selected.

AUTO FAN LED The **"AUTO"** Fan Speed LED is lit when the fan speed has been automatically selected.

FAN SPEED BAR GRAPH There are six (6) individual fan speed LED's. Each LED represents one (1) fan speed. The lowest fan speed setting is indicated by illuminating the first LED. The highest fan speed setting is indicated by illuminating all six LED's.

LED The system operating status (Compressor On or Off) is indicated by turning on the right most decimal point in the 3 Digit Display.

System Overview

Press the POWER button once to engage the system. The Display indicates room temperature when the system is on and the display is blank when the system is off.

Press and release the MODE Button until the desired Mode LED is illuminated.

Set the desired room temperature by pressing the Up or Down arrow buttons. The set point can viewed by momentarily pressing and releasing the Up or Down arrow buttons.

Fan speed operation is automatic allowing fan speed to decrease as room temperature is approached. The fan speed decreases as the set point is approached. The fan will operate at low speed when the set point is satisfied. Manual fan speeds can be selected by pressing and releasing the FAN SPEED button to select the desired manual fan speed. The fan will operate at the speed selected and will not change speeds with room temperature.

The fan can be programmed to cycle on and off with demand, allowing the fan to run only when cooling or heating is required. Normally the automatic fan speed operation is reversed in the heating mode, however, the fan can be programmed to operate the same as in the cooling mode.

Normal Heating or Cooling Cycle

Select COOL mode and cooling only will be provided. The cabin temperature will be maintained within 2°F of the set point. Select HEAT mode and heating only will be supplied. The cabin temperature will be maintained within 2°F of the set point.

Select AUTO and either heating or cooling will be supplied when it is required. While in the automatic mode the controller will maintain the set point within a 2°F temperature variation. A four degree swing is required to cause the unit to shift to the opposite mode. Once in a given mode, heating or cooling, the controller will maintain a 2 degree differential.

When the heating or cooling demand is satisfied, the compressor cycles off and the automatic fan returns to low speed. The fan speed will remain constant if MANUAL Fan Speed had been selected.

Reversing Valve Operation

The reversing valve is toggled to the opposite mode (for pressure equalization) when heating or cooling is required to reduce the compressor's starting requirements and the electrical power surge. The valve will only toggle to the opposite mode when a cooling or heating cycle is called for and if the system has been off for less than seventy-five (75) seconds. The valve will also toggle if a cycle is interrupted from the display panel by pressing the POWER button On/Off, or by changing the set point. Unnecessary valve toggling has been limited to reduce reversing valve noise. Valve toggling can be totally eliminated by programming the minimum compressor staging delay at seventy-five (75) seconds or greater.

Power on reset, which occurs when the system is powered up, will always initiate a valve toggle.

Controller Memory

The MachAir Controller has non-volatile memory which requires no batteries or any form of backup power. When power is lost, the operating parameters are retained indefinitely. When power is restored, the controller resumes operation as last programmed. All operating and programming parameters are entered into non-volatile memory instantly and are retained indefinitely.

3.7. Operator Controls and Display Panel

1. **POWER BUTTON** The **POWER** button is used to toggle between the **On** and **Off** modes. Press the **POWER** button once to toggle the unit to the **On** mode. Press the **POWER** button again to toggle the unit to the **Off** mode.
2. **FAN SPEED BUTTON** Press and release the **FAN SPEED** button to advance from **AUTO** to **MANUAL** fan. Press and release the **FAN SPEED** button to advance the manual fan speeds, from 1 through 6. Press and release again to return to the **AUTO** fan mode. The selected fan mode is indicated by the **AUTO** and **MANUAL** fan LED's.

3. **UP ARROW BUTTON** Momentarily press the **UP** arrow button and the set point will appear in the temperature display. Press and release the **UP** arrow button to increase the set point one degree. The set point is increased by one degree each time the **UP** arrow button is pressed and released. The highest set point allowed is 85º Fahrenheit. The **UP** arrow button is used in conjunction with the **DOWN** arrow button to display the outside air temperature when the control is on. The **UP** arrow button is also used to increase program values in the program mode.

4. **DOWN ARROW BUTTON** Momentarily press and release the **DOWN** arrow button to display the set point. Press and release the **DOWN** arrow button to decrease the set point. The set point is decreased one degree each time the **DOWN** arrow button is pressed and released. The lowest set point allowed is 55º Fahrenheit. The **DOWN** arrow button is used in conjunction with the **UP** arrow button to display the outside temperature when the control is on. The **DOWN** arrow button is also used to reduce program values in the program mode.

5. **MODE BUTTON** The **MODE** button is used to select one of the four operating modes. Press and release the **MODE** button and the controller will advance to the next mode. Continue to press and release the **MODE** button until the desired operating mode is reached. The mode selected is indicated by the **MODE** LED, i.e., **COOL**, **HEAT**, **AUTO** or **MOISTURE CONTROL**.

6. **TEMP SELECT BUTTON** Press and release the **TEMP SELECT** button to view inside air temperature, outside air temperature or the set point. The appropriate LED, **INSIDE**, **OUTSIDE** or **SET POINT** will be illuminated indicating which temperature is being displayed. If no outside air sensor is installed three (3) dashes will appear in the Three Digit Display.

7. **THREE DIGIT SEVEN SEGMENT DISPLAY** The inside air temperature is displayed in the window whenever the control is turned on. The three digit 7 segment display provides a readout of the inside air temperature which is located in the face plate. An optional alternate air sensor is available for installations that can not use the face plate sensor.

   The display also indicates program information, fault codes and outside air temperature when the optional alternate air sensor is installed.

   The display momentarily indicates the **SET POINT** when the **UP** or **DOWN** arrow button is pressed.

   When the control resumes operation after a power interruption all the display LED's will turn on for one second. This is a normal operating condition and is referred to as "Power On Reset".

8. **HEAT MODE LED** The **HEAT** mode LED will be illuminated when the Heating Mode has been selected. The **HEAT** mode LED is also illuminated when optional electric heat is installed and the Heating Mode has been selected. Electric heater status, On or Off, is indicated by the right most decimal point (see Item 18).

9. **COOL MODE LED** The **COOL** mode LED will be illuminated when the Cooling Mode has been selected.

10. **AUTO LED** The **AUTO** LED is illuminated when the Automatic Heating or Cooling Mode has been selected. The controller will automatically switch to Heating or Cooling when this mode is selected.
11. **MOISTURE CONTROL LED** The **MOISTURE CONTROL** mode LED is illuminated when Moisture Control has been selected. This mode is used to control humidity during periods when the vessel is unoccupied.
12. **MANUAL FAN SPEED LED** The **MANUAL** Fan Speed LED will be illuminated when one of the six (6) Manual Fan Speeds has been selected.
13. **AUTO FAN SPEED LED** The **AUTO** Fan Speed LED is illuminated when Automatic Fan Speed is functioning.
14. **FAN SPEED BAR GRAPH** There are six (6) individual Fan Speed LED's in the Fan Speed Bar Graph. Each LED represents one (1) Fan Speed. Low Fan Speed **1** is indicated by illuminating the first LED. High Fan Speed **6** is indicated by illuminating all six (6) LED's. Any of the six (6) Fan Speeds available are displayed by the illuminated corresponding number of LED's.
15. **INSIDE LED** The **INSIDE** LED is illuminated when the Inside Air Temperature is being displayed.
16. **OUTSIDE LED** The **OUTSIDE** LED is illuminated when the outside air temperature is displayed.
17. **SET POINT LED** The **SET POINT** LED is illuminated when the Set Point is displayed.
18. **COMPRESSOR LED** The system operating status (Compressor On or Off) is indicated by turning on the right most decimal point in the 3 Digit Display.

Dual Button Functions

UP & DOWN ARROW BUTTONS Press the **UP** and **DOWN** arrow buttons together and the outside air temperature will be displayed, providing the Optional Outside Air Temperature Sensor has been installed. No programming is required. Press the **UP** and **DOWN** arrow buttons simultaneously, while in the program mode, to set new custom programming defaults.

POWER BUTTON & DOWN ARROW BUTTON Simultaneously pressing the **POWER** button and the **DOWN** arrow button while viewing the Service Fault History Log clears the fault History Log.

Special Button Functions

Special button functions are implemented by pressing and holding a particular button while the control's AC power is turned on.

1. **Service History Log** View the service history log by pressing and holding the **MODE** button while turning on the AC power. Exit the service history log by pressing the **POWER** button once. Clear the service history log by simultaneously pressing the **POWER** button and the **DOWN** arrow button.
2. **Self Test Mode** Press and hold the **POWER** button while AC power is applied to enter the self test mode. The self test mode is used to diagnose problems and to test the air conditioning system.

3. **View Hour Meter** To view the compressor hour meter, press and hold the **DOWN** arrow button while applying AC power. Maximum recorded time is 10,000 hours. The hour meter stops at maximum (10,000 hrs) and can only be reset by the Manufacturer.

3.8 Modes of Operation

Off Mode

When the controller is in the **Off Mode**, all control outputs are turned off. Program parameters and user settings are saved in a non-volatile memory. The program mode can only be accessed from the **Off Mode**.

On Mode

When the controller is in the **On Mode**, power will be supplied to the appropriate control outputs and the display will indicate the current state of operation. The operating and program parameters resume based on those stored the last time the unit was operating.

Cool Only Mode

When the **COOL** LED is on, only the Cooling systems are selected and operated as required. When the temperature drops below the set point, the system will not automatically switch to the Heating Mode. Cooling only is available for customers that do not want automatic Cooling and Heating operation. Systems without reverse cycle heating can have an optional electric heater installed should heating be required.

Heat Only Mode

When the **HEAT** LED is on, only the Heating systems are selected and operated as required. Should the temperature rise above the set point, the system will not automatically switch to the Cooling mode. Heating only is supplied for customers that require the system to not automatically switch from the Heating to the Cooling mode.

Automatic Mode

When the **AUTO** LED is on, either Heating or Cooling are supplied as required. The **HEAT** and **COOL** LED's will be illuminated according to the mode required. When the system requires compressor operation for Heating or Cooling the right most decimal point will turn on when the compressor is on.

Temperature in a given mode will be maintained at two degrees Fahrenheit (2°F), however, a four degree difference is required to allow the controller to change modes. Once in a new mode, the temperature will remain within two degrees Fahrenheit (2ºF) of the set point.

Moisture Control Mode

While in the on mode, press the **MODE** button until the **MOISTURE CONTROL** mode LED is illuminated. Every four (4) hours, the fan is started and air is circulated for thirty (30) minutes. During this time the air temperature is sampled and entered into memory. The cooling cycle is started and continues until the temperature is lowered 2°F. The compressor is allowed a maximum of one hour running time to reach the desired temperature. Four (4) hours after the temperature is satisfied on the compressor the cycle will be repeated. The right most decimal point is illuminated while the compressor is running.

3.9 Fan Speed Modes

Auto Fan Speed Mode

The controller has six automatic fan speeds available. Speed **6** is high, **3** is medium and **1** is low or the slowest speed. **AUTO** Fan Speed mode allows the controller to determine the required fan speed based on room temperature. The closer the room temperature is to the set point, the slower the fan will run. This permits a balance between the most efficient temperature control and the slower/quieter fan speeds. Automatic Fan Speed operation is the **factory default**, however, **MANUAL** Fan Speed mode is available.

Manual Fan Speed Mode

The controller has six automatic fan speeds available. Speed **6** is high, **3** is medium and **1** is low or the slowest speed. **MANUAL** Fan Speed mode allows the user to select and maintain the desired fan speed manually. When a **MANUAL** Fan Speed has been selected, the Fan Speed Bar Graph will indicate the speed selected by the number of LED's illuminated. Select Fan Speed **3**, for example, and the first three LED's in the Fan Speed Bar Graph will turn on. **MANUAL** Fan Speed mode is sometimes preferred when room temperature is constantly changing due to varying heat loads.

3.10 Program Mode

Program Mode Overview

The program mode is used to adjust the systems operating parameters to suit the particular needs of individual users. The program mode is also used to tailor the air conditioning system for the most efficient operation within an installation. Installation variables such as ducting, sensor location and system layout effect the perceived operation of the overall system. The program mode allows the system to operate as efficiently as possible under all conditions. The controller is shipped with factory programmable default settings which are stored in permanent memory and can be recalled at any time.

Warning

Severe electrical disturbances can sometimes upset the controller operating sequences. Operator confusion related to program parameters can also cause, what seem to be, operational problems. Whenever there is any doubt as to the proper operation of the controller, Factory Default Parameters, should be re-initialized.

Entering Program Mode

The program mode can only be entered from the Off Mode. From the Off Mode and in the following order, press the **TEMP SELECT**, **UP** arrow, **DOWN** arrow and **TEMP SELECT** buttons. These buttons have to be pressed and released in the order given. The numerals "85" which represent the high Fan Speed limit, appear in the display. The "85" is followed by the characters "P1" followed again by the parameter setting ("85"). **P1** represents the first programmable parameter. The controller is now in the program mode. Exit the program mode, to the Off Mode, by pressing and releasing the **POWER** button.

NOTE: The controller will exit the program mode and return to the Off Mode if no programming is attempted for one (1) minute.

Restore Memorized Default Settings

The memorized default settings can be restored by entering the program mode and setting P-16 to rSt. Exit the program mode and the software version number appears in the display. The memorized default settings are restored and the controller returns to the Off Mode. The software version number is always displayed when you exit the program mode.

Increment from one parameter to the next by pressing and releasing the **MODE** button while in the program mode. Use the UP arrow and DOWN arrow buttons to change the program parameter values. The programmable parameters range from P-1 through P-16.

Up and Down Buttons

The **UP** arrow and **DOWN** arrow buttons are used to select the data or set the desired limits for the parameters being programmed. This method is followed throughout the program mode, however, special instructions are included for individual functions that require them.

Exiting the Program Mode

There are two methods to exit the program mode. Press the **POWER** button and the controller will return to the Off Mode. Not pressing any buttons or attempting any program changes for sixty (60) seconds will allow the controller to exit the Program Mode to the Off Mode. Any programming changes that were made while in the program mode will be memorized and put into operation when the program mode is exited and the controller is returned to the On Mode.

3.11 Programming

Programmable Parameters

There are sixteen (16) programmable parameters with their Factory Default Settings listed in this section. The table below indicates what these parameters are, along with the permitted values and the original Factory Default Settings.

Program Number	Description	Default	Range
P-1	High Fan Speed Limit (arbitrary units)	85	56 to 85
P-2	Low Fan Speed Limit (arbitrary units)	50	30 to 55
P-3	Compressor Staging Time Delay	15	5 to 135 seconds
P-4	Temperature Sensor Calibration	0	Ambient ± 10°F
P-5	Failsafe Modes and Mnemonic High refrigerate Pressure (HPF) Low refrigerate Pressure (LPF) Low AC Line Voltage (LAC)	3 = 4 Failures With 90 Second Restart Delay. Manual Reset is Required	Off 1 = Continuous No Display 2 = Continuous With Display 3 = 4 Failures Reset Required
P-6	Low AC Voltage Cut-Off	85 VAC (115 vac) 185 VAC (230 vac)	Off - 75 to 100 (115 vac Units) Off - 175 to 200 (220 vac Units)
P-7	De-Icing Cycle	O	O = Off 1 to 3 Minutes
P-8	Pump Sentry - Protects Pump and Compressor From Loss of Water	Off	OFF ON = Select 100°F to 150°F
P-9	Display Brightness Control	13 = Maximum	4 = Low 13 = Maximum
P-10	Display °Fahrenheit or °Centigrade	°F	°F = Fahrenheit Displayed °C = Centigrade Displayed
P-11	Cycle Pump With Compressor or Continuous Pump	OFF = Cycle With Compressor	OFF = Cycle With Compressor ON = Continuous Pump
P-12	Reverse Fan Speeds During Heating Mode	rEF = Reversed	nor = Normal Fan Operation rEF = Reversed Fan in Heating
P-13	Continuous Fan or Cycle Fan With Compressor	con = Continuous Fan Operation	CYC = Cycle Fan w/Compressor rEF = Reversed Fan In Heating
P-14	Reverse Cycle Heating or Electric Heat Only Option Installed (Cooling Only Units)	nor = Reverse Cycle Heating	nor = Reverse Cycle Heating ELE = Electric Heater Installed
P-15	Fan Motor Type Selection - Shaded Pole or Split Capacitor	SP = Shaded Pole	SP = Shade Pole Fan Motor SC = Split Cap. Fan Motor (NOTE: All Marvair® units use a split capacitor motor. Select SC.)
P-16	Reset Memorized Programming Defaults	nor = Normal	rSt = Reset Defaults

Should any programming problems or confusion occur, reset the Memorized Default Settings by entering the program mode and setting P-16 to rSt.

P-1 **High Fan Limit**

The upper fan speed limit can be changed to suit different motors and operating conditions. The **high fan limit** is adjusted with the system installed and operational. The range of values are 56 through 85 and represent arbitrary units. Setting a higher number, results in a higher fan speed, setting a lower number, lowers the fan speed. Use the **UP** and **DOWN** arrow buttons to select the desired fan speed limit. The factory default is eighty-five (85).

P-2 **Low Fan Limit**

The **low fan limit** determines the lowest output allowed for the low fan speed. The range of values for the low fan speed are 30 through 55, in arbitrary units. Use the **UP** and **DOWN** arrow buttons to select the desired low fan speed limit. Setting a higher number, results in a higher fan speed, setting a lower number, lowers the low fan speed limit. The factory default setting is fifty (50).

Once the high and low fan speed limits are set, the unit will automatically readjust the four (4) remaining fan speeds to produce six (6) equally spaced fan speeds in both the **AUTO** and **MANUAL** fan speed modes.

P-3 **Compressor Staging Time Delay**

NOTE: This feature is not being used on the Marvair® reverse cycle air conditioners.

The **compressor staging relay** is provided for installations where more than one system is being operated from the same power source. Setting the staging delays at different intervals allows only one compressor to start at a time. The units should be staged at least five (5) seconds apart. The minimum delay is five (5) seconds and the maximum is one hundred thirty-five (135) seconds. The factory default setting is fifteen (15) seconds.

P-4 **Temperature Calibration**

Use this feature to calibrate the air sensor within a range of ± ten (10)ºF. Enter the program mode and the ambient temperature appears in the display. Use the **UP** and **DOWN** arrow buttons to select the desired offset. The temperature in the display will increase or decrease according to the offset programmed. The factory default setting is zero.

P-5 **Fail-Safe Level**

The system can be configured for one of four fail-safe levels. Selecting **OFF** turns off all fail-safe protection and mnemonic display codes. Level **ONE (1)** shuts down the system, allows the system to restart after a 90 second delay and displays no failure code. Level **TWO (2)** shuts down the system but allows continual restarts after the 90 second delay and displays the appropriate mnemonic failure code. Level **THREE (3)** operates the same as level **TWO (2)** with the addition of a system shutdown after four (4) consecutive failures. Manual reset is required to restart the system.

P-6 **Low Voltage Cut-Off**

The controller can be programmed to protect the system against sustained low AC line voltage conditions. The compressor will be shut down and **"LAC"** flashed in the display if the line

voltage goes below the programmed value for more then ten (10) minutes. Programmable values are 75 VAC to 100 VAC for 120 volt units and 175 VAC to 200 VAC for 220 volt systems. The factory default is 85 VAC for 120 volt units and 185 VAC for 220 volt systems. **NOTE:** Low Voltage Protection can be turned off by programming **OFF** instead of selecting a voltage value.

P-7 De-Icing Cycle

The controller is equipped with a De-Icing Cycle to prevent ice build up on the evaporator coil during extended periods of cooling operation. Installation variables such as grille sizes, length of ducting, insulation "R" factors and ambient temperatures determine the cooling run time required to achieve the set point. Customer usage may substantially increase run times by operating the system with the hatches and doors open. Programming an unrealistic set point (55ºF) and leaving the salon door open will usually cause the evaporator to ice up on warm muggy days.

De-Icing is accomplished by switching the reversing valve into the **HEAT** mode while the system is cooling. The valve will remain energized for the programmed cycle time. The cycle is programmable from OFF through a period of 3 minutes. The factory default setting is OFF.

P-8 Optional Pump Sentry

NOTE: This feature is not being used on the Marvair® reverse cycle air conditioners.

The controller can be equipped with an optional temperature sensor that is used to monitor the heat exchanger temperature. The sensor is plugged into the outside air sensor jack and programmed for a temperature between 100 and 150ºF depending on water temperature and the system type. When the heat exchanger temperature rise above the programmed value the pump and compressor are shut down and **"PPP"** is flashed in the display. The factory default is OFF, no Pump Sentry installed.

P-9 Display Brightness Control

The display brightness can be adjusted to suit ambient cabin lighting conditions. The allowed settings are four (4) to thirteen (13) the brightest. Typically a dark cabin will require a setting of four or five. A very bright cabin will require a setting of twelve or thirteen. The factory default setting is thirteen (13).

P-10 Fahrenheit or Celsius Selection

The unit can be programmed to display either Fahrenheit or Celsius. Programming ºF displays degrees Fahrenheit and programming ºC, displays degrees Celsius. The factory default setting is ºF, Fahrenheit. When degrees Celsius (ºC) is selected the readings are displayed in tenths, i.e. 22.2ºC.

P-11 Cycle Pump with Compressor

To increase pump life and conserve electricity the pump can be programmed to cycle on and off with the compressor. The pump can also be programmed to operate continuously whenever the system is on. To program the pump for continuous operation, turn "P-11" **ON**. The factory default setting is **OFF**, which cycles the pump with the compressor.

P-12 **Reverse Automatic Fan Speeds During Heating**

The automatic fan speeds can be reversed during the heating mode to improve heat output in cooler climates. The fan speed is decreased as the temperature spread increases. The fan will speed up as the set point is approached. Lowering the fan speed when the cabin is cold increases head pressure and raises the supply air temperature. Increasing the fan speed as the set point is approached also reduces unnecessary high pressure faults. The fan switches to low speed when the set point is satisfied and the compressor cycles off. The fan can be programmed to operate the same as in cooling by programming "P-12" **nor** which represents normal fan operation during reverse cycle heating. The factory default setting is **rEF**, which reverses the automatic fan speeds during heating.

P-13 **Cycle Fan with Compressor**

The fan can be programmed to run continuously when the system is on or can be allowed to cycle with the compressor. When cycled with the compressor, the fan will operate only when heating or cooling is called or. To cycle the fan with the compressor select **CYC** which stands for cycle the fan with the compressor. To operate the fan continuously select **con** which represents continuous fan operation. The factory default setting is **con** continuous fan operation when the system is on.

P-14 **Reverse Cycle Electric Heat**

Electric heat is not currently available on Marvair® units.

IMPORTANT

P-15 **Fan Motor Selection**

There are two basic fan motor types, shaded pole and split capacitor. Each motor reacts differently to speed control and each motor requires different timing for optimum fan speed control. The default setting is "**SP**" which selects the shaded pole motor type, however, "**SC**" should be selected if a split capacitor type motor is used in the system. The Marvair direct expansion systems are supplied with a split capacitor type fan motor so "**SC**" should be selected. The factory default setting is "**SP**" for the shaded pole type fan motor. IMPORTANT: The factory default setting "**SP**" should not be used on the Marvair reverse cycle air conditioners.

P-16 **Reset Memorized Defaults**

The default programming parameters can be reset by entering the program mode and selecting **"rST"**. This will restore the programmable parameters to the values selected when the system was shipped.

Why Memorize New Defaults?

Once the desired programming changes have been made and the system tests satisfactorily, your work can be saved as the **new factory defaults**. Your new defaults are initiated by **simultaneously** pressing and releasing the **UP** and **DOWN** arrow buttons prior to exiting the **program mode**. New defaults can be initialized at any time by entering the program mode and following the above instructions. Once **new defaults** have been initialized the control will revert back to the new defaults whenever factory defaults are restored as previously described in **"P-16"**.

Fail-Safe and Fault Handling Codes

When a fault is detected the controller will display one of the following Mnemonic fault codes:

HPF	Indicates high Refrigerant pressure, 15 second delay, ignored in HEAT mode.
LPF	Indicates low Refrigerant pressure. There is a ten minute charge time delay.
LAC	Indicates low AC line power.
AAA	Indicates failed air sensor. Unit will not run until repaired.
PPP	Indicates the water pump has failed.

Fail-Safe

There are four levels of fail-safe protection including the fail-safe **OFF** mode. Level **1** monitors the sensors, takes appropriate action and allows continuous restarts after a 90 second delay and **does not display the fault code**. Level **2** works the same as Level **1**, however, the appropriate fault code mnemonic is displayed during the time-out between restarts. Level **3** is identical to Level **2** with the inclusion of a three successive failures lockout routine. After four (4) consecutive failures the system is shutdown and a manual reset is required.

Lockout

Lockout occurs if **"P-5"** is programmed for Level **3** and four consecutive faults are detected within a heating or cooling cycle. Lockout causes the system to shut down and flash the mnemonic fault code. Lockout can only be cleared by turning the unit **OFF** and then **ON** by using the **POWER** button.

Fault Display

When a fault occurs the appropriate mnemonic code is flashed in the display. The flashing mnemonic can be removed from the display by pressing and releasing the **POWER** button to reset the controller. Resetting the controller does not solve the problem caused by the fault.

Fail-Safe Level	Action	Description of Action Taken
OFF	All Protection is Turned Off	FAIL-SAFE PROTECTION LEVELS TURNED OFF: Air Sensor Fault: Heating/Cooling Immediately Suspended; Normal Operation Not Resumed Until Fault is Cleared. Air Sensor Fault Code "Flashing Display" NO OTHER FAIL-SAFE PROTECTION IS PROVIDED.
1	No Mnemonic Fault Code Displayed Continuous 90 Sec. Re-Starts Allowed!	MINIMUM PROTECTION LEVEL All Actions Taken in Fail-Safe Protection Level "0" Plus: In Addition, Continuous 90 Second Compressor Restarts are Allowed. FAULT Mnemonic CODE NOT DISPLAYED NO OTHER FAIL-SAFE PROTECTION IS PROVIDED
2	Display Fault & Shut Down Compressor With Continuous 90 Second Delay Between Starts	INTERMEDIATE PROTECTION LEVEL All Actions Taken in Fail-Safe Protection Levels "0" & "1" Plus: In Addition, The FAULT MNEMONIC CODE Message Will Be Displayed With Continuous 90 Second Compressor Restarts Allowed. NO OTHER FAIL-SAFE PROTECTION IS PROVIDED
3	Display Fault and Require Manual Reset After 4 Failures.	MAXIMUM PROTECTION LEVEL FAULT CODE MESSAGES ARE DISPLAYED and The Appropriate Action is Taken According to The Problem Encountered. After 4 Consecutive Failures Manual Reset is Required.

3.12 Specification Notes

Custom cable lengths available on special request in 5 foot increments. Maximum length of display cable is 50 feet. Sensor cable lengths should be limited to 50 feet. The **outside air sensor**, **alternate air sensor** and **condenser coil sensor** are optional items and are not included with the standard control package.

3.13 Automated Factory Self Test Program

Self-Test Mode

The controller software contains a self-test program to facilitate factory testing of the entire air conditioning system. Once the **Self-Test** mode is activated, the test cycle will continue until the AC power is interrupted or the On/Off **POWER** button is pressed once which returns the system to the Off mode.

Activate the self-test mode by pressing and holding the On/Off **POWER** button while turning on the AC power. Be sure to continue to hold the **POWER** button until the power on reset is completed. The controller is now in the **Self-Test** mode.

Once activated the self-test software will continuously execute the following procedure:

1 - Turn on in the **HEAT** mode and supply heating for ten (10) minutes.

2 - Stop heating and run the **fan only** for five (5) minutes.

3 - Switch to **COOL** and continue cooling for ten (10) minutes.

4 - Stop cooling and run the **fan only** for five (5) minutes.

5 - Return to step one (1) and continue until interrupted.

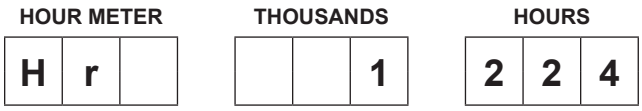
The test mode will continue until the power is interrupted or the test is halted by pressing the On/Off **POWER** button once.

3.14 Service Tools

Hour Meter

Total compressor cycle time is saved in **EEPROM** every 6 minutes of continuous compressor running time. Cycles less than 6 minutes will be discarded to conserve memory and to allow for the most flexible hour-meter possible.

To view the hour meter turn off the power at the AC breaker and hold the **DOWN** arrow button depressed. While depressing the **DOWN** arrow button, restore AC power. After the power on reset routine is complete, the following will appear on the display.



1. The hour meter mnemonic (Hr) is displayed for one (1) second.
2. The display blanks out for one second and then displays the THOUSANDS units for three (3) seconds.
3. The display blanks out for one (1) second and then displays the hours for three (3) seconds.
4. The unit returns to the last operating state before power was removed.

The example shown is displaying twelve-hundred twenty-four (1,124) hours.

Maximum recorded time is 10,000 hours. The hour meter stops at the maximum (10,000 hrs) and can only be reset by **Marvair**.

Service History

The controller will record and remember the last eight (8) service problems or service faults detected. Each time a fault is detected, a one hour timer is started. During that hour the same recurring fault will not be recorded. Should a different fault be detected during that hour, it will be entered into the service history log.

The following events are entered into the service history log:

1. High Refrigerant Pressure
2. Low Refrigerant Pressure
3. Air Sensor Fault
4. Low AC Voltage
5. Pump or Loss of Water Fault

To view the service log, turn off the AC power and depress the **MODE** button. With the **MODE** button depressed turn on the AC power. Once the **power on reset** is completed, the display will flash the most recent mnemonic for the fault detected, followed by the event number. To view the other events detected press either the **UP** or **DOWN** arrow buttons.

To exit the service history log press the **POWER** or the **MODE** button or wait 30 seconds without pressing any buttons.

The service log can be cleared by simultaneously pressing the **POWER** and **DOWN** arrow buttons while you are viewing the service log mode.

Double check all electrical connections and all hose connections.

3.15 Cooling Cycle

1. Turn the seacock valve to the open position.
2. On SPB models, there is a short delay on starting. On SPM models, set the delay to 15 seconds. If there is more than one unit, set the delays to different times.
3. If the water pump has a dedicated breaker, turn it on. Verify that water is being discharged overboard.
4. Turn on the circuit breaker to the Marvair® unit.
5. Refer to the operating instructions in this manual for the MachAir controller or the thermostat& set the system for cooling by using the display module or the thermostat.
6. Adjust the cooling temperature set point on the display module or the thermostat higher than the cabin temperature.
7. Slowly lower the thermostat's cooling set point until the set point is below the cabin temperature. The blower, compressor and pump should be operating.
8. Close all doors and hatches.
9. Allow the unit to operate 10 minutes.
10. After 10 minutes, there should be a 15°F (8°C) to 20°F (9°C) difference in the supply and return air temperatures.

3.16 Heating Cycle

Note: Do not turn unit "OFF" and then immediately back "ON". Wait three minutes to allow refrigerant pressures to equalize.

1. Follow steps 1, 2 & 3 as outlined above in the Cooling Cycle section.
2. Refer to the operating instructions in the manual & set the system for heating by using the display module or the thermostat.
3. Adjust the heating temperature set point on the display module or the thermostat higher than the cabin's temperature.
4. Slowly raise the thermostat's heating set point until the set point is above the cabin temperature. The blower, compressor and pump should be operating.
5. Close all doors and hatches.
6. Allow the unit to operate 5 minutes.
7. After 5 minutes there should be a 15°F (8°C) to 25°F (9°C) difference in the supply and return air temperature.

3.17 Operation Checklist

1. Verify that all tie downs clamps have been correctly installed
2. Make sure all electrical cover plates are in place
3. Test for continuity between the ground and the boat's bonding system or the engine's DC negative connection
4. Make sure that there are zero volts between the boat's ground and the ground in the SeaMach reverse cycle air conditioner with the unit operating.
5. Check all water hoses for leaks.
6. Make certain that poisonous gases or noxious fumes are NOT being introduced into the vessel via the HVAC system.
7. Check for proper condensate drainage.

Chapter 4 – Owner's Maintenance

4.1 Maintenance

Air Filter

The air filter is located on the face of the indoor coil of the reverse cycle air conditioner. The indoor coil may be located behind a return air grille. The air filter should be checked monthly and cleaned, if necessary, with dishwasher soap and warm water.

Condensate Drains

The condensate drain(s) on the reverse cycle air conditioner should be checked every three months for obstructions. This can be accomplished by pouring a gallon of water into the condensate pan and observing that the water will drain down to its original level within one minute. If the unit has more than one drain outlet, it is important to verify that both drain outlets are working.

Water Strainer

The water strainer should be checked daily. Remove any debris that is collected in the strainer.

Water Pump

Systems that utilize the "rubber impeller" water pump should be inspected every 400 hours. The rubber impeller or water pump should be replaced if excessive wear is evident. Systems that utilize a centrifugal water pump should not require regular maintenance.

Water Connections

It is important to verify that all water connections are water tight and that the water flow from each unit's overboard discharge is evident when the units are running to ensure proper drainage.

Refrigerant Charge

The refrigerant used in your self-contained Marvair® reverse cycle air conditioner is factory charged and sealed. The refrigerant charge should not require adjustment and should be adequate for the life of the air conditioning system. Split system units are charged in the field, and should not require additional refrigerant after the unit is installed.

Winterizing the System

There are two scenarios for winterizing the system – the boat remains in the water or the boat is out of the water, in dry dock storage. Please follow the procedures described below for your situation.

A. Boat remains in the water.

   In water storage requires the use of a potable anti-freeze solution throughout the system's water supply and discharge lines. Be sure to follow all state, local and federal ordinances before discharging an anti-freeze solution overboard.

1. Close ball valve.
2. Disconnect water line at ball valve.
3. Insert line into a bucket of potable anti-freeze.
4. Run air conditioner until a solid stream of anti-freeze is being discharged overboard.
5. Reconnect water line at ball valve.

Follow the procedures detailed in sections 3.1 and 3.2 when starting the Marvair® unit after winterizing the system.

B. Boat is out of water in dry dock.

With the boat out of the water:

1. Open the seacock to permit all the water to drain out of system via the thru-hull fitting.
2. Remove and empty the sea water strainer basin.
3. Loosen the screws on the pump head to allow the water to drain from the pump and from the water line between the pump and strainer.

Prior to launching the boat in the spring, replace the screws on the pump head.

Follow the procedures detailed in sections 3.1 and 3.2 when starting the Marvair unit after winterizing the system.

Chapter 5 – Troubleshooting

5.1 Troubleshooting Guide

Problem/Symptom	Likely Causes	Correction
The unit does not operate	1. Power supply problem.	1. Check voltage at power supply and at the electrical box. Check wiring to unit and at shore, boat and unit (if applicable) breakers or fuses. Check shore power connection.
	2. Tripped breaker/disconnect.	2. Check circuit protection devices for continuity.
	3. Display/controller	3. Setpoint may be too high if in cooling mode or too low if in heating mode; check unit and reset. Display/ controller may be out of calibration or otherwise defective. Also check for loose connection(s).
	4. Unit has power, but display/ controller is inactive.	4. Check interface cable connections. Control is faulty. Replace
	5. Low voltage	5. Check voltage at dock. Check panel voltage Check shore cord and connections Check voltage at board in the unit. If low, check wiring connections.

Problem/Symptom	Likely Causes	Correction
Blower runs but compressor doe not start.	1. Power supply problem.	1. Check voltage at power supply. Voltage at unit must be + 10% of rated nameplate voltage.
	2. Thermostat	2. Check the display/controller and unit for loose wires. Fan is programmed to run with the compressor. Adjust set points or reset defaults. Secure any loose connection. Check location of sensor and make sure that it does not touch the indoor coil. The sensor and/ or display/controller should be replaced if defective.
	3. Safety switches are tripping out unit.	3. Check for water flow. Check refrigerant charge. Check switches for loose wire connection, broken or burned contacts.
	4. Loose or defective wires.	4. Tug on wires to see if they will separate from their connections. Replace terminals if they are loose or weak.
	5. Compressor	5. Check for electrical shorts, ground and open circuits. Replace compressor if defective. If electrical checks are ok, install a start capacitor and direct wire to see if the compressor will start. If this fails, remove and replace the compressor.
	6. Refrigerant leakage or loss.	6. Locate leak(s), reclaim, repair, evacuate and recharge unit with refrigerant.
	7. Control board	7. Verify that power is being provided from the control board. Replace control board if defective.
	8. Compressor Run capacitor	8. Verify capacitance, check for electrical shorts and ground. If defective, replace.

Problem/Symptom	Likely Causes	Correction
Compressor runs, but blower will not run.	1. Blower motor capacitor	1. Verify capacitance, check for electrical shorts and ground. If defective, replace.
	2. Blower motor	2. Check for electrical shorts, ground and open circuits. Replace blower motor if it is defective.
	3. Blower supply problem.	3. Check voltage at power supply. Voltage at unit must be + 10% of rated nameplate voltage.
	4. Control board	4. Verify that power is being provided from the control board. Replace control board if it is defective.
Display/controller calling for heating and unit is in cooling mode	No power to reversing valve or bad valve	Check wiring to vale. Replace valve if defective.
Unit trips off on high pressure in cooling mode or low pressure in the heating mode, but pump is running.	1. Low water flow to the condenser.	1. Check water lines to the unit for kinks in line. Check strainer and thru hull for obstructions. Clean as required. Make sure seacock (ball valve) is open. Check for obstruction in the pump and remove.
	2. Pump is air locked.	2. Purge air from system
Pump does not run.	1. Compressor is off and the pump is programmed to run with the compressor.	1. Adjust set point
	2. If there is a pump relay, check pump circuit breaker .	2. Reset breaker
	3. No power to pump at control board.	3. Control board may be faulty
	4. Faulty pump[1]	4. Replace pump
Low air flow	1. Dirty filter.	1. Clean filter
	2. Return air flow blocked.	2. Remove obstruction
	3. Louvers in grille closed.	3. Open louvers
	4. Fan speed set too low.	4. Raise fan speed Reset program parameters.

Problem/Symptom	Likely Causes	Correction
Unit provides insufficient cooling.	1. Restriction in water system.	1. Strainer or thru-hull fitting are clogged. Clean and check for water flow. Make sure seacock (ball valve) is open.
	2. Water pump	2. Check for electrical shorts, ground and open circuits. Replace water pump if it is defective. Replace water pump if it is undersized.
	3. Air filter	3. Clean or replace the air filter if it is dirty.
	4. Indoor coil	4. The indoor coil may require cleaning if the unit was operated without a filter.
	5. Ice on indoor coil.	5. Thermostat setting is too low. Shut down unit until ice has melted and restart at a higher temperature setting.
	6. Unit is undersized.	6. Check if the unit is undersized for the load. Replace with larger unit or add additional unit(s) if necessary.
	7. Low refrigerant	7. Add refrigerant

Problem/Symptom	Likely Causes	Correction
Unit provides insufficient heating.	1. Restriction in water system.	1. Strainer or thru-hull fitting are clogged. Clean and check for water flow. Make sure seacock (ball valve) is open.
	2. Water pump	2. Check for electrical shorts, ground and open circuits. Replace water pump if it is defective or undersized.
	3. Air filter	3. Clean or replace the air filter if it is dirty.
	4. Indoor coil	4. The indoor coil may require cleaning if the unit was operated without a filter.
	5. Unit is undersized.	5. Check if the unit is undersized for the load. Replace with larger unit or add additional unit(s) if necessary.
	6. Water temperature	6. Check water inlet temperature using a thermometer. The inlet water temperature should never be below 50°F.
	7. Reversing valve	7. Check for power to the solenoid coil, verify that the coil is functional. If the unit still does not switch to heating, replace the reversing valve, evacuate and recharge the unit.
	8. Low refrigerant	8. Add refrigerant
Noisy operation.	1. Copper tubing is vibrating.	1. Adjust by bending slightly to a more stable position. Separate any tubing that is making contact with other tubing or components
	2. Indoor blower assembly.	2. If blower wheel is hitting housing, adjust the wheel position in the housing. Replace blower motor or assembly if the bearing(s) are defective.
	3. Loose cabinet or components.	3. Check and tighten loose screws.
	4. Improper unit installation.	4. Make sure unit is level and secure to deck.

Problem/Symptom	Likely Causes	Correction
Water is leaking from unit.	1. Condensate pan	1. Check for leaks and repair as required.
	2. Condensate drain line or pump.	2. Check for leaks and repair as required.
	3. Loose fittings or connections.	3. Tighten fittings and connections. Check the condensate drain line for leaks.
Electrical shock at unit.	1. Electrical component is shorted to ground.	1. Check control board, blower motor, compressor and pumps with an ohmmeter or high potential tester. Determine what is grounded and replace or rewire.
		2. Line trip is too sensitive

5.2 Alarm Screens – o-LED Display/Controller only

Problem/Symptom	Likely Causes	Correction
Low Voltage	1. Insufficient power to unit.	1. Check power supply to the unit.
Int. Air Sensor	1. The internal air sensor in the display is defective.	1. Replace display. Contact Marvair or your local Marvair representative.
Sensor OPT	1. The optional remote sensor is not connected.	1. Install the remote sensor.
	2. Internal sensor was selected in the programming mode, but a remote sensor is not installed.	2. Change OPT to INT in the air sensor SET UP.
	3. Remote sensor is not properly connected.	3. Connect remote sensor properly.
	4. Remote sensor is defective.	4. Replace sensor. Contact Marvair or your local Marvair representative.
LPS (low refrigerant pressure) in cooling mode or HPS (high refrigerant pressure) in heating mode	1. Blocked or severely restricted air flow.	1. Clean filter, open any closed grilles and checked for kinks in duct work
	2. Improper refrigerant charge	2. Contact Marvair or your local Marvair representative.
LPS (low refrigerant pressure) in heating mode or HPS (high refrigerant pressure) in cooling mode	1. Inadequate water flow.	1. Check strainer. Clean if necessary. Check for kinked water lines. Make sure the pump is primed.
	2. Defective pump	2. Replace pump
Coil Sensor	1. Frost sensor not properly installed.	1. Properly attach the frost sensor.
	2. Defective frost sensor	2. Replace the frost sensor.

Chapter 6 – Spare Parts List

6.1 Parts List

o-LED and MachAir I Display/Controller Replacement Parts List

Description	Current Self Contained & Split Systems
PC Board (in electrical box)	80525
Display Cable (15 ft.)	80526
Air Sensor (mounts on condensate pan in front of the coil)	70347
o-LED Display/Controller	01592
MachAir I Display/Controller (Black)	80527
MachAir I Display/Controller (White)	80528
MachAir I Display/Controller (Designer)	80529

SABxxRCA 208/230v. 60 Hz. R-410A Replacement Parts List

Item	Description	SAB05RCA	SAB07RCA	SAB10RCA	SAB12RCA	SAB16RCA	SAB18RCA	SAB24RCA
1	Compressor	10316	10318	10320	10323	10325	10373	10333
2	Capacitor, Compressor	50240			50311	50328	50265	50280
3	Indoor Coil, RH Unit	N/A	60087	60088	60089	60090		60118
	Indoor Coil, LH Unit	60127	60119	60121	60122	60123		60124
4	Motor Blower assembly (std)	30062	30046	30048		30051	30057	N/A
	Motorized Impeller	N/A						30059
5	Capacitor, Motor Blower Assembly	50307	50302	50299		50297		50302
6	Inlet Ring, Motorized Impeller	N/A						01388
7	Distributor with Screen	N/A	20276		20275		20294	20333
8	Capillary Tube (Qty)	81124	81032 (2)	81224 (2)	81032 (3)	81224 (3)	80950 (3)	81032 (6)
9	Capillary Tube/Distributor Assembly	N/A						01388
10	Heat Exchanger, RH Unit	60126	60091	60092				60117
	Heat Exchanger, LH Unit	60126	60091	60092				60139
11	Reversing Valve	20279A		20280A				20220A
12	Reversing Valve Coil	50232A						
13	Switch, High Pressure	70570[1]						
14	Switch, Low Pressure	70342						
15	Plenum, Adapter Ring	N/A	01316	01317				N/A
16	Hose Adapter (diameter)	N/A	90134 (5”)	90135 (6”)		90136 (7”)		91568 (8”)
17	Filter	91916	81291	81288		81289		91922
18	5 ft. Multiwire Cable Harness	01595						

[1]Field replacement high pressure switch. Screws onto the refrigerant access valve.

SABxxRCB 115v. 60 Hz. R-410A Replacement Parts List

Item	Description	SAB05RCB	SAB07RCB	SAB10RCB	SAB12RCB	SAB16RCB	SAB18RCB
1	Compressor	10317	10319	10321	10324		10374
2	Capacitor, Compressor	50280				50315	N/A
3	Indoor Coil, RH Unit	N/A	60087	60088	60089	60090	
	Indoor Coil, LH Unit	60127	60119	60121	60122	60123	
4	Motor Blower assembly (std)	30061	30047	30049		30052	30056
5	Capacitor, Motor Blower Assembly	50308	50303	50301		50298	
6	Distributor with Screen	N/A	20276		20275		20294
7	Capillary Tube (Qty)	81124	81032 (2)	81224 (2)	81032 (3)		80950 (3)
8	Capillary Tube/Distributor Assembly	N/A					20358
9	Heat Exchanger	60126	60091	60092			
10	Reversing Valve	20279A		20280A			
11	Reversing Valve Coil	20278A					
12	Switch, High Pressure	70570[1]					
13	Switch, Low Pressure	70342					
14	Plenum, Adapter Ring	N/A	01316	01317			
15	Hose Ring, Plenum Adapter (Diameter)	N/A	90134 (5”)	90135 (6”)		90136 (7”)	
16	Filter	91916	81291	81288		81289	
17	5 ft. Multiwire Cable Harness	01595					

[1]Field replacement high pressure switch. Screws onto the refrigerant access valve.

SABxxRCF 220v. 50 Hz. R-410A Replacement Parts List

Item	Description	SAB05RCF	SAB07RCF	SAB10RCF	SAB12RCF	SAB16RCF	SAB18RCF	SAB24RCF
1	Compressor	10401	10402	10403	TBD	TBD	TBD	10376
2	Capacitor, Compressor	50236		50237	TBD	TBD	TBD	50321
3	Indoor Coil, RH Unit	N/A	60087	60088	60089	60090		60118
	Indoor Coil, LH Unit	60127	60119	60121	60122	60123		60124
4	Motor Blower assembly (std)	30062	30046	30048		30051	30057	30059
5	Capacitor, Motor Blower Assembly	50307	50302	50299		50297		50302
6	Distributor with Screen	N/A	20276		20275		20294	20333
7	Capillary Tube (Qty)	81124	20421 (2)		81224 (3)		80950 (3)	81032 (6)
8	Capillary Tube/Distributor Assembly	N/A					20358	N/A
9	Heat Exchanger, RH Unit	60126	60091	60092				60117
	Heat Exchanger, LH Unit	60126	60091	60092				60139
10	Reversing Valve	20279A		20280A				20220A
11	Reversing Valve Coil	50232A						
12	Switch, High Pressure	70570[1]						
13	Switch, Low Pressure	70342						
14	Plenum, Adapter Ring	N/A	01316	01317				N/A
15	Hose Adapter (Diameter)	N/A	90134 (5”)	90135 (6”)		90136 (7”)		91568 (8”)
16	Filter	91916	81291	81288		81289		91922
17	5 ft. Multiwire Cable Harness	01595						

[1]Field replacement high pressure switch. Screws onto the refrigerant access valve.

SPBxxRCB 115v. 60 Hz. R-22 Replacement Parts List

Item	Description	SPB05RCBL	SPB07RCBR SPB07RCBL	SPB10RCBR SPB10RCBL	SPB12RCBR SPB12RCBL	SPB16RCBL SPB16RCBL	SPB18RCBR SPB18RCBL
1	Compressor	10257	10239	10012	10067	10229	10256
2	Capacitor, Compressor	50296		50265			50315
3	Motor Protector, Compressor Texas Instruments P/N	N/A	MRA5731-114	MRA4761-114	MRA4760-114	MRA4759-117	Internal
4	Indoor Coil, RH Unit	N/A	60087	60088	60089	60090	
	Indoor Coil, LH Unit	60127	60119	60121	60122	60123	
5	Motor/Blower Assembly, Standard	30061	30053	30049		30052	30056
	Motor/Blower Assembly, High Static	N/A	30047	N/A			
6	Capacitor, Blower Motor, Standard	50308		50301		50298	50298
	Capacitor, Blower Motor, High Static	N/A	50303	N/A			
7	Distributor, with Screen	N/A	20276		20275		20294
8	Tube, Capillary (Qty)	81224	81032 (2)	81224 (2)	81032 (3)	81224 (3)	80950 (3)
9	Heat Exchanger	60126	60091	60092			
10	Valve, Reversing	20279A		20280A			
11	Coil, Reversing Valve	20278A					
12	Switch, High Pressure	70080					
13	Switch, Low Pressure	70047					
14	Plenum, Adapter Ring	N/A	01316	01317			
15	Hose Adapter, Blower (Optional)	N/A	90134 (5”)	90135 (6”)		90136 (7”)	
16	Filter, Return Air	91916	81291	81289		81288	
17	5 ft. Multiwire Cable Harness	01536					

SPBxxRCA 208/230v. 60Hz. R-22 Replacement Parts List

Item	Description	SPB07RCAR SPB07RCAL	SPB10RCAR SPB10RCAL	SPB12RCAR SPB12RCAL	SPB16RCAR SPB16RCAL	SPB18RCAR SPB18RCAL	SPB24RCAR SPB24RCAL
1	Compressor	51450	10081	10082	10228	10007	10223
2	Capacitor, Compressor	50306		50265			50280
3	Motor Protector, Compressor Texas Instruments P/N	MRA5472-114	MRA4765-114	TBD	MRA4763-114	TBD	Internal
4	Indoor Coil, RH Unit	60087	60088	60089	60090		60118
	Indoor Coil, LH Unit	60019	60121	60122	60123		60124
5	Motor/Blower Assembly, Standard	30054	30048		30051	30057	30059
	Motor/Blower Assembly, High Static	30046	N/A				
6	Capacitor, Blower Motor, Standard	50307	50299		50297		N/A
	Capacitor, Blower Motor, High Static	50302	N/A				
7	Distributor, with Screen (QTY)	20276 (1)		20275 (1)		20294 (1)	20275 (2)
8	Tube, Capillary (Qty)	81032 (2)	81224 (2)	81032 (3)	81224 (3)	80950 (3)	81032 (6)
9	Heat Exchanger	60091	60092				60117
10	Valve, Reversing	20279A	20280A				20220A
11	Coil, Reversing Valve	50232A					
12	Switch, High Pressure	70080					
13	Switch, Low Pressure	70047					
14	Plenum, Adapter Ring	01316	01317				
15	Hose Adapter, Blower (Optional)	90134 (5”)	90135 (6”)		90136 (7”)		
16	Filter, Return Air	81291	81289		81288		
17	5 ft. Multiwire Cable Harness	01536					

SCBxxRCB 115v. 60 Hz. R-407c Replacement Parts List

Item	Description	SCB07RCBR SCB07RCBL	SCB10RCBR SCB10RCBL	SCB12RCBR SCB12RCBL	SCB16RCBR SCB16RCBL
1	Compressor	10247	10250	10248	10249
2	Capacitor, Compressor	50296		50265	
3	Motor Protector, Compressor - Texas Instruments P/N	MRA5731-114	MRA5723-114	MRA5784-113	MRA4759-117
4	Indoor Coil, RH Unit	60087	60088	60089	60090
	Indoor Coil, LH Unit	60019	60121	60122	60123
5	Motor/Blower Assembly, Standard	30053	30049		30052
	Motor/Blower Assembly, High Static	30047	N/A		
6	Capacitor, Blower Motor, Standard	50308	50301		50298
	Capacitor, Blower Motor, High Static	50303	N/A		
7	Distributor, with Screen	20276		20275	
8	Tube, Capillary (Qty)	81032 (2)	81224 (2)	81032 (3)	81224 (3)
9	Heat Exchanger	60091	60092		
10	Valve, Reversing	20279A	20280A		
11	Coil, Reversing Valve	20278A			
12	Switch, High Pressure	70080			
13	Switch, Low Pressure	70047			
14	Plenum, Adapter Ring	01316	01317		
15	Hose Adapter, Blower (Optional)	90134 (5”)	90135 (6”)		90136 (7”)
16	Filter, Return Air	81291	81289		81288
17	5 ft. Multiwire Cable Harness	01581			

SCBxxRCF 220v. 50Hz. R-407c Replacement Parts List

Item	Description	SCB05RCF	SCB07RCF	SCB10RCF	SCB12RCF	SCB16RCF	SCB18RCF
1	Compressor	10290	10245	10246	10243	10244	
2	Capacitor, Compressor	50260		50265			
3	Indoor Coil, RH Unit	N/A	60087	60088	60089	60090	
	Indoor Coil, LH Unit	60127	60119	60121	60122	60123	
4	Motor/Blower Assembly, Standard	30062	30054	30048		30051	30057
5	Capacitor, Blower Motor, Standard	N/A	50307	50299		50297	
6	Distributor, with Screen	N/A	20276		20275		
7	Tube, Capillary (Qty)	81224	81032 (2)	81224 (2)	81032 (3)	81224 (3)	
8	Capillary Tube/Distributor Assembly	N/A					20358
9	Heat Exchanger	60126	60091	60092			
10	Valve, Reversing	20279A		20280A			
11	Coil, Reversing Valve	50232A					
12	Switch, High Pressure	70080					
13	Switch, Low Pressure	70556					
14	Plenum, Adapter Ring	N/A	01316	01317			
15	Hose Adapter, Blower (Optional)	N/A	90134 (5”)	90135 (6”)		90136 (7”)	
16	Filter, Return Air	91916	81291	81288		812889	
17	5 ft. Multiwire Cable Harness	01582					

DEAHxxRCBR 115v. 60 Hz. Replacement Parts List

Item	Description	DEAH07RCB	DEAH10RCB	SCB10RCF	SCB12RCF	SCB16RCF
1	Indoor Coil, RH Unit Application	60087	60088	60089	60090	
2	Distributor, with Screen	20276		20275		20294
3	Tube, Capillary (Qty)	81032 (2)	81224 (2)	81032 (3)	81224 (3)	80950 (3)
4	Indoor Motor/Blower Assembly	30053	30049		30052	30056
5	Capacitor, Indoor Motor	50308	50301		50298	
6	Valve, Shutoff, Discharge Line	20308				
7	Valve, Shutoff, Suction Line	20309			20310	
8	Plenum Adapter Ring	01316	01317			
9	Hose Adapter	90134	90135		90136	
10	Filter, Standard	81291	81288		81289	
	Filter, High Filtration	91918	91919		91920	

DEAHxxRCA 208/230v. 60Hz. Replacement Parts List

Item	Description	DEAH05RCA	DEAH07RCA	DEAH10RCA	DEAH12RCA	DEAH16RCA	DEAH18RCA	DEAH24RCA
1	Indoor Coil, RH Unit Application	N/A	60087	60088	60089	60090		60118
	Indoor Coil, LH Unit Application	60144	N/A					
2	Distributor, with Screen	N/A	20276		20275		20294	20333
3	Tube, Capillary (Qty)	81224	31032 (2)	81224 (2)	81032 (3)	81224 (3)	80650 (3)	81032 (6)
4	Indoor Motor/Blower Assembly	30062	30054	30048		30051	30057	30059
5	Capacitor, Indoor Motor	N/A	50307	50299		50297		50302
6	Valve, Shutoff, Discharge Line	20308						20309
7	Valve, Shutoff, Suction Line	20309				20310		20332
8	Plenum Adapter Ring	N/A	01316	01317				N/A
9	Hose Adapter	N/A	90134	90135		90136		N/A
10	Hose Ring, Flat Oval 8”	N/A						91568
11	Filter, Standard	91916	81291	81288		81289		91922
	Filter, High Filtration	91917	91918	91919		91920		91921

CPBxxRCBN 115v. 60Hz. R-22 Replacement Parts List

Item	Description	CPB07RCBN	CPB10RCBN	CPB12RCBN	CPB16RCBN	CPB18RCBN
1	Compressor	10239	10012	10067	10008	10256
2	Capacitor, Compressor	50296	50265			50315
3	Heat Exchanger	60091	60092			
4	Valve, Reversing	20279A	20280A			
5	Coil, Reversing Valve	20278A				
6	Valve, Shutoff, Discharge Line	20308				
7	Valve, Shutoff, Suction Line	20309			20310	
8	Switch, High Pressure	70080				
9	Switch, Low Pressure	70047				
10	Accumulator	70430				
11	Receiver	70429				
12	5 Ft. Multi-Wire Cable Harness	01574				

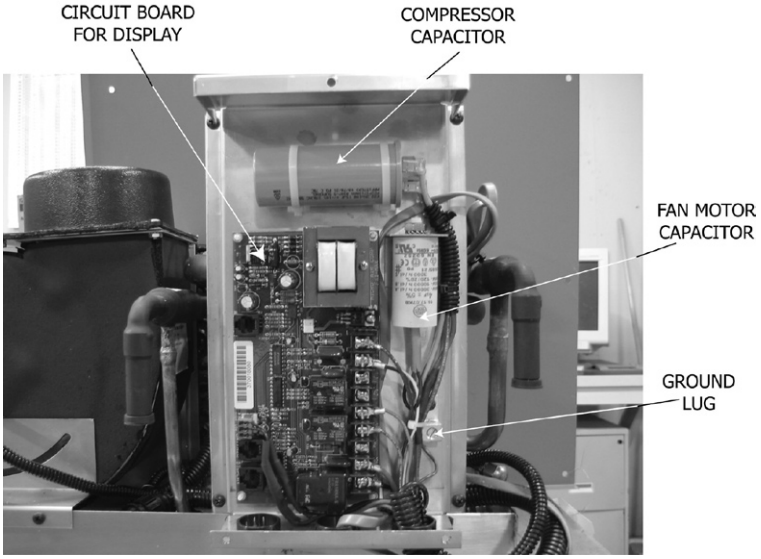
CPBxxRCAN 208/230v. 60Hz. R-22 Replacement Parts List

Item	Description	CPB05RCAN	CPB07RCAN	CPB10RCAN	CPB12RCAN	CPB16RCAN	CPB18RCAN	CPB24RCAN
1	Compressor	10297	51450	10081	10082	10228	10007	10223
2	Capacitor, Compressor	50240	50306		50265			50280
3	Heat Exchanger	60091		60092				60117
4	Valve, Reversing	20279A		20280A				20220A
5	Coil, Reversing Valve	20278A						
6	Valve, Shutoff, Discharge Line	20308						20309
7	Valve, Shutoff, Suction Line	20309				20310		20332
8	Switch, High Pressure	70080						
9	Switch, Low Pressure	70047						
10	Accumulator	70430						
11	Receiver	70429						
12	5 Ft. Multi-Wire Cable Harness	01574						

CCBxxRCFN 220v. 50Hz. R-407c Replacement Parts List

Item	Description	CCB07RCFN	CCB10RCFN	CCB12RCFN	CCB16RCFN	CCB18RCFN	CCB24RCFN
1	Compressor	10245	10246	10243	10244		10292
2	Capacitor, Compressor	50265					50321
3	Heat Exchanger	60091	60092				60117
4	Valve, Reversing	20279A	20280A				20220A
5	Coil, Reversing Valve	50232A					
6	Valve, Shutoff, Discharge Line	20308					20309
7	Valve, Shutoff, Suction Line	20309			20310		20332
8	Switch, High Pressure	70080					
9	Switch, Low Pressure	70047					
10	Accumulator	70430					
11	Receiver	70429					
12	5 Ft. Multi-Wire Cable Harness	01583					

6.2 Typical Control Box



Chapter 7 - Warranty

Marvair® Self-Contained and Split Systems Warranty

Parts

If any part of your Marvair unit fails because of a manufacturing defect within twenty-four months from the date of purchase of a new boat or within twenty-four months from the date of installation of the air conditioner, but not to exceed thirty-six from the date of manufacture by Marvair, Marvair will furnish without charge, EXW Cordele, Georgia, the required replacement part.

Labor

If any part of your Marvair reverse cycle air conditioner fails because of a manufacturing defect within twenty-four months from the date of purchase of a new boat or within twenty-four months from the date of installation of the air conditioner, but not to exceed thirty-six from the date of manufacture by Marvair, Marvair will pay for the related service labor to replace the failed part according to the Marvair Flat Rate Schedule currently in effect. The owner must provide proof of the date of the purchase of the boat or date of installation of the unit. The owner's registration card filed with Marvair, the invoice for the purchase of the vessel, an invoice for the installation of the unit, or similar documents are examples of proof of the date.

When service is required, it must be performed during normal working hours (8:00 a.m. to 5:00 p.m.) Monday through Friday and must be performed by Marvair personnel or their designated Service Representative.

The responsibility of the Owner of the Equipment includes the following:

1. To operate the equipment according to the manufacturer's instructions.
2. To provide easy accessibility for service.
3. To check and reset circuit breaker(s) and disconnect before calling for service. (Circuit breaker(s) may be in the main service panel.)
4. To keep the unit clean and free of dirt.
5. To clean and/or replace the filter as required. (The filter may be located in the return air filter grille or in front of the evaporator coil.)
6. To keep the evaporator coil clean and the condenser coil free of sediment or scale.
7. To pay the charges incurred when any of the above have not been done.
8. To pay for repair or replacement of any material or part other than those within the Marvair unit or thermostat itself.
9. To check any fuses on the circuit board and replace as required.

The owner of the product may ship the allegedly defective or malfunctioning product or part to Marvair, at such owner's expense, and Marvair will diagnose the defect and, if the defect is covered under this warranty, Marvair will honor its warranty and furnish the required replacement part. All costs for shipment and risk of loss during shipment of the product or part to Marvair and back to the owner shall be the responsibility and liability of the owner. Upon request by an owner, Marvair may arrange for remote diagnosis and repair of the allegedly defective or malfunctioning product or part.

An owner requesting performance under this Warranty shall provide reasonable access to the allegedly defective or malfunctioning product to Marvair and its authorized agents and employees.

This warranty does not cover damage caused by improper installation including any refrigerant leaks in the tubing and fittings between the evaporator and condenser sections on split systems; misuse of equipment; negligent servicing; damage due to use of the product for purposes other than those for which it was designed; damage caused by natural disasters, power surges, lightning and submersion; damage caused by unauthorized modifications; and damage caused by improper wiring or power supply to the air conditioner including operating the unit with an undersized generator.

THIS WARRANTY AND SERVICE POLICY CONSTITUTE THE EXCLUSIVE REMEDY OF ANY PURCHASER OF A MARVAIR REVERSE CYCLE AIR CONDITIONER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE, TO THE FULLEST EXTENT PERMITTED BY LAW. IN NO EVENT SHALL ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE EXCEED THE TERMS OF THE APPLICABLE WARRANTY STATED ABOVE AND MARVAIR SHALL HAVE NO OTHER OBLIGATION OR LIABILITY. IN NO EVENT SHALL MARVAIR BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OR MONETARY DAMAGES.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE-TO-STATE. Some states do not allow limitations or exclusions, so the above limitations and exclusions may not apply to you.

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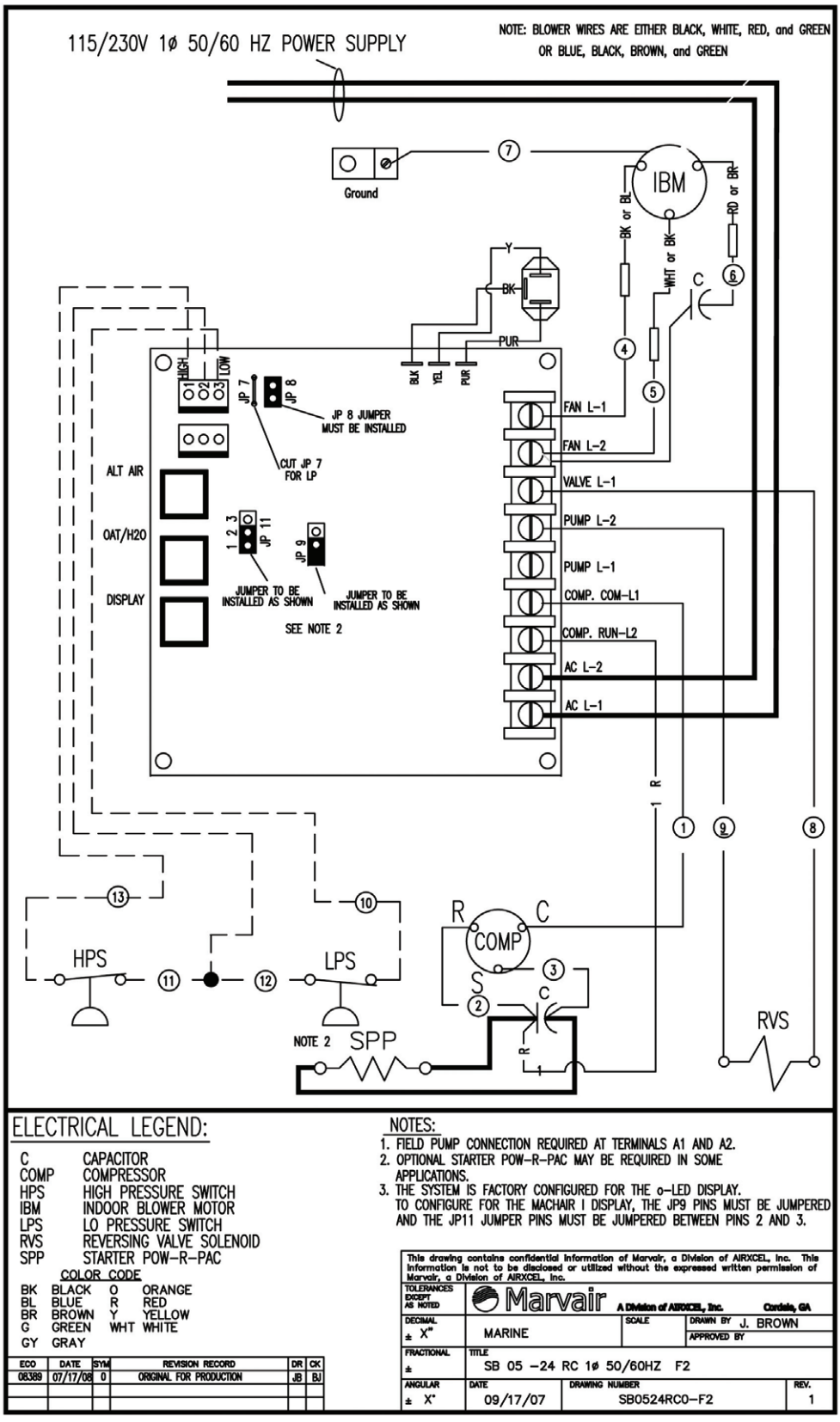
Appendix A – Wiring Schematics

For self-contained units with the o-LED and the MachAir I display/controller.



ELECTRICAL LEGEND:

C	CAPACITOR
COMP	COMPRESSOR
HPS	HIGH PRESSURE SWITCH
IBM	INDOOR BLOWER MOTOR
LPS	LO PRESSURE SWITCH
RVS	REVERSING VALVE SOLENOID
SPP	STARTER POW-R-PAC

COLOR CODE

BK	BLACK	O	ORANGE
BL	BLUE	R	RED
BR	BROWN	Y	YELLOW
G	GREEN	WHT	WHITE
GY	GRAY		

ECO	DATE	SYM	REVISION RECORD	DR	CK
08389	07/17/08	0	ORIGINAL FOR PRODUCTION	JB	BJ

NOTES:
1. FIELD PUMP CONNECTION REQUIRED AT TERMINALS A1 AND A2.
2. OPTIONAL STARTER POW-R-PAC MAY BE REQUIRED IN SOME APPLICATIONS.
3. THE SYSTEM IS FACTORY CONFIGURED FOR THE o-LED DISPLAY. TO CONFIGURE FOR THE MACHAIR I DISPLAY, THE JP9 PINS MUST BE JUMPERED AND THE JP11 JUMPER PINS MUST BE JUMPERED BETWEEN PINS 2 AND 3.

This drawing contains confidential information of Marvair, a Division of AIRXCEL, Inc. This information is not to be disclosed or utilized without the expressed written permission of Marvair, a Division of AIRXCEL, Inc.

TOLERANCES EXCEPT AS NOTED	Marvair A Division of AIRXCEL, Inc. Cordele, GA		
DECIMAL ± X"	MARINE	SCALE	DRAWN BY J. BROWN
			APPROVED BY
FRACTIONAL ±	TITLE SB 05 -24 RC 1ø 50/60HZ F2		
ANGULAR ± X°	DATE 09/17/07	DRAWING NUMBER SB0524RC0-F2	REV. 1