



K2 Air® Marine Air Conditioners

K2-KMSC Series

Owner's Manual



Self-Contained Unit



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Manufactured by:


K2 Air® Systems

K2 Air® Marine Air Conditioners

Chapter 1 – Safety Considerations

Congratulations on your purchase of a K2 Air® marine air conditioner. Your air conditioner has been designed to provide years of safe, dependable operation. These instructions contain a general description on the operation of the unit, how to set up or program the thermostat/ controller, a list of routine maintenance items, basic trouble shooting information, and the warranty.

Safety Considerations

This is the safety alert symbol . When you see this symbol on the K2 Air® 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.

Self-contained units should never be installed in engine rooms or other areas where fuel, battery or bilge vapors may be introduced to the living quarters on board.

These components do not meet federal requirements for ignition protection. Do not install in spaces containing gasoline engines, tanks, LPG/CPG cylinders, valves, fuel line fittings, or regulators. Failure to comply may result in injury or death. (Condensing units do comply with USCG/ABYC Ignition Protection standards and may be installed in engine compartments.)

Do not terminate condensate drain line within four feet of any outlet of engine or generator exhaust systems, nor in a compartment housing an engine or generator.

Installation and servicing of this system can be hazardous due to system pressure and electrical components. When working on this equipment, always observe precautions described in the literature, tags and labels attached to the unit(s). Follow all safety codes.

K2 Air recommends that you use only factory certified, EPA licensed refrigerant technicians and qualified marine electricians. ABYC certification in both HVAC and Marine electrical trades is desirable. In receiving these certifications, a technician and his employer has made a statement of commitment to professional, technically proficient and reliable service.

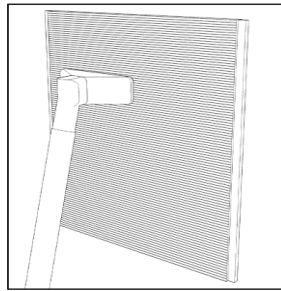
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Chapter 2 - Routine Maintenance

Return Air Filters

Return air filters should be cleaned regularly. The filter shipped with your K2 Air® unit is located in front of the air coil.

Figure 1: Filter can be cleaned with a vacuum cleaner.

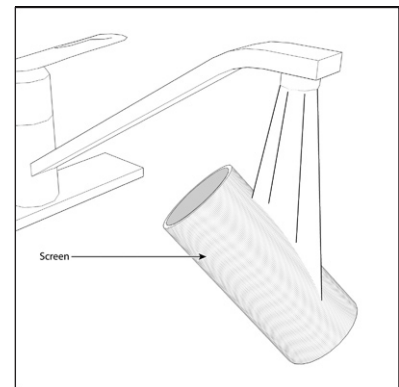
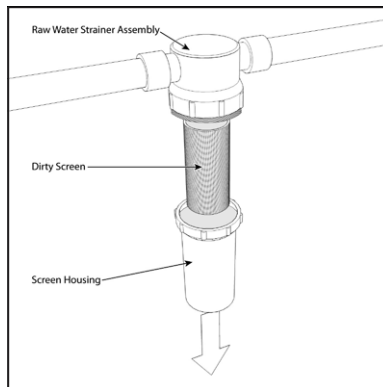
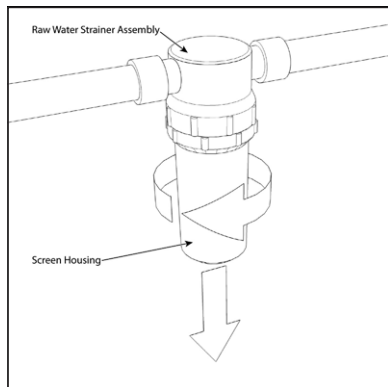


Condensate Pan and Lines

The condensate line can develop an algae type growth. Periodic inspection and treatment with a mild solution of bleach and water poured into the condensate pan will keep the condensate pan and lines clear.

Sea Water Strainer

The seawater strainer is available in several configurations – bronze or plastic. Yours has been sized in accordance to system specifications for volume of water required. It is used to prevent debris such as eelgrass, sea weed, leaves, etc., from passing through the system water lines and condensing coil. These items could lodge themselves in the water supply causing possible shutdown faults, and left unchecked, equipment damage. Should the strainer become clogged or partially obstructed, adverse performance will be experienced. The first indication will be high pressure switch activation if the unit is in the cooling mode or low pressure if the unit is in the heating mode. The unit will shut down. Turn unit off; check strainer and pump, restart.



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To eliminate these potential problems, it is recommended that you check to make sure you have water flow each time you turn the system on and clean your strainer weekly. More often as conditions dictate. Localized situations: In some regions, it is common to experience a tremendous presence of jellyfish or sea nettles concentrated in Back Bay marinas for short periods of time. These can clog strainers and water pumps every hour to hour and a half in some cases. In such severe conditions, seek the advice of your local factory service representative. They will be most familiar with solutions to localized situations. K2 Air works closely with our servicing dealers when custom solutions are required. During the warranty period, factory approval must be obtained for any modification to be done to alleviate the problem.

Sea Water Pump Operation and Maintenance

Your seawater pump has been sized in accordance with specifications for system water flow and volume. While it will shut down to protect from damage, it is not advisable to run the seawater pump dry. Possible damage may still be incurred. *Damage incurred due to a pump running dry is not covered under warranty.* The pump is not self-priming. It must be initially primed upon commissioning. Properly installed, once primed, barring haul outs or interrupted water flow due to an external cause, it should not need to be primed again.

Occasionally, sea grass, jellyfish and other items may pass through your strainer and get lodged in the pump impeller. Should cleaning your strainer fail to eliminate a water flow problem, you should next contact your K2 Air® Marine air conditioner service technician.

Minimum Water Flow* for K2 Air® Reverse Cycle Self-Contained 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.

Table 1: Minimum Water Flow Chart

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Grilles and Proper Air Flow

Adequate air flow is essential for the proper operation of the air conditioner. All grilles, both supply and return air, must never be restricted by objects such as bed linens, duffel bags, tackle bags, etc. Your unit has been designed to deliver conditioned air over a wide range of conditions. However, a dirty filter, or restricted ductwork can prevent proper air flow. If this situation exists and the unit is in cooling mode, ice may form on the coil and the unit will go into the defrost mode.

The unit may go into the Defrost mode or for the HPS alarm to be displayed occasionally. However, repeated Defrost cycles or High Pressure notices indicate a problem and you should contact your K2 Air® Marine dealer or the factory.

If you have the Easy-Touch thermostat controller, when a high refrigerant pressure is detected, High Refrigerant Pressure is shown on the screen of the thermostat.

Return Air Grille(s) and Filter(s)

Return air grilles are available in both aluminum and wood in standard configurations. They do not have adjustable louvers and are available with and without filters. Return air filters should be cleaned regularly. The filter shipped with your unit is located in front of the air coil and can be cleaned with a vacuum cleaner or rinsed with fresh water.

If your unit's return air grille has a filter, be sure that your boat builder or installation technician has removed the standard filter that comes with every unit in front of the evaporator (air) coil. Two filters can unduly restrict air flow and in some cases, cause problems with performance. Use EITHER a return air filter grille or the supplied filter, **never both**.

Depending upon the floor plan, your boat's space constraints may dictate that a unit be installed in an area that makes it difficult to access and clean the filter. If this is the case, and you do not have a return air filter grille, you should consider removing the disposable unit filter and upgrading to a return air filter grille.

NOTE: Blocking the return air grille or neglecting filter cleaning will result in a restriction of air flow. In the heating mode, this will cause a HIGH PRESSURE FAULT shutdown. In the cooling mode, after a period of time, you will experience icing of the evaporator coil and a resultant LOW PRESSURE FAULT shutdown or activation of the defrost sensor.

Supply Air Grille(s)

Most installations will have more than one supply air grille. Standard main supply air grilles are generally made of aluminum or wood frames with two or four-way adjustable louvers. These may be adjusted to direct air flow from the grille to ensure a uniform cabin temperature. Main supply air grilles should never be closed at any time while running in either the heating or cooling modes. Secondary supply air grilles more frequently will be a 4" round plastic design, but they can also be of the aluminum or wood frame standard configuration and are usually located out of the main salon, galley, and dinette area. These may, depending upon the style you or your boat manufacturer has chosen, be closable. During the day, these may be closed should you like more air directed to the main living area. Consult with your local K2 Air® Marine service representative if you are unsure which the main supply grilles on your boat are. Closing off the main supply air grille or secondary air grilles, in some applications, may restrict air flow in the cooling mode, causes ice to form on the evaporator coil and a low pressure fault shut down. If the unit is

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In the heating mode, inadequate air flow can cause a high pressure fault shut down.

Should either of these conditions occur, open all closed supply air grilles and restart system. This should eliminate the problem. If the problem recurs again, consult your local K2 Air Marine service representative.

Chapter 3 - General Description

The K2 Air® lines of reverse cycle air conditioners built by K2 Air® are self-contained and split system, water-cooled units designed for use with either fresh or seawater. The self-contained units are built in various sizes with capacities from 5,000 to 24,000 BTUH.

Operating Ranges

The K2 Air® reverse cycle air conditioner is designed to operate over a wide variety of conditions. Among the most important factors that affect the performance of the unit are inlet water temperature, (return) inlet air temperature and the humidity of the inlet (return) air. Please consult your K2 Air® Marine dealer or the factory if you have a question about the operation of your unit.

General Operation

The K2 Air® reverse cycle air conditioner has both a heating and cooling mode of operation.

It uses 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 the cabin air through the indoor or evaporator coil where it is cooled and dehumidified. 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 the warm air 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 reverse cycle air conditioner is controlled by a thermostat mounted on the 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 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. Cooling and heating performance of the two units is virtually identical.

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Chapter 4 - Installation Instructions

General Operation

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The reverse cycle air conditioner is controlled by a thermostat mounted on the wall.

A. High Pressure Switch

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 R-410A refrigerant. The system must be checked for sufficient water flow in the cooling mode and air flow in the heating mode. See Section Fail Safe & Fault Handling Modes in the thermostat/controller section.

B. Low Pressure Switch

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 Fail Safe & Fault Handling Modes in the thermostat/controller section.

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R-410A Refrigerant		
	<i>Opens</i>	<i>Closes</i>
Low Pressure	40 psig	60 psig
High Pressure	610 psig	420 psig

Table 2. Refrigerant Pressure Points

C. Compressor Time Delay

Prevents compressor from destructive short cycling by delaying the compressor from starting when compressor contactor is energized. The delay is set at the factory from 10-15 seconds.

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

Table 3. Air Conditioner Size Calculation

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 ft³ (7x12x15)
2. 1,260 ft³ 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. 35.63m³ (213x366x457)
2. 35.63m³ x 250 (k factor) = 8,908 BTU

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

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Equipment Inspection

Concealed Damage

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 the 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 standing 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.

Installation Requirements

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. Location Requirements

- Do not install the K2 Air® 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.

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- 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 installations, acoustic baffles may be required.
- The K2 Air ® 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 K2 Air 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.

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Electrical Requirements

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 $\pm 10\%$ 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 K2 Air® unit. A separate breaker is required for the water pump if multiple K2 Air 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.

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Electrical Data for Self-Contained Units

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.

Mounting of the K2 Air® 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.

Condensate Drains

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

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 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 K2 Air 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 or any other hazardous gases or vapors from being introduced into the conditioned air system.

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Sea or Fresh Water System

Proper water flow is absolutely critical to the operation of the K2 Air 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.

The best material for sea water piping and fittings is cupronickel. Suitable materials for piping are hi-grade bronze cupronickel 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 K2 Air® 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. See Figure 4, Seawater Piping Schematics.

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 K2 Air units, a manifold with balancing valves is required. It is mandatory when using a manifold that each unit have the correct water flow. See Table 5 - Recommended Water Pipe Sizes. A manifold can also be used on the discharge of the K2 Air units if a single overboard fitting is used

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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	3/4"	5/8"
7 through 11	1"	3/4"
11 through 15	1"	1"
15 through 20	1-1/4"	1"

Table 4. Recommended Water Pipe Sizes

Table 5 shows the minimum flow rate required, measured at the inlet to the unit, with 85°F (29.4°C) water of the various units.

Minimum Water Flow* For K2 Air Marine Self-Contained Systems	
Model (BTUH)	Minimum Water flow at the unit
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
24,000	7.0 GPM / 26.5 LPM

*Based upon 85°F (29.5°C) inlet water measured at the inlet of the unit.

Table 5. Minimum Water Flow Chart

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The Conditioned Air Duct & Grille System

Failure to follow safety warnings could result in serious injury, death, or property damage. Do NOT operate in a corrosive atmosphere containing chlorine, fluorine 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.

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 it remains in its installed position.
- Always use insulated duct to prevent condensation.
- Insulate all transitions and plenums.
- If duct is in storage or a 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.

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 K2 Air® 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 area to permit adequate air to the indoor coil. The K2 Air 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.

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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)	K2 Air 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)
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)
<p>*Use larger size if duct run is greater than 10 ft. (3 meters).</p> <p>¹Shipped standard with unit.</p> <p>²Two adapters are shipped with each two ton unit.</p>						

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 Table 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.

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Electrical

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 K2 Air® 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 K2 Air® 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 K2 Air 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-Touch display/controller. The board is configured at the factory for the o-Touch display/controller. To use the board with the 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 K2 Air 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 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.

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Refrigerant Line Set and Charging (Split Systems only)

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 Table 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”
36,000, 48,000, & 60,000	3/8” flare	3/4” flare	3/8”	5/8”	3/8”	¾”

Table 8. 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 wrench, turn Counterclockwise until it stops. Repeat on suction line.
11. Replace the hex head caps. The unit is ready to be charged.
12. Add refrigerant using standard charging procedure.

Chapter 5 - 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.

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.

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 seawater 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.
4. Close the seacock.

When the boat is put back into the water in the spring:

1. Gradually open the seacock to allow water to fill the system to the level of the pump.
2. Tighten the pump face to achieve a seal.
3. When pump is primed, open the seacock valve completely.

Chapter 6 – Troubleshooting



WARNING

Troubleshooting and repair of the K2 Air® unit should only be performed by qualified personnel.

Troubleshooting Guide

PROBLEM/SYMPTOM	LIKELY CAUSE(S)	CORRECTION
The unit does not operate. (nothing works at all)	<ol style="list-style-type: none"> 1. Power supply problem. 2. Tripped breaker/disconnect. 3. Display/Controller. 4. Low Voltage. 	<ol style="list-style-type: none"> 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. Check circuit protection devices for continuity. 3. Set point 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. Check voltage at dock. Check panel voltage. Check shore connections and shore cord. Check voltage at board in the unit. If low, check Wiring connections.
Unit has power, but display/controller is Inactive.	<ol style="list-style-type: none"> 1. Check interface cable connections. Control is faulty. 	<ol style="list-style-type: none"> 1. Replace

Blower runs but compressor does not start.

1. Power supply problem.
2. Display/Controller.
3. Safety switches are tripping out unit.
4. Loose or defective wires.

1. Check voltage at power supply. Voltage at unit must be within 10% of rated nameplate voltage.
2. Check the display/controller and unit for loose wires. Secure any loose connection. Fan is programmed to run with the compressor. Adjust set points or reset defaults. Check location of sensor and make sure that it does not touch the indoor coil. The sensor and/or thermostat should be replaced if defective.
3. Check for water flow. Check for proper air flow. Check refrigerant charge. Check switches for loose wire connection, broken or burned contacts.
4. Tug on wires to see if they will separate from their connections. Replace terminals if they are loose or weak.

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PROBLEM/SYMPTOM	LIKELY CAUSE(S)	CORRECTION
<p>Blower runs but compressor does not start. <i>(continued)</i></p>	<p>5. Compressor.</p> <p>6. Refrigerant leakage or loss.</p> <p>7. Control board.</p> <p>8. Compressor Run Capacitor.</p>	<p>5. Check for power to compressor on PC board. Check for electrical shorts, ground and open circuits. 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.</p> <p>6. Locate leak(s), reclaim, repair, evacuate and recharge unit with refrigerant.</p> <p>7. Verify that power is being provided from the control board. Replace control board if it is defective.</p> <p>8. Verify capacitance, check for electrical shorts and ground. If defective, replace.</p>
<p>Compressor runs, but Blower will not run.</p>	<p>1. Blower motor capacitor.</p> <p>2. Blower motor.</p> <p>3. Power supply problem.</p> <p>4. Control board.</p>	<p>1. Verify capacitance, check for electrical shorts and ground. If defective, replace.</p> <p>2. Check for electrical shorts, ground and open circuits. Replace blower motor if it is defective.</p> <p>3. Check voltage at power supply. Voltage at unit must be within 10% of rated nameplate voltage.</p> <p>4. Verify that power is being provided from the control board. Replace control board if it is Defective.</p>
<p>Display/controller calling for heating and unit is in cooling mode.</p>	<p>1. No power to reversing valve or bad valve.</p>	<p>1. Check wiring to valve. Replace valve if defective.</p>
<p>Unit trips off on high pressure in cooling mode or low pressure in the heating mode, But pump is running.</p>	<p>1. Low water flow to the condenser.</p>	<p>1. Check water lines to the unit for kinks in line. Check strainer and thru hull for obstructions. Clean as required. Verify seacock (ball valve) is open. Check for Obstruction in the pump and remove.</p>

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Pump does not run.

1. Compressor is off and the pump is programmed to run with The compressor.

2. If there is a pump relay, check pumps circuit breaker.

3. No power to pump at control board.

4. Faulty pump.¹

1. Adjust set point.

2. Reset breaker.

3. Control board may be faulty.

4. Replace pump.

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Low air flow.	<ol style="list-style-type: none"> 1. Dirty filter. 2. Return air flow blocked. 3. Louvers in grille closed. 4. Fan speed set too low. 	<ol style="list-style-type: none"> 1. Clean filter. 2. Remove obstruction. 3. Open louvers. 4. Raise fan speed and reset program parameters.
Low Water Flow ¹	<ol style="list-style-type: none"> 1. Restriction or blockage in waterline. 2. Air lock in pump 	<ol style="list-style-type: none"> 1. Clean raw water strainer. Clean thru hull. Make sure valve is open. Clean pump. 2. Open ball valve, remove discharge hose and open valve to bleed air from the pump. Check Pump's impeller for wear or debris.
PROBLEM/SYMPTOM	LIKELY CAUSE(S)	CORRECTION
Unit provides insufficient heating/cooling.	<ol style="list-style-type: none"> 1. Restriction in water system. 2. Water pump. 8. Low refrigerant 	<ol style="list-style-type: none"> 1. Strainer or thru-hull fitting are clogged. Clean and check for water flow. Make sure watercock (ball valve) is open. 2. Check for electrical shorts, ground and open circuits. Replace water pump if it is defective. Replace water pump if it is undersized. 3. Check for power to the solenoid coil, clean and check for water flow. Make sure watercock (ball valve) is open. 4. Clean and check for water flow. Make sure watercock (ball valve) is open. 5. Add refrigerant.
Noise operation.	<ol style="list-style-type: none"> 1. Copper tubing is vibrating. 3. Air filter. 4. Indoor coil. 2. Indoor blower assembly. 5. Ice on indoor coil. 3. Loose cabinet or components. 6. Unit is undersized. 7. Low refrigerant. 4. Improper unit installation. 	<ol style="list-style-type: none"> 1. Adjust by bending slightly to a more stable position. Separate any tubing that is in contact with other tubing or components. 2. Clean or replace the air filter if it is dirty. 3. If blower wheel is hitting housing, adjust the wheel position in the housing. Replace blower motor or assembly if the bearing(s) are defective. 4. Thermostat setting is too low. Shut down unit until ice has melted and restart at a higher temperature setting. Check to see if filter is dirty or long or restricted ductwork. 5. Check if the unit is undersized for the load. Replace with larger unit or add additional unit(s) if necessary. 6. Add refrigerant.
Water is leaking from unit.	<ol style="list-style-type: none"> 1. Condensate pan. 2. Condensate drain line or pump. 3. Loose fittings or connections. 	<ol style="list-style-type: none"> 1. Check for leaks and repair as required. 2. Check for leaks and repair as required. 3. Tighten fittings and connections. Check the condensate drain line for leaks.
Electrical shock at unit.	<ol style="list-style-type: none"> 1. Electrical component is shorted to ground. 	<ol style="list-style-type: none"> 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

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Unit provides insufficient heating.	<ol style="list-style-type: none"> 1.Restriction in water system. 2.Water pump. 3.Air filter. 4.Indoor coil. 5.Unit is undersized. 6.Water temperature. 	<ol style="list-style-type: none"> 1. Strainer or thru-hull fitting are clogged. Clean and check for water flow. Make sure seacock (ball valve) is open. 2. Check for electrical shorts, ground and Open circuits. Replace water pump if it is defective or undersized. 3. Clean or replace the air filter if it is dirty. 4. The indoor coil may require cleaning if the unit was operated without a filter. 5.Check if the unit is undersized for the load. Replace with larger unit or add additional unit(s) if necessary. 6. Check water inlet temperature using a thermometer. Low inlet water temperatures, less than 50°F (10°C), combined with high heating set points and restricted air flow can cause low pressure trips. Check heating set point and air Flow.
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Alarm Screens

A complete description of the alarm screens can be found in the section that describes the display/controller for your K2 Air Marine unit. A high pressure alarm when in the cooling mode or a low pressure alarm in the heating mode is typically caused by a lack of water flow. A low pressure alarm when the unit is in the cooling mode or a high pressure alarm when the unit is in the heating mode typically means that there is insufficient air flow. Refer to the Troubleshooting table for diagnosing and correcting these problems.

Fault	Mode of Operation	Likely Cause
High Pressure Alarm	Cooling	Low Water Flow
Low Pressure Alarm	Cooling	Inadequate Air Flow
High Pressure Alarm	Heating	Inadequate Air Flow

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Low Pressure Alarm	Heating	Low Water Flow
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Chapter 7 – Warranty

K2 Air® Marine Self-Contained and Split Systems Warranty

Parts

If any part of your K2 Air® 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 K2 Air, K2 Air will furnish without charge, EXW Cordele, Georgia, the required replacement part.

Labor

If any part of your K2 Air® 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 K2 Air, K2 Air will pay for the related service labor to replace the failed part according to the K2 Air 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 K2 Air® unit. The owner's registration card filed with K2 Air, the invoice for the purchase of the vessel, an invoice for the installation of the K2 Air® 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 K2 Air 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 Grill 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 K2 Air unit or thermostat itself.
9. To check any fuses on the circuit board and replace as required.

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The owner of the product may ship the allegedly defective or malfunctioning product or part to K2 Air, at such owner's expense, and K2 Air will diagnose the defect and, if the defect is covered under this warranty, K2 Air 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 K2 Air and back to the owner shall be the responsibility and liability of the owner. Upon request by an owner, K2 Air 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 K2 Air 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 K2 AIR 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 K2 AIR SHALL HAVE NO OTHER OBLIGATION OR LIABILITY. IN NO EVENT SHALL K2 AIR 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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