



*Raypak® RHP Series
Swimming Pool and
Spa Heat Pump*

**OWNER and
INSTALLATION MANUAL**

Models
RHP 100
RHP 115
RHP 160



This manual should be maintained in legible condition and kept adjacent to the heat pump or in a safe place for future use.

For additional information call: **(800) 260-2758**



The instructions in this manual are for the use of qualified individuals specially trained and experienced in the installation and maintenance of this type of equipment and related system components. Installation and service personnel are required by some states to be licensed.

Persons not qualified shall not attempt to install, service, or maintain this equipment.



The Pool and Spa Heating Experts

Manual Effective Date: 3/1/2003

Replaces: All Previous Versions

PRODUCT SAFETY SIGNS AND LABELS



This manual, as well as the pool/spa heat pump itself, contains ANSI-approved product safety signs and labels. Please read these signs and labels, as they convey important safety information about hazards that may be potentially present in and around the heat pump. They are classified according to relative seriousness of the hazard potential, from DANGER at the most serious, to WARNING, to CAUTION at the least serious.

An example of a heat pump safety label follows.



**Excessive chemical content in a swimming pool or spa can damage the heat pump.
DO NOT skimmer feed - Avoid adding chemicals in this manner.**

AUDIENCE

The audience for this manual is twofold:

1. For the installing contractor, to provide information for the proper installation and adjustment of the heat pump;
2. For the owner-operator, to explain the features, operation, safety precautions, and service/maintenance of the heat pump. The manual also includes system drawings and illustrated replacement parts lists.

WARRANTY CLAIMS (See the enclosed Warranty information)

For the Warranty to apply, proper authorization MUST be obtained PRIOR to making any repairs. This Warranty is VOID if the product is repaired or altered in any way by ANY persons or agencies other than those authorized by Raypak.

CONTACT INFORMATION

Raypak, Inc., 2151 Eastman Ave., Oxnard, CA 93030



RHP Series Swimming Pool and Spa Heat Pump
OWNER and INSTALLATION MANUAL

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Introduction



This pool/spa heat pump is an electromechanical machine that incorporates a pressurized refrigerant gas in a sealed system. ONLY trained and qualified service personnel should attempt to install or service this equipment. Without proper training and knowledge of such equipment, any attempt to install or service the unit could result in serious injury or even death.

This manual contains important information on the use, maintenance, chemistry requirements and installation of your new heat pump. Proper installation and operation of the unit will increase the benefits you receive from the unit.

This heat pump is an extremely efficient, economical machine designed specifically for pool and spa heating. It is similar in design and operation to a typical residential air conditioning system. The heat pump employs a hermetic motor/compressor operating in a refrigeration cycle to extract heat from ambient air and deliver it to the circulating pool water.

As with all pool/spa heat pumps, compared to other types of pool heat pumps such as gas- or oil-fired, this heat pump has lower heating capacity on a BTU/hr basis. As a result, it will be required to operate longer to accomplish the desired results. It may, at certain times, operate as much as 24 hours per day. However, this should not be of concern to the owner, because the unit is designed to operate continuously. Even though it may operate continuously for many hours, it will still heat the pool with greater economy than other types of fossil fuel heaters.

You are advised to put a pool cover over the pool at night and other non-use periods. This will keep evaporation, the cause of the greatest heat loss, to a minimum, and so greatly reduce overall pool heating costs. During warmer weather, the pool cover may be required only at night.

I. Installation

- The placement of the pool heat pump is very important to minimize installation costs while providing maximum efficiency of operation, and to allow adequate service access.
- The unit is designed for outdoor installation and must not be installed in a totally enclosed area such as a shed or garage, unless ventilation is provided to ensure adequate air exchange for proper operation. Recirculation of cold discharge air back into the evaporator coil will greatly reduce the unit's heating capacity and efficiency.
- When installed in a geographical location where freezing temperatures can be encountered, the water circuit should be drained to prevent possible freeze-up damage. See Section IX, Freeze Protection.
- The unit should be located as close as possible to the existing pool pump and filter to minimize water piping.
- All models feature an "up-flow" discharge for quiet operation. Air is pulled up through the evaporator coil and discharged through the top grill. Allow at least 8 ft clearance above the unit for unrestricted air discharge. Do NOT install the unit under a porch or deck.

- Each side of the unit must be located at least 1 ft from walls, pipes, or other obstructions for unrestricted air intake and service access.



Do not install the unit within 3 ft of fossil fuel burning heaters. Air intake along the sides of this heat pump could disturb the combustion process of the unit, and could cause damage or personal injury.

- Mount the unit on a level, sturdy base, preferably a concrete slab or blocks. The size of the base should be not less than 3 ft by 3 ft.
- Completely isolate the base from the building foundation or wall to prevent sound or vibration transmission into the building. **For this purpose, 4 black rubber sound isolation pads are included with the unit. These pads must be installed under the corners of the unit to reduce vibration and sound transmission to the base.**
- If the unit is installed in an area known for water accumulation during periods of heavy rainfall, its supporting base must be high enough to keep it completely free of standing water at all times.

II. Electrical Connections

The table below lists the typical electrical power requirements for your heat pump.

Table 1: Typical System Electrical Power Requirements

Model	V _{IN} - Phase - Hz	Min. circuit Ampacity (A)	Max. breaker size (A)
RHP 100	208/230 - 1 - 60	31.4	50
	208/230 - 3 - 60	20.5	30
RHP 115	208/230 - 1 - 60	40.4	60
	208/230 - 3 - 60	27.5	40
RHP 160	208/230 - 1 - 60	46.2	60

Refer to the unit rating plate below the control panel for precise power requirement for each unit, and for ampacity and over-current protection requirements. All wiring must be in accordance with the National Electrical Code, NFPA No. 70, latest edition, and all applicable state and local codes.

NOTE: Refer to the National Electrical Code, Article 680, for general requirements for swimming pools and equipment, and to Article 440 for special considerations necessary for circuits supplying hermetic refrigeration motor/compressors.

The power supply connections to the unit are located behind the control panel. Remove the control panel to expose the electrical controls. Line voltage connections are made at the line voltage terminals of the compressor contactor. Refer to the Heat Pump Schematic (page 11) and the Control Panel Assembly Replacement Parts List (page 12).

Conduit entrance to the unit is through a hole below the control panel.

NOTE: Make certain all electrical connections to unit terminals are secure.

III. Water Connections



The heat pump inlet and outlet connections are NOT interchangeable. They must be connected as instructed below.

1. Connect the heat pump in the return water line between the pool filter and the pool. See page 10, Plumbing Diagrams.
2. Connect the filter outlet to the fitting marked **WATER IN** at the bottom front of the unit.
3. Connect the fitting marked **WATER OUT** to the return piping to the pool. Unit inlet/outlet connection fittings are 2-inch PVC slip couplers.

Water connections from the heat pump to the main return line can be PVC pipe or flexible pipe approved for the purpose and, in either case, should be at least equal in size to the main pool circulation piping.

4. In cold weather (freeze zone) areas, shutoff valves (ball or gate type) must be installed at the heat pump inlet and outlet to facilitate service and cold weather drain-down.
5. When the water connections are complete, operate the pool pump and check the system for leaks.

Automatic chemical feeders should not be installed upstream of the heat pump. Improper installation of erosion-type automatic chemical feeders can result in serious damage to, or premature failure of, the heat pump. A flow check valve and/or a Hartford loop will be required.

IV. Controls and Indicator Lamps

Your heat pump incorporates safety controls and indicators to ensure its safe, reliable operation.

Water Pressure Switch: Prevents operation when the pump is OFF. The unit requires 5 psi minimum pressure.

Water Temperature Control: Pool/spa water temperature is controlled by the heat pump thermostat on the unit control panel, which contains a switch and 2 thermostats, one for setting a heat spa temperature and the other for a swimming pool temperature. The switch can operate an optional external control system, or can switch between thermostats for pool or spa.

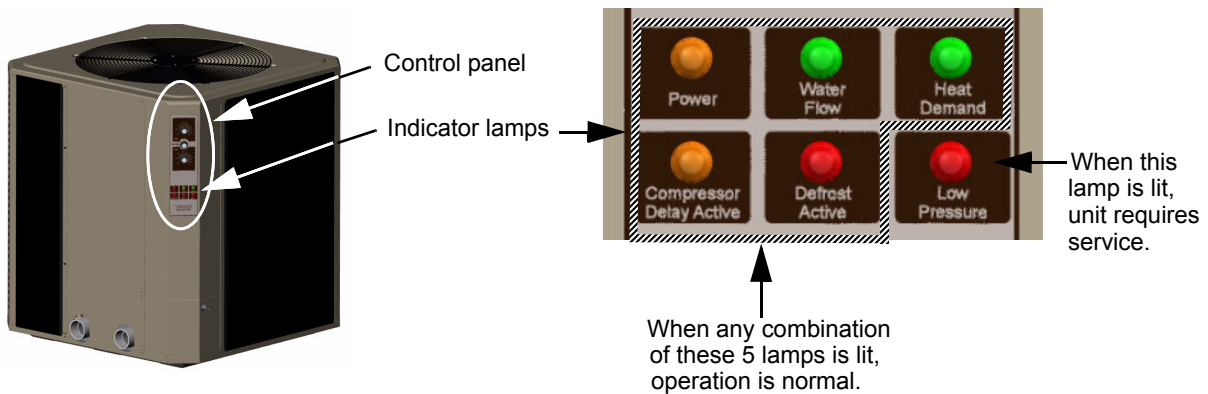
NOTE: The heat pump will not run when the Remote position is selected and there is no remote control system attached.

Defrost Switch: Prevents heat pump operation if ambient air temperature falls below a predetermined safe minimum (approximately 42° F).

Delay Timer: Prevents compressor from short cycling, which could damage or destroy the hermetic motor/compressor. Upon water temperature control satisfaction, or other control circuit interruption, this solid state device will prevent compressor restart for approximately 5 minutes. Upon power failure or interruption, a 6 to 8 minute delay will also be initiated.

Refrigerant Low Pressure Control: Stops the compressor if refrigerant suction (low side) pressure falls too low as a result of a malfunction or loss of charge.

Indicator Lamps: There are 6 indicator lamps located on the unit control panel:



- **Power** (amber lamp): When lit, indicates power is applied to the unit.

NOTE: The heat pump will not run when the Remote position is selected and there is no remote control system attached.

- **Water Flow** (green lamp): When lit, indicates normal water flow.
- **Heat Demand** (green lamp): When lit, indicates the actual water temperature is below the target water temperature.
- **Compressor Delay Active** (amber lamp): *Under normal operation*, when lit, indicates compressor anti-short cycle timer is active. The fan will run but the compressor will be OFF for 6 to 8 minutes.
- **Defrost Active** (red lamp): When lit, indicates unit is in defrost mode. Defrost mode occurs when ice starts to form on the outside coil. The fan will continue to run but the compressor will stay OFF (not heating) until weather conditions improve.
- **Low Pressure** (red lamp): When lit, indicates failure in the refrigeration circuit. When this lamp is **ON**, service is required. Call the number shown in the CONTACT INFORMATION at the front of this manual.

V. Initial Start-Up and Check

1. Verify that the **Power** lamp is ON and that the pool pump is running and circulating properly.
2. Verify that the control panel **Spa-Remote-Pool** switch is in the **Remote** (OFF) position; see the figure.
3. Turn the control switch to either **Pool** or **Spa** to turn the system ON and raise the thermostat setting above the current water temperature. At this time the 2 green lamps should illuminate. The fan and compressor should start up and run simultaneously.



Spa thermostat

Pool/Spa selector switch

Pool thermostat

NOTE: The heat pump will be OFF when the Remote position is selected on the Pool/Spa selector switch and there is no remote control system attached.

4. Allow the heat pump to operate for a few minutes to stabilize operating pressures and to allow various component temperatures to normalize.

5. Verify that the discharge air temperature is approximately 8° - 10° cooler than the air entering the unit.

VI. Seasonal Start-Up or Annual Check

1. Remove leaves, pine needles, etc. from the evaporator coil. Clean the coil by spraying it with a mild solution of household liquid soap and water.
2. Flush the coil with a garden hose; DO NOT use a high-pressure sprayer.
3. Backwash or otherwise clean the pool filter. If necessary, clean the skimmer basket and pump strainer.
4. Set the valves to assure proper water flow through the unit.
5. Set the water temperature control to the desired temperature range for either pool or spa.
6. Turn the control switch to either **Pool** or **Spa**. If the pool pump is running and the water is colder than the setting of the temperature control, the heat pump will start up and run. It will run until the desired water temperature is reached, or until the pool pump shuts OFF.

NOTE: If the pool pump and heat pump shut OFF before the water temperature is raised to the desired level, you must lengthen the running time of both. To do this, reset the time clock dial for the longer running time, or manually operate the pump with the timer override switch. Since the pool heat pump capacity and efficiency are both greater at higher ambient air temperatures, run time should be set to take advantage of all daylight hours, when the air is generally warmer.

VII. Heat Pump Running Time

1. Determine the length of pump and heat pump operating time necessary for your particular requirements. Minimum run time should be the required hours to attain proper pool water filtration. Maximum run time obviously is 24 hours per day, or as required to reach desired pool temperature, and depends on such things as weather, pool size, covering, shading, etc.
2. If cooler or warmer water is desired, simply adjust the water temperature control and/or the pump and heat pump operating time accordingly, until the desired water temperature is reached.

NOTE: At the beginning of the heating season, or whenever the pool water temperature is to be raised several degrees, the pool pump and heat pump may need to operate continuously for several days. During summer months, only a few hours per day may be necessary, or none at all.

VIII. Summer Shutdown

If you do not plan to use the pool heat pump during the summer months, secure and protect it as follows:

1. From the control panel, turn the control switch to **Remote** (OFF).
2. Turn the heat pump circuit breaker or disconnect switch to OFF.
3. Leave the valves set the way they are unless additional circulation is required. DO NOT stop all flow through the heat pump.
4. **IMPORTANT:** Remember to reset the valves before the next heating season, or the heat pump will not operate properly.

IX. Freeze Protection

If the pool heat pump is installed in a location subject to freezing conditions, it is important to protect the water circuit from freezing, just as should be done for the pump and filter.

System Drain-Down

1. Turn the heat pump circuit breaker or disconnect switch to OFF.
2. From the control panel, turn the control switch to **Remote** (OFF).
3. With the pool pump OFF, close the external shutoff valves and remove the internal drain plug. Use a Shop Vac or air pressure to remove water from the bypass assembly and heat exchanger.
4. Leave the drains open until the unit is started in the spring.
5. Cover the heat pump with a waterproof cover.

Continuous Pump Operation

It is also possible in some areas to prevent heat pump freeze damage by operating the pump continuously during freezing weather. However, this results in significantly higher pump operating cost. Further, if a sustained power failure occurs, the heat pump would have to be drained anyway, or freeze damage could result.


X. Maintenance

The following maintenance procedures are designed to keep your heat pump operating at a high level of reliability. Maintenance should be performed on a periodic basis to prevent system failures and performance degradation.

A. Air Coil Cleaning - Efficient system operation depends on free circulation of air through the thin and tightly-spaced fins of the evaporator coils. The evaporator should be cleaned whenever it has a buildup of dirt or debris.

1.

	WARNING Shut OFF electricity to the heat pump.
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2.  To clean the fins, spray with a garden hose. But avoid high water pressure, which will bend and damage the fins.

B. Cabinet Care (optional) - The cabinet is designed for outdoor use and requires little care. However, you can clean it if you wish.

1.  Shut OFF electricity to the heat pump.

2. Wash the cabinet with soap and water.

C. Condensate Drainage - The heat pump extracts humidity from the air as it passes through the coil, similar to the way a cold drink outside “sweats” on a hot day. This condensate drains from the bottom of the unit.

1. Routinely check to be sure the condensate drain holes in the base of the unit are not plugged with dirt or debris.

NOTE: Owners often suspect that the heat pump is leaking when in fact it is condensate that is draining. To check that the liquid is condensate and not leakage from the heat pump, either:

- a. Use the pool chemistry test kit to confirm there is no chlorine in the condensate. *Or*,
b. Shut the heat pump OFF and leave the filter pump running to see if the water disappears. If the water disappears, it would confirm the water to be condensate.
2. If the flow of condensate becomes a problem, optional drain pans are available from the factory.

XI. Troubleshooting

If your heat pump does not operate, or simply does not heat your pool water, the indicator lamps on the front control panel (see page 4) can provide valuable clues as to what is wrong, and may even indicate precisely what the problem is. Always observe these lamps before calling a service representative. By reporting on the telephone which lamps are ON and OFF, the service rep may be able to solve the problem without the expense of a service call.

A. UNIT IS RUNNING, BUT NOT HEATING

- Is the ejected air from the unit 8-10° cooler than incoming air? If so, the unit is extracting heat from the air and transferring it to the pool.
- Are the evaporator and internal copper pipes “sweating”? This is also evidence of heat removal from the air. When the air is cool with low humidity, “sweating” may not be evident.
- How long has the heater been operating? During initial pool heating in cold weather, it may require a week to elevate the pool temperature to a comfortable level. Normally, it takes about 4 days.
- How many hours per day is the unit operating? **Remember that the heat pump only operates while the pool pump is running.** Set the time clock to permit 24 hour per day

operation. After the desired temperature is reached, return the system to normal operation of 8-10 hours per day.

- Is airflow through the unit being obstructed? Restrictions such as shrubbery, tall grass, dirty coils, or any other obstruction to airflow will reduce performance.
- Is the pool blanket/cover being used? Unblanketed pools can lose up to 10 degrees per night compared to 4 degrees or fewer when a blanket is used. Without a blanket, the total heat gained during the day can be lost overnight.
- Are rapid heat losses occurring in some other way, such as high wind, waterfalls, spa spillage, bubblers, rainfall, flow through solar panels at nights, or a high water table?
- Is water flow through the unit adequate? Check the system for obstructions, such as a clogged filter pump strainer or a dirty filter.

B. UNIT IS NOT RUNNING

- Is the control panel **Power** lamp ON? If not, the circuit breaker may be shut OFF or tripped. Reset the breaker by switching it OFF, then back ON. *Verify that the breaker is set and operating properly before calling for service.*
- Is the thermostat setting correct? Verify that the temperature has been properly set on the thermostat, and that it is *higher* than the current water temperature.
- Have you waited 6 minutes for the time delay? After the unit has been running and then shut OFF for any reason, there is a 6-minutes timed cycle before operation can begin again.
- Is the **Water Flow** lamp OFF? This lamp will turn OFF if not enough water is flowing through the heater. Improperly positioned valves or a dirty filter could decrease the flow of water required for efficient operation. When the **Water Flow** lamp is ON, proper flow is present. If this lamp is OFF, but you can feel normal flow at the pool returns, check the water valves or settings.
- Is the **Defrost Active** lamp OFF? If this lamp is ON, the fan will be running but not the compressor. The unit is waiting for the frost to melt or the air temperature to rise before heating is resumed.
- Is the **Heat Demand** lamp ON? If not, then the thermostat setting is not higher than the temperature of the pool water. Raise the thermostat setting.
- Is the **Low Pressure** lamp ON? If this lamp is ON, there is a problem with the unit that will require service. Turn the unit OFF and call the number shown in the CONTACT INFORMATION at the beginning of this manual.

SERVICE CALL REQUESTS

Determine if the problem is:

- Warranty Service (within 5 years of installation)
- Non Warranty Service (beyond 5 years of installation)
- Maintenance-related (power supply, water flow, or time clock adjustment)

NOTE: The MANUFACTURER IS NOT RESPONSIBLE for maintenance adjustments.

POWER SUPPLY

- Verify that all circuit breakers are reset and working properly.
- If the **Power** lamp on the control panel still does not light, contact the installing dealer, since it may be a power problem requiring an electrician.

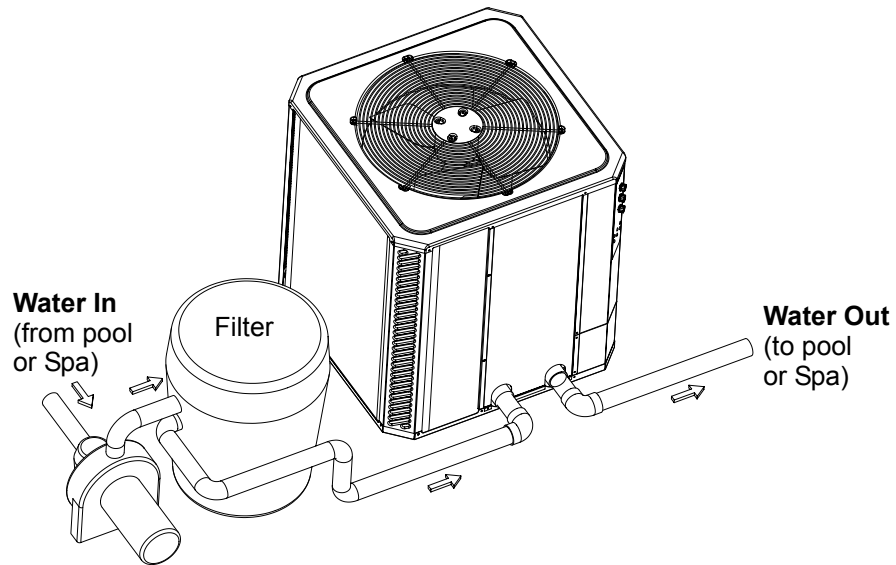
WATER FLOW

- Verify that the filter is clean to provide good flow.
- Verify that the valves are properly positioned.
- If the **Water Flow** lamp on the control panel still does not light, and water is circulating in the pool or spa, contact the installing dealer to adjust the valves.

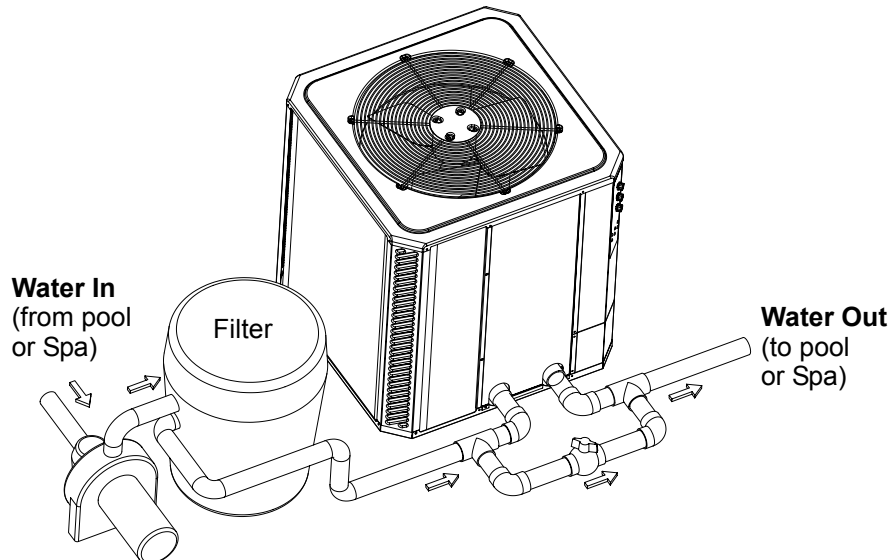
TIME CLOCK ADJUSTMENT

Verify that the time clock is set to permit the heater to run long enough to heat properly.

Plumbing Diagrams

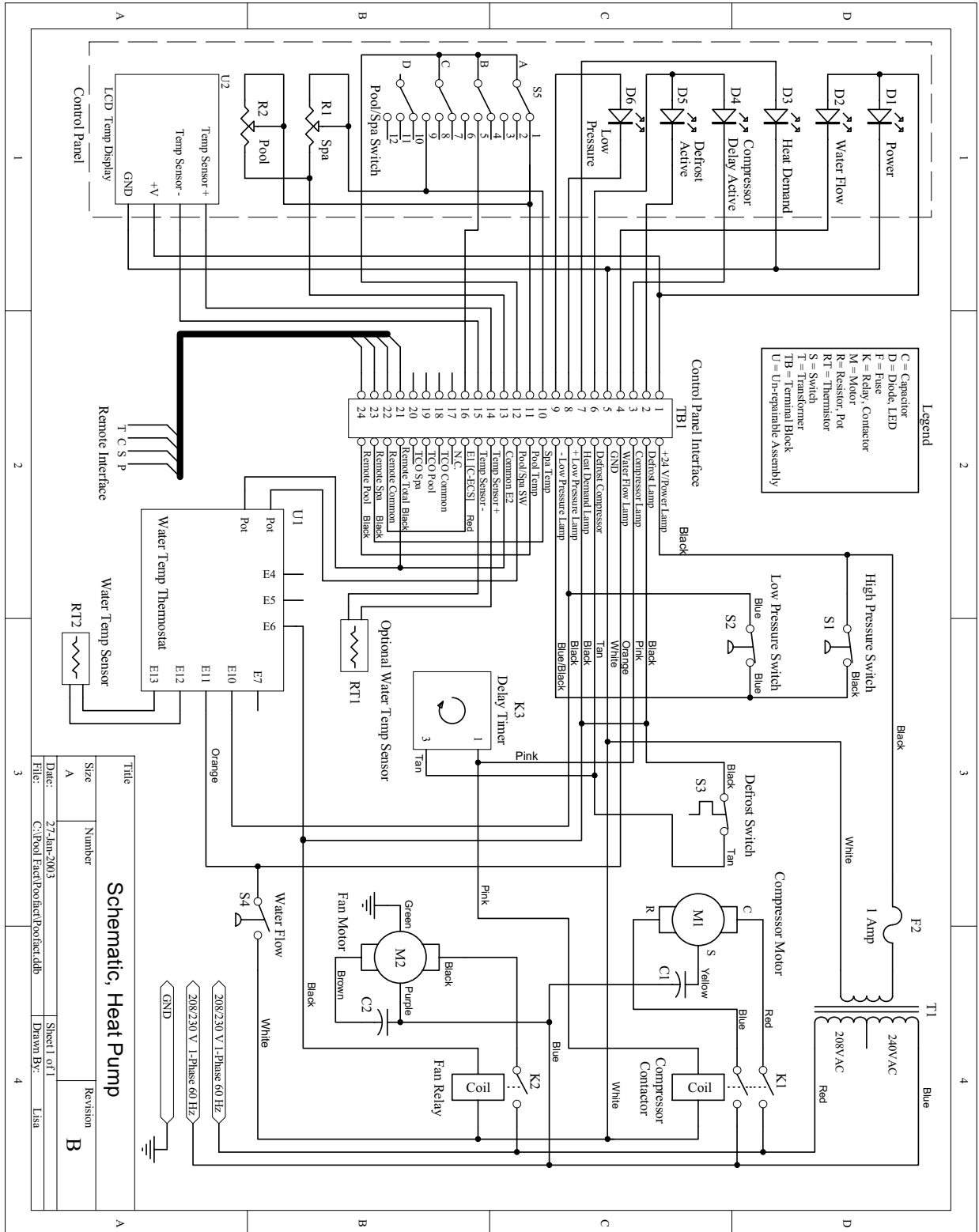


For systems with pumps of less than 2 HP (under 80 gpm), no external bypass is required. Connections are 2-inch pipe slip. Plumb the heat pump **after** the filter and **before** any chlorinators.

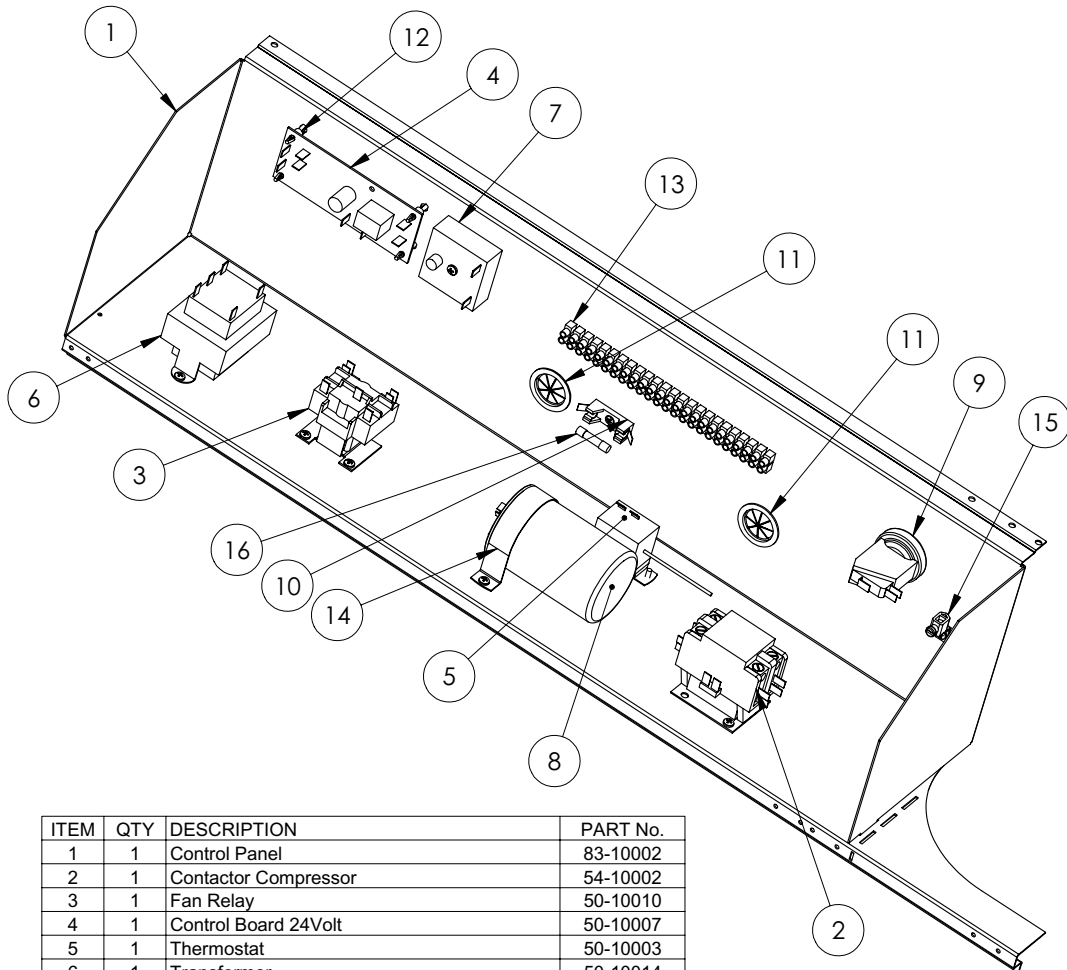


For systems with pumps of 2 HP or greater (over 80 gpm), an external bypass is required. Adjust the bypass valve to divert a minimum of 40 gpm through the heat pump. Connections are 2-inch pipe slip. Plumb the heat pump **after** the filter and **before** any chlorinators.

Heat Pump Schematic

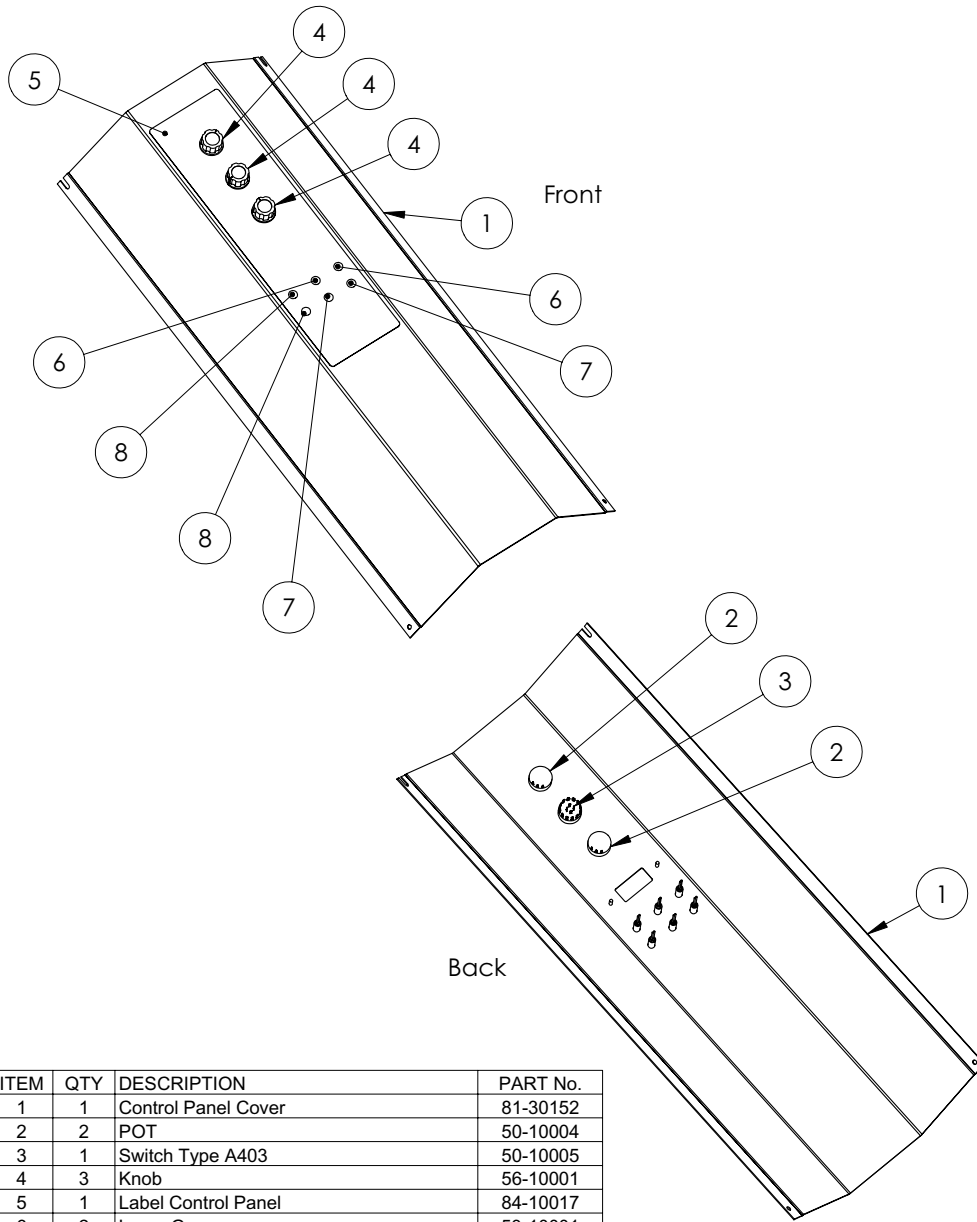


Control Panel Assembly Replacement Parts List



ITEM	QTY	DESCRIPTION	PART No.
1	1	Control Panel	83-10002
2	1	Contactor Compressor	54-10002
3	1	Fan Relay	50-10010
4	1	Control Board 24Volt	50-10007
5	1	Thermostat	50-10003
6	1	Transformer	50-10014
7	1	Timer IMC 203	55-10011
8	1	Capacitor	55-10003
9	1	Pressure Switch Water	50-10015
10	1	Fuse Block	50-10003
11	2	Bushing Heyco 2184	70-10001
12	4	Stand-off RLCBSR1	99-10001
13	2	Terminal Strip	52-10006
14	1	Clamp Capacitor 04	70-10004
15	1	Ground Lug	50-10017
16	1	Fuse 2A Type 3AG	50-10016

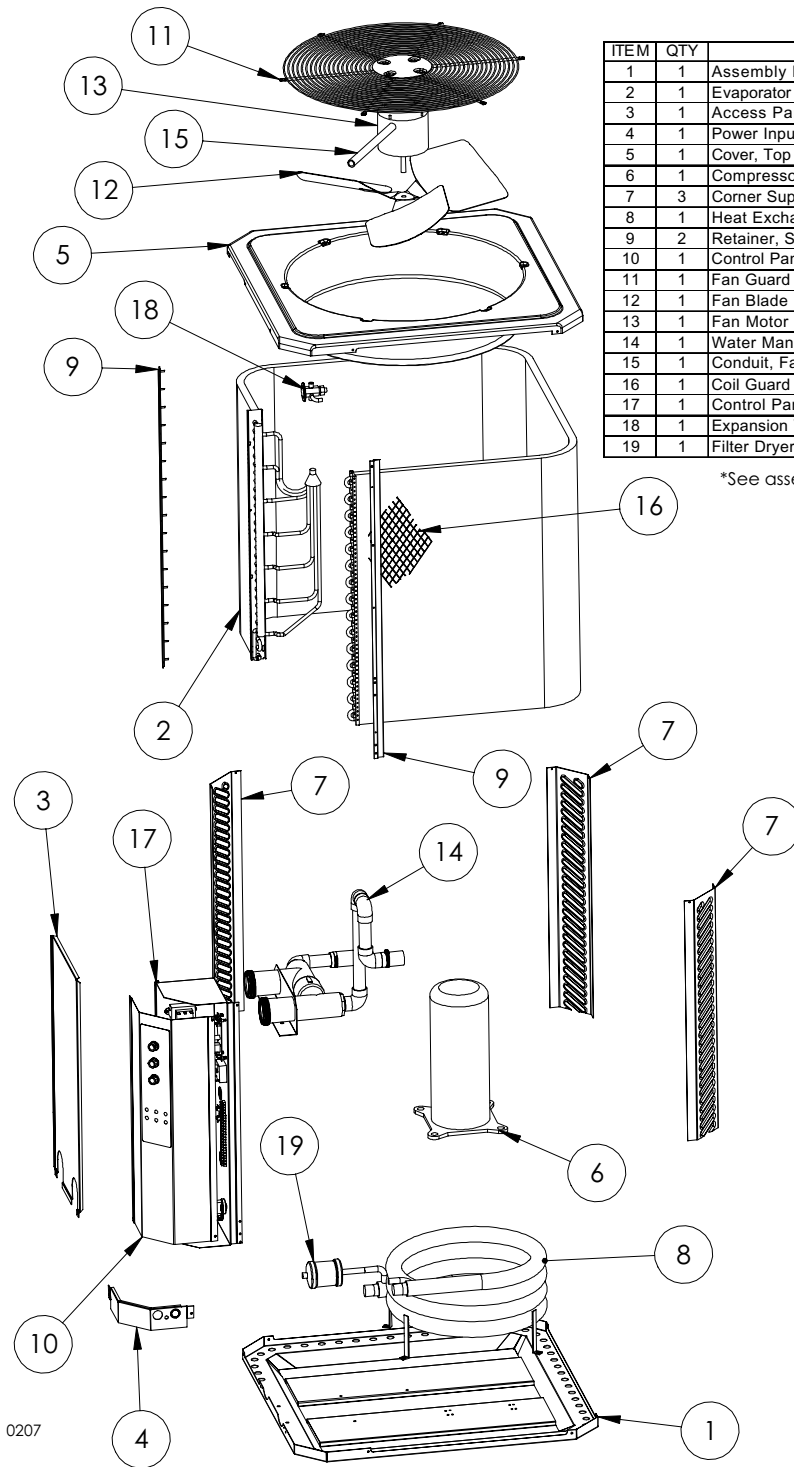
Control Panel Cover Assembly Replacement Parts List



ITEM	QTY	DESCRIPTION	PART No.
1	1	Control Panel Cover	81-30152
2	2	POT	50-10004
3	1	Switch Type A403	50-10005
4	3	Knob	56-10001
5	1	Label Control Panel	84-10017
6	2	Lamp Green	53-10001
7	2	Lamp Red	53-10003
8	2	Lamp Amber	53-10002

RHP Control Panel Cover

Heat Pump Assembly Replacement Parts List - RHP 100



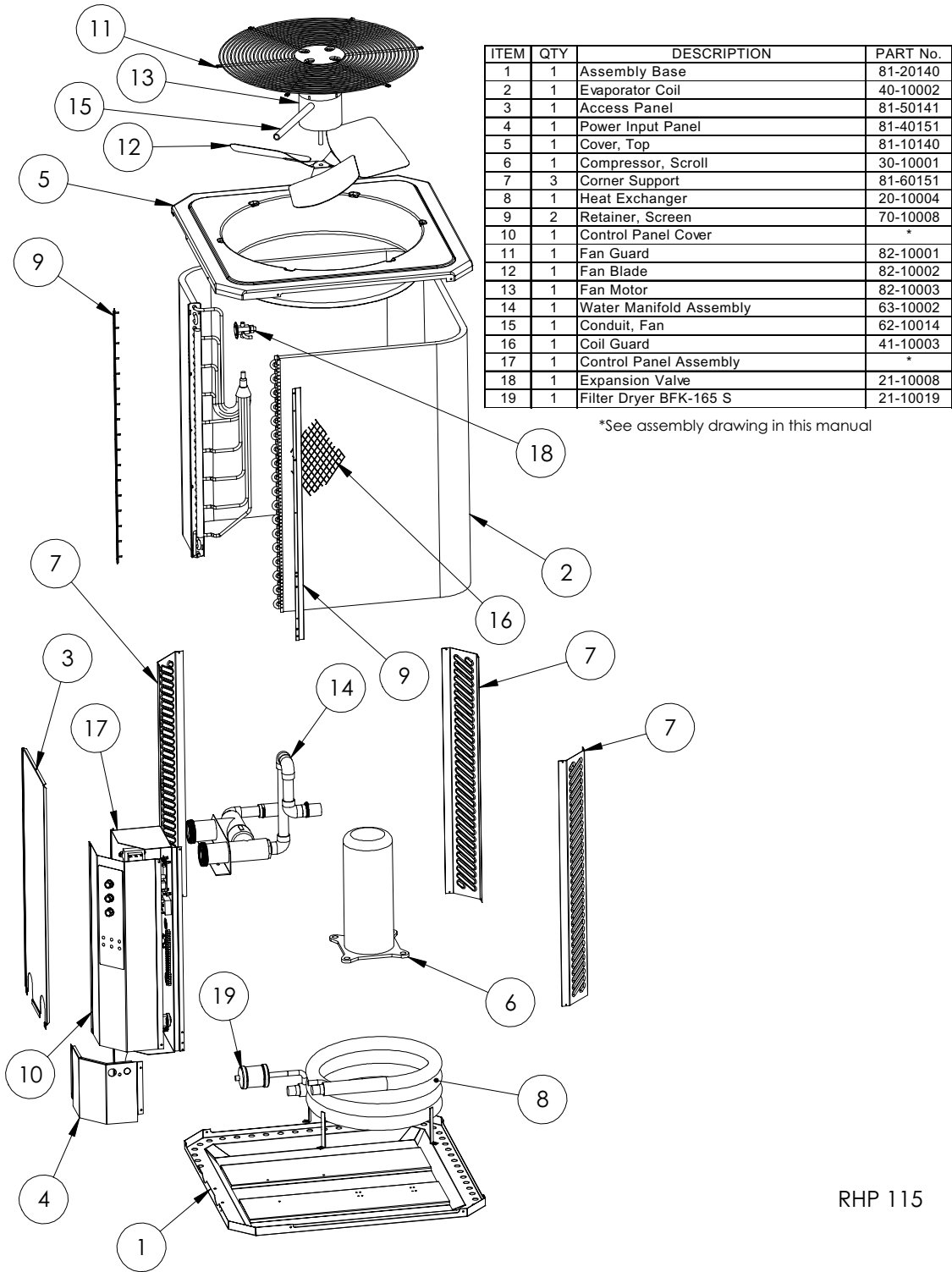
ITEM	QTY	DESCRIPTION	PART No.
1	1	Assembly Base	81-20140
2	1	Evaporator Coil	40-10002
3	1	Access Panel	81-50141
4	1	Power Input Panel	81-40151
5	1	Cover, Top	81-10140
6	1	Compressor, Scroll	30-10001
7	3	Corner Support	81-60151
8	1	Heat Exchanger	20-10004
9	2	Retainer, Screen	70-10008
10	1	Control Panel Cover	*
11	1	Fan Guard	82-10001
12	1	Fan Blade	82-10002
13	1	Fan Motor	82-10003
14	1	Water Manifold Assembly	63-10002
15	1	Conduit, Fan	62-10014
16	1	Coil Guard	41-10003
17	1	Control Panel Assembly	*
18	1	Expansion Valve	21-10008
19	1	Filter Dryer	21-10019

*See assembly drawing in this manual

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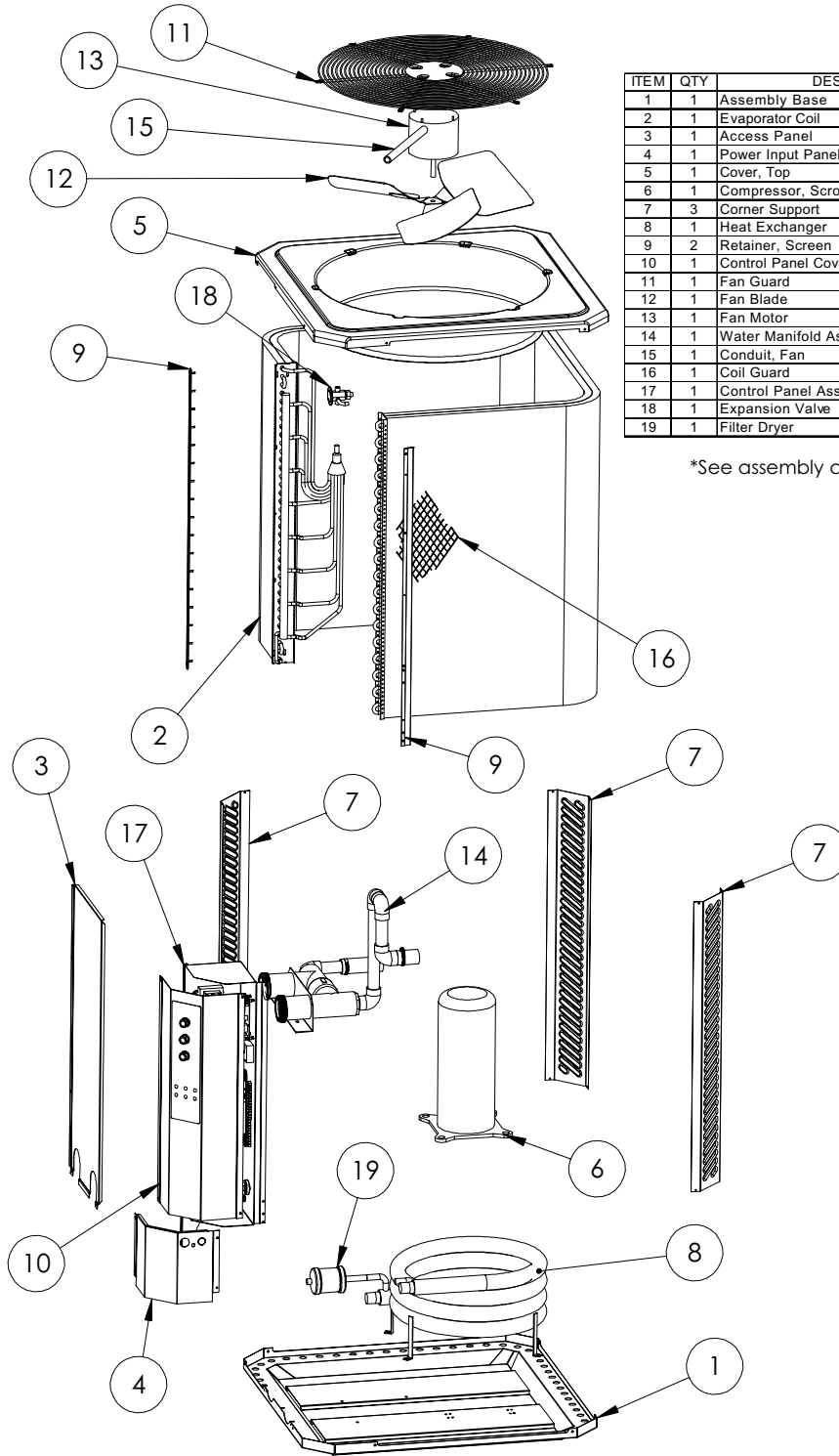
RHP 100

Heat Pump Assembly Replacement Parts List - RHP 115



RHP 115

Heat Pump Assembly Replacement Parts List - RHP 160



ITEM	QTY	DESCRIPTION	PART No.
1	1	Assembly Base	81-20140
2	1	Evaporator Coil	40-10003
3	1	Access Panel	81-50142
4	1	Power Input Panel	81-40152
5	1	Cover, Top	81-10140
6	1	Compressor, Scroll	30-10003
7	3	Corner Support	81-60152
8	1	Heat Exchanger	20-10004
9	2	Retainer, Screen	70-10007
10	1	Control Panel Cover	*
11	1	Fan Guard	82-10001
12	1	Fan Blade	82-10002
13	1	Fan Motor	82-10003
14	1	Water Manifold Assembly	63-10002
15	1	Conduit, Fan	62-10014
16	1	Coil Guard	41-10002
17	1	Control Panel Assembly	*
18	1	Expansion Valve	21-10008
19	1	Filter Dryer	21-10002

*See assembly drawing in this manual

RHP 160