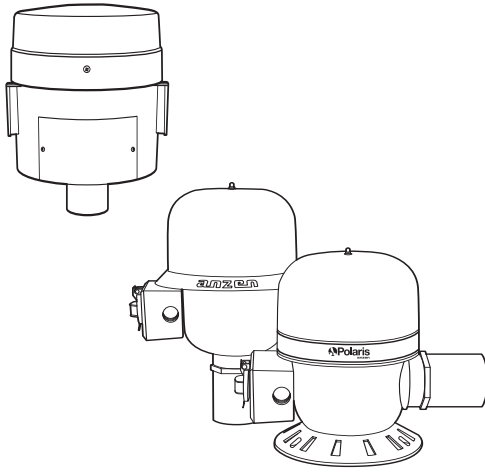


# TROUBLESHOOTING HANDBOOK



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QT Residential Blower  
Metal Residential Blower

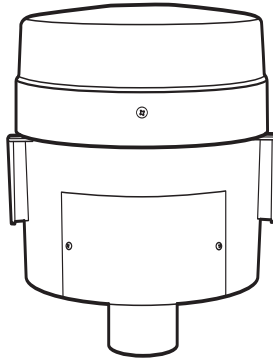
# Blower Basics

Polaris aboveground, residential blowers are specially designed for installation in noise-sensitive environments.

All blowers are equipped with a patented thermal protection device that prevents overheating from excessive back pressure or mechanical problems. An auto-reset feature automatically restarts the motor once it has cooled. The unique thermal valve also compensates for temporary rises in temperature so the blower motor is less likely to reach the shutoff point.

Two styles, Polaris QT Blowers® and Polaris Metal Blowers, are available. Metal blowers include models for indoor applications. All Polaris blowers are UL listed.

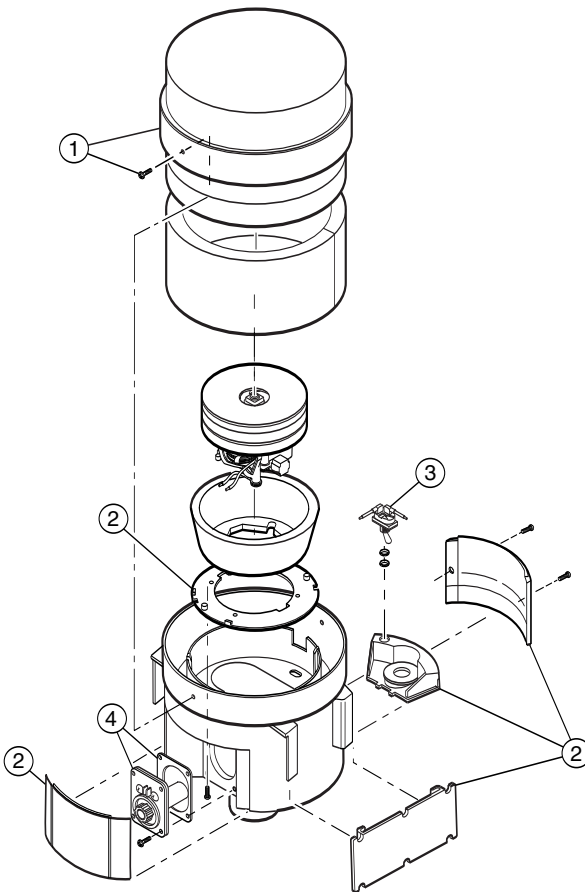
## Polaris QT Blowers



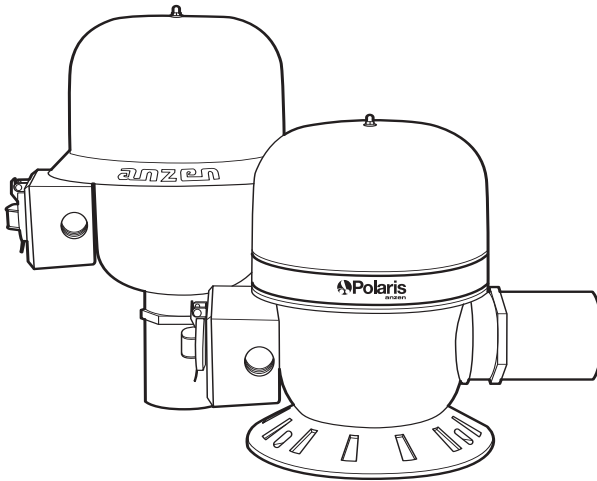
Model	Volts	Horsepower	Amps	Exhaust
1-460-01	120	1.0 HP	6.8	Bottom
1-460-02	240	1.0 HP	3.8	Bottom
1-470-01	120	1.5 HP	7.5	Bottom
1-470-02	240	1.5 HP	4.0	Bottom
1-480-01	120	2.0 HP	9.0	Bottom
1-480-02	240	2.0 HP	5.6	Bottom

## QT Blowers Exploded Parts Diagram

Number	Part Number	Description	Quantity
1	1-400-10	Blower Top	1
2	1-400-20	Motor Plate Set	1
3	1-400-30	Switch	1
4	1-400-60	Thermo Valve and Gasket	1



## Polaris Metal Blowers

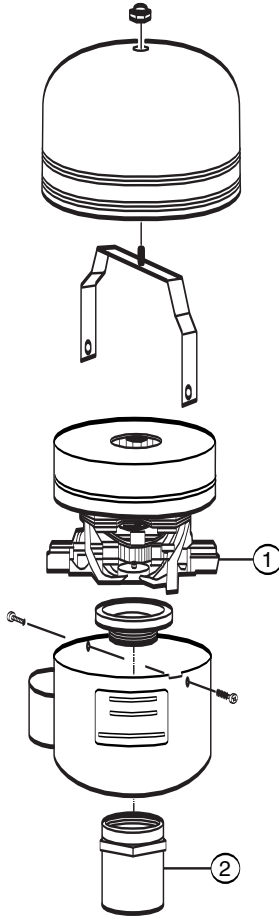


120V Models	Horsepower	Amps	Exhaust
1-521-01	1.0 HP	6.8	Bottom
1-521-02	1.0 HP	6.8	Side
1-516-01	1.5 HP	7.5	Bottom
1-516-02	1.5 HP	7.5	Side
1-566-01	2.0 HP	9.0	Bottom
1-566-02	2.0 HP	9.0	Side

240V Models	Horsepower	Amps	Exhaust
1-521-03	1.0 HP	3.8	Bottom
1-521-04	1.0 HP	3.8	Side
1-516-03	1.5 HP	4.0	Bottom
1-516-04	1.5 HP	4.0	Side
1-566-03	2.0 HP	9.0	Bottom
1-566-04	2.0 HP	5.6	Side

# Metal Blowers Exploded Parts Diagram

Number	Part Number	Description	Quantity
1	1-700-29	Motor Brush Kit	1
2	1-700-06	Check Valve, Bottom	1



## Review of Blower Sizing

Many problems can be attributed to improperly sized blowers.

**Accurately sizing the blower for the application is crucial for proper blower function.** Damage caused by incorrect sizing is not covered under the warranty.

Several factors influence sizing:

Blower motors are cooled by air flowing over the motor. The amount of air required to prevent overheating is determined by the blower horsepower (HP), the system back pressure and the number and size of the air holes/jets in the spa. Airflow is measured in cubic feet per minute (CFM).

Different horsepower blowers require different levels of air flow to keep the motor cool. A higher HP motor requires more flow.

System back pressure, measured in inches of water, is the sum of the forces restricting air flow over the blower motor and through the spa plumbing. These limiting forces include:

- Pipe diameter
- Length of run
- Number of spa jets
- Number and type of elbows
- Check valves
- Size of spa jets

As back pressure increases, air flow decreases, reducing the ability of the motor to stay within normal operating temperatures.

### Maximum Back Pressure For Blowers

Blower HP	Inches of Water
1.0	45
1.5	45
2.0	50

### Airflow Ranges for Blowers (for 2" PVC)

Blower HP	Min Airflow	Max Airflow
1.0	30 SCFM	90 SFCM
1.5	45 SCFM	90 SFCM
2.0	50 SCFM	90 SFCM

Refer to the **Blower Sizing Worksheet** to check accuracy of blower sizing.

# Blower Sizing Worksheet

## Step 1 – Calculate Back Pressure

Use the formula to determine the spa's back pressure as an "inches of water" measurement. If available, use an Inches-of-Water gauge.

Measure from water surface to air line in inches \_\_\_\_\_

+ No. of feet of 2" pipe divide by 10 = \_\_\_\_\_

+ No. of 90° elbows \_\_\_\_\_ x .5 = \_\_\_\_\_

+ No. of 45° elbow \_\_\_\_\_ x .125 = \_\_\_\_\_

+ No. of 1/2 lb. check valves \_\_\_\_\_ x 4 = \_\_\_\_\_

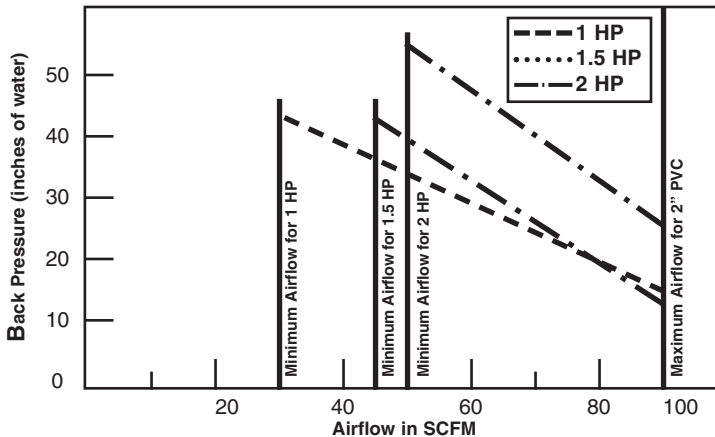
**Total Back Pressure** (inches of water) =

## Step 2 – Determine the Airflow

Locate the Total Back Pressure on the left side of the **Blower Performance Chart** and draw a horizontal line. Note where the line intersects each dashed line. Reference the Airflow requirement listed directly below the intersection for each size blower.

**Total Airflow SCFM** =   
(Standard Cubic Feet per Minute)

**Blower Performance Chart**



### Step 3 – Calculate Number of Air Holes

Determine how many air holes are needed to achieve the necessary airflow. Installing less than the required number of holes will increase back pressure. **Do not increase back pressure beyond minimum airflow for the blower.** Too many holes will result in reduced blower action.

Choose an air hole size from the chart below and apply the adjacent conversion factor in the formula to determine how many holes are required.

Air Hole Size	Conversion Factor
1/8"	2.4
5/32"	1.5
3/16"	1.1
1/4"	.6
3/8"	.27
1/2"	.15
Jet	.1

$$\begin{array}{rcl}
 \text{Total Airflow (SCFM) From Step 2} & & \underline{\hspace{2cm}} \\
 \text{Multiply by Conversion Factor} & \times & \underline{\hspace{2cm}} \\
 \text{Number of Holes Required} & = & \boxed{\hspace{2cm}}
 \end{array}$$

### Measuring Amperage Drop:

Motor amperage will drop under load (on the pipe). If the drop exceeds 0.5 amps for 240V motors or 1.0 amps for 120V motors, a problem exists. The cause may be excessive back pressure, a plumbing block, or some other plumbing issue. Complete an amperage test both on and off the standpipe.

1. Remove the piping from the outlet port of the air blower.
2. Clamp the amp meter around one of the hot wires feeding the air blower. Do not use the green ground wire.
3. Start the blower and record the amp reading. It should be between 5 and 15 amps, depending on the blower size and voltage. Record amp reading w/o load: \_\_\_\_\_
4. Turn the blower off and reconnect the piping to the outlet.
5. Start the blower again. When air is seen coming through the jets in the spa, record amp reading w/ load: \_\_\_\_\_



# Troubleshooting

**Action: Blower keeps shutting off.**

**Solution:** Remove the blower from the standpipe and run it for 20 minutes. If no mechanical problems are apparent:

1. Check the spa configuration (number and size of air holes) to verify accurate sizing of blower.
2. Check for a debris blockage and remove it.
3. Confirm that there are no more than eight 90-degree elbows in the line.
4. Verify that 2" pipe was used and that the run is not too long.
5. Locate the check valve and confirm rating of no more than 1/2 lb.

**Action: There is corrosion on winding side of motor, calcium deposits inside motor or other signs of water damage.**

- Solution:**
1. Raise the blower or the Hartford Loop.
  2. Verify that a check valve is installed.
  3. Confirm that blower is not positioned too close to sprinklers or other water source.
  4. Verify blower mounting. Is it right-side-up and properly protected.

**Action: Black carbon build-up on motor.**

- Solution:**
1. Check the spa configuration (number and size of air holes) to verify accurate sizing of blower.
  2. Check for a debris blockage and remove it.
  3. Confirm that there are no more than eight 90-degree elbows in the line.
  4. Verify that 2" pipe was used and that the run is not too long.
  5. Locate the check valve and confirm rating of no more than 1/2 lb.

**Action: Separation, melting and/or disfigured of housings. Motor failure.**

- Solution:
1. Check the spa configuration (number and size of air holes) to verify accurate sizing of blower.
  2. Check for a debris blockage and remove it.
  3. Confirm that there are no more than eight 90-degree elbows in the line.
  4. Verify that 2" pipe was used and that the run is not too long.
  5. Locate the check valve and confirm rating of no more than 1/2 lb.

**Action: Motor brushes worn out in a short amount of time.**

- Solution:
1. Verify that the blower is not wired into the circulation system.
  2. Confirm that the blower is not being used in a commercial application.

**Action: The fan is locked up and "puffed" up on top or the housing screws and/or plastic around casings are separated**

- Solution:
1. Indicates possible explosion from glue fume ignition. Replace the blower.

**Action: Brushes have disintegrated and commutator is blown.**

- Solution:
1. Verify that the 110V unit is not wired to 220V. Replace unit.

# Repairs and Replacements

Polaris blowers are warrantied for one year from the date of installation. Check the installation date to determine if repairs or replacement items will be covered under the warranty.

## **Motor Replacement Kits for 120V and 240V Units**

1-595-01 (120V) and 1-595-02 (240V) motors will replace blower model numbers 460, 502, 503, 510, 511, 512, 520, 521.

1-593-01 (120V) and 1-593-02 (240V) motors will replace blower model numbers 470, 500, 501, 515, 516, 525, 526.

1-597-01 (120V) and 1-597-02 (240V) motors will replace blower model numbers 480, 565, 566, 570, 571.

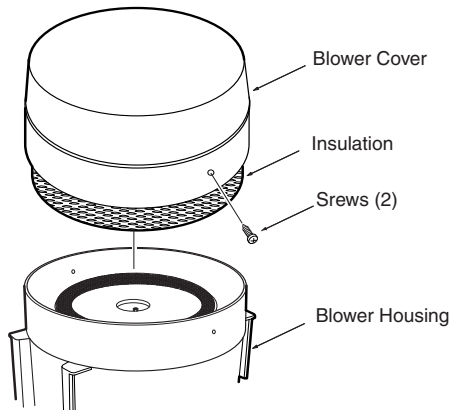
# QT Blower Repairs

## Tools required:

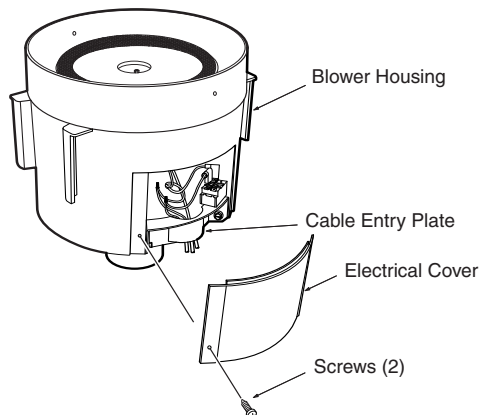
- Phillips-head screwdriver
- 5/16" hex-head screwdriver
- Wire Cutter
- Crimp Pliers

## QT Motor Replacement Kit

1. Turn off the power at the main supply panel.
2. Remove the blower cover screws, lift off the top and remove the insulation.

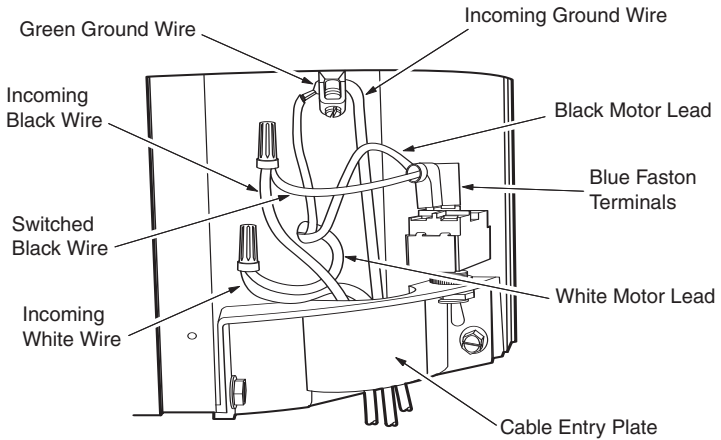


3. Remove electrical cover attached to housing.
4. Remove screws securing vent cover and snap out cover.

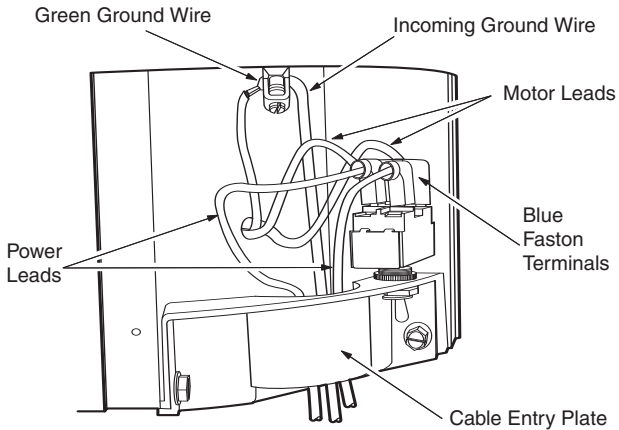


5. Before disconnecting, mark all wires on the old and new motors, as well as the incoming sources.

**For 120V motors:** Disconnect the motor lead wire connected to the incoming white wire. Cut the black motor lead to the switch 3" from the blue Faston terminal.

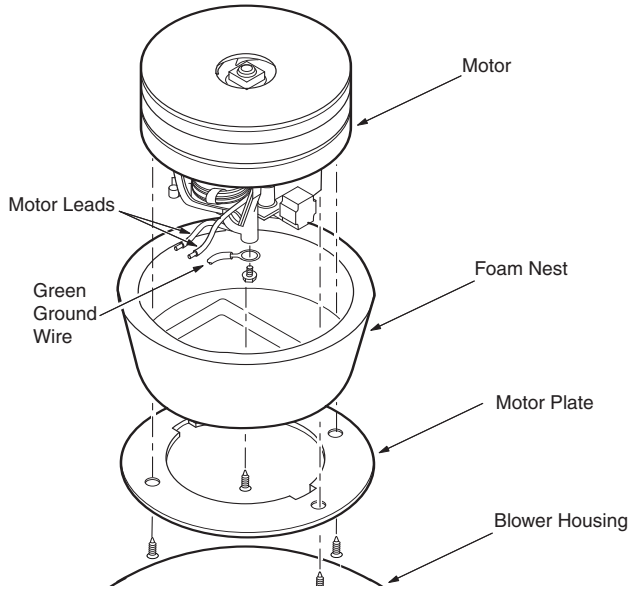


**For 240V motors:** Cut both black motor leads 2" below the blue Faston terminals.



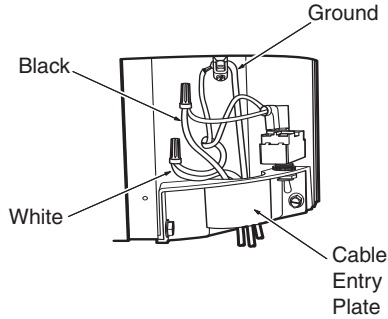
6. Remove the cable entry plate.
7. Detach the motor assembly from the blower housing, and lift out the motor and foam nest.

8. Unscrew the motor plate and discard it.
9. Push the motor out from the foam nest.

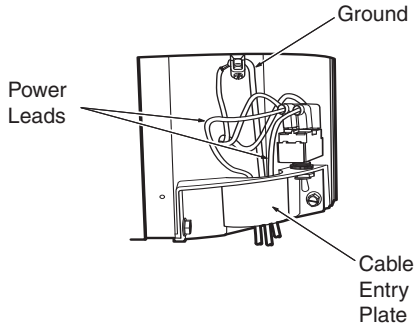


10. Disconnect the green ground wire from old motor and reconnect it to the same location on the new motor.
11. Grasping the motor leads and ground wire, thread them through the foam nest.
12. Slide the new motor plate over the wires until it rests on the foam nest.
13. Thread all the leads from the inside through the hole in the side of the housing. Set the new motor inside the foam nest, aligning the four foam nest slots with the motor screw holes.
14. Attach the new motor plate to the motor.
15. Set the motor/nest/plate assembly inside the housing case using the guide on the housing. Align the motor plate holes with the slots on the housing.
16. Attach the motor assembly to the blower housing and reattach the cable entry plate.
17. Place the top on the housing.

18. **For 120V motors:** Strip one motor lead and the 2" wire with the blue Faston terminal. Join the two wires with a wire nut. Reconnect the other motor lead to the incoming white wire, and the motor ground wire to the incoming ground wire (both green).



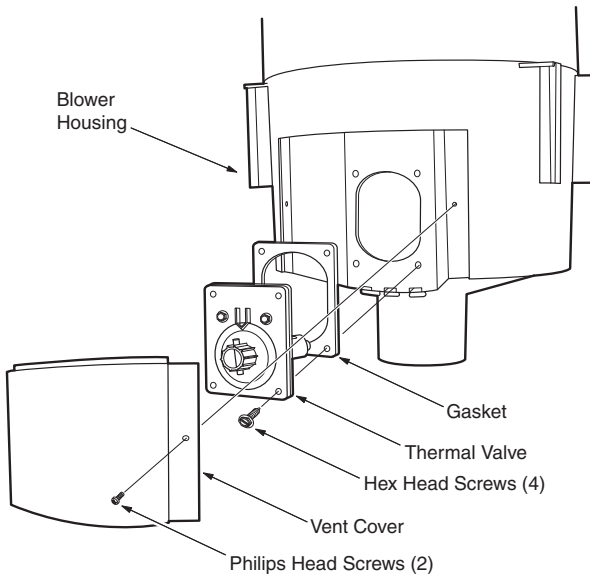
- For 240V motor:** For each motor lead strip the lead and the 2" wire with the blue Faston terminal, and join the two wires with a wire nut. Reconnect the other motor lead to the incoming white wire, and the motor ground wire to the incoming ground wire (both green).



19. Position electrical cover on housing and secure with screws.  
20. Snap vent cover back onto the housing and secure.  
21. Turn on the power to the unit to verify that the motor runs and the spa action meets expected standards.

## QT Thermal Valve Replacement

1. Turn off the power to the blower from the main supply panel.
2. Remove screws securing vent cover and snap out cover.
3. Using the 5/16" hex-head screwdriver, remove the screws that attach the thermal valve to the blower housing.
4. Grasp the center knob of the thermal valve and remove the valve from the housing. Discard the old valve and gasket.
5. Position the new thermal valve and gasket with the arrow-shaped pointer on the valve facing upward.
6. Insert the screws through the face of the thermal valve and the gasket and secure.
7. Snap the vent cover back into place.
8. Turn on the power to the unit to verify that the motor runs and the spa action meets expected standards.





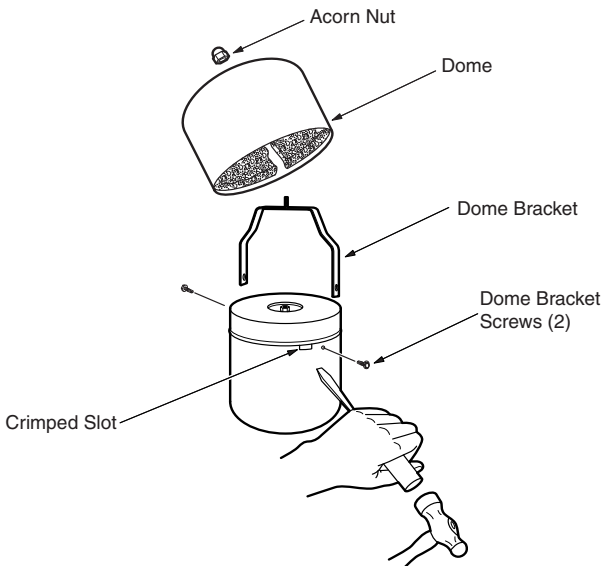
# Metal Blower Repairs

## Tools required:

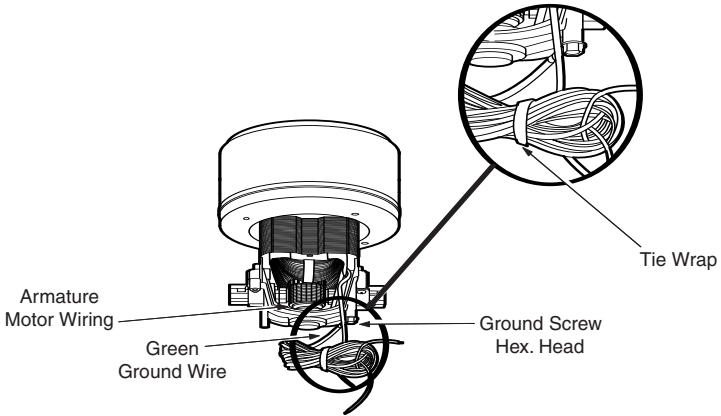
- 3/8" nut driver
- 5/16" nut driver
- Small chisel or flat blade screwdriver
- Hammer
- Wire Cutter
- Crimp Pliers
- Belt wrench or two 2-1/2" channel-lock pliers
- Silicone or tub caulking

## Motor Replacement Kit

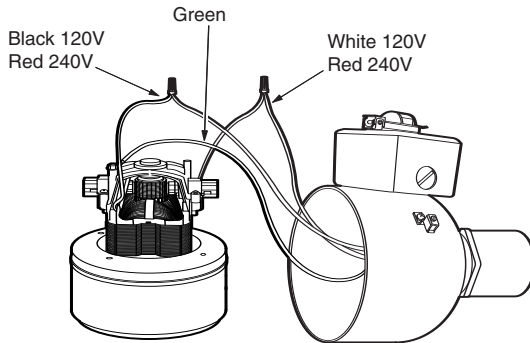
1. Turn off the power to the blower from the main supply panel.
2. Unscrew the acorn nut from the top of the blower dome and lift off the dome.
3. Remove dome bracket screws and bracket.
4. With a small chisel or flat blade screwdriver and a hammer, tap the lip of the crimped slot (located at the blower housing seam) in an upward motion to loosen until the motor can be removed. Separate the motor from the housing.



5. Cut the tie-wraps holding the wires to the motor frame.
6. Remove the green ground wire from its screw mounting on the motor. Do not remove the screw nut.



7. Cut the motor lead wires approximately 3-6" from housing and remove the motor.
8. Strip the insulation on both motor leads.
9. Fasten the green ground wire to the new motor.
10. Using the wire nuts supplied, connect the new motor leads to the incoming wires inside the blower housing. Tie-wrap wires to the motor frame.



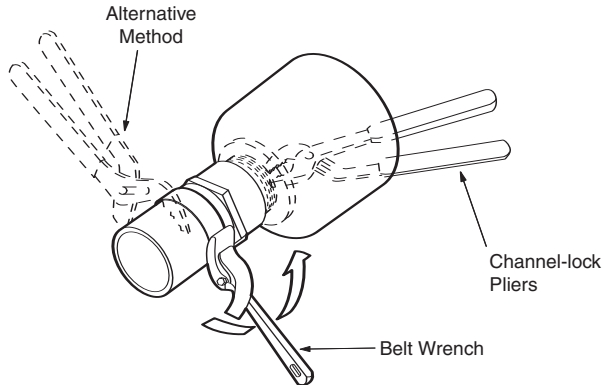
11. Align the pre-drilled mounting holes and tap the motor down along the lip of the housing until it is properly sealed. **Do not tap on the impeller cover.**
12. Align the dome and push down the dome bracket down onto the impeller cover as far as possible and secure. Reinstall the dome and acorn nut.
13. Turn on the power to the unit to verify that the motor runs and the spa action meets expected standards.

## **Motor Brushes Replacement**

1. Turn the power to the blower off at the main supply panel.
2. Unscrew the acorn nut and lift off the dome.
3. Unscrew the dome bracket screws and remove the bracket.
4. With a small chisel or flat blade screwdriver and a hammer, tap the lip of the crimped slot (located at the blower housing seam) in an upward motion to loosen until the motor can be removed. Separate the motor from the housing.
5. Cut the tie-wraps holding the wires to the motor frame.
6. Using a flat blade screwdriver, pry the spade terminal from each brush holder.
7. Remove the harness screws, then lift the harness and brushes from the motor.
8. Insert the spade terminals into the new brush holders.
9. Place the new brushes into the motor, replace the harness and secure tightly.
10. Reinstall the motor into the blower housing.
11. Turn on the power to the unit to verify that the motor runs and the spa action meets expected standards.

## Bottom-Mount Check Valve Replacement

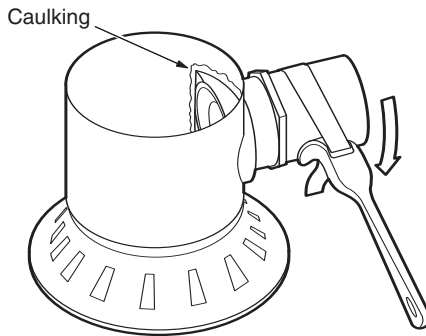
1. Turn the power to the blower off at the main supply panel and remove the blower from the standpipe.
2. Remove the acorn nut and lift off the dome.
3. Unscrew the dome bracket screws and remove the bracket.
4. With a small chisel or flat blade screwdriver and a hammer, tap the lip of the crimped slot (located at the blower housing seam) in an upward motion to loosen until the motor can be removed. Separate the motor from the housing.
5. Using a belt wrench and channel-lock pliers, unscrew the check valve from the bottom nut. Remove the bottom nut from the inside of the can.



6. Insert the new bottom nut through the bottom of the can and attach the check valve. Tighten securely.
7. Reinstall the motor into the housing.
8. Place the blower onto the standpipe.
9. Turn on the power to the unit to verify that the motor runs, the spa action meets expected standards and that there are no air leaks around the check valve fitting.

## Side-Mount Check Valve Replacement

1. Turn the power to the blower off at the main supply panel and remove the blower from the standpipe.
2. Remove the acorn nut and lift off the dome.
3. Unscrew the dome bracket screws and remove the bracket.
4. With a small chisel or flat blade screwdriver and a hammer, tap the lip of the crimped slot (located at the blower housing seam) in an upward motion to loosen until the motor can be removed. Separate the motor from the housing.
5. Use a belt wrench and channel-lock pliers to unscrew the check valve from the bottom nut. Remove the nut.
6. Remove the radius nut from the inside of the can.
7. Apply tub caulking or silicone onto the base surface of the new radius nut, and push the nut through the hole in the side of the blower can.



8. Put the new radius nut washer over the nut, while pushing it firmly against the side of the blower.
10. Screw the check valve onto the nut and tighten securely with a belt wrench or channel-lock pliers.
11. Reinstall the motor into the housing and return the blower to the standpipe.
13. Turn on the power to the unit to verify that the motor runs, the spa action meets expected standards and that there are no air leaks around the check valve fitting.

# General Replacement Parts

120V and 240V toggle switches

(120V and 240V circuit breakers used in earlier models of the blowers must be replaced with identical circuit breakers.)

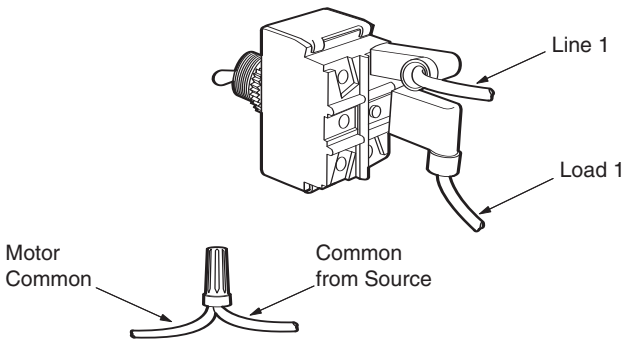
## Tools required:

- Rubber mallet
- Flat-blade screwdriver
- Phillips screwdriver
- Pliers
- 1/4" nut driver

## 120V Toggle Switch

Use a switch rated at 15A-150VAC to replace the 120V switch.

1. Turn off the power to the blower at the main supply panel.
2. Remove the switch cover of the bell box to gain access to the toggle switch.
3. Remove the screws and pull the switch assembly out of the bell box as far as possible.
4. Remove the spade terminals from the switch prongs. **Do not cut the wires.** Remove the bracket.



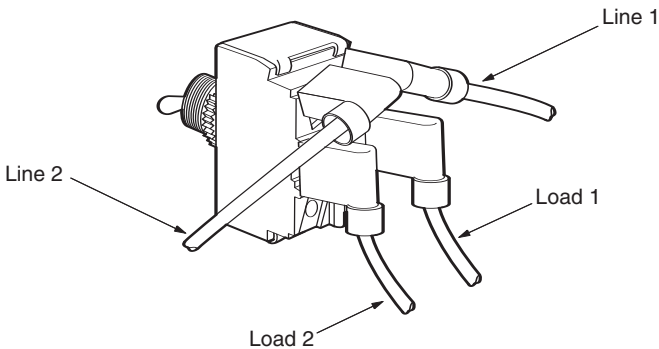
5. Insert the new switch into the bracket. Tighten securely.
6. Reattach the spade terminals to the new switch.

7. Carefully push the wires back into the bell box, and attach the bracket.
8. Securely replace the cover plate and turn on the main power supply.

## 240V Toggle Switch or Circuit Breaker Replacement

Use a switch rated at 11.75A-277VAC to replace the 240V switch.

1. Turn off the power to the blower at the main supply panel.
2. Remove the switch cover of the bell box to gain access to the toggle switch.
3. Remove the screws and pull the switch assembly out of the bell box to the fullest length possible.
4. Remove the spade terminals from the switch prongs. **Do not cut the wires.** Remove the nut from the face of the switch and remove the bracket.



5. Insert the new switch into the bracket. Tighten securely.
6. Attach the motor leads (Load 1 and 2) to the bottom terminals and the power supply leads (Line 1 and 2) to the top terminals.
7. Carefully push the wires back into the bell box, and attach the bracket to the bell box.
8. Securely replace the cover plate and turn on the main power supply.



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