



GUZZLER® G2 SAPPULLER DOUBLE DIAPHRAGM PUMP



OPERATOR'S MANUAL FOR ...

G2-0501N

G2-0503N

G2-0504N

for use as Maple Sap Vacuum pumps



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IMPORTANT SAFETY INFORMATION

NEVER OPERATE YOUR GUZZLER PUMP WITHOUT THE PUMP HOUSING COVER PLATE PROPERLY INSTALLED ON THE PUMP.

NEVER REACH INSIDE THE PUMP OR INSERT ANY OBJECTS INTO THE PUMP WHILE THE PUMP IS OPERATING. SERIOUS INJURY OR DAMAGE TO THE PUMP WILL RESULT.

ALWAYS CONNECT THE PUMP TO THE CORRECT POWER SOURCE USING PROPERLY INSULATED CONNECTORS. OPERATING THE PUMP WITHOUT PROPER ELECTRICAL CONNECTIONS CAN CREATE A SERIOUS RISK OF ELECTRICAL SHOCK.

INTRODUCTION

Register Your Guzzler

To validate your Guzzler warranty, go to <https://thebosworthco.com/register> to register your pump. You will need to enter your pump's serial number. Your pump's **serial number** can be found on the side of the pump gearmotor, as shown in Figure 1.

Assembling Your Pump

Your Guzzler G2 pump ships with the inlet and outlet manifolds disconnected from the pump and packed separately in the box. To assemble your pump, simply attach each manifold to either side of the two pump bodies by slipping the manifold with rubber flex couplers over the flanges of the pump bodies. (Figure 2) Secure the manifold to each pump flange with the included hose clamps to make a tight, leak-free connection.

Note that the inlet of each pump is the shorter of the two pump ports. (Figure 3). You can connect the manifolds to your pump so that the manifold end port (inlet or outlet) faces in either direction along the axis defined by the blue pump tubular housing (Figure 4). Choose an orientation for your inlet and outlet manifolds that best suits the orientation of your incoming and outgoing sap lines. The pump assembly rests on the inlet manifold and the blue metal leg.

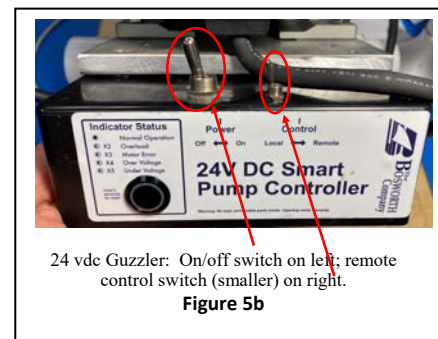
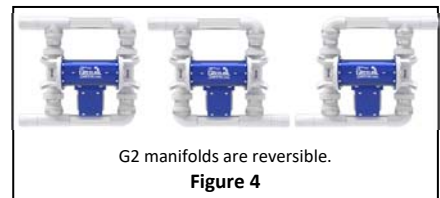
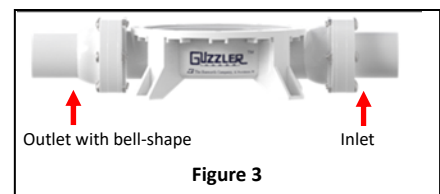
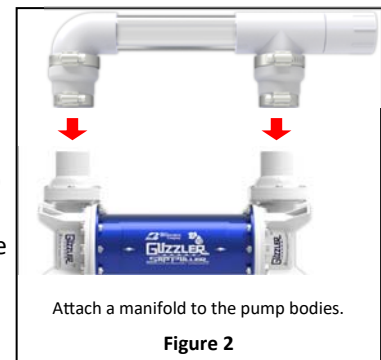
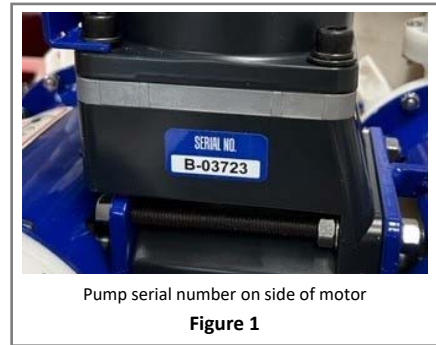
Power Requirements

Model	G2-0501N	G2-0503N	G2-0504N
Voltage	120 vac	12 vdc	24 vdc
Watts	90	90	100
Full load amps	1.44	9.4	5.0
Suggested Power Source	Household current or 1000 watt pure sine generator	One (1) 12 vdc battery, minimum 60 amp-hr	Two (2) 12 vdc batteries in series; minimum 60 amp-hr each

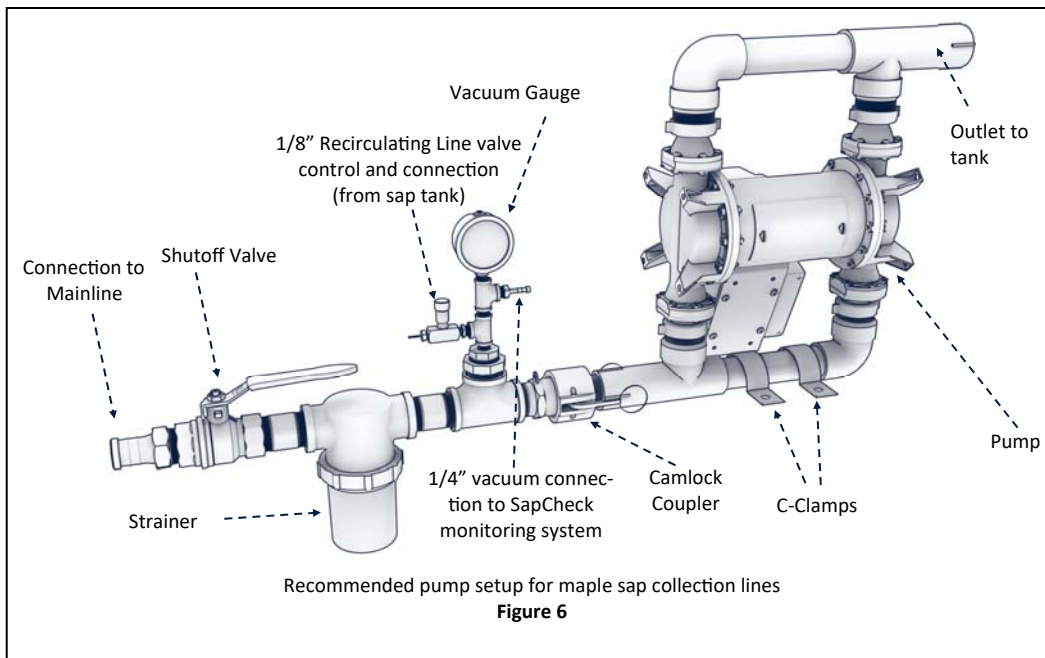
Test the Pump

Test your pump before installation at a sugar-bush.

1. Connect the pump to power
12 or 24 vdc pump: Connect the positive (red wire) on the motor to the positive terminal on the battery/power supply; connect the negative (black wire) motor lead to the negative terminal. Reversing these wires will blow the fuse located on the side of the junction box.
2. Turn the pump on
120 vac pump: On/off switch is on side of electrical junction box.
12 vdc pump: On/off switch is on side of electrical junction box. (Figure 5a.)
24 vdc pump: On/off switch is the larger of the two switches located at the top of the electrical junction box. **For normal operation, ensure that the smaller switch labelled "Control" is set to "Local".** (Figure 5b).
3. If you feel suction on your hand at the inlet manifold port and exhaust pressure on your hand at the outlet manifold port, the pump is operating properly.



PUMP SETUP



Note: Refer to Figure 6 (above) in the following discussion on pump setup for a maple sap application.

1) Securely Mount the Pump	Use the two C-clamps provided with the pump to secure the inlet manifold to a mounting surface. An additional mounting hole is located on the pump leg.
2) Protect the Pump from the Elements	Mount the pump in an enclosure that will prevent exposure to rain or snow.
3) Ventilate Pump to Keep from Overheating	If you install your pump in an enclosure, ensure that it provides adequate ventilation to prevent the pump motor from overheating.
4) Camlock Couplers between Pump and Mainline	Camlocks allow the pump to be easily disconnected from and reconnected to your mainline.
5) Install Shut-off Valve and Vacuum Gauge at Pump Inlet	Allows you to isolate the pump from your sap lines for trouble-shooting purposes.
6) Minimize Pump Back Pressure	Back pressure at the pump outlet will shorten diaphragm lifetime. To minimize back-pressure, install your Guzzler at or above your collection tank level. Avoid having the pump “push” sap up a vertical distance or through a long, small-diameter (less than 1-1/4 inch) outlet hose/pipe or through right-angle bends.
7) Strainer to Keep Foreign Materials and Ice from Entering the Pump	Early sap runs may contain small wood or plastic shavings that can foul or tear the pump valves or diaphragm. Install a strainer to keep such material from being drawn into the pump. Clean the strainer of any debris.
8) Recirculation Line for Best Vacuum	Guzzler pump valves seal best when wet. To achieve the best vacuum with your Guzzler, we recommend that you install a small (1/8”) recirculation line from your collection tank back to the inlet of the Guzzler (Figure 6). Regulate this backflow of sap by installing a small shutoff valve where the line connects to the inlet. When the pump is running, open the valve to allow a small amount of sap to flow back from the collection tank into the pump. This ensures the valves remain wet and seal optimally. With a recirculating line, some users have increased vacuum to as much as 28 in Hg (25 in Hg in 24 vdc pumps*)

*Note: Higher vacuums are possible with 24 vdc pumps but may require charging systems (e.g. solar) that keep batteries operating on the range 25.0-26.0 vdc.

Remote Operation for 24 vdc Guzzlers

The 24-volt Guzzlers are equipped with a remote activation option. The pump can be turned on/off manually or it can be remotely controlled by supplying a 3.3-volt signal to the remote-control interface connector on the side of the pump control box (Figure 7). (Consult the factory for more detailed information on this interface.) There are two switches on the top of the pump control box; the larger is the pump power switch and the smaller is the remote-control switch (Figure 8).

To manually turn the pump on/off, turn the **Control** switch to **Local** position and turn the **Power** switch to **On**. To turn the pump on/off using the remote-control interface, set the **Power** switch to **On** and turn the **Control** switch to **Remote**. The pump can now be turned on by an external device. Bosworth's **SapCheck**® remote monitoring product can be used to supply this signal and remotely control the pump.

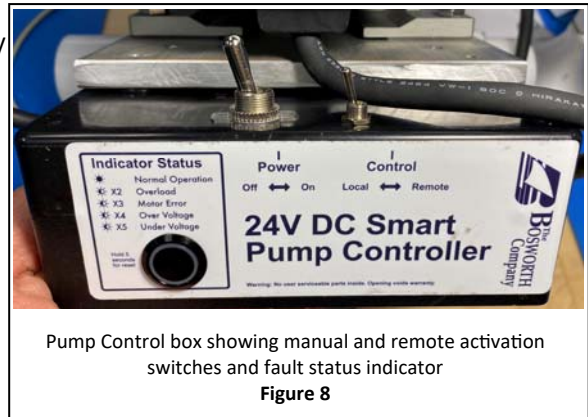


Remote Control Interface on side of Controller Box
Figure 7

TIPS FOR BEST OPERATION

Eliminate Leaks for Best Vacuum

Your Guzzler Pump can develop 19-28 in. of Hg vacuum, depending on whether the valves are dry or wet.* Because the Guzzler is a low-cfm (cubic feet of air per minute) pump, even very small leaks can prevent the pump from delivering its rated vacuum. Maintain your tap lines to keep your system tight and address problems that can cause vacuum leaks.



Pump Control box showing manual and remote activation switches and fault status indicator
Figure 8

Isolate the Pump to Find Cause of Vacuum Loss

If you experience a loss of vacuum in your system – as registered by the gauge near the pump – slowly turn the shut-off valve to isolate the pump from your mainline. **DO NOT SHUT THE VALVE SUDDENLY, AS PUMP DAMAGE MAY RESULT.** If the gauge begins to return to normal operating vacuum, then the pump is working properly, and the source of the leak is somewhere in your sap lines or taps. If the pump fails to recover normal vacuum, then the pump is the source of the problem. Inspect the pump diaphragms and/or valves for any holes or tears. In the case of the valves, check for and remove any material that may have entered a pump body and lodged in the valve, preventing the valve from proper opening and closing.

Keep Ice from Forming Inside Pump

Sap can freeze within the pump body. If the pump is turned on when there is ice in a pump body, it will result in damage to various pump components, including the pump body, valves and diaphragm. If there is a risk of freezing conditions, disconnect the pump from your sap lines when the pump is not running and drain any excess sap from the pump. Alternatively, some users install a small heat lamp in the enclosure with the pump to prevent ice from forming when the pump is not operating.

Drain Sap if Removing Pump from Mainline

To shut off and disconnect the pump from the mainline, first slowly close the shut-off valve to isolate and maintain any vacuum in the mainline. Then, turn the pump off. Disconnect the pump from the mainline, using Camlock Couplers if you have used these for your pump-to-mainline connection. Turn the pump back on briefly to flush any remaining sap from it. Finally, tilt the pump to drain any remaining sap.

*Note: Maximum vacuum for 24 vdc G2 pumps is generally limited to no more than 25 in Hg unless the pump is powered by a slightly higher (25-26 vdc) voltage power source.

MAINTENANCE - CHANGING A DIAPHRAGM

Over time, the elastomer components of the pump (i.e., the diaphragm and valves) will fail. If a diaphragm fails, the pump may continue to develop some vacuum (depending on the size of the hole/tear), but it will be significantly reduced. You may see sap leaking from the diaphragm through either weep hole on the underside of the tubular pump housing. If this happens, the diaphragm should be replaced.

When replacing the diaphragm, pay close attention to the orientation of various parts. The use of witness marks may be helpful during reassembly.

Tools Needed: Philips Head Screwdriver, Flat Head Screwdriver

Materials Needed: Blue Loctite 242

Removing a Diaphragm

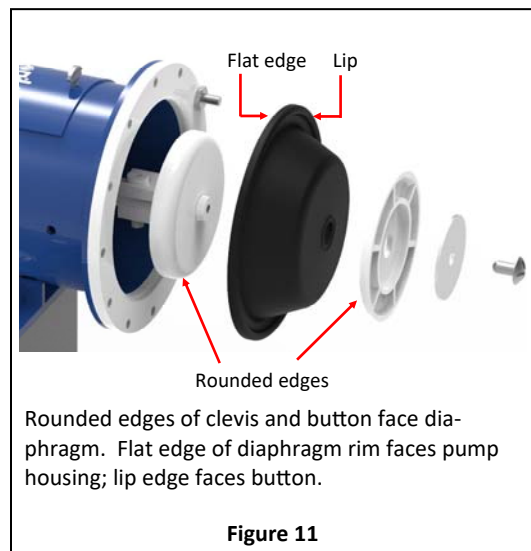
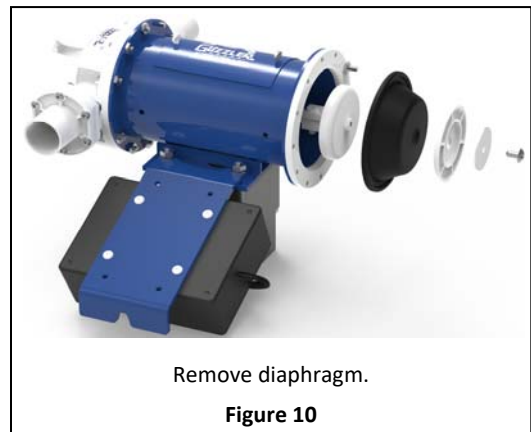
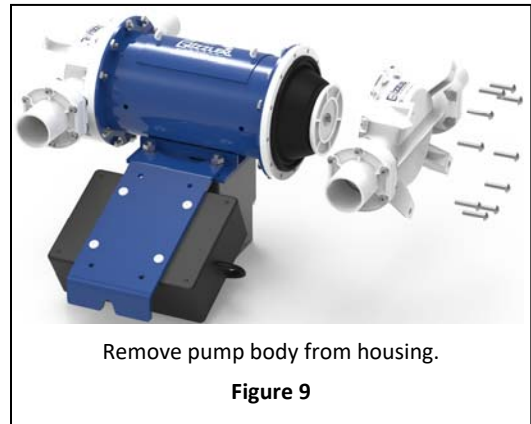
1. Disconnect the power.
2. Remove the pump/motor assembly by loosening the hose clamps on the flex couplers holding the manifolds to the pump flanges.
3. Pull the pump/motor assembly from the inlet and outlet manifolds.
4. Place the pump/motor assembly with the motor in a vertical position (Figure 9).
5. Remove the 10 screws holding the pump body to the housing (Figure 9)
6. Remove the pump body to expose the diaphragm screw attaching the plastic “button” (a plastic support plate) to the diaphragm.
7. Pull the diaphragm out to its maximum travel. Remove the slotted head screw, washer, button and diaphragm from the plastic clevis. (Figure 10)

*Note: If you plan to change the valves, do so now. Go to **Maintenance—Changing Pump Valves**, otherwise, go to **Installing a Diaphragm**.*

Installing a Diaphragm

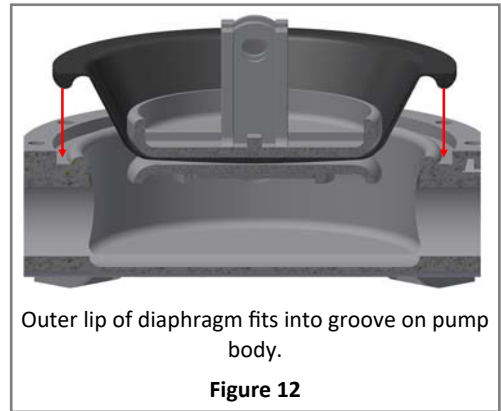
1. Place the new diaphragm onto the base of the plastic clevis, ensuring it is seated on the raised central boss; install the button (rounded edge toward diaphragm) and stainless steel washer.

Note: Place the diaphragm on the clevis so that the “lip” running along the diaphragm's circumference is facing toward you. (Figure 11)
2. Apply blue Loctite to the diaphragm screw. Secure the above with the diaphragm screw, tightening it to **35 in-lb** of torque. (Using blue Loctite on the screw helps ensure it does not loosen during pump operation, but will still allow you to remove the screw if the diaphragm needs to be replaced.)



Installing a Diaphragm

3. Place the pump body up against the diaphragm and align it with the holes in the housing. The diaphragm's outer lip should sit in the groove running around the circumference of the pump body (Figure 12).
4. With the pump body outlet port facing up, fasten the pump body to the housing using the 10 screws and nuts. Start all screws and nuts before tightening them down. When everything is aligned, tighten screws to a maximum of 30 in-lbs of torque. Tighten screws evenly in a crisscross pattern.
5. If necessary, repeat from step 5, **Removing a Diaphragm**, for the other pump body diaphragm.
6. Re-attach the pump/motor assembly, connecting the pump flanges to the manifolds, and tighten all hose clamps on the flex couplers.



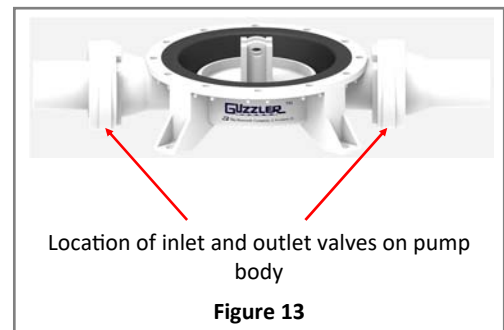
MAINTENANCE - CHANGING PUMP VALVES

Pump Valves

Each pump body in the Guzzler G2 SapPuller pump features a pair of valves (total of 4 per pump assembly). A valve is fastened between the pump body and each of its inlet and outlet ports. (Figure 13)

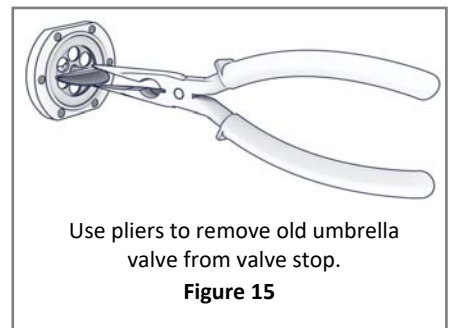
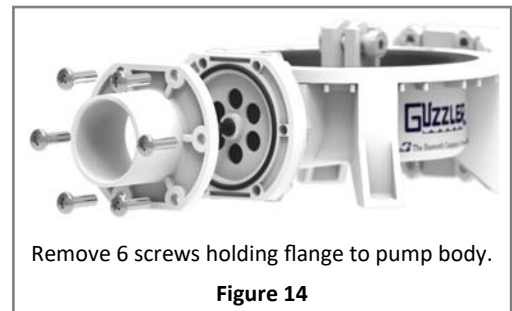
Valves are typically replaced in pairs; i.e., the inlet and outlet valve of a given pump body are replaced at the same time.

When replacing a pair of pump valves, it is best that only one valve is removed and replaced before attempting to remove and replace the other valve.



Removing the Valves

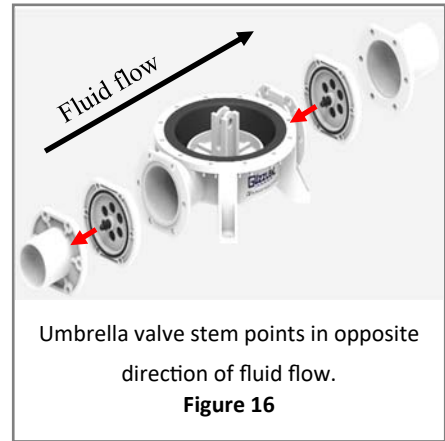
1. Follow steps 1-5 in **Removing a Diaphragm** if not already done so.
2. Remove the 6 screws holding the inlet flange to the pump body. The umbrella valve is located between this flange and the pump body, inserted in a valve stop (Figure 14).
3. Remove the umbrella valve with a pair of pliers, pulling the flat of the valve until the stem is pulled through the valve stop center retaining hole (Figure 15).
4. Inspect the valve for any tears. Inspect the valve pores and remove any dirt or material that may have become lodged in the pores. Inspect O-rings for any sign of wear and replace as necessary. Ensure that they are correctly installed in the grooves of the valve stop.



MAINTENANCE - CHANGING PUMP VALVES / TROUBLESHOOTING

Installing the Valves

1. Insert the stem of the new umbrella valve (or the inspected and cleaned old valve) into the valve stop center retaining hole. Use pliers to grasp the stem of the valve on the other side and pull it completely through until it snaps into place.
2. Position the valve stop between the pump body and the pump inlet flange, taking care to orient it with the valve stem pointing in opposite direction of fluid flow and the valve flat toward the pump (Figure 16). Fasten the pump flange and the valve stop to the pump body using the flange screws.
3. Repeat from step 2, **Removing the Valves**, this time with the outlet side of the pump. When installing the umbrella valve on the pump outlet, be sure that the valve is oriented with the flat side of the rubber facing away from the pump body and toward the outlet flange.
4. Re-install the pump body to the housing.



NOTE: IF THE VALVES ARE NOT ORIENTED CORRECTLY IN THE PUMP FLANGES, THE PUMP WILL NOT FUNCTION PROPERLY AND COULD BE DAMAGED UPON OPERATION.

TROUBLESHOOTING

PROBLEM	WHAT TO DO
<i>"I'm only getting 19-20 in Hg vacuum at the pump. How can I get more?"</i>	Pump valves seal better when wet. When dry, the pump valves will generally produce 19-20 in Hg vacuum. If the valves are wet, their improved sealing can create up to 28 in Hg vacuum (25 in Hg for 24 vdc pumps) on leak-free sap lines. Installing a recirculation line from your sap tank back into the inlet of the pump will help keep the pump valves wet and maximize pump vacuum. (See Pump Setup—Recirculation Line for Best Vacuum).
<i>"The pump was working fine and then stopped."</i>	Inspect your power source to ensure that it is providing sufficient power. (For 24 vdc pumps, if the reset button is flashing, consult the 24 vdc Pump Motor Protection Fault Table for more specific information on the nature of the problem.) Ensure that you have provided adequate ventilation for the motor. The motor is thermally protected and will shut down if overheated. If this happens, allow the motor to cool down before restarting. Special note for 24 vdc pumps: These pump motors have built-in protection to guard against excessive load conditions, as can occur if the pump is pulling a vacuum in excess of 25 in Hg. Even if the batteries are fully charged, the motor controller may determine that there is insufficient voltage available to support the load on the motor. In some cases, keeping the batteries charged (as can be done, for example, with a solar recharging system) and operating on the range 25.0-26.0 vdc can provide sufficient power to support loads generated by vacuums on the range 26.0-28.0 in Hg. If this is not practical, then it is recommended to reduce the vacuum that the pump is pulling to a maximum of 25 in Hg so that the pump will continue to operate until the batteries have discharged to the point of providing only 18-20 vdc. Limit the maximum vacuum by using a vacuum/pressure relief valve as available from suppliers like Grainger (www.grainger.com , Item # 5Z763).
<i>"My motor is very hot. Is something wrong?"</i>	A properly operating motor can be uncomfortably hot to the touch. Even with adequate ventilation, the pump can develop a motor surface temperature that may exceed 160°F (70° C). This alone does not indicate anything is wrong.

PROBLEM	WHAT TO DO
<i>"I've got little or no vacuum on the gauge at my pump."</i>	<p>If you have installed a shut-off valve in front of the vacuum gauge, slowly turn the valve to the off position to isolate the pump from your sap lines. If the vacuum gauge goes back up, then the pump is operating properly and you should check your lines for a leak.</p> <p>If the vacuum gauge doesn't go back up, then inspect the pump to see if sap is leaking around the diaphragm. Leaking sap indicates a diaphragm is torn or has developed a hole. If the diaphragm is leaking, replace it.</p> <p>If no sap is leaking from the pump diaphragm, disconnect the pump from your sap lines. With the pump turned on, place your hand over the inlet/outlet of the pump to determine if you can feel pump suction at the inlet and exhaust pressure at the outlet. If you do not feel the suction and pressure for a pump, and there is no tear/hole in the diaphragm, then inspect the inlet and outlet valves. Remove any material that might be preventing the valves from opening/closing properly. If the valves are torn or worn, replace them.</p>
<i>"My pump is frozen. Should I start it up?"</i>	Do not start a pump if you suspect there is ice in the pump body. Starting a pump when there is ice in the pump body could tear the pump diaphragm and/or damage the pump body. Allow the pump to thaw before restarting.
<i>"I've got good vacuum at the pump and there's sap in the lines, but nothing's going into my tank."</i>	If you have installed a filter near the inlet of the pump, check the filter screen to ensure that it is not clogged with foreign material. A clogged filter will reduce or completely prevent sap flow through to the pump.
<i>"Sap occasionally sloshes back and forth in my sap lines. Is something wrong with the pump?"</i>	If you have good vacuum at the pump, this back-and-forth motion of the sap may be the natural result of the pressure inside the trees dropping to the point where it cannot push the sap out into your tap lines. This can happen as the temperature drops. When tree pressure increases, the sap will begin flowing toward the pump again, often surging for a period of time.
<i>"I'm trying to run my 120 vac Guzzler on my generator, but it keeps shutting off."</i>	The 120 vac Guzzlers can be run on a generator, but the generator must be providing a pure sine wave AC voltage signal. Many older generators truncate the signal. While some equipment can tolerate these distortions in power, the motors on the 120 vac Guzzlers will not. They can cause the motor to run inefficiently, resulting in overheating. The motor's internal thermal protection sensor will then automatically shut the motor off to prevent damage.
<i>"My battery is fully charged, but my 12 vdc pump won't turn on."</i>	The 12 vdc brushless motor is rated for operation at temperatures as low as 28 deg F. Below 28 deg F, the pump will not start. Be sure the motor is at or above that temperature before trying to start it.



24 vdc Pump Motor Protection Fault Table

Protection Function	Number of Reset Button Flashes	Possible Causes
Overload protection	2	When a load in excess of the rated motor torque is applied to the motor for approximately 5 seconds or more
Motor sensor protection	3	When the sensor cable in the motor cable is disconnected
Over-voltage protection	4	When voltage applied to the driver has exceeded the voltage setting (24 vdc) by 15% or greater
Insufficient voltage protection	5	When voltage applied to the driver is less than the voltage setting (24 vdc) by 25% or greater
Overspeed protection	6	When motor speed has reached an excess of 3500 rpm. Can also be triggered when pump is pulling excessive vacuum (>25 in Hg.)

REPLACEMENT PARTS

Guzzler replacement parts are available from authorized Guzzler pump dealers. Additionally, parts are available on the company website at www.thebosworthco.com.

Each pump has a replacement parts page that shows an exploded view of the pump along with a listing of all parts in the view. The following table provides the URL addresses of the double diaphragm pump replacement parts pages, as well as their corresponding QR codes to scan for immediate access.

Pump Model	Replacement Parts Web Page	QR Code
G2-0501N	https://thebosworthco.com/products/replacement.php?baseid=G2-0501N-0&settab=2	
G2-0503N	https://thebosworthco.com/products/replacement.php?baseid=G2-0503N-0&settab=2	
G2-0504N	https://thebosworthco.com/products/replacement.php?baseid=G2-0504N-0&settab=2	