INSTALLATION INSTRUCTIONS FOR THE MOTORIZED SIMPLE PUMP SYSTEM

(WEATHER RESISTANT LINEAR BEARING LINK DRIVE OPTION)

LAST UPDATED: June 2, 2023

(The following instructions are very detailed, and should tell you everything you need to know. If you have questions, please phone 877-492-8711, ext. 6)

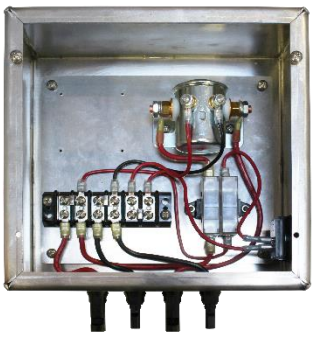

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TABLE OF CONTENTS

INTRODUCTION

Thank you for purchasing a Simple Pump gear motor assembly. This Motorized Pump with Linear Bearing Link Drive (LBLD) is designed for use with the Simple Pump model 100, 125, and 200 hand pumps. When installed with the Model 100, it delivers up to 1.0 GPM from a total dynamic head (TDH) limit of 225 feet (24V) or 200 feet (12V). When installed with the Model 125, the gear motor is capable of delivering up to 2.0 gallons of water per minute (GPM) from a total dynamic head (TDH) limit of 150 feet (24V) or 125 feet (12V). When installed with the Model 200, it delivers up to 4.5 GPM from a total dynamic head (TDH) limit of 60 feet (24V) or 50 feet (12V). See detailed limits below.

The linear bearing link drive translates the rotary action of the 12 or 24 VDC gear motor to move the pump rod up and down on a precision ground and polished stainless shaft guided by two linear TEFLON bearing carriers.

The Motorized System weighs about thirty (30) pounds, so depending on your level of strength, you may want to perform this installation with a helper.

SPECIFICATIONS

WHEN POWERED WITH 12V DC

Motor Rating	.140 HP continuous
Gear Ratio	30:1
Output Torque	154 in/lbs. continuous
Output Torque Maximum	175 in/lbs. @56RPM @ 16.3 amps
Nominal Output RPM	57
Efficiency	59.5%
Full Load Motor Current	14.6 amps
Allowable Voltage Range	11.5 to 15 VDC
Typical temperature of casing, operating in 72°F ambient	110° Fahrenheit

WHEN POWERED WITH 24V DC

Motor Rating	.151 HP continuous
Gear Ratio	30:1 @ 91.0% efficiency
Output Torque	195 in/lbs. continuous
Output Torque Maximum	400 in/lbs. @45.9RPM @ 16.63 amps
Nominal Output RPM	60.1
Efficiency	64.24%
Full Load Motor Current	7.32 amps
Allowable Voltage Range	24 to 30 VDC
Typical temperature of casing, operating in 72°F ambient	110° Fahrenheit

RECOMMENDED OPERATING ENVIRONMENT AND APPLICATIONS

AMBIENT TEMPERATURE

DC motors operating in ambient temperatures above 100°F lose operating efficiency -- the hotter the ambient temperature, the less efficient. If the temperature at the planned site regularly peaks above 100°F, we recommend operation of the motor in shade. The component box needs to be mounted near the batteries and out of the sun in a protected environment as it contains electrical equipment.

CONSISTENT SOURCE OF DC POWER

As with any DC motor, precaution must be taken to prevent operation under low voltage conditions -- below 11.5V with the 12VDC model, 23.5V with the 24VDC model.

RECOMMENDED PUMPING CONFIGURATION

The DC powered Simple Pump is an integrated, standardized system that will provide water within a specified head limit. This head limit is based on the pumping cylinder that is used. Please see the table below for the different head limits. The Total Dynamic Head (TDH) is a combination of up to three factors, not all factors apply to every installation.

1. The lift from the static water level. (Example - 85')
2. Any vertical distance from the well head. (Example – 15')
3. Any pressure that is being pumped (1 PSI = 2.31', 45PSI ≈ 100')

When calculating your TDH, evaluate your specific application and determine how many of the three you need to account for in your application.

See example below. The well has a 78' static water level, the water is being lifted an additional 16' above ground level, and is being pumped into a pressure tank. This particular application would require the 100CA, and we would suggest the 24V system to account for any potential drops in static water level.

Static Water Level – 78'

Additional Vertical Lift – 16'

Pressure – 100' (45 PSI)

Total Dynamic Head (TDH) – 194'

Cylinder Assembly	24VDC TDH Limit	12VDC TDH Limit
100CA	225'	200'
125CA-82515	150'	125'
200CA	60'	50'

Please evaluate your application to ensure that it fits within the limits of the system. If your desired application exceeds the limits of our system, there are alternative ways to meet your goals. The best way to reduce the TDH on our system is to find an alternative way to pump into pressure. Using an ambient (i.e. non-pressurized) storage tank along with a small DC powered transfer pump will allow you to pump the water into your pressure tank. The Simple Pump would be used to bring water to the surface and fill the ambient tank. The transfer pump would pump the water from the ambient storage tank into the pressurized system.

Since needs for tank volume and pumping capacity will vary greatly, we do not provide the ambient tank or transfer motor.

Tanks: See the range of Bushman drinking water storage tanks, on the bottom of the following web page: https://www.loomistank.com/homeowners

Transfer pump: Pumps designed specifically for this job are available from a number of vendors, e.g. Dankoff, Surflo and Jabsco. Price range depends on the manufacturer and model, anywhere from $150-$1000.

This configuration raises the overall reliability and longevity of the system. Transfer pumps include an integrated pressure switch. The switch turns the transfer pump on and off, according to a target pressure. If you are able to use the Simple Pump to pump into pressure, we STRONGLY suggest that you wire in a pressure switch to control the ON/OFF state of the system. If the pump is not controlled in this way and is left on, it could exceed the allowed pressure and potentially damage both the pressure tank and/or the Simple Pump gear motor. If you have any questions or concerns about your application and the limits explained above, please call us at 877-492-8711, extension 6.

UNSUPPORTED APPLICATIONS

Operating the Motorized System (LBLDWR Option) in certain configurations voids its warranty.

- Exceeding the rated total dynamic head limit of the Motorized System.
- Directly connected to batteries without a low voltage disconnect that prevents the supply of current below 11.5V or 23.5V, depending on whether the motor accepts 12VDC or 24VDC as input.

SUPPLYING POWER RELIABLY

The task of supplying power above the 11.5V and 23.5V (for 12VDC and 24VDC systems) thresholds is more complex than many anticipate, particularly with solar-powered systems. Most configurations using the Simple Pump Motorized System are powered by batteries being charged by solar panels, only solar is discussed in this section.

Keeping voltage above 11.5 or 23.5 volts seems simple: Provide enough power, with a device to regulate its delivery. However, a number of factors influence what constitutes "enough power" when considering how to configure an off-grid application:

- Days of autonomy: The total number of days the system must provide power without sunny days, in the worst-case scenario. For example, if the system will be used throughout the year, with expected water usage the same throughout the year, the radiation expected on the winter solstice is used to for the worst-case calculation.
- Solar radiance: Factor in both how far north (latitude) and expected cloud cover.
- Daily water used. If more water is used when radiation levels are higher -- e.g., more for gardening starting in March -- then projected water consumption must be compared against expected radiation at multiple points in time throughout the year.
- Location: Separate from how much solar radiance a location receives, those north of 45˚N (about as far north as Columbus, Ohio, should also have a system that can be pivoted manually, to account for the sun's much lower angle in the sky in winter.
- Distance between power source and consuming machine.
- Worst-case cold: If batteries are used, requirements can jump up to 1.6 times more than would be required in a warm climate.

PROFESSIONAL HELP?

If this is more complex than you planned, there are alternatives.

Anyone with NABCEP (North American Board of Energy Practitioners) certification, *and* experience configuring off-grid systems, is almost certainly qualified to help. However, while all NABCEP-certified professionals must learn about off-grid systems, most pursue grid-tie solar systems -- a very different field. This is why it is important to ask about recent experience.

SECTION 1: UNPACKING AND TOOLS REQUIRED

Carefully remove the cables, LBLD control box, LBLD assembly, pump rod extension, bolts and fuses (in poly bag) from the shipping box.

CONTENTS OF BOX

(1) LBLD Assembly, with aluminum gear motor cover and linkage cover

(1) 9” x 9” Control Box (solenoid, fuse blocks, and terminal block)

(2) Control box mounting brackets

(4) 10-32x3/8” Stainless bolts for control box mounting brackets

(2) 12’ load cables (red/black) w/ MC4 connectors

(2) 4’ battery cables (red/black) w/ MC4 and loose ring connectors

(1) 3/4” x 13" stainless steel pump rod extension

(4) 1/4-20 x 3/4" SS SHCS fasteners for mounting the LBLD to the pump head

(4) 25A (12V) or 15A (24V) ATO/ATC prong style fuses (spares)

TOOLS REQUIRED

(4) Allen wrenches: 9/64", 3/16", 5/16"

(2) Channel lock pliers

(1) Medium Phillips screwdriver

SECTION 2: POWER SOURCE AND CONTROL BOX INSTALLATION AND STORAGE

POWER SOURCE RECOMMENDATIONS

The recommended power source for our motorized systems are deep cycle batteries. The system is not designed to run panel direct, meaning that you cannot directly connect the output of the panels to our motorized system. If you would like to use AC power to run the system, you have the option to use an AC to DC Converter. If your system is 12VDC make sure the converter you select is rated to handle 25A. If your system is 24VDC make sure the converter you select is rated to handle 15A.

LOCATION AND STORAGE

To avoid increased voltage drop we recommend that the power source and control box be located as close to the well head as possible. We provide two sets of cables with this system. The cables to connect the batteries to the control box are 4' long, so you will need to make sure the control box is within close proximity to the batteries. The cables to connect the control box to the motorized system are 12' long, so the location of the batteries and control box need to be within this proximity to the motorized system.

Regardless of which power source is used, both that source and the control box will need to be in protected storage. Storage should protect the power source and control box from the elements including, rain, snow, and direct sunlight. NOTE: The control box is mildly weather resistant, but definitely not weather proof.

SECTION 3: LBLD ASSEMBLY PREPARATION

Using the 9/64" Allen wrench, remove the six screws that attach the linkage cover. Set it to the side, it will be installed later. Cut the zip tie that is securing the clevis, this was for shipping purposes only.

SECTION 4: PREPARING YOUR EXISTING PUMP

Your Simple Pump Hand Pump should already be installed and pumping water without any binding and with an overall smooth operation prior to attempting to install this gear motor.

You should confirm that your pump is delivering at least one gallon of water when using the lever arm assembly; approximately 25 complete strokes (model 100), 15 complete strokes (model 125), or 6 complete stokes (model 200).

Starting with a fully-functional lever-arm pump, what follows are the step-by-step installation instructions.

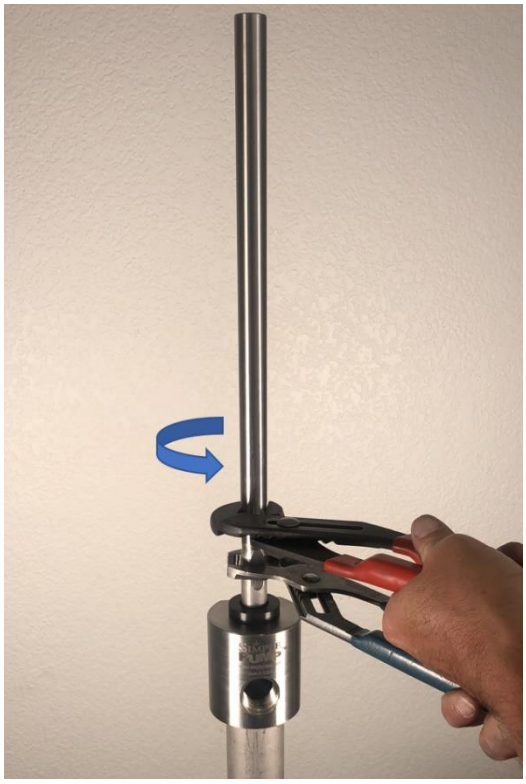
REMOVE THE LEVER ARM MECHANISM

Using the 3/16" Allen wrench, remove each of the four fasteners holding the lever arm mechanism to the pump head.

Remove the lever arm bracket and lever (they should still be connected) from the 3/4" stainless rod. These are reverse threads, the direction you screw is the opposite of normal -- turn clockwise to remove, rather than the normal counterclockwise.

Before adding the 13” Rod Extension you will need to verify the height of the existing Pump Rod. With the Pump Rod at the bottom position measure from the Rod Gland to the base of the threads on the Pump Rod. The Pump Rod will need to sit somewhere between level with the Rod Gland and 2.5” above it.

If the measurement is above 2.5”, it means that the lift rod protrusion above the top drop pipe was above the 4”-6” range specified in the hand pump installation instructions. In the event this needs to be fixed, please reference the hand pump installation instructions for details on how to make the adjustment.



Add the 13” Rod Extension to the top of the existing pump rod. As mentioned above, these are reverse threads so you will go counterclockwise to tighten. Use the two channel locks to tighten.

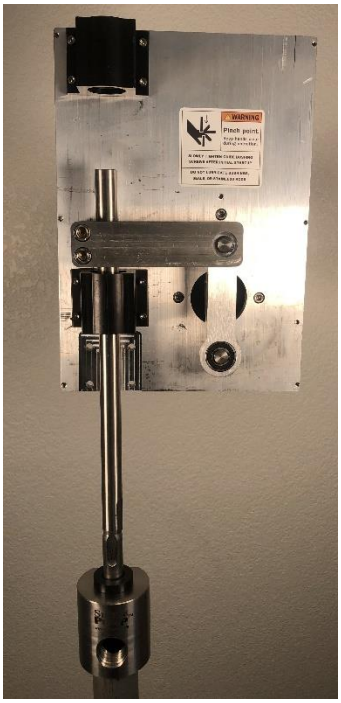
NOTE: When using the Motorized System, like with the Hand Pump, half of the Riser Tube must be below the well cap. This means that when using the PHA2 only 12” of Riser Tube can be showing above the well cap, when using the PHA47, only 24” can be showing.

SECTION 5: INSTALLATION

NOTE: The Motorized System weighs about thirty (30) pounds. We suggest that this portion of the installation be done with a helper.

Make sure the orientation of the unit is correct before taking the next step. The cabinet portion of the unit faces away from the pump head. The bottom of the unit is where the two MC4 style plugs are mounted.

The clevis will need to be in the bottom position for the installation. It is in the bottom position when the dog bone overlaps the crank arm fully as shown in the image to the right, circled in red.



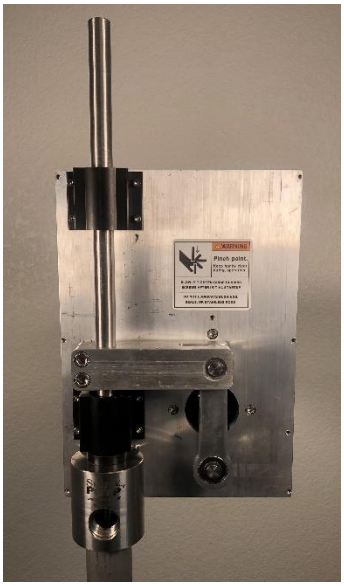
Lower the assembly onto the pump head so that the pump rod and extension are inserted through three (3) openings. As the unit is lowered down, the rods move through the below pieces, in order.

- The lower linear bearing
- The clevis
- The top linear bearing

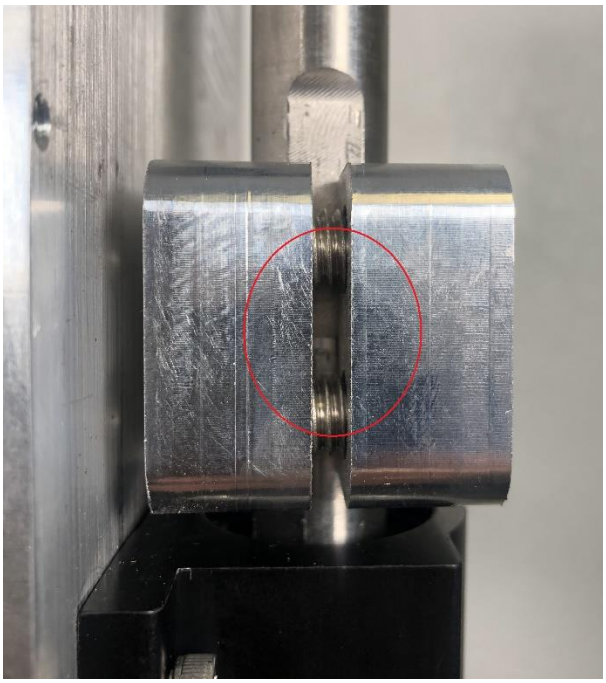
The tolerances are tight between the clevis ID and the shaft OD. You may need to wiggle the yoke while lowering the unit to get it to drop all the way down.

There is a 1/4" of space between the bearing housing and the top of the rod gland when the holes are fully aligned. The rod gland is the topmost exposed component on the pump head.

Screw the four 1/4-20x3/4" SS SHCS mounting bolts through the holes just aligned, fastening the mounting plate to the pump head.



This next step is very important. We will need to make sure the piston is in the correct position. To do this, grab the portion of the 13” rod extension that is sticking out of the top of the unit and pull up. The ideal location for the joint between the standard pump rod and the 13” extension is in the middle of the clevis, as shown in the photo to the right, circled in red. If your rod to pipe ratio is correct, you should need to lift the rod up to get it into the position explained above.



It may be necessary to wiggle the clevis in order to move the rod upward. With deeper static water levels, it could take a fair amount of force to lift the rod.

Then, using a 5/16" Allen wrench, tighten the two stainless steel socket head cap screws on the clevis. This pinches the clevis to the stainless rod. These need to be VERY tight. You will notice when you tighten one and move to the other it will appear loose. Keep tightening in sequence until both are tight.

SECTION 6: ALIGNMENT

The next step is to check/adjust the alignment of the pump rod with the linear bearings and the mounting plate. Completing this alignment will prevent any binding between the linear bearings and the pump rod.

Make sure all eight (8) 8-32x1/2 SS socket head cap screws that hold the top and bottom linear bearings to the mounting plate are loose. We won't tighten these fully until the alignment process is complete.

Remove the four (4) 8-32x1/2 SS socket head cap screws that are holding the top linear bearing in place. This step ONLY needs to be performed on the TOP linear bearing. Once removed compare the placement of the holes in the linear bearing with the holes threaded into the mounting plate. See image.

If these holes do not line up, it will likely be that the holes in the mounting plate are to the right of the holes in the linear bearing, as shown in the picture to the right. You want them to be lined up like the image to the bottom right with the green check mark.

The adjustment for this requires that you loosen the four (4) ¼-20x3/4 SS cap screws holding the unit to the pump head. Lift up on the bottom right corner of the mounting plate slightly and tighten the four mounting bolts. Check the alignment between the holes in the top linear bearing and the mounting plate again. Make as many adjustments as necessary to get the holes lined up like the image to the right.

Once alignment is verified make sure the ¼-20x3/4 SS cap screws holding the assembly to the pump head are fully tight. You can now put the four (4) 8-32x1/2 SS cap screws back into the top linear bearing. At this point just make these screws finger tight.

We will do final alignment adjustments in Section 7 below.

SECTION 7: ELECTRICAL CONNECTIONS

There are two different sets of cables provided with this system; battery and load.

CAUTION: MAKE SURE THAT THE ON/OFF SWITCH IS IN THE OFF POSITION WHEN MAKING ALL ELECTRICAL CONNECTIONS. THE SWITCH IS OFF WHEN THE BOTTOM IS DEPRESSED AND ON WHEN THE TOP IS DEPRESSED. THERE ARE PINCH POINTS IN THIS SYSTEM. EVEN IF YOU ARE CERTAIN THE SWITCH IS IN THE OFF POSITION, MAKE SURE THAT ALL PINCH POINTS ARE CLEAR.

BATTERY:

This will create a connection between the control box and the battery or batteries. The control box will need to be installed close to the battery(s), as the cables are only 3' long. Use the red cable to connect to the positive terminal on the battery and the black cable to connect to the negative terminal on the battery.

LOAD:

This will create a connection between the control box and the LBLD unit. When the rocker switch on the control box is in the on position it will provide power to the LBLD unit. Use the two (2) 12' cables for this connection. Use the red cable to connect the two positive leads and the black cable to connect the two negative leads. As mentioned above, even if the switch is in the off position, make sure all pinch points are clear.

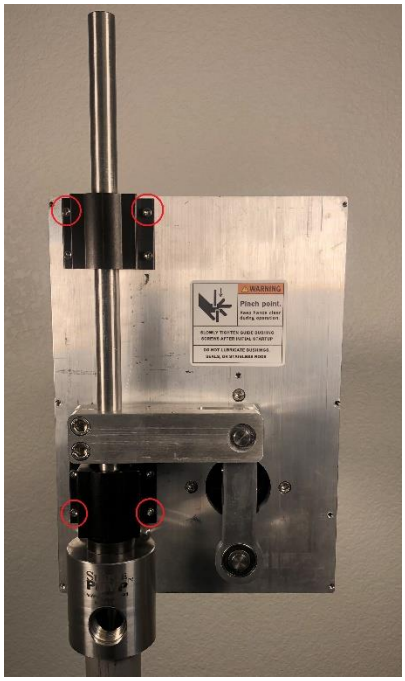
The LBLD should now be fully powered!!!

CAUTION: Provisions need to be made in your power supply to prevent operation of the motor when voltage is below 11.5VDC (12VDC System) or 23.5VDC (24VDC System), such as when the battery is nearly discharged. This is up to you or to the professional you hire.

SECTION 8: OPERATION

Now that the initial alignment is complete and the power has been connected, we can perform the initial startup. During the initial startup we will verify the alignment and tighten the linear bearings for the break in period.

NOTE: During the first startup and break-in period, leave the pump outlet open or pump through a short drinking-water quality garden hose unrestricted. We recommend a break-in period of 6 hours. Make sure your power source can provide adequate power for the break-in period.

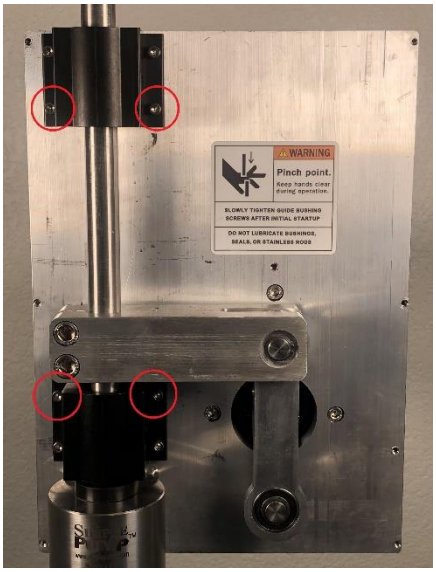


CAUTION: The first startup will be done without the cover installed. This will expose pinch points so use extreme caution.

Turn the switch to the ON position. The unit should start to run. Let it run until you start to produce water. Once it is producing water you will need to tighten the screws on the linear bearings. We do this while the unit is running as it will center the linear bearing to a natural, non-binding position. BEWARE OF THE PINCH POINTS FOR THIS NEXT STEP. While the unit is running, tighten the top linear bearing first, only tighten the top two screws to avoid pinch points. Next, tighten the lower linear bearing, only tighten the bottom two screws to avoid pinch points.

Let the system run for about 5 minutes then turn it OFF and follow the two steps listed below.

1. DO NOT DO THIS STEP WITH THE SYSTEM RUNNING. Check the temperature of the pump rod that is sticking out above the unit. If it is ambient or a little warmer than ambient move to step two. If it is really hot there is a binding issue and you need to go back to the alignment step and re-verify. If you have verified and it continues to get really hot, please contact our technical support.
2. Tighten the remaining loose screws on both the top and bottom linear bearings, there should be four (4) left to tighten.



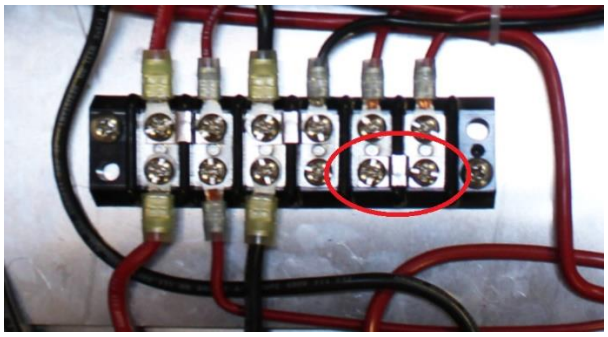
Attach the cover to the LBLD mechanism. Use your 9/64" Allen Wrench for the six (6) 8-32 SS SHCS that attached the cover to the mechanism's mounting plate.

Start the system again and begin the 6-hour break-in period. During the break-in period, leave the pump outlet open or pump through a drinking-water quality garden hose unrestricted.

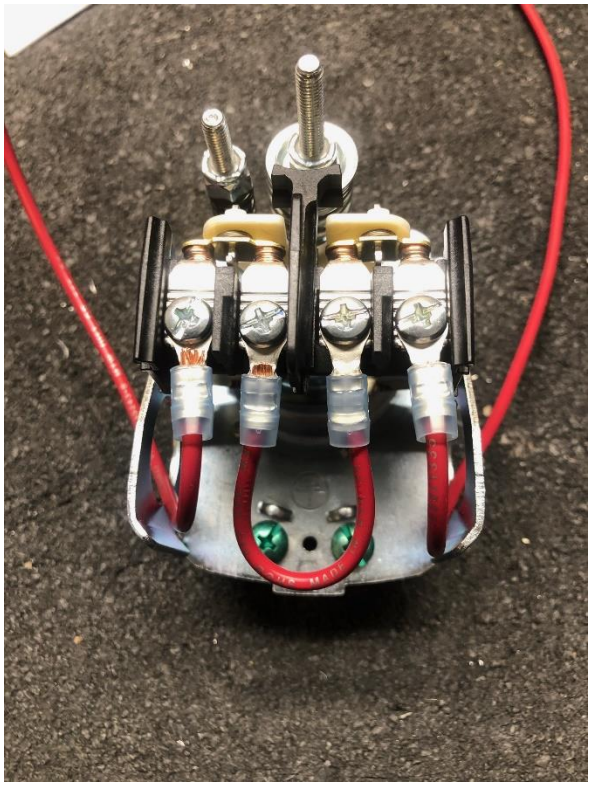
SECTION 9: INSTALLING A FLOAT OR PRESSURE SWITCH

If you are planning to utilize a float or a pressure switch, please follow the instructions below. Make sure to verify if pumping into pressure will work with your well specifications, you can find details in the RECOMMENDED PUMPING CONFIGURATION section on page 3.

With any float or pressure switch there should be a supply and return wire. This means there will be two wires. We have made it very easy to integrate these into our system. Inside the control box you will see a terminal block. There is currently a jumper on the bottom two most right terminals of the terminal block. Simply remove the jumper from the terminal block and add the supply wire to the left terminal and the return wire to the right terminal. See image below. The switch is now integrated.



If you are planning to integrate a pressure switch you can use a standard pressure switch. When using DC voltage, you can simply jumper the two middle terminals and add your supply wire to one of the outer terminals and the return wire to the other outer terminal.



Always consider the distance from the pressure switch to the control box when selecting the gauge of the wire you are going to use. A general rule of thumb can be found below.

1’ – 10’	16 gauge
11’-25’	14 gauge
26’-75’	12 gauge
> 75’	Utilize Voltage Drop Calculator found online

SECTION 10: TROUBLE-SHOOTING

BLOWING FUSES

As long as the gear motor system is pumping correctly and not causing the motor to overload, no maintenance is required. If the mechanism experiences a bearing failure for any reason, the motor protection fuse will blow. It is extremely important to replace the fuse with only a 25 amp ATO/ATC automotive style fuse (if 12VDC version), or 15 amp ATO/ATC automotive style fuse (if 24VDC version). Using a higher amperage fuse will overheat the motor and damage the gears. The motor normally operates at around 100-110º F.

If the fuse has blown for any reason, remove the cover. Go back to the Alignment section

If the system continues to blow fuses after verifying the alignment, remove the motor mechanism and stroke the pump rod by hand. It should require about 40 lbs. of lifting effort for each 100 feet of static water level depth. If the effort is any more than this, something is binding in the pump system and it is not an issue with the drive system. Please reference the troubleshooting section of the pump installation instructions.

UNIT WILL NOT TURN ON

If the unit will not turn on there is likely an electrical issue, see a list of potential causes below. Make sure to disconnect the connection to the battery ground terminal before performing the steps below.

1. A fuse is blown and needs to be replaced. There are two fuse blocks, check both fuses and replace any that are blown. Reconnect battery ground connection and turn the system on.
2. The battery or batteries are low on voltage. Use a volt meter to check the voltage. For a 12VDC system make sure the voltage is above 11.5VDC. For a 24VDC system make sure the voltage is above 23.5VDC.
3. One of the electrical connections is loose. Tighten all connections in the control box; terminal block, fuse blocks and solenoid. Reconnect the battery ground and try the system again.
4. Solenoids can fail over time. You will need to reconnect the battery ground before performing this next step. Be careful, the system will be energized.
    1) First verify there is power to the solenoid by using a volt meter to check the terminal on the left side. If there is power to the solenoid, move to step 2.
    2) With the switch on, check that there is voltage on the top left terminal of the solenoid. If there is voltage at this terminal, with the switch still on move to step 3
    3) Check if there is voltage at the terminal on the right side. If there is voltage, then the solenoid is not the problem. If there is no voltage, then the solenoid needs to be replaced.
5. The cable connections might not be fully connected. Take a closer look and make sure all cables are fully connected.

If none of the steps in this section help you solve your problem, please do not hesitate to call Simple Pump at 877.492.8711, extension 6.

SECTION 11: MAINTENANCE

ONGOING MAINTENANCE

As with any motorized system, there is vibration and movement in the assembly. Over time, this vibration and movement can cause bolts to loosen. If you are using the system on a normal basis, we recommend that you check all threaded connections about every 3-6 months.

As long as the Motorized System with the LBLD is pumping correctly and not causing the motor to overload, no additional maintenance is required for the LBLD motor component.

The pump's seals must be replaced periodically -- typically every 5 to 10 years. (It can be more frequent for industrial applications, or any application pumping water with a significantly non-neutral pH, or high particulate levels.) Note that all of these are those that must be replaced on any Simple Pump system, no matter what configuration -- driven by hand, or motor. If the flow rate of your pump starts to fall, replacing the seals may well be the solution. Information about the periodic replacement of seals can be found in the INSTALLATION AND MAINTENANCE manual for the hand-operated system.

There is no requirement to oil any of the LDBD system components. Optionally, if you have the cover off, you can apply a bit of lubricating oil on the two points where ball bearings in the drive move during operation. However, do not under any circumstances apply oil to the linear bearings, or the 3/4" stainless steel rod that moves up and down within those two linear bearings. Also, there is no need to lubricate any component or surface on the motor itself.

SECTION 12: WARRANTY

The gear motor assembly is warranted against defective materials and workmanship for a period of 1 year from the date of purchase. The motor load must not be exceeded, and all instructions must be adhered to.

All other components that are not wear items have a lifetime warranty. The wear items in this system include the two linear bearings, brass shims and two ball bearings pressed into the dog bone. Warranty is void given any one of the situations explained below.

1. If the system was not installed per these instructions.
2. If the system is pushed beyond the limits explained in these instructions.
3. If the system is not maintained on a normal basis.