



# INSTALLATION INSTRUCTIONS FOR THE MOTORIZED SIMPLE PUMP SYSTEM (LINEAR BEARING LINK DRIVE OPTION)

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(The following instructions are very detailed, and should tell you everything you need to know. If you have questions, please phone 775-267-1093.)

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## TABLE OF CONTENTS

Introduction	2
Specifications	3
Recommended Operating Environment and Applications	3
Section 1: Unpacking and Tools required	5
Section 2: Unpacking & Inspection	5
Section 3: Preparing Your Existing Pump	6
Section 4: Installation	10
Section 5: Electrical Connection	13
Section 6: Operation	13
Section 7: Maintenance & Trouble-Shooting	13
Section 8: Warranty	14

## INTRODUCTION

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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 and 125 hand pumps. When assembled and installed on the Model 125, the gear motor is capable of delivering 2.0 gallons of water per minute (GPM) from as deep as 175 feet. Installed on the Model 100, it delivers 1.3 GPM.

The motor is available in two models, 12 volt and 24 volt DC. These instructions cover both versions.

The linear bearing link drive translates the rotary action of the Simple Pump 12 or 24 volt DC 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.

## SPECIFICATIONS

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### 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

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### 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.

### 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.

### IDEAL APPLICATION TO MINIMIZE WEAR

Ideally, when pumping from any significant depth, you should not operate the Motorized System (LBLD Option) configured to pump into a pressurized system. The most difficult part of delivering water to a

pressurized system is moving it out of the well. Once at ground level, the water can be delivered by a booster pump available at a fraction of the cost of the Motorized System (LBLD Option). The only other additional cost is the tank for ambient storage, i.e., not under pressure.

The water lifted out of the well is pumped into the ambient storage tank by the Motorized System. Booster pumps designed specifically to pump into a pressure tank are available from a number of vendors, e.g. Dankoff, Surflo and Jabsco. Many such pumps cost less than \$150.

Configuring like this also raises the overall reliability of the system. Most notably, booster pumps include an integrated pressure sensor. It signals the booster pump to turn the pump on and off, according to a target pressure, when water is demanded from the pressure tank.

By contrast, any Simple Pump provides water with a pulsed delivery, and therefore varying pressure, making the task of regulating flow to the pressure tank more difficult.

## UNSUPPORTED APPLICATIONS

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

- ▶ Pumping into pressure greater than 50 psi.
- ▶ 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. Because most configurations using the Simple Pump Motorized System are powered using 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 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

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### CONTENTS OF BOX

LBLD mechanism with cover, delivered as one piece.

White protective over wrap on cover to be removed before installation

(6) 8-32x1/2 SS socket head cap screws (SHCS) fasten cover on mounting plate

(1) 3/4" x 36" stainless steel rod

(4) 1/4-20x3/4" SS SHCS mounting bolts

(3) 25A ATO/ATC automotive-style fuses (for 12V system), OR

(3) 15A ATO/ATC automotive-style fuses (for 24V system)

### TOOLS REQUIRED

(4) Allen wrenches: 9/64", 3/16", 1/4", 5/16"

(2) Channel locks

(1) Medium Phillips screwdriver

## SECTION 2: UNPACKING & INSPECTION

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Carefully remove the LBLD mechanism, rod, bolts (in poly bag) and fuses from the shipping box.

Using the 9/64" Allen wrench, remove the six screws that attach the cover. Remove the white protective over wrap from the cover.

## SECTION 3: PREPARING YOUR EXISTING PUMP

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Your Simple 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 with approximately 25 strokes with the lever handle system (model 100L). If you have the model 125L, your pump should be delivering about one gallon of water in approximately 14 complete strokes.

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. The direction you screw is the opposite of normal -- turn clockwise to remove, rather than the normal counterclockwise.



Using the 3/16" Allen wrench, loosen the pinch bolt and the 3 mounting bolts on the split flange enough to pull the pump head (including riser tube) up out of the well.



While holding the pump head by the riser tube, seat the safety tool securely in the split flange.



Then, slowly lower the bell end of the top drop pipe into the safety tool (left).





Use a channel lock to remove the riser tube and pump head. This allows access to the 3/4" stainless rod.

Do not remove the stainless nipple.



Disconnect the 3/4" stainless rod from the topmost sucker rod (left).

The stainless rod shipped with this Motorized Pump with Linear Bearing Link Drive is longer than the lever arm stainless rod just removed. Attach the longer 36" rod to the top sucker rod.





Reinstall the pump head and riser tube. Secure it firmly on the stainless nipple that is attached to the topmost drop pipe.



Lift the riser tube (and pump head), and then remove the safety tool.



Lower the riser tube so that at least 6 inches of riser tube are below the split flange on the cap. Tighten the pinch bolt and 3 mounting bolts (right).



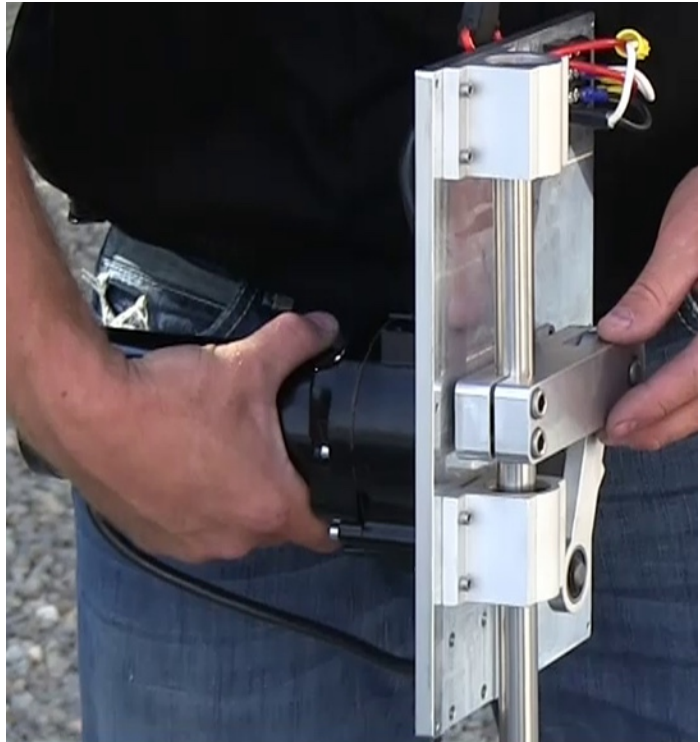
## SECTION 4: INSTALLATION

Lower the **Linear Bearing Link Drive Mechanism** (LBLD) so that the stainless rod is inserted into 3 openings.

- ▶ Orientation: When you lower the LBLD onto the stainless rod, the electric terminals are on the top side.
- ▶ The DC motor faces away from the pump head.

As the mechanism is lowered down, the stainless rod moves through, in order:

- ▶ The lower linear bearing.
- ▶ The yoke.
- ▶ The top linear bearing.



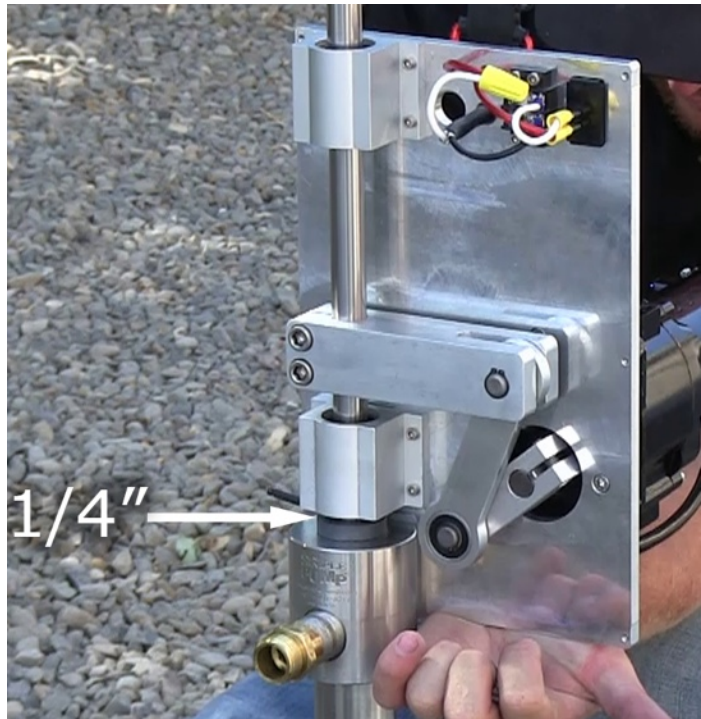
The tolerances are tight between the yoke ID and shaft OD. You MAY need to splay the gap in the yoke slightly, as shown in the photo.



Rotate the Linear Bearing Link Drive Mechanism around the pump head until the holes for the four mounting bolts are aligned.

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

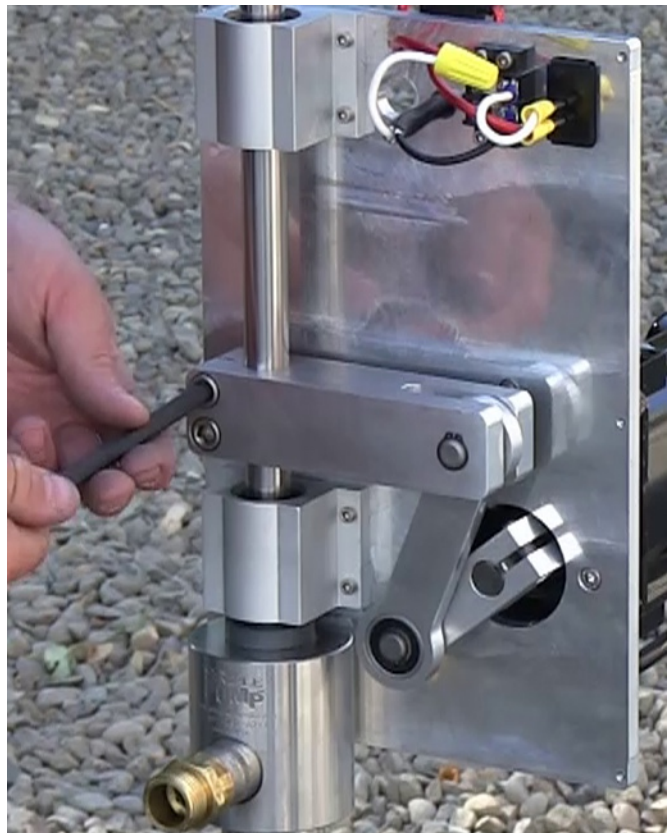
Screw the four 1/4-20x3/4" SS SHCS mounting bolts through the holes just aligned, fastening the mounting plate to the pump head.



Lift up the 3/4" diameter SS pump rod 2 inches to make sure that the piston is not sitting on the ball at the bottom of the pump cylinder.

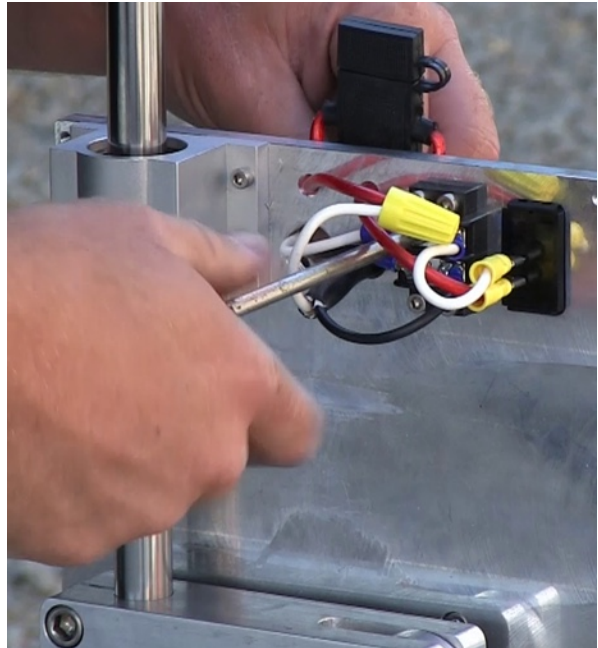
Then using a 5/16" Allen wrench, tighten the two stainless steel socket head cap screws on the yoke.

This pinches the yoke so it is fastened to the stainless rod.





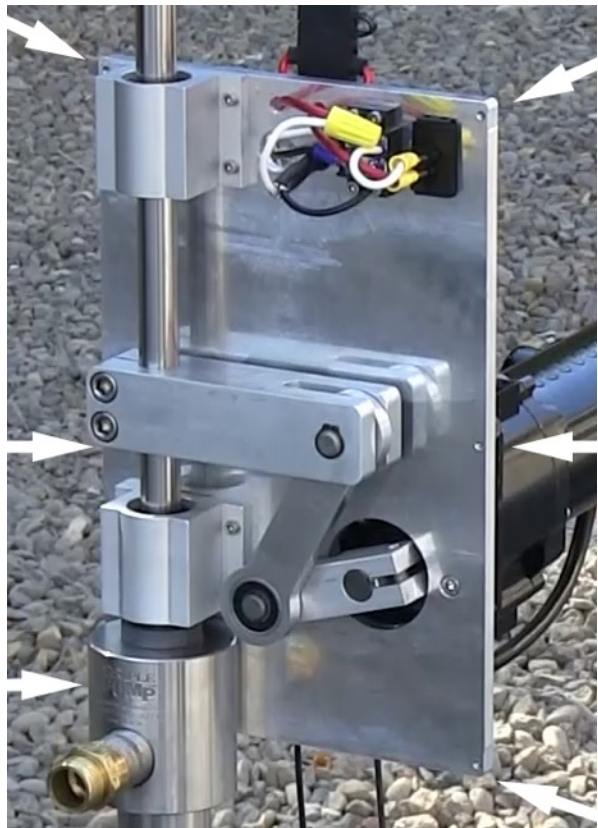
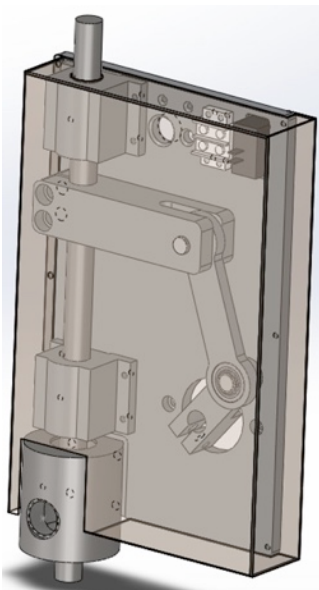
Attach your 12V or 24V power source to the terminal strip.



Attach the cover to the LBLD mechanism.

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

Diagram below shows how the cover fits onto the mounting plate.



## SECTION 5: ELECTRICAL CONNECTION

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The two wires coming out the bottom of the gear motor are to be supplied with 12 VDC or 24 VDC power. Make sure that your supply wiring is at least 16 gauge and can maintain a minimum of 11.5 volts with the motor at a full load of 15 Amps. Note that the greater the distance to the power source, the higher gauge wire required. Determining what you need may require a professional.

The white wire is the positive (+) power lead and the black is the negative (-). When working on the power connection, put the switch next to the motor in the off position by pushing the button on the bottom side and remove the fuse by pushing and turning it counter-clockwise.

**CAUTION:** Provisions need to be made in your power supply to prevent operation of the motor when voltage is below 11.5 volts, such as when the battery is nearly discharged. This is up to you or to the professional you hire.

## SECTION 6: OPERATION

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Once the power has been connected, install the fuse and attach the cover. During the break-in period, leave the pump outlet open or pump through a drinking-water quality garden hose unrestricted. We recommend a break-in period of 6 hours.

## SECTION 7: MAINTENANCE & TROUBLE-SHOOTING

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### PROTECTION FROM WEATHER

In the standalone motor assembly, the DRIVE has a cover. The motor should also be provided some protection. Alternatives could be

- a small roof with open sides
- a small pump "house" that just covers the well head and pump
- a full-sized pump house

### FUSE

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 100-110° F.

If the fuse has blown for any reason, remove the cover. Lift the stainless rod up and down, by hand. How freely it moves is an indication of what the motor is working against. The typical reason for difficult movement is pump binding.

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, remove the pump head and try again to determine if the problem is in the head.

If you suspect your system is not behaving as it should, do not hesitate to call Simple Pump.  
(877.492.8711)

## ONGOING MAINTENANCE

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

The pump's seals must be replaced periodically -- typically every 3 to 7 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 LBLD 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" x 36" 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 8: WARRANTY

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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.