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OWNER'S MANUAL

Submersible Turbine Pumps

6TSP Series Radial Flow

Installation/Operation/Parts

For further operating, installation, or maintenance assistance:

Call 1-888-237-5353

Important Safety Instructions

SAVE THESE INSTRUCTIONS - This manual contains important instructions that should be followed during installation, operation, and maintenance of the product. Save this manual for future reference.

▲ This is the safety alert symbol. When you see this symbol on your pump or in this manual, look for one of the following signal words and be alert to the potential for personal injury!

▲ DANGER indicates a hazard which, if not avoided, *will* result in death or serious injury.

▲ WARNING indicates a hazard which, if not avoided, *could* result in death or serious injury.

▲ CAUTION indicates a hazard which, if not avoided, *could* result in minor or moderate injury.

NOTICE addresses practices not related to personal injury.

Keep safety labels in good condition. Replace missing or damaged safety labels.

General Considerations

Before installing your submersible turbine pump, review the following checklist.

Be sure the well is clear of sand and abrasive material before installing pump. Abrasive materials in the water cause component wear and reduce pump capacity and discharge pressure. Never use the pump to develop or clean the well. Permanent pump damage can result within the first few hours of operation.

If the well casing is suspected of being crooked, check it with a gauge of identical length and diameter as the pump and motor with two lengths of pipe attached. Serious damage can result if the pump becomes lodged in a crooked casing.

Be sure the well can supply a high-capacity turbine pump. The well should be deep enough to cover the pump unit with water, even at extreme pumping rates. Typically, the pump should be submerged 10 to 20 feet below the lowest water level and at least 5 feet above the bottom of the well.

Air entrained in the water reduces performance and will damage the pump.

Your pump is designed to provide maximum efficiency under specific capacity and head conditions. Do not operate it beyond specified limits.

System controls and pump must match. Do not interchange controls with other models. Serious damage can result to the unit if pump and controls do not match. Average number of starts per day will influence motor and control component life (starters, relays, capacitors, etc). Select pump size, tank size and control components for lowest practical number of starts per day. Excessive cycling accelerates bearing, spline, and pump wear and control contact erosion.

Specifications

Table I: Frequency of Starts

Average Number of Starts per Hour		
HP Rating	Single Phase	Three Phase
1 to 50	15	15

Table II: Weight of Pipe (Column)

Weight per Foot (Lbs)		
Pipe Size (In)	Full	Empty
2-1/2	7.9	5.8
3	10.8	7.6
4	16.3	10.8
5	23.3	14.62
6	31.5	18.97

Table III: Weight of Cable per 1000 Ft. (lbs.)

AWG Size	3-Phase		1-phase	
	Nom. Dia.	Weight	Nom. Dia.	Weight
12-3	.500	140	.487	130
10-3	.545	186	.517	161
8-3	.771	328	.750	293
6-3	.965	525	.826	400
4-3	1.071	717		
2-3	1.243	1066		

Table IV: Cable Wire Resistance

AWG Wire Size	Resist (Ohms/Ft)
14	.0050
12	.0032
10	.0020
8	.0013
6	.0008
4	.0005

Table V: Cooling Flow Rates Past Submersible Motors In Feet Per Second (FPS), 6" Nominal Motor (5.38" OD)

Casing Size	GPM											
	20	40	60	80	100	120	140	160	180	200	220	240
6" ID	1.2	2.3	3.5	4.6	5.8	7.0	8.1	9.3	10.4	11.6	12.7	13.9
8" ID	–	0.5	0.7	0.9	1.2	1.4	1.6	1.9	2.1	2.3	2.6	2.8
10" ID	–	–	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.4

Formula to find flow rate:

$$FPS = \frac{GPM \times .409}{D1^2 - D2^2}$$

D1 = Casing inside diameter

D2 = Motor outside diameter

NOTICE If flow rate past motor is expected to be less than rate shown in Table V, install a shroud around motor to force cooling flow past shell. To minimize erosion to shell if flow rate is expected to be more than 10 FPS (especially if sand is present), reduce flow through pump to reduce flow past shell.

Limited Warranty

BERKELEY warrants to the original consumer purchaser ("Purchaser" or "You") of the products listed below, that they will be free from defects in material and workmanship for the Warranty Period shown below.

Product	Warranty Period
Water Systems:	
Water Systems Products — jet pumps, small centrifugal pumps, submersible pumps and related accessories	<i>whichever occurs first:</i> 12 months from date of original installation, or 18 months from date of manufacture
Pro-Source™ Composite Tanks	5 years from date of original installation
Pro-Source™ Steel Pressure Tanks	5 years from date of original installation
Pro-Source™ Epoxy-Lined Tanks	3 years from date of original installation
Sump/Sewage/Effluent Products	12 months from date of original installation, or 18 months from date of manufacture
Agricultural/Commercial:	
Centrifugals – close-coupled motor drive, frame mount, SAE mount, engine drive, VMS, SSCX, SSHM, solids handling, submersible solids handling	12 months from date of original installation, or 24 months from date of manufacture
Submersible Turbines, 6" diameter and larger	12 months from date of original installation, or 24 months from date of manufacture

Our limited warranty will not apply to any product that, in our sole judgement, has been subject to negligence, misapplication, improper installation, or improper maintenance. Without limiting the foregoing, operating a three phase motor with single phase power through a phase converter will void the warranty. Note also that three phase motors must be protected by three-leg, ambient compensated, extra-quick trip overload relays of the recommended size or the warranty is void.

Your only remedy, and BERKELEY's only duty, is that BERKELEY repair or replace defective products (at BERKELEY's choice). You must pay all labor and shipping charges associated with this warranty and must request warranty service through the installing dealer as soon as a problem is discovered. No request for service will be accepted if received after the Warranty Period has expired. This warranty is not transferable.

BERKELEY SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, OR CONTINGENT DAMAGES WHATSOEVER. THE FOREGOING LIMITED WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE FOREGOING LIMITED WARRANTIES SHALL NOT EXTEND BEYOND THE DURATION PROVIDED HEREIN.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitations on the duration of an implied warranty, so the above limitations or exclusions may not apply to You. This warranty gives You specific legal rights and You may also have other rights which vary from state to state.

This Limited Warranty is effective June 1, 2011 and replaces all undated warranties and warranties dated before June 1, 2011.

In the U.S.: BERKELEY, 293 Wright St., Delavan, WI 53115
In Canada: 269 Trillium Dr., Kitchener, Ontario N2G 4W5

Preinstallation Procedures And Checks

Grounding

⚠ WARNING Risk of electric shock. Can shock, burn or kill. Permanently ground pump, motor and control box before connecting power supply to motor.

Ground pump and motor in accordance with local codes and ordinances. Use a copper ground wire at least as large as wires carrying current to motor.

Motor is supplied with a copper ground wire. Splice this ground wire to a copper conductor that matches motor wire size per local codes. Also see *Electrical Splices and Connections*.

⚠ WARNING Risk of explosion. Do not ground to a gas supply line. Permanently ground pump, motor and control box before connecting power cable to power supply. Connect ground wire to approved ground first and then connect to equipment being installed.

⚠ WARNING Risk of fire and electric shock. Can cause severe injury, property damage or death. If using a drop cable larger than AWG 10 (5.5mm²) [for example, AWG 8 (8.4mm²) wire] between pump and control box, run drop cable to a separate junction box. Connect junction box to control box with AWG 10 (5.5mm²) wire. For more information, contact your local code authority.

Wiring

Installation must meet United States National Electrical Code, Canadian Electrical Code and local codes for all wiring (as applicable).

Use only copper wire when making connections to pump and control box.

To avoid over-heating wire and excessive voltage drop at motor, be sure that wire size is at least as large as size listed in cable sizing tables for your horsepower pump and length of wire run.

NOTICE When built-in overheating protection is not provided, install an approved overload equipped motor control that matches motor input in full load amps. Select or adjust overload element(s) in accordance with control instructions. When built-in overheating protection is provided, use an approved motor control that matches motor input in full load amperes.

Electrical Splices and Connections

Splice cable to motor leads. Use one of the three methods outlined below. Use only copper wire for connections to pump motor and control box. Use only UL®-approved water-submersion-grade electrical tape.

Taped splice - For wire sizes AWG 8 (8.4mm²) and larger:

1. Cut off motor leads. Stagger lead and wire length so that 2nd lead is 2" (50mm) longer than 1st lead and 3rd lead is 2" (50mm) longer than second.
2. Cut off cable ends. Be sure to match colors and lengths of wires in drop cable to colors and lengths of motor leads.
3. Trim insulation back 1/2" (13mm) from cable ends and motor lead ends.
4. Insert motor lead ends and cable ends into butt connectors (see Figure 1). Be sure to match wire colors between drop cable and motor leads.



Figure 1

5. Using crimping pliers (Figure 4), indent butt connector lugs (see Figure 2) to secure wires.



Figure 2



Figure 3

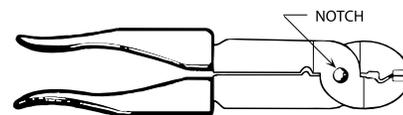


Figure 4



Figure 5

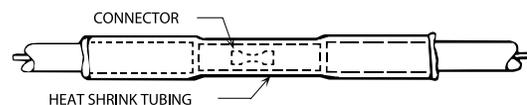


Figure 6

6. Cut electrical insulation putty into 3 equal parts and form tightly around butt connectors. Be sure electrical insulation putty overlaps insulated part of wire.

- Wrap each joint tightly with electrical tape - cover wire for about 1-1/2" (4cm) on each side of joint. Make four passes with the tape - when finished you should have four layers of tape tightly wrapped around the wire. Press edges of tape firmly down against the wire (see Figure 4).

NOTICE Since the tightly wound tape is the only means of keeping water out of the splice, the efficiency of the splice will depend on the care used in wrapping the tape.

NOTICE For wire sizes larger than AWG 8 (8.4mm²), use a soldered joint rather than a butt connector (see Figure 3).

Heat-shrink splice - For wire sizes AWG 14, 12 and 10 (2, 3, and 5.5mm²):

- Remove 3/8" (10mm) insulation from ends of motor leads and drop cable wires.
- Put plastic heat shrink tubing over motor leads.
- Match wire colors and lengths in drop cable to wire colors and lengths of motor leads.
- Insert cable and motor wire ends into butt connectors and crimp (See Figure 2). BE SURE to match wire colors between drop cable and motor leads. Pull leads to check connections.
- Center tubing over butt connector and apply heat evenly with a torch (a match or lighter will not supply enough heat).

NOTICE Keep torch moving. Too much concentrated heat may damage tubing (see Figure 6).

Butt Connectors with plastic insulators - For wire sizes AWG 14, 12 and 10 (2, 3, and 5.5mm²):

- Cut off motor leads. Stagger lead and wire length so that 2nd lead is 4" (100mm) longer than 1st lead and 3rd lead is 4" (100mm) longer than second.
- Cut off cable ends. Be sure to match colors and lengths of wires in drop cable to colors and lengths of motor leads.
- Trim insulation back 1/2" (13mm) from cable ends and motor lead ends.
- Unscrew plastic caps from insulators. Place a cap and a neoprene gasket sleeve on each wire end to be spliced (see Figure 7).

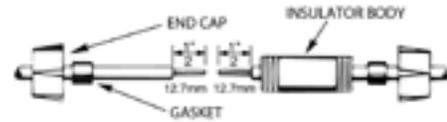


Figure 7



Figure 8

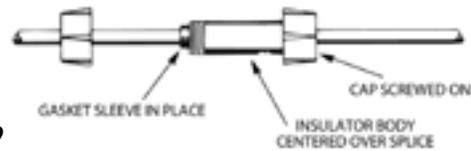


Figure 9

- Slide insulator body onto one wire end (Figure 7).
- Insert wire end into butt connector and crimp (see Figure 8). Be sure to match cable and motor wire colors.
- Center insulator body over splice and slide neoprene sleeves into body as far as they will go. Screw caps onto insulator body (Figure 9) and tighten by hand for a strong, waterproof splice.

Splice and Cable Continuity Test

Before installing pump, check cable and splices as follows (see Figure 10):

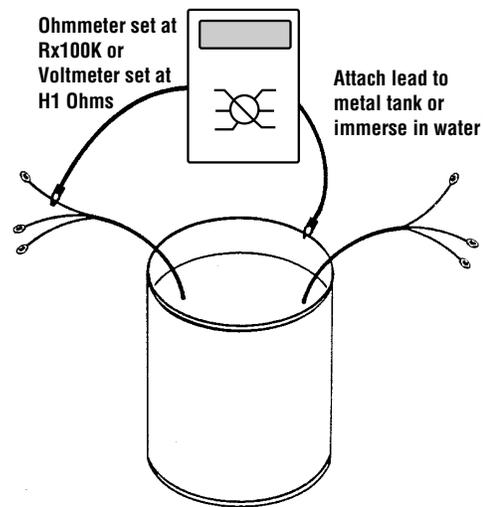


Figure 10 - Splice and Cable continuity

1. Submerge cable and splice in steel barrel filled with water. Make sure both ends of cable are out of water.
2. Clip one ohmmeter lead to barrel. Test each lead in cable successively by connecting the other ohmmeter lead to the three cable leads, one after the other.
3. If resistance reading goes to zero on any cable lead, a leak to ground is present. Pull splice out of water. If meter reading changes to “infinity” (no reading) the leak is in the splice.
4. If leak is not in splice, slowly pull cable out of water until reading changes to “infinity”. Reading will change to “infinity” when leak comes out of water.
5. Repair cable by splicing as explained under *Electrical Splices and Connections*.

Rotation Check (3-Phase Only)

After satisfactorily completing continuity test, connect cable to motor controller and then wire controller to disconnect switch. Connect temporary jumper wire between proper terminals in controller to temporarily energize magnetic coil.

Momentarily engage disconnect switch. Observe the rotation of pump as motor starts. If connections are properly made, pump will “jerk” clockwise when looking into the pump discharge when started. If the “jerk” is counter-clockwise, the motor is running in the wrong direction. Interchange any two cable leads where they connect to the “lead” terminals in the magnetic starter. Mark wires to correspond with the controller terminal numbers.

NOTICE Pump is water lubricated. Do not operate the pump for more than 5 seconds while it is out of water.

Installation

General

After completing all connections and tests so far, connect a 5-foot length of pipe to pump.

Lower pump into well with pipe clamps attached to the 5-foot pipe. Attach a standard length of pipe to 5-foot length and lower pump CAREFULLY into well.

NOTICE Do not use a pipe longer than 5 feet for the first connection. Hoisting pump upright with a long length of pipe can cause pump misalignment from excessive leverage.

▲ WARNING Risk of electric shock. Can shock, burn or kill. Use extreme care when lowering pump and cable to avoid damage to cable insulation.

Anchor power cable to pipe every 20 feet with adjustable steel band clamps. Protect insulation from clamps with pieces of split rubber hose inserted between clamps and cable. Attach cable to pipe halfway between clamps with UL®-approved water-submersion-grade electrical tape.

Submergence

Be sure the pump is always submerged, even at extreme pumping rates. Install pump at least 10 to 20 feet below the lowest “drawdown” water level and at least 5 feet above bottom of well.

Check Valves

Pump back spin and hydraulic shock can cause severe damage to the pump and motor. Install at least one check valve in the discharge pipe (riser pipe) to help prevent this.

Install the first check valve in the pump discharge or in the discharge pipe it self, not more than 25' above the pump. Install another check valve not more than 200 feet above the first one. Repeat, all the way up the riser pipe. The last check valve on the riser pipe should be not more than 200' below the surface. Finally, install a check valve near the well head in the horizontal pipe at the surface (see Figure 11).

NOTICE: To avoid water hammer and pipe breakage, do not put a check valve exactly half-way up the riser pipe (that is, with equal distance down to the pump and up to the surface), especially if it is the only check valve in the riser pipe after the pump discharge check. The ‘equal distance’ in both legs of the pipe can allow resonations from water hammer which can blow the pump off the riser pipe.

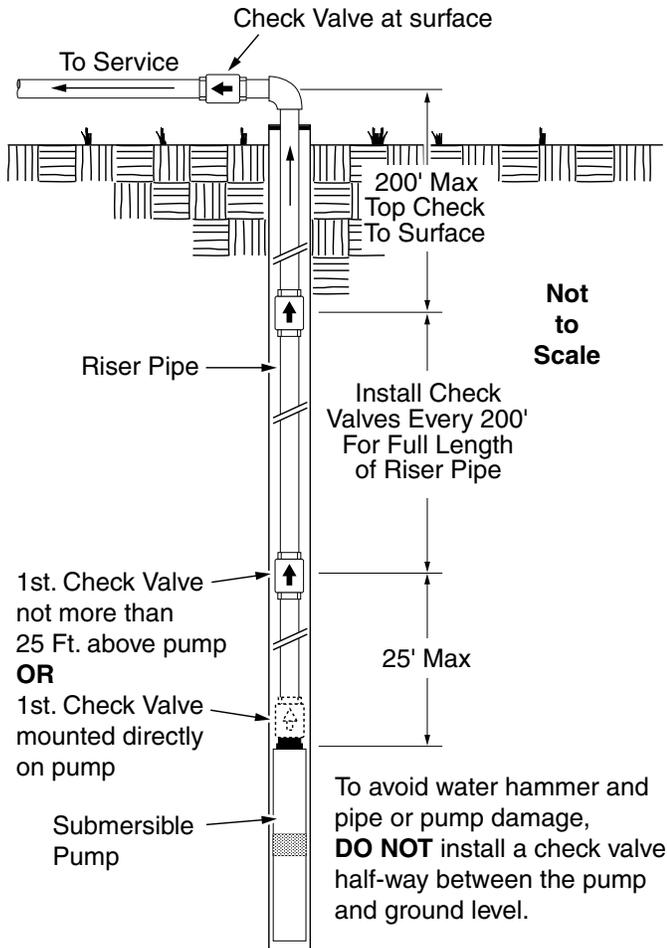


Figure 11 - Check Valve Location

Well and Pump Test

Check and record static water level of well before starting tests. Before making final piping connections, test flow rate, capacity, and condition of well.

NOTICE Do not operate pump with discharge valve closed. Operate pump only within pressure and flow limits of operating range established by performance curve.

NOTICE: If sand is present in discharge, allow pump to run with discharge completely open until water is clear. If loud rattling noises develop, pump is probably cavitating. Gradually close discharge valve until rattling stops.

Electrical Tests

▲WARNING Risk of electric shock. Can shock, burn or kill. Only qualified electricians should perform these tests. When testing, use all normal precautions for the voltages involved.

Electrical Test Of Motor, Cable, Connections

The cable and splices can be damaged as the pump is lowered into the well. To electrically test them, attach one lead of ohmmeter to pipe. Attach other lead to each cable lead in turn. See motor owner’s manual for required resistance in a good motor. A low reading indicates that cable or splice has developed a leak to ground. Remove pump from well and correct problem before proceeding with installation.

Measure electrical resistance between motor leads and well casing when motor is cold.

Voltage Test

Low or high voltages can cause motor failure. While pump is operating, check voltage across each pair of leads at motor controller. Readings more than 10% above or below rated nameplate voltage can damage pump; correct before placing pump in service. Test as follows:

1. Disconnect main power supply and open controller.
2. Connect power and start pump (Figure 12). For 3-phase motors, read voltage across three pairs of leads (L1 – L3, L3 – L2, L2 – L1) while pump is operating. For single phase motors, read voltage across L1 and L2 while pump is operating. Voltage should be within $\pm 10\%$ of motor nameplate rated voltage. If not, consult power company.

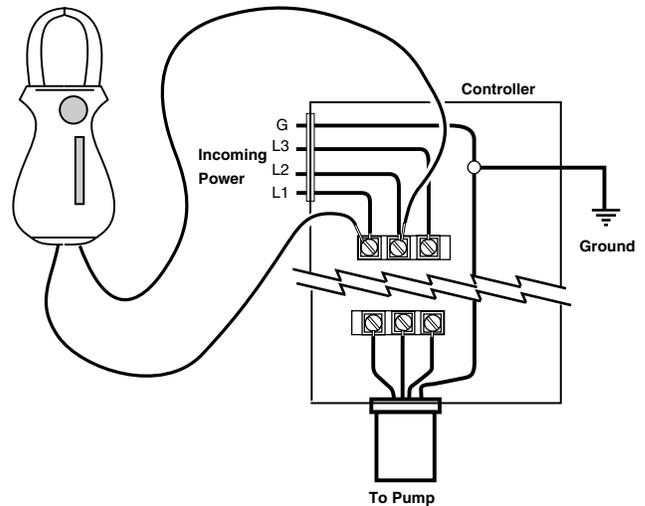


Figure 12 - Voltage Test

Load Current Test

Load current should be obtained on each motor lead at the controller. Partially close pump discharge valve (keep pressure and flow within specified operating range) until maximum amp reading has been obtained (Figure 13). Compare reading with motor nameplate rating. If reading is 15% or more over rated load, check for incorrect voltage in supply line or overload due to abrasives in pump. Find and correct problem before putting pump in service.

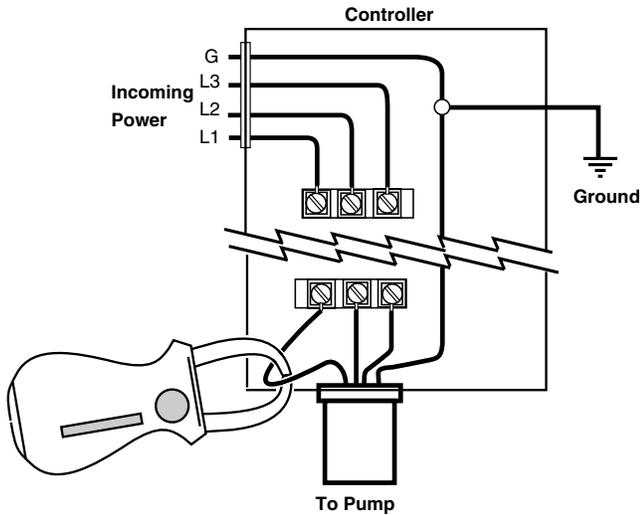


Figure 13 - Load Current Test

Electrical Test

The following electrical checks can be made with pump installed.

⚠ WARNING Risk of electric shock. Can shock, burn or kill. Only qualified electricians should perform these tests. When testing, use all normal precautions for the voltages present.

Circuit (Winding) Resistance Test

1. Shut off main power supply and disconnect motor wires.
2. Attach two ohmmeter leads to pairs of cable wires in turn (black and red wires on three wire single phase units). Compare readings with data provided in motor manual (Figure 14).

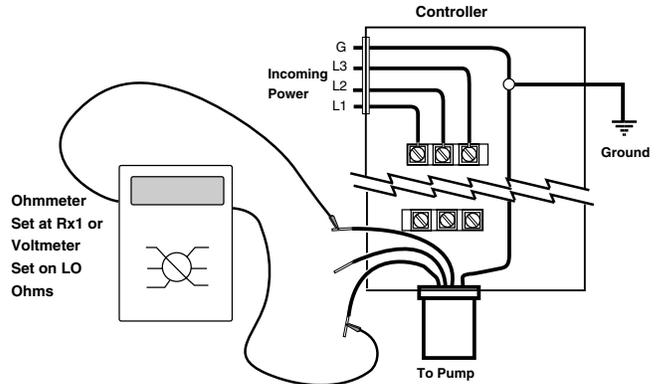


Figure 14 - Circuit (Winding) Resistance Test

3. If reading is considerably higher than chart, an open circuit (broken wire) is indicated; if reading is considerably lower, a short circuit is indicated. In either case, remove pump from well and repair unit.

NOTICE Be sure to include cable and winding resistance. Multiply cable length by the per-foot cable resistance (see Table IV) and add winding resistance from motor chart to get total.

Ground Check

1. Shut off main power supply and disconnect motor wires.
2. Attach one ohmmeter lead to pipe or METAL well casing and the other lead, in turn, to each individual motor wire (Figure 15).

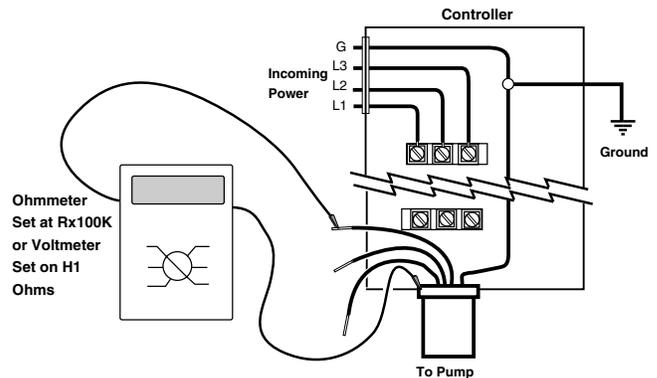


Figure 15 - Ground Check

3. If resistance reading goes to zero after touching any of the wires, the pump should be raised to determine location of ground fault (cable, motor, or splice).
4. Raise pump, watching resistance reading. When resistance goes to infinity, fault has come out of the water. If ground fault is located in cable or splice, repair it.
5. If ground fault appears to be located in motor, remove pump from well. Cut cable at motor side of splice and determine whether or not motor is grounded. If motor indicates complete ground (resistance reading goes to zero) replace unit.

If motor is not grounded, re-check splice and cable.

Current Unbalance Test (3 Phase only)

Determine current unbalance by measuring current in each power lead. Measure current for all three possible hookups. Use example and worksheet to calculate current unbalance on a three phase supply system and retain for future reference.

NOTICE Current unbalance should not exceed 5%. If unbalance cannot be corrected by rolling leads, locate and correct source of unbalance.

If, on all three possible hookups, the reading furthest from average stays on the same power lead, most of the unbalance is coming from the power source.

However, if the reading furthest from average changes leads as the hookup changes (that is, stays with a particular motor lead), most of the unbalance is on the "motor side" of the starter. In this case, consider a damaged cable, leaking splice, poor connection, or faulty motor winding.

3-Phase Current Unbalance and Example

Here is an example of current readings at maximum pump loads on each leg of a three wire hookup. Make calculations for all three possible hookups.

- A. For each hookup, add the readings for the three legs:

Ex.: Hookup #1	Hookup #2:	Hookup #3
L1 = 51Amps	L1 = 50 Amps	L1 = 50 Amps
L2 = 46 Amps	L2 = 48 Amps	L2 = 49 Amps
L3 = 53 Amps	L3 = 52 Amps	L3 = 51 Amps
Total 150 Amps	Total 150 Amps	Total 150 Amps

- B. Divide each total by three to get average amps:

Example: $150/3 = 50$

Example: $150/3 = 50$

Example: $150/3 = 50$

- C. For each hookup, find current value farthest from average (Calculate the greatest current difference from the average).

Ex. #1	Ex. #2	Ex. #3
50 Amps	50 Amps	50 Amps
-46 Amps	-48 Amps	-49 Amps
= 4 Amps	= 2 Amps	= 1 Amps

- D. Divide this difference by the average and multiply by 100 to obtain the percentage of unbalance.

Example 1: $4/50 = .08 \times 100 = 8\%$

Example 2: $2/50 = .04 \times 100 = 4\%$

Example 3: $1/50 = .02 \times 100 = 2\%$

Use smallest percentage unbalance, in this case Ex. 3.

3-Phase Current Unbalance - Worksheet

Use this worksheet to calculate current unbalance for your installation.

- A. Add the readings for the three legs:

Ex.: Hookup #1	Hookup #2:	Hookup #3
L1 = Amps	L1 = Amps	L1 = Amps
L2 = Amps	L2 = Amps	L2 = Amps
L3 = Amps	L3 = Amps	L3 = Amps
Total Amps	Total Amps	Total Amps

- B. Divide each total by three to get average amps:

Hookup #1: /3 =

Hookup #2: /3 =

Hookup #3: /3 =

- C. For each hookup, find current value farthest from average (Calculate the greatest current difference from the average).

Hookup #1	Hookup #2	Hookup #3
Amps	Amps	Amps
Amps	Amps	Amps
Amps	Amps	Amps

- D. Divide this difference by the average to obtain the percentage of unbalance:

Hookup #1: / = x100 = %

Hookup #2: / = x100 = %

Hookup #3: / = x100 = %

Use hookup with smallest percentage unbalance.

General

When installed in a clear well and operated under normal conditions, the submersible turbine pump requires no special maintenance. The hermetically sealed motor is pre-filled and self-lubricating. Completely tested at the factory, it should provide many years of dependable service. The motor is a continuous duty type and can operate continuously for long periods.

Removing Pump From Well

Most pump problems are caused by above-ground electrical problems. Minor control box components or outside electrical difficulties (such as low voltage) can cause a malfunction. Before removing pump from well, check motor windings for damage (see *Electrical Tests*). Eliminate all above-ground trouble causes before pulling pump. Pull the pump only as a last resort.

Sandlocked Pump:

NOTICE Before pulling pump, make all possible above ground electrical tests. Most submersible pump problems are above ground, not in the pump itself.

NOTICE Motor failure can result from starting a sandlocked pump. Do not bypass overload circuit or exceed electrical rating when trying to start a seized pump.

Remove a sandlocked pump from well for cleaning. To prevent pump from locking again when reinstalled, clean the well thoroughly before reinstalling the pump.

Cleaning Sandlocked Pump:

1. Insert a reducing bushing in discharge adapter cap to receive a hose coupling.
2. Use a hose to flush pump backwards (discharge to suction). Oscillate shaft backwards and forwards with a pump pliers and backwash pump for several minutes.

Checking Pump Performance:

Water containing abrasives can cause impeller wear and reduce impeller efficiency, resulting in overload conditions. In such cases, it is necessary to remove the pump from the well and replace the impellers to maintain capacity and pressure. To assure quality and integrity of the unit, have your pump serviced by authorized Berkeley personnel.

Preventive Maintenance

To avoid major repairs, make the checks listed below every 4 to 6 months.

Test	Result Should Be	Possible Indications
Measure and record the standing water level (from top of well casing).	Reference number.	To aid in monitoring pump performance.
Measure electrical resistance between motor leads and well casing with motor cold.	See motor manual.	See motor manual.
Check pump flow capacity (gallons per minute).	At least 90% of readings at installation.	Lower readings may indicate pump needs repair.
Check pump discharge pressure (PSI) at operating conditions.	At least 90% of readings at installation.	Lower reading indicates pump wear, increased friction losses, or change in standing water level in well.
Check drawdown level (in feet) from standing water level.	High enough so that pump does not break suction.	Cavitation can damage pump; increased drawdown may indicate reduced well flow.
Measure voltage across motor leads while pump is operating.	Within $\pm 10\%$ of rated voltage.	If voltage is more than 110% or less than 90% of rated voltage, consult power company.

⚠ WARNING Risk of electric shock. Can shock, burn or kill. When troubleshooting or servicing pump, use all normal precautions for the voltages involved.

1. Disconnect power unless required for testing.
2. Have electrical testing done by a qualified electrician.
3. Most problems occur above ground. Remove pump from well only as a last resort.

Problem	Possible Cause	Remedy
Fuses blow or overload circuit breaker trips when motor starts.	Pump sandlocked.	a) Check motor winding resistance - see <i>Circuit (Winding) Resistance Test</i> .
		b) If motor is not shorted, turn on current and rap discharge pipe sharply to loosen sand.
		c) Pull pump and clean.
	Low or high voltage.	Check line voltage (see Page 4). If high or low, contact power company.
	Cable damaged or shorted.	Check pump cable for ground (see Page 6).
	Pump forced into crooked well.	Forcing pump into a crooked hole will cause misalignment of pump and motor. Consult well driller.
Fuses blow or overload trips while motor is running.	Low or high voltage.	Check voltage on service lines (see Page 4).
	Water contains abrasives.	If water contains excessive sand, remove pump and clean sand out of well.
	Motor or cable shorted and/or grounded.	See <i>Circuit (Winding) Resistance Test</i> and <i>Ground Check</i> .
Motor does not start but does not blow fuses or trip circuit breaker.	Fuses blown or circuit breaker tripped.	Reset circuit breakers or replace fuses.
	Voltage does not reach terminals.	3-Phase: Check voltage at controller between wire pairs: L1 – L3, L3 – L2, L2 – L1.
		Single Phase: Check voltage between L1 and L2 on box terminal strip.
	Loose wire in control box.	Check and tighten all wires.
Defective magnetic controller coil.	Check starter and coil.	
Pump does not shut off.	Cable leads improperly connected.	Check wiring diagram on box cover for correct connections.
Motor runs, but delivers little or no water.	Horizontal line check valve installed backwards.	Reinstall correctly.
	Motor running backwards (3-Phase only).	Reconnect motor for proper rotation (see Rotation).
	Pump gaslocked.	Start and stop pump several times allowing one minute between stops and starts.
	Water level in well has dropped.	a) Restrict pump flow to equal well production.
		b) Install liquid level control.
		c) Reset pump lower in well.
	Leak in discharge pipe.	Raise pipe until leak is found.
	Coupling between motor shaft and pump shaft broken.	Remove pump from well and check coupling. If broken, call Berkeley Pumps.
	Pump parts worn from abrasives.	a) Check pump shut-off pressure. Pressure should be at least 90% of pressure at installation.
		b) Call Berkeley Pumps.
Intake screen clogged.	Remove pump from well and clean screen.	
Pump set below recommended depth.	a) Reduce pressure switch setting until pump will shut off.	
	b) Install pump producing higher pressure.	
Discharge pipe friction reduces output.	Install larger pipe or pump producing higher pressure.	

