800-767-8731
www.aquascience.net

SS/SSH Submersible Pump

Owner's Manual

4" SUBMERSIBLE PUMP INSTALLATION INSTRUCTIONS

IMPORTANT: Read this manual carefully before installing or operating the pump.

- Review instructions before operating the pump.
- Electrical installation shall be in accordance with the National Electrical Code, and all applicable local codes & ordinances.
- This submersible pump is capable of developing very high pressure. A 100 PSI pressure relief valve must be installed between the pump and pressure tank to avoid possible danger of the tank bursting that can cause property damage, personal injury, or death.

WARNING - RISK OF ELECTRICAL SHOCK:

- Always disconnect power before servicing.
- Have a qualified electrician provide electrical power to motor.
- Ensure lead and ground wires are properly waterproofed and securely connected.
- This pump is built to be used in a water well. Never use it in swimming pools.
- Never test a pump or use a pump outside a well without grounding it and submerging in water.

BEFORE INSTALLATION

Inspect your pump and motor for damage prior to installation. The well should be thoroughly developed by pumping out all fine sand and foreign matter that can damage the pump, normally done by the well driller. Your submersible pump must be installed at a minimum of 10 feet (3 m) from the bottom of your well in order to prevent aspiration of sand by the pump. Use only cable specifically designed for well water use. DO NOT USE ROMEX.

SPLICE CONNECTION INSTALLATION

SPLICING CONNECTORS, protected by heat-shrink tubing.

1) Remove 3/8" (9.5 mm) insulation from ends of motor leads and drop cable wires.
2) Slide plastic heat shrink tubing over motor leads.
3) Match colors and lengths of drop cable to colors and lengths of motor leads.
4) Insert cable and motor wires into butt connectors (Fig. A). Crimp connectors and solder with tin (Fig. B). Pull leads to check if the connections are secure.
5) Center heat-shrink tubing over butt connectors (Fig. C) and heat with a torch (a match or lighter IS NOT RECOMMENDED). ***IMPORTANT: Keep torch moving, because too much concentrated heat may damage tubing. Let tubing cool before moving to prevent cracking.***

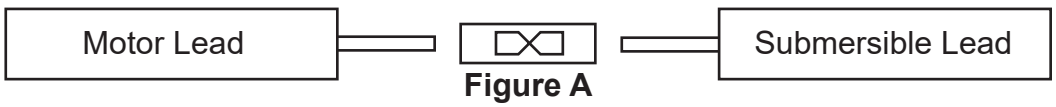


Figure A

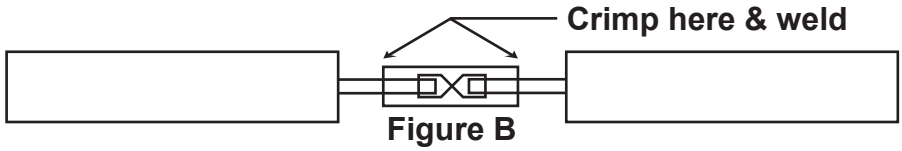


Figure B

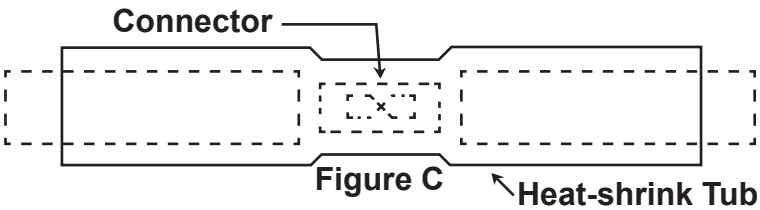


Figure C

4" SUBMERSIBLE PUMP INSTALLATION INSTRUCTIONS (Continued)

PUMP INSTALLATION

1) Use a high quality pipe (160 PSI or 200 PSI polyethylene pipe) that will withstand high pressure produced by the system.
2) Cut the pipe at the exact length that you need. Remember that the pump must be installed at a minimum of 10 feet (3 m) from the bottom of the well.
3) All pumps have a check valve installed. For installation over 200 feet (60 m), install an extra check valve at the tank entrance and at each 100 feet (30 m).
4) Use high quality barbed adapters and stainless steel hose clamps to connect the pump to the polyethylene well pipe.
5) Install a torque arrestor 1 foot (30 cm) above the pump discharge to absorb start up thrust as well as keeping the pump centered in the well FOR ADEQUATE MOTOR COOLING.
6) Fasten the electrical cable to the pipe with wire guides every 25' or tape every 10 feet (3 m) to avoid damaged wires. At the first fastener above the pump, leave 5" of slack to avoid wire tension. Take care not to scrape the submersible cable against well casing as you lower the pump into the well.
7) Use an ohmmeter to make insulation and continuity checks on the cable once the pump is installed.

PRESSURE TANK AND CONTROL CENTER INSTALLATION

1) Select a high quality pressure tank that is large enough to allow the pump to run for 1 minute (at minimum) for each cycle.
2) At the connection to the tank, select a tank package that has a check valve, pressure relief valve, hose bib, shut-off valve, pressure gauge, and pressure switch.

ADVICE: Teflon tape coated with pipe paste is recommended for all threaded brass & stainless steel connections.

3) Never install a water filter or ball valve between the well pump and pressure switch.
4) Do not allow the pump, pipe, or pressure tank containing water to freeze.

ELECTRICAL INSTALLATION

1) It is recommended that a qualified electrician connect the pump. All electrical installations must be in accordance with the National Electrical Code, and all applicable local codes and ordinances.
2) A pump with a 2 wire motor does not need control box. All electrical components are incorporated in the motor. Connect the switch as shown in the wiring diagram Fig. 1 and Fig. 2
3) A pump with a 3 wire single phase motor needs a control box that includes a relay and a capacitor. The control box is matched specifically to the motor brand and horsepower. Connect the control box and switch as shown in the wiring diagram Fig. 3 to Fig. 6
4) Select the proper size wire from Table I or Table II on the next page according to the length of run and motor horsepower. Improperly sized wire will void the warranty.

4" SUBMERSIBLE PUMP INSTALLATION INSTRUCTIONS (Continued)

INSTALLATION IN LAKE OR RIVER

The pump must be supported at a 15 degree angle or higher to assure proper bearing wear. Shield the pump from direct physical contact. Protect and screen the pump intake to prevent blockage by leaves and weeds. A flow inducer sleeve must be installed over the pump to draw water past the motor for adequate cooling. Protect the entire underwater installation from water currents, ice, etc...

NOTE: A submersible pump is usually isolated at the bottom of a well, where electrical leakage from the motor and cable presents no hazard to human life. This natural protection is lost when installed in a lake, pond or river (there is no way to stop people from entering or touching surrounding water). Take precaution.

TEST WATER QUALITY

After installation is complete, sanitize the entire well water system. Call your local health department for your local testing procedures.

PENTEK XE-Series Motor

Submersible Motor Control & Fusing/Wiring Specifications

2 WIRE

Table I: Recommended Fusing Data

PENTEK XE-Series 60Hz., Single Phase 2 Wire Submersible Pump Motors

HP	Volts/Hz/Ph	Motor Winding Resistance Ohms	Service Factor Amps	Locked Rotor Amps	Fuze Size Standard/ Dual Element
0.5	115/60/1	1.4-1.7	9.5	36.4	30/20
0.5	230/60/1	4.6-5.6	4.7	19.5	15/10
0.75	230/60/1	3.5-4.3	6.4	24.8	20/15
1.0	230/60/1	4.2-5.2	9.1	21.7	25/15
1.5	230/60/1	1.9-2.3	11.0	42.0	35/20

NOTE: 2 Wire Motor leads are not color coated. Overload is located in motor and cannot be tested from above ground.

PENTEK XE-Series Motors: 1Ph, 2 Wire Cable, 60Hz. Wire Size

	HP	Volt	Wire Size, AWG										
			14	12	10	8	6	4	3	2	1	0	00
2 Wire in feet	0.5	115	115	183	293	463	721	1150	1445	1825	2299	2902	3662
	0.5	230	466	742	1183	1874	2915	4648	5843	7379	9295	11733	14803
	0.75	230	342	545	869	1376	2141	3413	4291	5419	6826	8617	10871
	1.0	230	241	383	611	968	1506	2400	3018	3811	4801	6060	7646
	1.5	230	199	317	505	801	1246	1986	2496	3153	3972	5013	6325

PENTEK XE-Series Motor

Submersible Motor Control & Fusing/Wiring Specifications

3 WIRE

Table II: Recommended Fusing Data

PENTEK XE-Series 60Hz., Single Phase, 3 Wire Induction Run Submersible Pump Motors

HP	Volts/Hz/Ph	Motor Winding Resistance Ohms		Service Factor Amps	Locked Rotor Amps	Fuze Size Standard/ Dual Element
		R to Y	B to Y			
0.5	115/60/1	5.7-7.0	1.1-1.4	12.6	49.6	35/20
0.5	230/60/1	16.3-19.9	4.0-4.9	6.3	22.3	20/10
0.75	230/60/1	11.1-13.6	2.7-3.3	8.3	32.0	25/15
1.0	230/60/1	10.6-13.0	2.5-3.1	9.7	41.2	30/20
1.5	230/60/1	7.4-9.1	1.9-2.4	11.1	47.8	35/20
2.0	230/60/1	10.8-12.0	1.6-2.2	12.2	49.4	30/20
3.0	230/60/1	2.0-2.5	1.1-1.4	16.5	76.4	45/25
5.0	230/60/1	1.36-1.66	0.62-0.76	27.0	101.0	70/40

PENTEK XE-Series Motors: 60 Hz., Single Phase, 3 Wire

	HP	Volt	Wire Size, AWG										
			14	12	10	8	6	4	3	2	1	0	00
3 Wire in feet	0.5	115	87	138	221	349	544	867	1090	1376	1734	2188	2761
	0.5	230	348	553	883	1398	2175	3467	4359	5505	6935	8753	11044
	0.75	230	264	420	670	1061	1651	2632	3309	4178	5264	6644	8383
	1.0	230	226	359	573	908	1413	2252	2831	3575	4504	5685	7173
	1.5	230	197	314	501	793	1234	1968	2474	3124	3936	4968	6268
	2.0	230	180	286	456	722	1123	1790	2251	2843	3581	4520	5703
	3.0	230	133	211	337	534	830	1324	1664	2102	2648	3342	4217
	5.0	230	-	-	206	326	507	809	1017	1284	1618	2042	2577

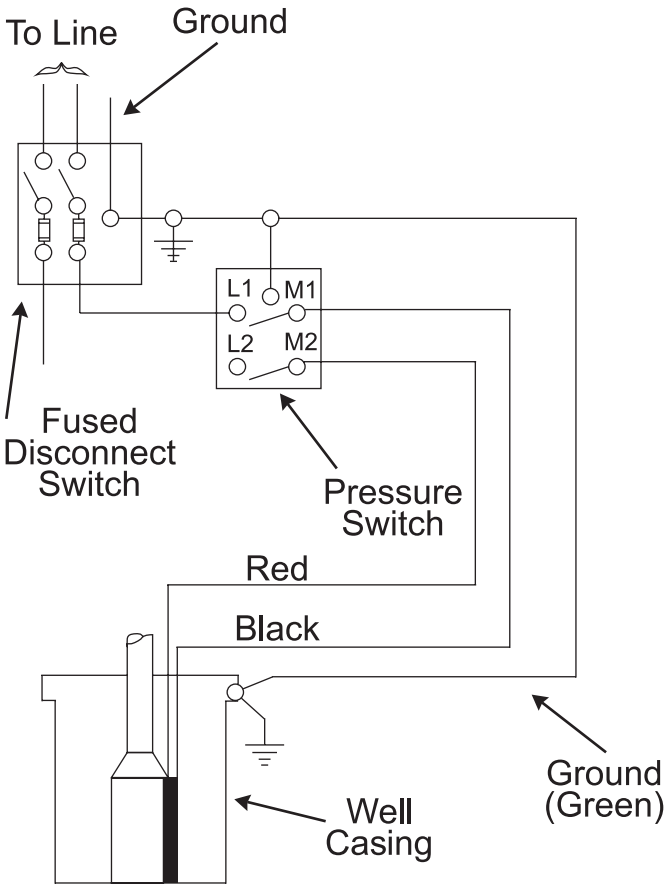
PENTEK XE-Series Motor

Submersible Motor Control & Fusing/Wiring Specifications

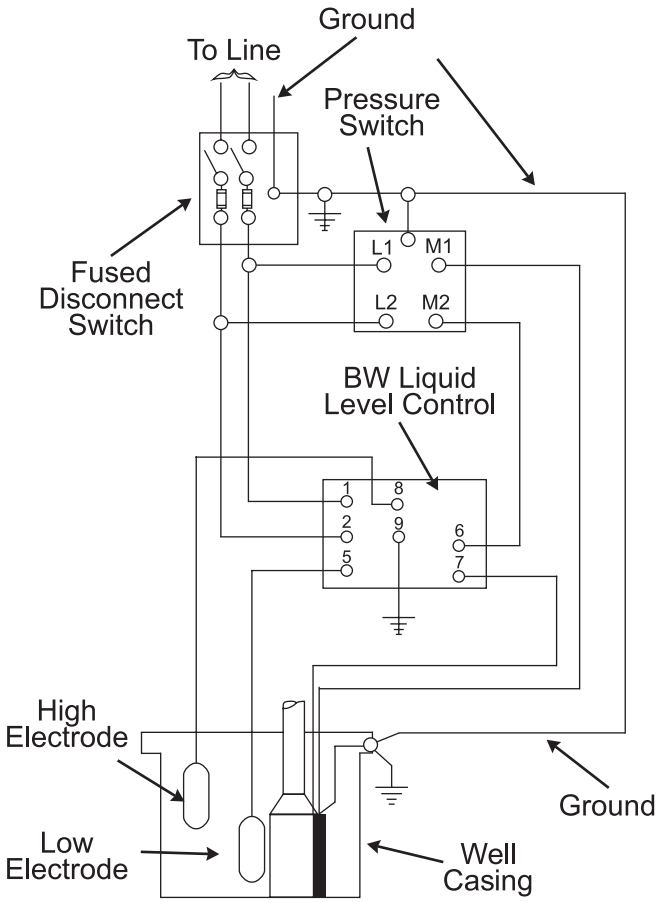
Installation Wiring Diagrams - 2 Wire

For motors of 1 - 1/2 HP and above, use magnetic starter to avoid damage to pressure switch. Consult factory for wiring information.

1.) One Pump For One House With Pressure Switch



2.) With Pressure Switch & Liquid Level Control



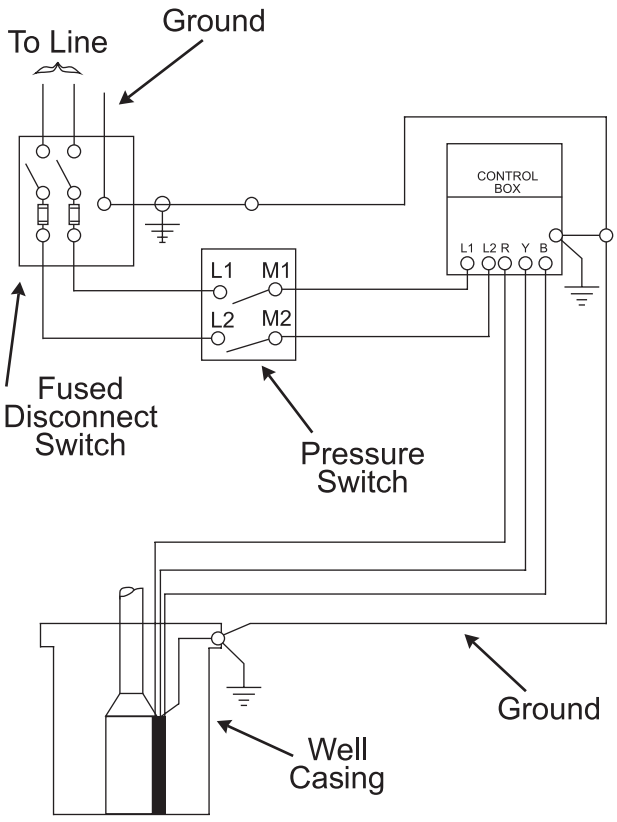
PENTEK XE-Series Motor

Submersible Motor Control & Fusing/Wiring Specifications

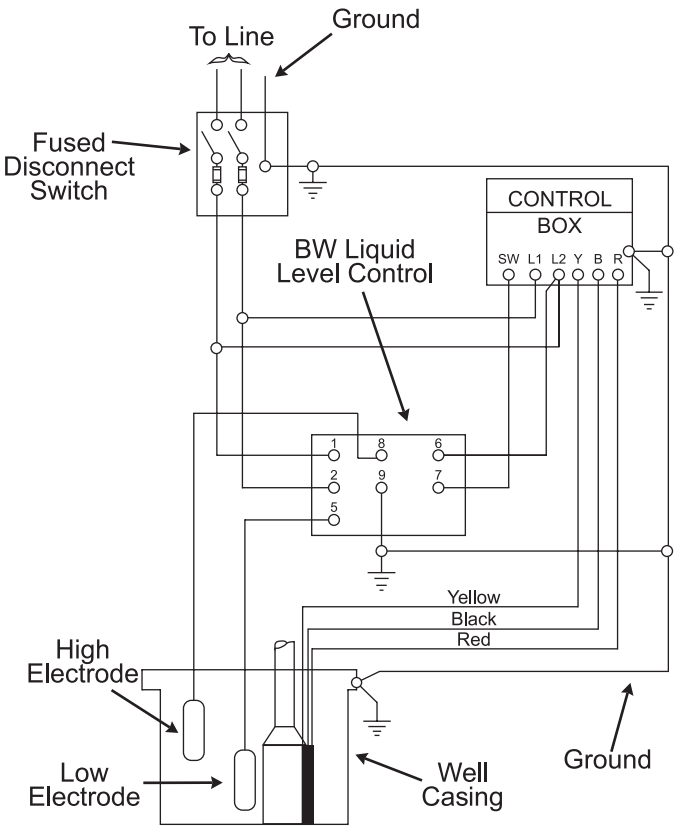
Installation Wiring Diagrams - Single Phase, 3 Wire

For mortors of 1 - 1/2 HP and above, use magnetic starter to avoid damage to pressure switch. Consult factory for wiring information.

3.) Single Phase - 1/2 HP Thru 5 HP Standard Control Box With Adequate Rated Pressure Switch



4.) Single Phase - 1/2 HP Thru 5 HP Standard Control Box With Liquid Level Control



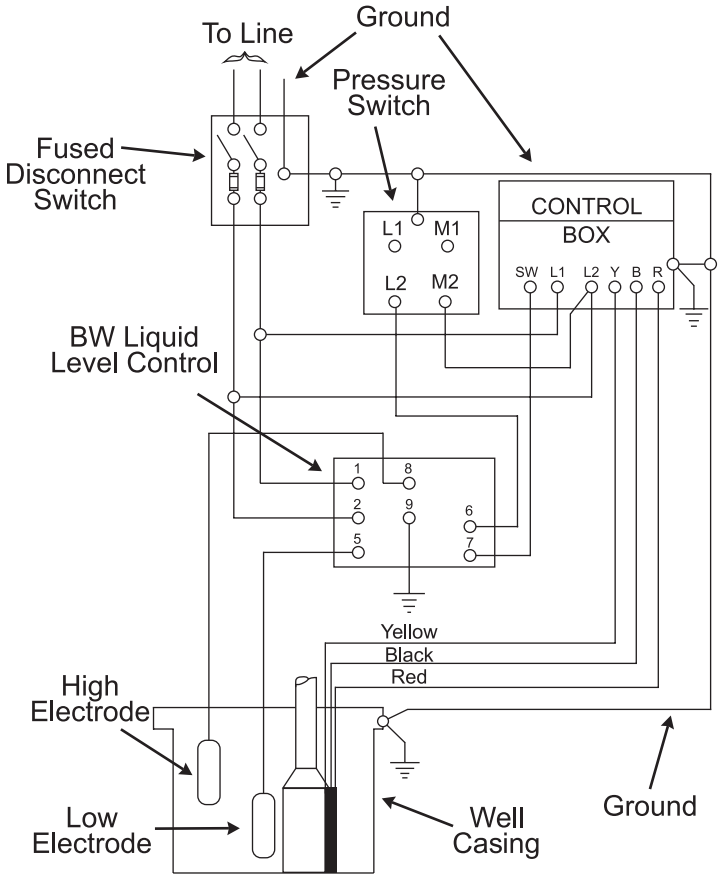
PENTEK XE-Series Motor

Submersible Motor Control & Fusing/Wiring Specifications

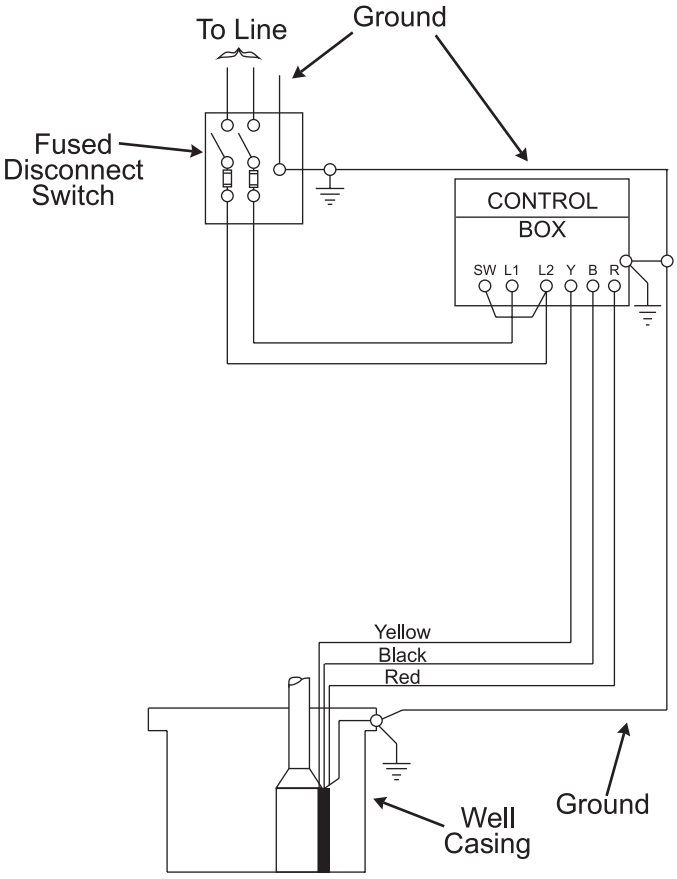
Installation Wiring Diagrams - Single Phase, 3 Wire

For mortors of 1 - 1/2 HP and above, use magnetic starter to avoid damage to pressure switch. Consult factory for wiring information.

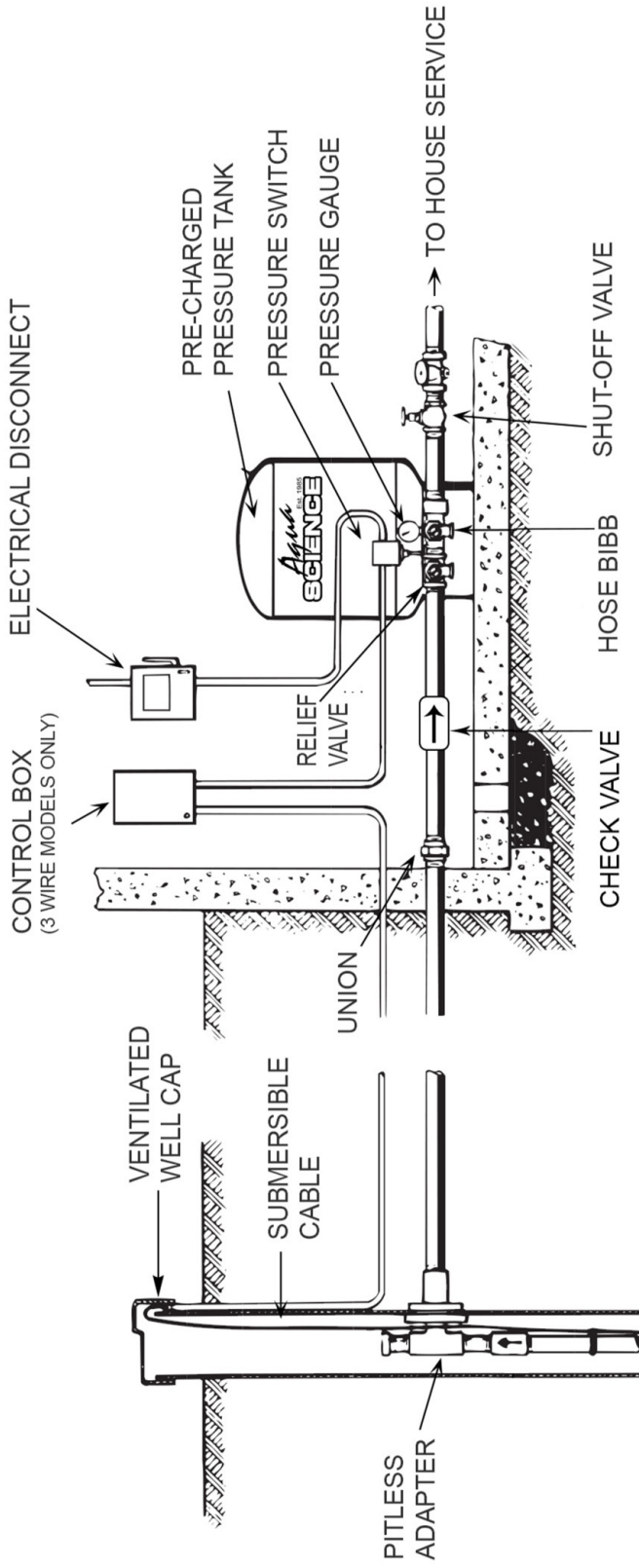
5.) Single Phase - 1/2 HP Thru 5 HP Standard Control Box With Pressure Switch & Liquid Level Control



6.) Open System - Single Phase - 1/2 HP Thru 5 HP Standard Control Box



TYPICAL SUBMERSIBLE PUMP INSTALLATION



Cut-In PSI	Cut-Off PSI	Pre-charge Pressure *
20 (138 kPa)	40 (276 kPa)	18 PSI (124 kPa)
30 (207 kPa)	50 (345 kPa)	28 PSI (193 kPa)
40 (276 kPa)	60 (414 kPa)	38 PSI (262 kPa)

* Pre-charge air pressure must be checked with the tank completely empty.

Troubleshooting Guide

Problem	Check	Corrective Action
MOTOR WILL NOT START BUT FUSES DO NOT BLOW		
No Voltage	No Voltage at fuse box	Consult power supplier, check generator
	No Voltage at control box	Check connections, rewire from fuse box to control box
	No voltage at pressure switch	Check connections, replace control box, rewire from control box to pressure switch
	No voltage on load side of pressure switch	Check connections, replace pressure switch
	Cable or splices bad	Consult serviceman or licensed electrician
	Control box incorrectly wired	Reconnect control box correctly (see diagrams in prior pages)
FUSES BLOW OR OVERLOAD PROTECTOR TRIPS WHEN MOTOR STARTS		
Wrong size fuse or wrong size time delay fuse.	Check fuse size against charts	Install correct fuse or time delay fuse
Wire size too small.	Check wire size against charts	Install correct size wire
Starting capacitor defective or blown.	Check control box to see if starting capacitor has blown out	Replace starting capacitor
Low or high voltage.	Check that line voltage is within ± 10% of nameplate rated voltage while motor is running	If voltage variation is greater than ± 10%, call power company to adjust voltage
Cable leads not correctly connected to control box.	Check control box wiring diagram against incoming power hookup. Check drop cable color coding	Reconnect leads to match wiring diagram in control box cover. Reconnect drop cable so cable color code matches motor lead color code
Broken wire in control box.	Examine all connections and wiring in control box	Disconnect power and repair or replace faulty wire
Pump or motor stuck or binding.	Check for locked rotor in pump	If necessary, pull pump (make all possible above ground checks first). If pump is locked, replace it. Clean well of all sand or lime before reinstalling pump
FUSES BLOW OR OVERLOAD PROTECTOR TRIPS WHEN MOTOR IS RUNNING		
Low or high voltage.	Check that line voltage is within ± 10% of rated nameplate voltage while motor is running	If voltage variation is more than ± 10%, call power company to adjust voltage
High ambient (atmospheric temperature)	Check temperature of control box	Do not mount control box in drect sunlight
Control box with wrong voltage or horsepower rating.	Compage voltage and horsepower on motor nameplate with those given on control box nameplate or on circuit diagram inside control box cover	Replace control box if numbers do not match
Wire size too small.	Check wire size against charts	Install correct wire size
Cable splices or motor leads grounded, shorted, or open.	Consult licensed electrician or qualified serviceman	Do not attempt to dissemble pump or motor

Troubleshooting Guide (continued)

Problem	Check	Corrective Action
PUMP STARTS TOO FREQUENTLY		
Leaks in system.	Check all tank connections with sapsuds for air leaks. Check plumbing for leaks	System must be air and water tight
Pressure switch.	Check for defective switch or switch out of adjustment	Re-adjust or replace pressure switch
Tank waterlogged.	Pre-charged tanks; check tank precharge air pressure, check for leak in bladder	Pre-charge tanks: adjust air pressure to 2 PSI (13.8 kPa) less than pump cut-in pressure (when there is no water pressure on system) *Replace tank if necessary*
	Air over water tanks: check for air leaks Check Air Volume Control (AVC) Check snifter valve operation	Air over water tanks: repair or replace tanks; replace snifter valves if necessary
Leak in drop pipe.	Raise drop pipe one lengh at a time until water stands in pipe	Replace pipe above that point
Pressure switch too far from tank.	Measure distance from pressure switch to tank.	Move switch to within one foot (.3M) of tank.
LITTLE OR NO WATER DELIVERED		
Low water level.	Determine lowest water level in well while pump is running and compare to pump depth setting.	Lower pump further into well (but at least 5' (1.6M) above bottom of well). Throttle pump discharge until discharge equals recovery rate of well. NOTICE: Running pump while airlocked can cause loss of prime and serously damage pump.
Low voltage.	Check voltage at control box with pump running. Check incoming wire size and drop cable size against charts.	Install larger wire from meter to control box. Install larger wire from control box to pump. If necessary, have power company raise supply voltage.
Plugged intake screen.	Pull pump and check condition of screen.	Clean or replace as necessary.
Check valve at pump discharge stuck.	Pull pump and examine check valve.	Free check valve.
Worn impellers and diffusers.	Make sure system is clear of obstructions and pump is in solid water and operation normally.	Replace pump.
AIR OR MILKY WATER DISCHARGE FROM FAUCETS.		
Gas in well water.	Check for presence of gas in well water.	Remove bleeder orifices; plug tees. Be sure plugged tees do not leak. If necessary, seperate gas from air before it enters pressure tank.
Air volume control not working (standard tanks only).	Make sure ports and ball check valves are clear.	Replace control if necessary.

Aqua Science Limited Warranty

SS/SSH 4" Submersible Pump

The warranty period:

- SS 1/2 to 1.5 HP = 5 year from date of purchase
- SSH 1 1/2 to 5 HP = 5 year from date of purchase

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the customer during the warranty period when used in accordance to the outline below.

The warranty covers the pump and the motor from any manufacturers' defects. It does not apply to problems caused by incorrectly sized pumps, incorrect size pressure tank and settings, improper voltage, lightning, freak accidents, excessive sand or abrasives, lack of water, or improper installation.

The warranty excludes:

(a) Labor, return and replacement shipping;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

To initiate a claim, please send an email to claims@aquascience.net with your name,order number, and best way to contact you. Also send the pump model and a detailed description of the problem.

We will respond promptly with an RMA # (return merchandise authorization). Clearly write the RMA # on the outside of the box and send the pump back to the address below. No pumps will be accepted without an RMA.

Aqua Science
ATTN: Claims
301 Nooseneck Hill Rd
Wyoming, Rhode Island 02898