INSTALLATION AND OPERATING MANUAL

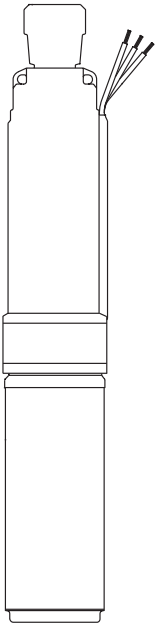
4" Submersible Pumps Two and Three Wire, Single and Three Phase, 1/2 through 10 H.P., 60 Hz

NOTICE D'INSTALLATION ET DE FONCTIONNEMENT

Pompes submersibles de 4 pouces Moteurs bifilaires et trifilaires, Monophasés et triphasés, Puissance de 1/2 à 10 ch, 60 Hz

MANUAL DE INSTALACIÓN Y FUNCIONAMIENTO

Bombas sumergibles de 4" Bifilares y Trifilares, Monofásicas y trifásicas, 1/2 hasta 10 H.P., 60 Hz



Record the following information from the motor and pump nameplates for future reference:

Sur les lignes qui suivent, indiquer les informations suivantes qui se trouvent sur les plaques signalétiques du moteur et de la pompe de façon à pouvoir s'y reporter ultérieurement :

Anote la siguiente información de las chapas del motor y de la bomba para referencia futura:

Pump Model No.	
N° de modèle de la pompe	
No. de modelo de la bomba	
Pump Serial No.	
N° de série de la pompe	
No. de serie de la bomba	
Motor Model No.	
N° de modèle du moteur	
No. de modelo del motor	
Motor Serial No.	
N° de série du moteur	
No. de serie del motor	
H.P., Volts/Hz/Ph	
Puissance en CH Volts/Hz/Phase(s)	
H.P. Voltios/Hz/Fase	
Rated Amp Draw	
Débit nominal en ampères	
Corriente nominal extraída	

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PH: 262-728-5551

PN280 (REV 02/20/13)

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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.

To avoid serious or fatal personal injury and possible property damage, carefully read and follow the safety instructions.

⚠ WARNING **Hazardous voltage.** Can shock, burn or cause death. To avoid dangerous or fatal electric shock hazard, use pump only in a water well.

⚠ WARNING **Risk of electrical shock.** Do not install this pump in any pond, river, or other open body of water that could be used for swimming or recreation. Do not swim, wade or play in a body of water in which a submersible pump has been installed.

- Installation must meet United States National Electrical Code, Canadian Electrical Code, and local codes (as applicable) for all wiring.
- Disconnect electrical power supply before installing or servicing pump.
- Make sure line voltage and frequency of power supply match motor nameplate voltage and frequency.

⚠ WARNING **Hazardous pressure.** Under certain conditions, submersible pumps can develop extremely high pressure. Install a pressure relief valve capable of passing entire pump flow at 75 PSI (517 kPa) when using an air over water pressure tank. Install a pressure relief valve capable of passing entire pump flow at 100 PSI (690 kPa) when using a pre-charged pressure tank.

⚠ CAUTION **Risk of freezing.** Do not allow pump, pressure tank, piping, or any other system component containing water to freeze. Freezing may damage system, leading to injury or flooding. Allowing pump or system components to freeze will void warranty.

California Proposition 65 Warning

⚠ WARNING This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Electrical Grounding Information

⚠ WARNING **Hazardous voltage.** Can shock, burn, or kill. To reduce the risk of electrical shock during pump operation, ground and bond the pump and motor as follows:

- To reduce risk of electrical shock from metal parts of the assembly other than the pump, bond together all metal parts accessible at the well head (including metal discharge pipe, metal well casing, and the like). Use a metal bonding conductor at least as large as the power cable conductors running down the well to the pump's motor.
- Clamp or weld (or both if necessary) this bonding conductor to the grounding means provided with the pump, which will be the equipment-grounding terminal, the grounding conductor on the pump housing, or an equipment-grounding lead. The equipment-grounding lead, when provided, will be the conductor having green insulation; it may also have one or more yellow stripes.
- Ground the pump, motor, and any metallic conduit that carries power cable conductors. Ground these back to the service by connecting a copper conductor from the pump, motor, and conduit to the grounding screw provided within the supply-connection box wiring compartment. This conductor must be at least as large as the circuit conductors supplying the pump

Allowing pump or system components to freeze will void warranty.

Install pump according to all plumbing, pump and well code requirements.

Test well water for purity before using well. Call your local health department for testing procedure.

During installation, keep well covered as much as possible to prevent leaves and foreign matter from falling into well. Foreign objects in well can contaminate the water and cause serious mechanical damage to the pump.

Pipe joint compound can cause cracking in plastics. Use only PTFE pipe thread sealing tape when sealing joints in plastic pipe or when connecting pipe to thermoplastic pumps.

Pre-Installation

Inspect pump and motor for delivery damage. Report any damage immediately to the shipping carrier or to your dealer.

The well driller should thoroughly develop the well (that is, pump out all fine sand and foreign matter) before pump is installed.

Pump performance is based on pumping clear, cold, liquid water.

Warranty is void in the following conditions:

- If pump has pumped excessive sand – excessive sand can cause premature wear to pump.
- If water is corrosive.
- If entrained gas or air are present in the water being pumped – these can reduce flow and cause cavitation which can damage pump.
- If pump has been operated with discharge valve closed – severe internal damage will result.

Install pump at least 15 to 20′ (4.5 to 6m) below the lowest water level reached with pump running (lowest draw-down water level), and at least 5′ (1.5m) above the bottom of the well.

See *Tables* for information on submersible motor overload protection, control box specifications, recommended fusing, and service wiring requirements. Also see *Diagrams* for typical submersible pump installation wiring.

Wiring/Grounding

⚠WARNING **Hazardous voltage.** Can shock, burn, or cause death. 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 specified in *Cable Sizing Tables*. Also see *Cable Splicing* instructions.

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. Do not ground to a gas supply line.

⚠WARNING **Fire and electrical shock hazard.** 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 Connections

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 See *Diagrams* for typical wiring hookups and control box identification.

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.

Rotation – (3 Phase only)

To make sure motor is running in the correct direction, proceed carefully as follows:

After electrical connections have been made as outlined, and with pump hanging in well supported from clamp on the discharge pipe, turn on then turn off the switch connecting the motor to the power supply line.

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. With connections properly made, and pump lowered into water, turn the switch ON again and the pump should deliver water according to the performance charts.

Overload Protection Of Three Phase Submersible Motors – Class 10 Protection Required

The characteristics of submersible motors are different from standard motors and special overload protection is required.

If the motor is stalled, the overload must trip within 10 seconds to protect the motor windings. All recommended overload selections are of the ambient compensated type to maintain protection at high and low air temperatures.

All heaters and amp settings shown are based on total line amps. When a six-lead motor is used with a Wye-Delta starter, divide motor amps by 1.732 to make your selection or adjustment for heaters carrying phase amps.

See *Table I* for overload specifications for PENTEK motors.

NOTICE Warranty on three phase submersible motors is void unless proper quick trip protection in all three motor lines is used.

Surge Arresters in Control Box

Grounding: When the box has a surge arrester, the surge arrester MUST be grounded, metal to metal, all the way to the water strata for the arrester to be effective. Grounding the arrester to a driven ground rod provides little or no protection for the motor.

NOTICE Surge arresters DO NOT protect against direct lightning strikes.

Install grounded surge arresters to protect pump from high voltage surges. Install arrester on the incoming power line to control box or pressure switch, as close to pump motor as possible. See Figures 1 and 2 for installation wiring diagrams for arresters.

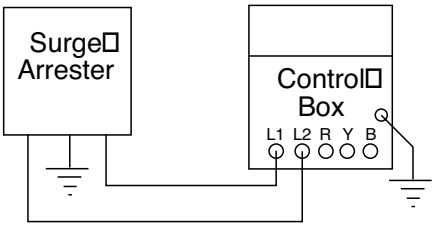


Figure 1 – Typical 3 Wire, Single Phase, 230 Volt Surge Arrester Wiring Diagram

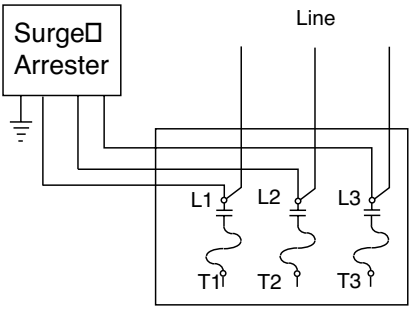


Figure 2 - Three Phase Surge Arrester (650 Volt Maximum) Wiring Diagram

NOTICE Ground the arrester with a AWG 10 or larger bare wire. Ground according to local code requirements.

NOTICE If surge arresters wired into the control box do not comply with local electrical code, contact power company for correct wiring information.

Recommended Adjustable Overload Relays

AEG Series:
B17S, B27S, B27-2.

Allen Bradley:
Bulletin 193, SMP-Class 10 only.

Fanal Types:
K7 or K7D through K400.

Franklin Electric:
Subtrol-Plus.

General Electric:
CR4G, CR7G, RT*1, RT*2, RTF3, RT*4, CR324X-Class 10 only.

Klockner-Moeller Types:
Z00, Z1, Z4, PKZM1, PKZM3, PKZ2.

Lovato:
RC9, RC22, RC80, RF9, RF25, RF95.

Siemens Types:
3UA50, -52, -54, -55, -58, -59, -60, -61, -62, -66, -68, -70, 3VUI3, 3VE, 3UB (Class 5).

Sprecher and Schuh Types:
CT, CT1, CTA 1, CT3K, CT3-12 thru CT3-42, KTA3, CEF1 & CET3 set at 6 sec. max., CEP 7 Class 10, CT4, 6,& 7, CT3.

Square D/Telemecanique:
Class 9065 types TD, TE, TF, TG, TJ, TK, TR, TJE, TJF (Class 10) or LR1-D, LR1-F, LR2-D13, -D23, -D33, Types 18A, 32A, SS-Class 10, SR-Class 10 and 63-A-LB Series. Integral 18,32,63, GV2-L, GV2-M, GV2-P, GV3-M (1.6-10 amp only).

Westinghouse Types:
FT13, FT23, FT33, FT43, K7D, K27D, K67D, Advantage (Class 10), MOR, IQ500 (Class 5).

Other relay types from these manufacturers or from other manufacturers may or may not provide acceptable protection. Contact Pentair Customer Service for more information.

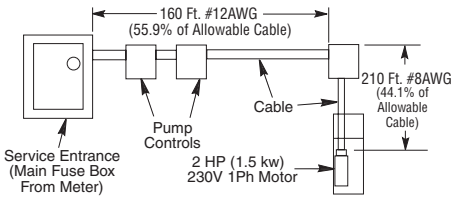
Some approved overload types may not be available for all of the listed motor ratings. When relays are used with current transformers, divide the specified amps by the transformer ratio to obtain the relay setting.

Calculating Cable Size

When two different sizes can be used (calculated in feet)

Sometimes conditions make it desirable to use more than one size cable in an installation.

For example: Replace a pump with a 2 HP, 230 volt, 60 Hz, single phase motor, with the motor setting at 210′ down the well and with 160′ of #12AWG cable buried between the service entrance and the well head. In order to avoid replacing the buried cable, the question is: What size cable is required in the well? Calculate as follows:



1. According to *Table VIII*, a total of 286′ of #12AWG cable is allowed to power the 2 HP motor. The percent of this total that has been used by the 160′ of cable in the buried run is: 160′/286′ = .559 = 55.9%.
2. With 55.9% of the allowable cable already used, 44.1% of the total length is left for use in the well. To avoid running a cable that is too small and lowering the voltage to the motor, we have to find a cable size large enough so that 210′ is less than 44.1% of the total length allowed for that size.
3. Trying #10AWG cable, *Table VIII* shows that the total allowable length for a 2 HP motor is 456′.

   456′ x 44.1% = 456′ x .441 = 201′

   This is not long enough.
4. Trying #8AWG cable, *Table VIII* shows that the total allowable length is 722′.

   722′ x 44.1% = 722′ x .441 = 318′

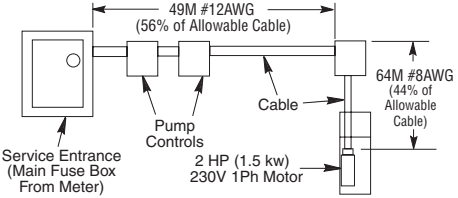
   This is longer than needed. Therefore, #8AWG cable can be used for the 210′ of cable in the well.

   Any combination of sizes can be used, provided that the total percentage of the length of the two sizes of cable does not exceed 100% of the allowed lengths.

When two different sizes can be used (calculated in meters)

Sometimes conditions make it desirable to use more than one size cable in an installation.

For example: Replace a pump with a 2 HP, 230 volt, 60 Hz, single phase motor, with the motor setting at 64m down the well and with 49m of #12AWG cable buried between the service entrance and the well head. In order to avoid replacing the buried cable, the question is: What size cable is required in the well? Calculate as follows:



1. According to *Table IX* , a total of 87m of #12AWG cable is allowed to power the 2 HP motor. The percent of this total that has been used by the 49m of cable in the buried run is: 49m/87m = .56 = 56%.
2. With 56% of the allowable cable already used, 44% of the total length is left for use in the well. To avoid running a cable that is too small and lowering the voltage to the motor, we have to find a cable size large enough so that 64m is less than 44% of the total length allowed for that size.
3. Trying #10AWG cable, *Table IX* shows that the total allowable length for a 2 HP motor is 139m.

   139m′ x 44% = 139m x .44 = 61m

   This is not long enough.
4. Trying #8 cable, *Table IX* shows that the total allowable length is 220m.

   220m x 44% = 220m x .44 = 97m

   This is longer than needed. Therefore, #8AWG cable can be used for the 64m of cable in the well.

   Any combination of sizes can be used, provided that the total percentage of the length of the two sizes of cable does not exceed 100% of the allowed lengths.

Installation Wiring Diagrams - Single Phase, 3 Wire

⚠WARNING **Hazardous voltage**. Can shock, burn, or kill. Ground control box, all metal plumbing, and motor frame with copper wire in compliance with local codes. Use a ground wire at least as large in gauge as the wires supplying power to the motor.

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

Permanently close all unused openings in this and other equipment enclosures.

Disconnect power to control box before working on or around control box, pipes, cable, pump, or motor.

To be sure that starting relay will function and that overload will not "nuisance trip", install control box vertically with top side up.

Wire control box as shown in *Diagrams*. Submersible pump will not operate without a control box, and some boxes require a switch or a jumper lead between 'SW' and 'L2' terminals. Operation without control box will burn out the pump motor.

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

If main overload trips, look for:

1. Shorted capacitor
2. Voltage problems
3. Overloaded or locked pump.

NOTICE Match motor to control box or motor control as shown in *Specifications*.

Liquid Level (Pump Down) Controls:

Use pump down controls on wells with low flow to prevent pumping well dry. See *Installation Diagrams* for proper installation. Ground controls according to local code requirements.

If start overload trips, replace start relay. Reset and analyze for tripping cause. To avoid motor burnout, do not remove or short circuit overload protection.

Checking Procedure (All Control Boxes):

⚠WARNING **Hazardous voltage.** Can shock, burn, or cause death. Disconnect power to control box before doing these check procedures.

A. General Procedures. (Power to control box disconnected)

1. Disconnect line.
2. Inspect for damaged or burned parts, loose connections, etc.
3. Check for misconnections against diagram in control box.
4. If box is too hot, circuit breakers may trip or fuses blow. Ventilate or shade box. Move away from heat source.
5. If problem has not been found, check motor and control box. Use test procedures that follow.

B. Ground (Insulation Resistance) Test. (Power to control box disconnected)

1. Ohmmeter Setting: Highest scale (usually Rx100K or Rx10,000).
2. Terminal Connections: One ohmmeter lead to "Ground" screw on control box and touch other lead to each of the terminals on terminal board.
3. Ohmmeter Reading: Pointer should remain at infinity (∞) and not deflect.

C. Capacitor Tests. (Power to control box disconnected)

⚠WARNING **Risk of electric shock.** Short capacitor across terminals before testing.

1. Ohmmeter Setting: Rx1000.
2. Terminal Connections: Connect ohmmeter leads to black and orange wires out of capacitor case.
3. Ohmmeter Reading: Pointer should swing toward "zero" and "float" back to (∞). Capacitor is shorted if pointer does not move back to (∞), open if it does not move from (∞).
4. To reset capacitor, reverse ohmmeter connection to capacitor terminals.

D. Triac Test. (Solid state switch only)

1. Ohmmeter Setting: Rx1000.
2. Connect the leads to "R" (start) terminal and to orange lead terminal on start switch.
3. Ohmmeter reading: Infinity (∞).

E. Coil Test. (Solid state switch only)

1. Ohmmeter Setting: Rx1.
2. Connect leads to "Y" (common) and L2 terminal and to orange lead terminal on start switch.
3. Ohmmeter reading: Infinity (∞).

Cable Splicing

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 3). Be sure to match wire colors between drop cable and motor leads.
5. Using crimping pliers (Figure 6), indent butt connector lugs (see Figure 4) to secure wires.

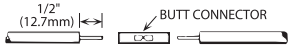


Figure 3

Figure 4

Figure 5

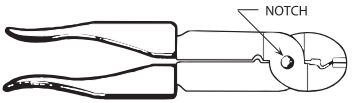


Figure 6

Figure 7

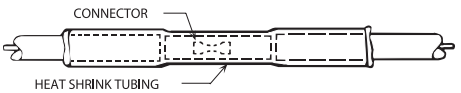


Figure 8

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.
7. 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 7).

   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 5).

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

1. Remove 3/8″ (10mm) insulation from ends of motor leads and drop cable wires.
2. Put plastic heat shrink tubing over motor leads.
3. Match wire colors and lengths in drop cable to wire colors and lengths of motor leads.
4. Insert cable and motor wire ends into butt connectors and crimp (See Figures 3 and 4). **BE SURE** to match wire colors between drop cable and motor leads. Pull leads to check connections.
5. 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 8).

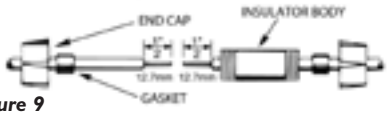


Figure 9

Figure 10

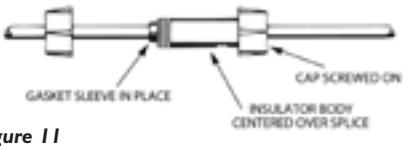


Figure 11

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

1. 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.
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. Unscrew plastic caps from insulators. Place a cap and a neoprene gasket sleeve on each wire end to be spliced (see Figure 9).
5. Slide insulator body onto one wire end (Figure 9).
6. Insert wire end into butt connector and crimp (see Figure 10). Be sure to match cable and motor wire colors.
7. Center insulator body over splice and slide neoprene sleeves into body as far as they will go. Screw caps onto insulator body (Figure 11) and tighten by hand for a strong, waterproof splice.

Cable Installation

1. To test submersible pump, momentarily connect it to proper power supply. Power supply frequency and voltage must match motor nameplate frequency and voltage to within ±10%. See *Rotation* for three phase pumps.
2. Fasten cable leads securely to pump discharge section; leave 4-5″ (100-127mm) of slack in leads at this point. Securely fasten leads to plastic pipe within 6″ (150mm) of the pump discharge section. Use properly-installed torque arresters to protect pump and pipe from twisting damage as pump starts and stops.
3. Connect copper ground wire to motor bracket. Ground wire must be at least as large as wires supplying current to motor. Consult current National Electrical Code, Canadian Electrical Code and local codes (as applicable) for grounding information.
4. Use only submersible cable supplied by pump manufacturer. When lowering pump into well, secure cable to discharge pipe at 10′ (3.5m) intervals with electrical tape. Take care not to damage pump cable.
   NOTICE To avoid dropping the pump down the well or damaging cable or cable splices, **NEVER** allow pump cable to support weight of pump.

Pump Installation

1. If a standard air over water pressure tank is being used, install two bleeder orifices about 2′ (60cm) apart as shown on page 63. These orifices will automatically charge the tank with air. See page 62 to determine orifice location.
   NOTICE If a pre-charged tank is used, DO NOT install bleeder orifices. If pump and pre-charged tank are replacing a standard tank system, remove bleeder orifices before installing pump in well.
2. To prevent losing pump down the well, connect a safety rope strong enough to support pump and drop pipe (minimum 5/16″ [8mm] twisted polypropylene or pronila rope) to eyelet on pump discharge. Tie off other end of safety rope securely to well seal, well cap or pitless adapter.
3. Discharge outlet is threaded 2″ NPT (60 Hz) or 2″ BSP (50 Hz).
   Use 100 PSI rated polyethylene plastic pipe for installations up to 100′ (30m) depth.
   Use 160 PSI rated polyethylene plastic pipe for installation up to 220′ (67m) depth.
   For depths beyond 220′ (67m), use galvanized steel pipe for the entire drop pipe.

Initial Start-Up

NOTICE NEVER operate pump with discharge valve completely closed. Pump can destroy itself if run with discharge shut off ("deadheaded").

NOTICE To avoid sand-locking pump, follow procedure below when starting pump for the first time. NEVER start a pump with discharge completely open unless you have done this procedure first.

1. Connect a pipe elbow, a short length of pipe and a gate valve to pump discharge at well head (see Figure 12).

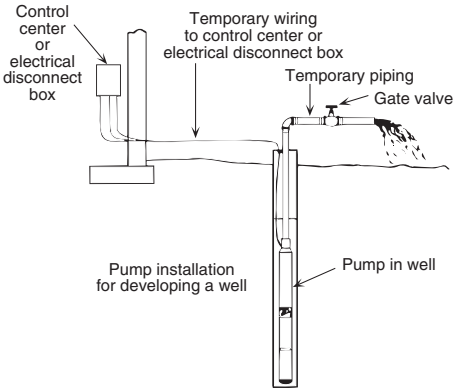


Figure 12 - Typical pump start-up

2. Mount motor control box (3-wire pump), fused disconnect switch (2-wire pump), or magnetic starter (three-phase pump) in a permanently weather proofed place. Make sure that controls will not be subjected to extreme heat or excess moisture.
3. Make sure controls are in OFF position.
4. Connect motor leads and power supply to motor control box, fused disconnect switch, or magnetic starter (see *Diagrams*). **Do not start pump yet**.
5. Set gate valve on discharge 1/3 open; start pump (see Figure 12).
6. Keep gate valve at this setting while water pumps out on ground. Let it run until water is clear of sand or silt. To check solids in water, fill a glass from pump and let solids settle out.
7. When water is completely clear at 1/3 setting, open gate valve to approximately two-thirds open and repeat process.
8. When water is completely clear at 2/3 setting, open gate valve completely and run pump until water is completely clear.
9. Remove gate valve for permanent installation near tank (see pages 62 and 63).
10. Install sanitary well seal or pitless adapter unit, well unit, electrical conduit and surface piping according to local code requirements.

Effluent Applications

Pumps designed and tested for effluent applications must meet the following:

⚠WARNING **Risk of electric shock.** Do not remove cord and strain relief. Do not connect conduit to pump.

1. Only qualified personnel should install the pump and associated control equipment.
2. Vent sewage or septic tank according to local codes.
3. Do not install pump in any location classified as hazardous by National Electrical Code, ANSI/NFPA 70-2001.
4. These pumps are intended for permanent connection only. Provide strain relief at control box for power supply cord connection to box. All control components must be UL listed and suitable for end use application.

Connecting To Tank / Water System

⚠WARNING **Hazardous pressure.** Submersible pumps can develop very high pressure in some situations. To prevent tank failure, install a pressure relief valve able to pass full pump flow at 75 PSI (517 kPa) when using an air over water pressure tank. Install a pressure relief valve capable of passing entire pump flow at 100 PSI (690 kPa) when using a pre-charged pressure tank. Install this relief valve between pump and tank.

NOTICE Allowing pump or piping system to freeze may severely damage pump and will void warranty. Protect pump and entire piping system (including pressure tank) from freezing.

Standard Tank Hookup:

See page 62 for piping connections to standard pressure tank and for correct distance of bleeder orifices from pressure tank.

Pre-charged Pressure Tank Hookup:

See page 63 for piping connections to pre-charged pressure tank.

NOTICE Check air pre-charge in tank before starting pump. Adjust pre-charge to 2 PSI (13.8 kPa) below pump cut-in setting. (For example, a pre-charge tank used with a 30-50 switch should be pre-charged with air to 28 PSI (193 kPa). Adjust pre-charge by either adding or bleeding air through air pressure valve located on top of tank. Check pre-charge annually and adjust as needed.

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*).
Fuses blow or overload protector trips when motor starts.		
Wrong size fuse or wrong size time delay fuse.	Check fuse size against *Fuse Size* tables.	Install correct fuse or time delay fuse.
Wire size too small.	Check wire size against *Cable Sizing* tables.	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.	Reconnect leads to match wiring diagram in control box cover.
	Check drop cable color coding.	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 direct sunlight.
Control box with wrong voltage or horsepower rating.	Compare 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 *Cable Sizing* tables.	Install correct wire size.
Cable splices or motor leads grounded, shorted, or open.	Consult licensed electrician or qualified serviceman.	Do not attempt to disassemble pump or motor.

Problem	Check	Corrective Action
Pump starts too frequently.		
Leaks in system.	Check all tank connections with soapsuds 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 pre-charge 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 bladder if necessary.
	Air over water tanks: check for air leaks. Check Air Volume Control (AVC). Check air pressure valve operation.	Air over water tanks: repair or replace tanks; replace air pressure valve if necessary.
Leak in drop pipe.	Raise drop pipe one length 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.		
Bleeder orifice check valve stuck or installed backwards (standard tank only).	Examine valve.	If stuck, free valve; if installed backwards, reverse it.
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 seriously damage pump.
Low voltage.	Check voltage at control box with pump running. Check incoming wire size and drop cable size against *Cable Sizing* tables.	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 normal.	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, separate 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.

Limited Warranty

PENTAIR 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 Products — jet pumps, small centrifugal pumps, submersible pumps and related accessories	*whichever occurs first:* 12 months from date of original installation, 18 months from date of manufacture
PENTEK INTELLIDRIVE™	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-Line 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

Our warranty will not apply to any product that, in our sole judgment, 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 PENTAIR's only duty, is that PENTAIR repair or replace defective products (at PENTAIR'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.

PENTAIR IS NOT 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 how long an implied warranty lasts, 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.

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