

WELL WIZARD®

Dedicated Monitoring Systems

INSTALLATION GUIDE

P/N 34999

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Air-Met Scientific
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Installation and Operation Manual

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Table of Contents

Topic	Page
Safety Warnings	1
Contacting QED and Introduction	1
Well Wizard® System Components	1
Well Wizard® System Types A and L	2-3
Well Wizard Bladder Pump Models	4
How a Bladder Pump Works	5-6
Twin-bonded Pump Tubing, Inlet Screens and Well Caps	7-9
MicroPurge® Portable System Components	10
Installing Your Well Wizard System	11-12
Installing the Bladder Pump Inlet Screen	13
Installing or Replacing Pump Fittings and Connectors	14
Attaching and Re-attaching Pump Fittings and Connectors	15-16
Installing Pump Systems with Pre-cut and Pre-Assembled Tubing	17
Installing Pump Systems Using Bulk Tubing	18-19
Installing Drop Tube Inlet Kits	20-21
Installing Support Cables	22-24
Pump Testing Procedure	25-26
Initial Troubleshooting	27
Bladder Pump Operation in Low Submergence Applications	28
Sampling Pump Troubleshooting Guide	29
QED Groundwater Sampling Products Warranty	30-31

Safety Warnings



Wear appropriate Personal Protective Equipment (PPE) including safety glasses when working with QED sampling pumps. Disconnect air supply to the pump before removing the pump from the well. Do not apply more than 5 psi air pressure to the pump if the pump is above ground.



Contacting QED

Please call our Customer Service Department at one of the following numbers for assistance

- **Monday through Friday, 8:30 a.m. to 5:00 p.m. Eastern Time: 800-624-2026** or +1-734-995-2547
- **After Hours and weekends: 1-800-272-9559** or +1-734-746-8045

Introduction

The Well Wizard dedicated bladder pump system includes both dedicated down-well components and portable above ground components. The water contacting components are dedicated; they remain installed in each well. The pump controller, compressed air or gas source and water quality monitoring components are portable and are transported from well to well.

This document is intended to assist you with the proper installation of your Well Wizard dedicated bladder pump system, covering key steps and installation tips. Your system may have some custom components that may require some deviation from these instructions. Instructions for those components will typically be included on an accompanying separate instruction sheet.

If you have any questions or problems while you're in the field and can't find a solution, please call QED Customer Service at the phone numbers above. For questions that aren't urgent, you can send an email to us at service@gedenv.com.

Dedicated System Components (Well Wizard Type A systems)

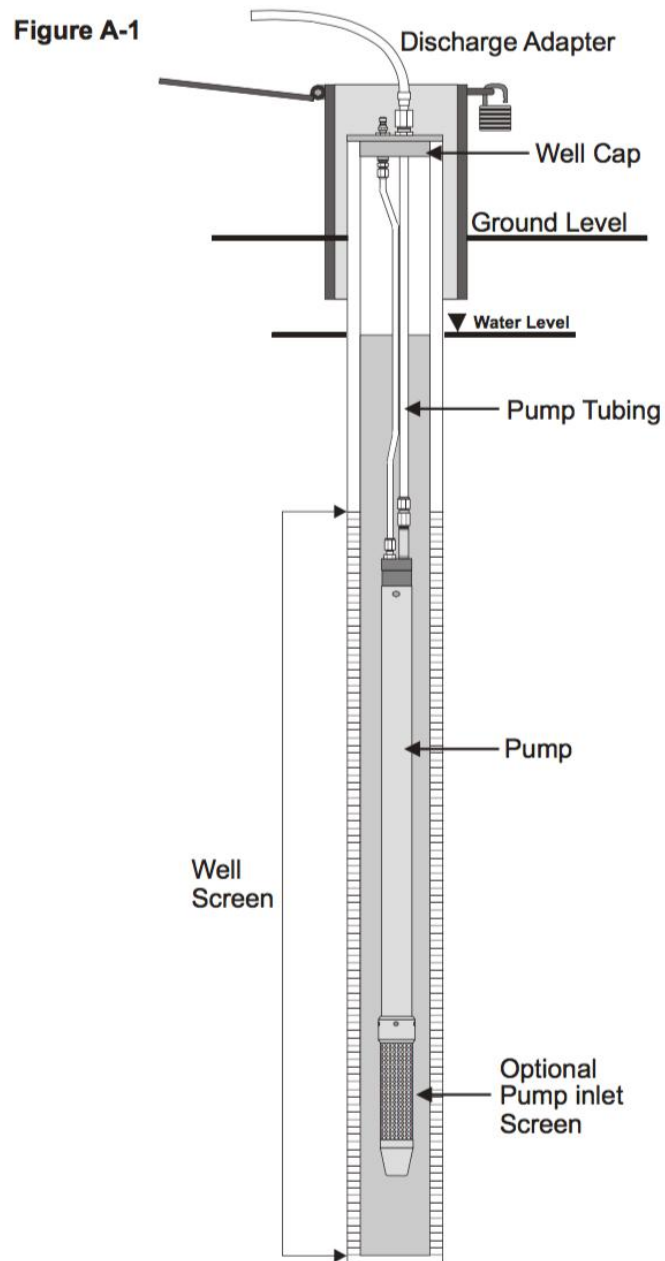
- Bladder pump
- Inlet screen
- Twin-Bonded pump tubing
- Well cap
- Discharge adapter

OPTIONAL SYSTEM COMPONENTS

- Drop tube inlet kits (Well Wizard Type L systems)
- Freeze Protection (recommended in cold climates)
- Support cable

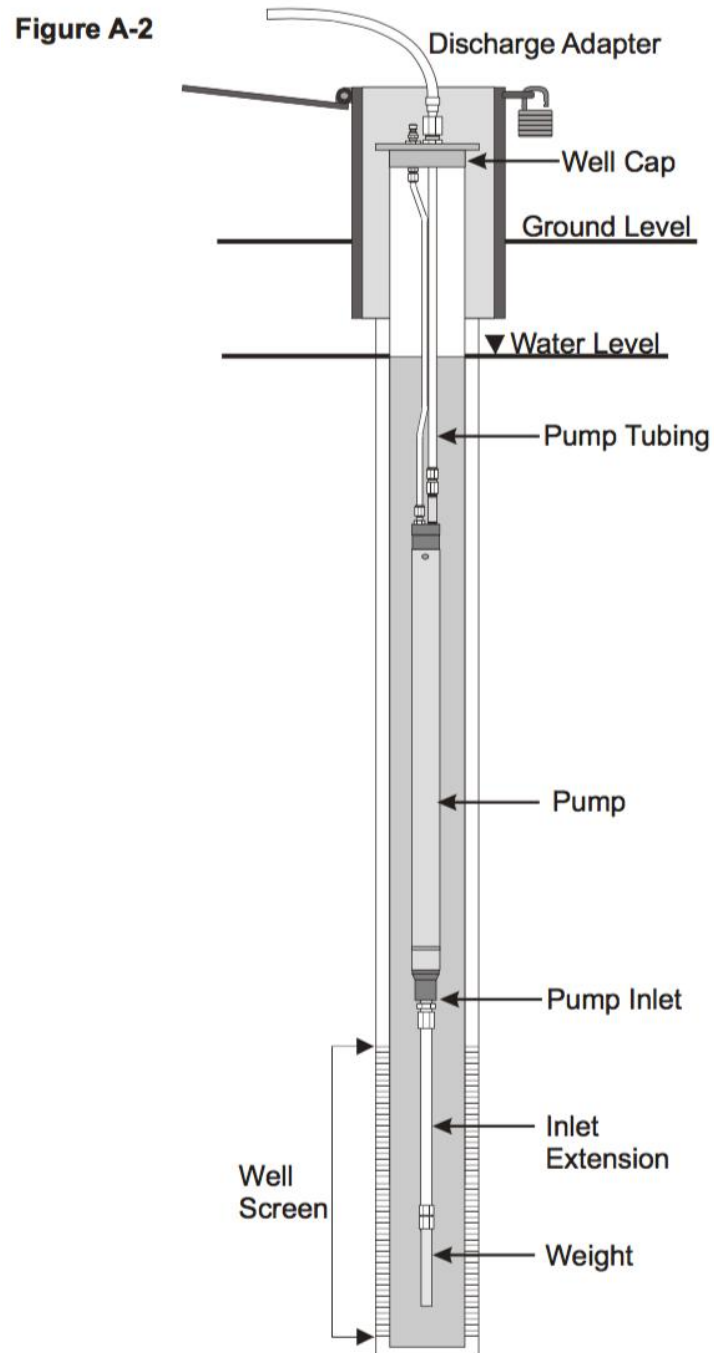
Sampling System Type A

Figure A-1 shows the Type A sampling system, the basic bladder pump.



Sampling System Type L

Figure A-2 shows the Type L sampling system, a bladder pump with a drop tube inlet extension.



Well Wizard Bladder Pump Models

A Well Wizard® dedicated bladder pump system is an air-actuated bladder pump that you permanently position in the well.

The pump is typically positioned with the pump inlet midway in the screened section of the well, suspended by twin-bonded tubing that supplies air to the pump and conveys the water sample to the well cap. Whenever possible, the pump systems are shipped already preassembled to the tubing and the well cap assembly. Several different models of Well Wizard® bladder pumps are available.

1000 Series Pump

Field service of the small diameter 1000 Series pump is generally not recommended as reassembly may result in damage. Please contact QED Technical Support at 1-800-624-2026 or +1-734-9995-2547 for more information on how to service these pumps.

1100 Series Pumps

The 1100 Series pumps can be disassembled for field service and include 4 major components:

- Discharge assembly (PVC, stainless steel or Teflon®)
- Inlet assembly (PVC, stainless steel or Teflon)
- Bladder cartridge assembly (Teflon bladder or Well Wizard Zero non-fluoropolymer bladder)
- Pump Body (PVC, stainless steel or Teflon)

You can disassemble the major components of the pump without tools by unscrewing the inlet and discharge assemblies by turning them counter-clockwise and pushing the bladder cartridge out of the pump body. The bladder cartridge can be replaced as a complete assembly on dedicated models; the bladder can be removed and replaced separately on portable models.

1200 Series Pumps

The 1200 series pumps can be disassembled for field service and include 2 major components

- Bladder and check valve assembly (either Teflon and stainless steel or PVC and stainless steel)
- Pump Body (stainless steel)

The 1200 Series pumps bladders can be replaced and will require tools for disassembly (refer to the instructions included with the field-replaceable bladder kit).

1300 Series Pumps

The small diameter 1300 series pumps require snap ring pliers to disassemble, and field service is generally not recommended. Please contact QED Technical Support at 1-800-624-2026 or +1-734-9995-2547 for more information on how to service these pumps.

1500 Series Pumps

The P1500 pump is a longer version of the 1200 Series pump. This pump has two major components.

- Bladder and check valve assembly (either Teflon and stainless steel or PVC and stainless steel)
- Pump Body (stainless steel)

The 1500 Series pumps bladders can be replaced but may require factory service; contact QED Technical Support at 1-800-624-2026 or +1-734-9995-2547 for more information on how to service these pumps.

How a Bladder Pump Works

The bladder pump has two alternating cycles called Discharge and Refill.

Discharge Cycle

During the discharge cycle, water within the pump is pushed to the surface by pressurized air or gas delivered to the pump through the air supply tubing. When the pressurized air fills the chamber between the pump body and the bladder, it squeezes the bladder, closing the bottom check valve and lifting the upper check valve, pushing water up the discharge tubing to the surface. When the full volume of the bladder is discharged or the cycle is ended by the controller, the upper check valve closes to prevent water in the tubing from draining back into the pump.

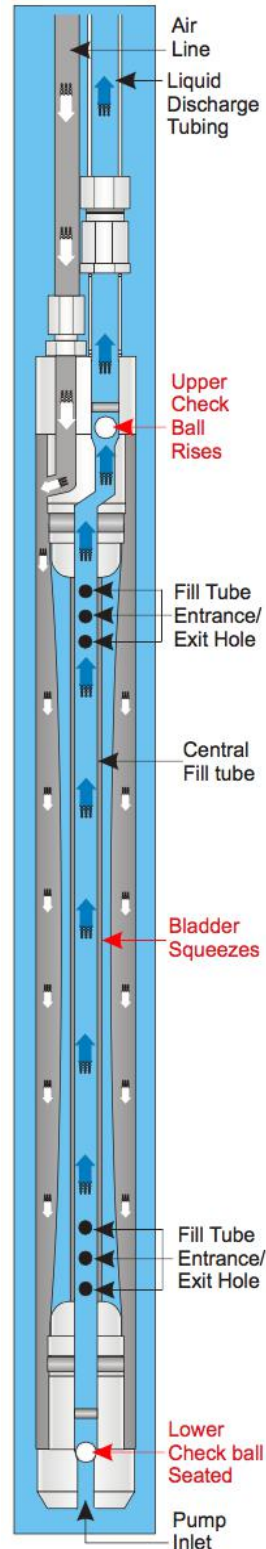


Figure 2

How a Bladder Pump Works

Refill Cycle

During the refill cycle, the pressurized air or gas within the pump is vented back up to the surface through the air supply tubing. When the air pressure within the pump falls below the hydrostatic pressure, the bottom check valve opens and allows water to enter the pump, filling the inside of the bladder.

Caution: A Well Wizard® pump bladder can be damaged by sand or solids. An inlet screen is recommended for all applications, especially when the pump inlet is located close to the bottom of the well. The Well Wizard 10-year warranty does not apply if an inlet screen is not used.

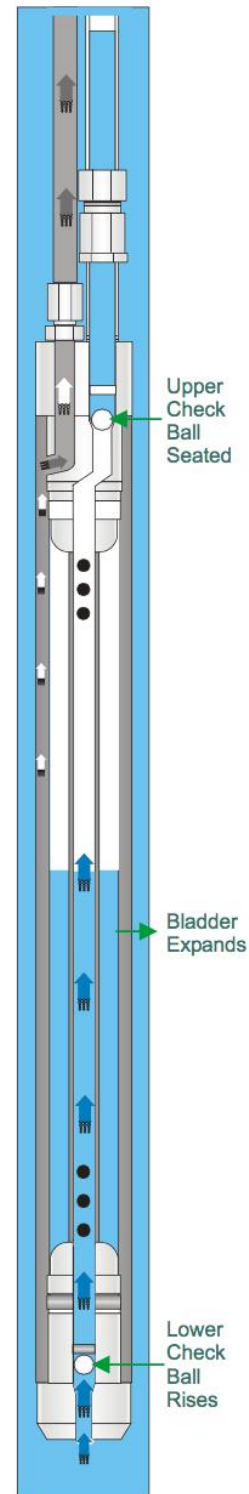


Figure 3

Twin-Bonded Pump Tubing, Inlet Screens and Well Caps

Pump Tubing

A ground water sample is only as good as the tubing it runs through. Your Well Wizard® system should be equipped with one of the following types of superior-quality tubing from QED:

- High Density Polyethylene (HDPE)
- Teflon® -lined polyethylene
- Teflon®

Most tubing is supplied as a bonded pair (air supply and discharge) to make installation easier and help to prevent other equipment such as water level measurement tapes from becoming entangled with the tubing.

Unless your order specified that you wanted bulk tubing, the tubing for your Well Wizard bladder pump is pre-cut to the correct length for your well based on the well data you provided.

Inlet Screen

An inlet screen can protect the bladder in your Well Wizard pump by preventing sand from contacting the bladder and ensure proper performance by keeping larger sand particles out of the check valves. The use of an inlet screen extends the pump warranty to ten years.

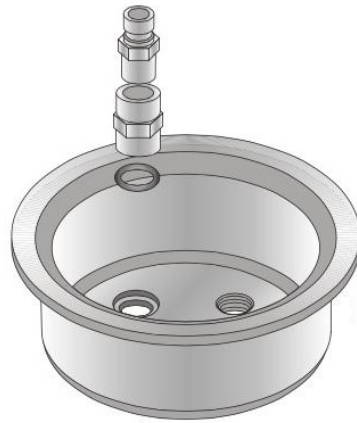
Well Cap

The pump and tubing are connected to a well cap that support the weight of the system and provides connections for the air supply and water discharge. There are two terminal fittings inside the well cap (see figure 4 below).

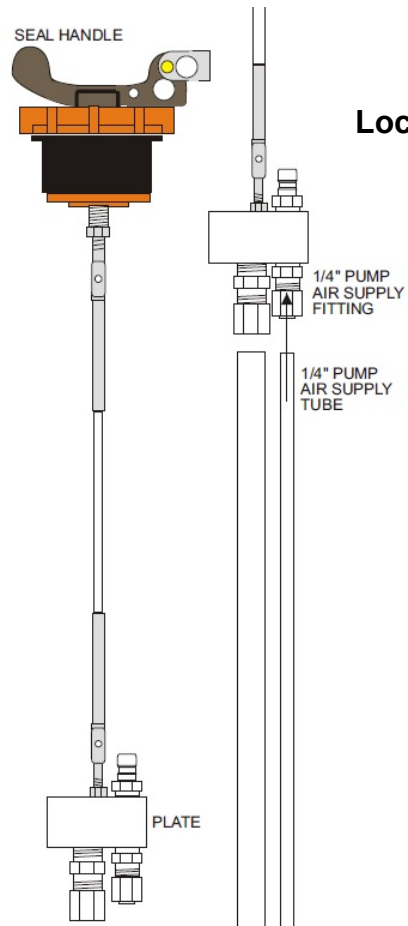
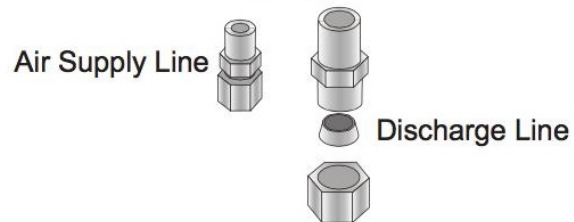
- A compression style *bore-through fitting* for the discharge line.
- A brass *quick-connect nipple* for the pump air supply line.

There are a wide variety of well cap designs to accommodate the majority of well completion designs, both above grade protective outer casing and at-grade vault boxes. Various designs include recessed caps for low clearance applications in vault boxes, slip caps for use in outer protective casings, locking caps to help prevent unauthorized access to the well, and sealing caps to help prevent surface water from entering the well. Consult QED's Customer Service or Sales representatives to determine the best design for each well at your site.

Well Cap Types



Recessed Well Cap



Locking and Sealing Well Cap



MicroPurge® Portable Components

Portable MicroPurge® sampling system components include bladder pump cycle controllers, portable compressor or compressed gas source, water level and drawdown limit meter, water quality analyzers for purging parameter monitoring, and disposable sample filter cartridges.

MicroPurge Controllers

A controller operates the Well Wizard pumps by regulating the air flow from a compressed-gas source to the pump. The controller alternately pressurizes and vents the air supply line to the pump, allowing the pump to discharge and then fill with water. Different controller models include the MP10, MP10H High Pressure 300 PSI and MP10UH Ultra High Pressure 500 PSI versions, designed to operate the Well Wizard pumps to depths up to 1,000 feet (305 meters) using external compressors or compressed gas cylinders. The MP15 backpack controller includes an integral 5 lb. CO2 cylinder for remote monitoring locations where vehicle access is limited. The MP50 model incorporates a 12-volt DC compressor that can be operated from a portable battery or vehicle battery connection. QED Customer Service representatives or your local QED sales representative or distributor can help you select the best model for your site.

Portable Compressors and Pressure Regulators

QED offers both 12-volt DC (Model 3020) and gasoline engine driven (Model MP40C) portable oilless compressors for use with the MicroPurge controllers. Where compressed gas cylinders are preferred, QED can supply either nitrogen or CO2 pressure regulators with quick-connect hoses that match up with the pressure ratings of our MicroPurge controllers.

Water Level & Drawdown Meters

The Model MP30 Drawdown/Water level meter is a dual function water level tape that can be connected to any of the QED cycle controllers to automatically limit water level drawdown during purging and sampling.

The 6000 Series electronic water-level measurement tapes have both a light for visual indication of water level and audio signal when the probe touches the water surface.

Water Quality Flow Cell Systems

The MicroPurge MP25 and MP25T water quality analyzers measure purging indicator parameters to let you know when it's time to collect samples. The multi-parameter instrument connects wirelessly via Bluetooth to a smart phone, tablet or laptop display. QED's PurgeScan software allows you to set your purging parameter limits and then monitors your data to determine when purging is completed. You can find additional details on the MP25 and MP25T at www.qedenv.com.

QuickFilter® Filter Capsules

QuickFilter cartridges are the original, in-line disposable groundwater filters, developed in 1982 to meet the stringent purity requirements of sensitive groundwater quality monitoring programs. Made from the highest purity materials and available common pore sizes, QuickFilter capsules connect directly to your sample pump discharge tubing to save time and ensure sample accuracy.

Installing Your Well Wizard System

Before Going to the Field Site

1. Check the outside of each box for well ID numbers to locate the pump and tubing for each well. Note that some components (e.g., drop tube inlet weights, inlet screens) may be in separate boxes from the pump/tubing systems – look on all boxes for product descriptions and part numbers to locate these items.
2. Open the boxes, then before unpacking any of the contents, put on a pair of clean protective gloves. Check your shipment against your order confirmation sheet and packing list. Make certain every component you ordered is there and familiarize yourself with how components go together before you go to the field.

NOTE: Always wear clean protective gloves before touching any of the down-well components (pump, inlet screen, tubing and drop tube weight if used). Touching well components without gloves could potentially contaminate samples obtained using the Well Wizard system.

3. Locate the Well Wizard Installation Guide and O&M manuals for any MicroPurge controls you purchased. Some components, such as well caps and inlet screens, are shipped with separate installation instruction included.
4. Locate any spare parts packages (such as extra fittings) and special tools shipped with your order (such as clamp tools or tubing cutters).
5. Where tubing is cut to length and attached to each pump, carefully remove the pump and tubing assembly from the box, taking care to not kink the tubing. A label on the package provides the well ID, cap model, and tubing length. You may need this information later, so save the label.
6. Open the packaging surrounding the pump and slide the protective plastic sleeve off the pump to allow installation of the pump inlet screen or connection of the drop inlet tubing, where used.

NOTE: The protective plastic sleeve on the pump contains the pump purity certificate, which includes the pump batch serial number. You may want to record the well ID and site name on each tag and retain it for your records. It's your proof that the pump has been tested and shown to be contaminant free. If needed, you can contact QED with the serial number to obtain details on the laboratory test results.

7. Make sure you have the necessary tools and supplies before you begin. The installation instructions included with some components should identify any specific tools that may be required. As a minimum, you should have:

- 8-inch and 10-inch adjustable wrenches
- Pliers – slip joint, needle nose and arc joint (e.g., “Channellock”)
- 1/4”, 9/32” and 5/16” sockets with handle (or nut drivers)
- Plastic tubing cutter
- Sharp utility knife (if permitted by site health & safety plan)
- pinch clamp installation tool for barb fitting clamps, if used (available from QED)
- Insulation stripping tool for plastic-coated pump support cable if used
- A water level tape or other means of measuring the depth to water and sounding well depth.
- A compressed gas/air source and pump controller for testing the pumps after installation.
- Field supplies - disposable gloves (glove material type based on site sampling plan), DI water, wipes or paper towels, and plastic sheeting (in case a pump system must be removed or laid out for installation)

Starting the Installation

1. Measure water level and well depth to confirm data. These numbers should match the data you provided on the QED Well Data Specification Sheets that were part of your order confirmation.
 - Well depth is critical when the pump or drop tube inlet is installed near the bottom of the well, as silt accumulation may prevent proper installation. If the well depth confirmation measurement shows that the bottom of the well is shallower than the original data due to measurement error, a database error, or possibly due to silt accumulation, the tubing length should be adjusted to raise the pump, as desired, or the silt should be removed prior to installation. (See Pump Testing section below for more details and suggested solutions.) NOTE: This determination should be made **BEFORE BEGINNING PUMP INSTALLATION** to avoid the need to pull the pump.
 - If the measured water level is lower than the data on the Specification Sheet, determine if the pump will still be adequately submerged. It may be necessary to change the pump position by adding tubing to achieve the desired submergence. In general, pumps should have at least 10 feet of submergence and systems using drop tube inlets should have 25 feet of submergence over the pump. **Call QED if you have any questions about submergence requirements and pump placement for your specific application.**
2. Check the well cap fit before lowering the pump and tubing into the well.
 - Determine that the cap you ordered is the correct size for the well casing diameter and there is adequate vertical clearance below the protective outer casing lid or vault box cover.
 - If the cap does not slip easily onto or into the casing, there may be burrs or rough edges on the edge of the casing. Use an appropriate tool to remove these before installing the system.
 - With the cap installed, there should be sufficient clearance between the top of the cap and the bottom of the vault cover or outer locking casing lid. If there is insufficient clearance, an alternate cap design may be required (e.g., low clearance cap), or the well casing can be cut down to increase the clearance in some cases. Contact a QED application specialist to discuss cap options.
 - Be sure to account for the change in the water level measurement reference point elevation (top of casing) due to the added thickness of the well cap. This should be recorded on a field form and entered into the elevation database.

Installing the Bladder Pump Inlet Screen

Inlet screens extend the life of the pump, protect the bladder from damage by sand or other solids, and help to prevent clogging and malfunction of the check valves in the pump.

Well Wizard bladder pumps equipped with an inlet screen carry a 10 year warranty on PTFE Teflon bladder models and a 5 year warranty on Teflon-free bladder Zero models. Well Wizard pumps installed without inlet screens are covered by a one year warranty.

- Well Wizard 1000, 1200 and 1500 Series pumps have inlet screens that attach to an internal female pipe thread in the pump inlet housing.
- 1100 Series plastic pumps (PVC or Teflon) use a slotted screen that attaches to external threads on the pump inlet housing.
- 1300 Series pumps have an integral inlet screen that is fastened to the pump using set screws that lock into a groove above the pump inlet.

Inlet Screen Installation for 1000 Series Pumps

1. Open the plastic wrapping and remove the screen.
2. Holding the pump inlet housing with an open end or adjustable wrench, thread the screen into the female thread in the inlet housing.

NOTE: Failure to hold the pump inlet with a wrench while installing the screen could result in damage to the pump bladder assembly inside, which is not covered under the product warranty.

Inlet Screen Installation for 1100 Series Pumps

1. Open the plastic wrapping and remove the screen.
2. Thread the screen onto the external male thread on the pump inlet housing and tighten firmly by hand only. Do not use tools to tighten the screen.

Inlet Screen Installation for 1200 and 1500 Series Pumps

1. Open the plastic wrapping and remove the screen.
2. Thread the screen into the internal female thread on the pump inlet housing and tighten firmly by hand only. Do not use tools to tighten the screen.

Inlet Screen Installation for 1300 Series Pumps

1. The inlet screen on the 1300 Series pumps comes installed at the factory.
2. If replacement of the inlet screen is necessary, loosen the set screws located just above the pump inlet, slide the screen over the inlet, then tighten the set screws to retain the screen.

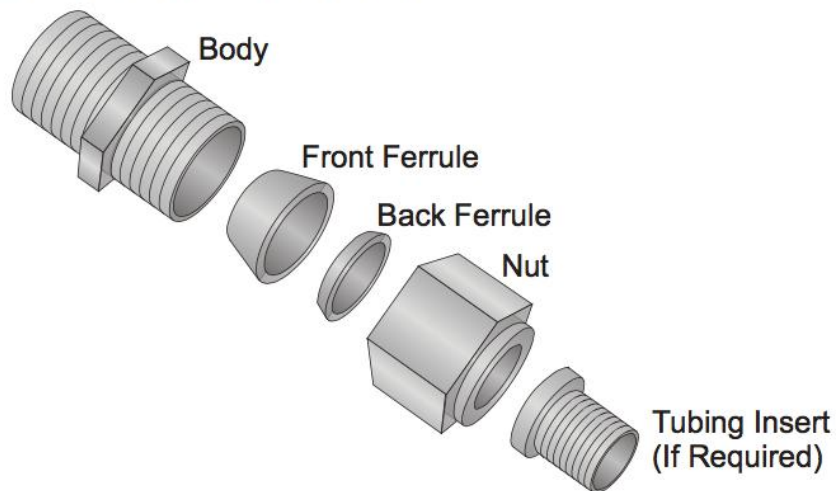
Installing or Replacing Pump Fittings and Connectors

The following sections describe how to install or replace the three types of connectors that may be included in your Well Wizard system. Well Wizard pump models use either stainless steel or polypropylene compression fittings or barb fittings with clamps for pump tubing connections. Please follow the appropriate instructions for the fitting type used on your pump model.

Stainless Steel Compression Fittings

Stainless steel compression fittings, which include four pieces come to you completely assembled, finger tight.

Figure 5
Parts of the Swagelok Tube Fitting



Note: Be careful not to fully disassemble compression fittings before use to avoid losing the ferrules or getting dirt or dust inside the fittings, which can make them difficult to tighten and result in leaks.

Note: When using compression fittings, if the discharge tubing is 3/8 inch OD or larger, a tubing insert is recommended to ensure a tight grip on the tubing by the compression fitting. If the discharge tubing is Teflon-lined PE tubing, you must use a tubing insert to prevent water from getting between the inner and outer tubing walls.

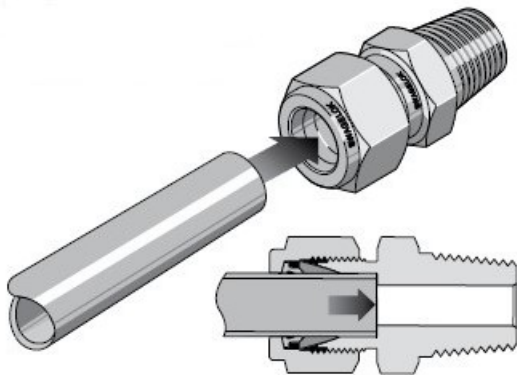
Attaching and Re-Attaching Pump Fittings and Connectors

Stainless Steel Compression Fittings

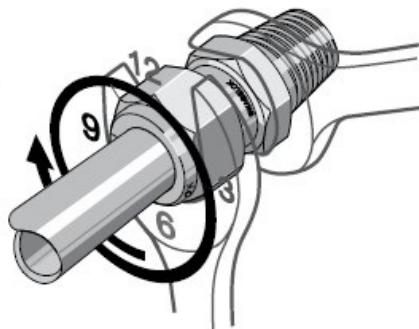
Pumps may be shipped with tubing pre-assembled and attached to the pump for shallow wells (up to 200 feet/60 meters of tubing) or may have tubing bundles or spools shipped separately for deeper wells with tubing longer than 200 feet/60 meters. Where the tubing has been preassembled and then disconnected from the pump, the fitting nut and sealing rings call “ferrules” should be attached to the tubing bundle/spool.

New connections (pump and tubing shipped separately and not previously assembled):

Fully insert the tubing into the fitting until it bottoms out on the shoulder inside the fitting. The length of tubing inserted into the fitting should be 0.80" (20 mm) for 1/2" OD tubing, 0.67" (17 mm) for 3/8" OD tubing and 0.50" (12.7 mm) for 1/4" OD tubing. Rotate the nut clockwise (when viewed from the top) until the nut is finger tight.



While holding the fitting body steady, tighten the nut one and one-quarter turns to the 9 o'clock position.



Reconnecting tubing with attached nut and ferrules (tubing previously pre-assembled and shipped in separate bundle or spool, or any removal of a fitting for service):

Stainless steel compression fittings can be reassembled as often as needed.

Connect the tubing to the fitting and finger tighten. Holding the fitting body steady with a wrench, turn the nut clockwise (when viewed from the top) until you feel resistance, then tighten a quarter turn.

Polypropylene Connector

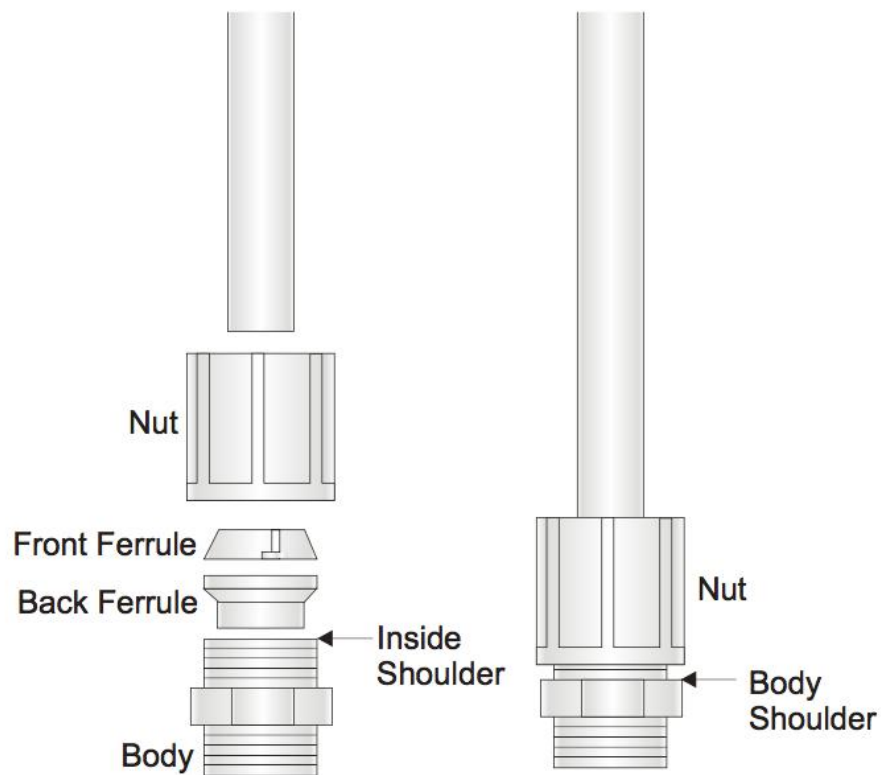
To install a polypropylene connector, follow these steps:

Cut the tubing cleanly and squarely to length.

Push the tubing into the completely assembled connector until it contacts the shoulder inside the fitting (see figure 7).

Tighten the nut with a wrench, but be careful to not over tighten it; the nut should not come in contact with the shoulder of the body (see figure 7).

Figure 7



Installing Pump Systems with Pre-Cut & Assembled Tubing

Well Wizard systems are most often supplied with the tubing cut to length for each well and connected to the bladder pump, with each pump and tubing assembly tagged with the well ID number provided. These systems are easier to install and can often be installed by one person, but QED recommends two people for more efficient installation.

Generally, pump tubing lengths up to 200 feet (60 meters) will be attached to the pump and shipped as an assembly. The well cap will also be pre-assembled onto the tubing unless specified to be packaged separately.

On 1100 and 1200 Series pumps that use compression fittings, tubing lengths greater than 200 feet (60 meters) are pre-assembled onto the pump to swage the fitting ferrules onto the tubing. The fittings are then removed and the tubing is packaged separately as a bundle or spool of tubing. Follow the instructions on page 17 on Installing or Replacing Pump Connectors to determine how to properly re-attach and tighten fittings prior to pump installation.

If your Well Wizard system was ordered with pre-cut tubing but the tubing has not been pre-assembled with the pumps by request, skip down to the instruction below under “Installing Pump Systems with Bulk tubing” for information on how to connect each pump model to its tubing bundle.

NOTE: During installation, be sure not to let the tubing or other pump components contact the ground or any other surface that isn't a known clean surface to avoid the risk of contamination. It's often helpful to spread out a clean plastic tarp next to the well during installation.

1. Slowly lower the pump into the well while uncoiling the tubing bundle, until the entire length of tubing is in the well. Be sure to control the rate of descent. Do not let the tubing free fall into the well.
2. An optional support cable is recommended for the ST1102 and ST1102M pumps and is available for all sampling pump models. Support cables are strongly recommended for deep wells (generally deeper than 300 feet/ 90 meters). See pages 21-23 on installing support cables.
3. To attach the well cap, separate about 8-12" (20-30 cm) of the twin-bonded tubing. Push the discharge tubing through the compression fitting on the cap to the appropriate height based on the cap design. Refer to the separate instruction sheet included with the well cap.

Installing Pump Systems Using Bulk Tubing

If your Well Wizard system was ordered with bulk tubing, it will be necessary to measure the tubing length in the field or to install the pump using tubing known to be longer than the well depth, cutting the tubing off when the pump is at the desired depth. Below are instructions for connecting the tubing to each pump model.

Pumps with compression style fittings – 1100 and 1200 Series models

1. Separate the ends of the twin-bonded tubing about 8-12 inches (20-30 cm).
2. These pumps use a discharge fitting that is taller than the air fitting connection. Shorten the length of the discharge tubing by measuring the difference between the fitting heights and cutting off this amount from the discharge tubing. Alternately, you can insert the air tubing into the fitting and then cut off the appropriate length of the discharge tubing, generally to the center of the fitting height. It's best to test fit the tubing for length before tightening the fittings.
3. If the discharge tubing is 3/8" O.D. or larger, or if it has a Teflon lining, you must use a tubing insert. Push the insert into the tubing before inserting the tubing into the fitting.
4. Loosen the nut-and-ferrule assembly and push the air supply tubing into the matching fitting on the top end of the pump.
5. Tighten both fitting nuts finger tight.
6. For each fitting nut, hold the fitting base with one wrench and the fitting nut with another wrench, then tighten the fitting nut one additional turn.

Pumps with barb style fittings – 1000, 1300 and 1500 Series models

1. Separate the ends of the twin-bonded tubing about 8-12 inches (20-30 cm).
2. For pumps that have staggered height air and discharge fittings, shorten the length of the discharge tubing by measuring the difference between the fitting heights.
3. Place the stainless steel pinch clamps onto the ends of the air supply and discharge tubing BEFORE pushing the tubing onto the barbs.
4. Install each tubing by pushing it over the barb fittings as far as possible, and then position the clamp over the barb and tightening the clamp with the pinch clamp tool.

Cut Bulk Tubing to Length

Measuring tubing length can be difficult under field conditions. Some users prefer to attach the pump to a bulk tubing spool that is known to be longer than the well depth and then cut off the tubing when the pump is installed to the desired sampling depth. However, this approach requires having more tubing than required for the desired sampling depth. To determine the desired pump position, follow these steps:

1. Before using this method, check the well construction log or other documentation to determine if there is a "tailpipe" or sediment trap installed below the well screen. If so, it's recommended to sound the well bottom depth before installing the pump system.
2. Lower the pump into the well until the pump touches the bottom of the well.
3. To position the pump at the middle of the well screen, where the screen extends upward from the bottom of the well and the length of the screen is known, pull the pump up by half of the screen length and mark the depth.
4. For low yield wells and/or wells with short water columns, raise the pump up at least 12 inches (30 cm) from the bottom and mark the depth.

Attaching Tubing to the Well Cap

To attach the well cap, separate about 8-12" (20-30 cm) of the twin-bonded tubing. Push the discharge tubing through the compression fitting on the cap to the appropriate height based on the cap design. Refer to the separate instruction sheet included with the well cap.

Installing Drop Tube Inlet Kits

Drop tube inlet kits can be used in applications where the desired sampling depth is significantly greater than the depth to water in the well. The drop tube allows the pump intake to be extended down to the desired sampling depth with the pump located higher up in the well, generally about 25-35 feet (8 – 10 meters) below the static water level. See Figure A-2 on Page 21 for an example of the drop tube inlet system design (Well Wizard Type L system).

Two people are recommended for installation of drop tube inlet systems.

1. The L system consists of the pump, twin-bonded pump tubing, drop inlet tubing, drop tube weight, inlet screen, and well cap. Support cable is an optional component that may be included. Both tubing bundles, support cable and the pump should each have a well ID tag attached or the well ID labeled on the outside of the packaging. The other components generally do not have any well identification and are not designated for use in a specific well. Check the Well Wizard data sheet to determine the correct components based on part numbers.
2. Prior to beginning installation, stage the pump and all other components near the well and all spooled tubing on a pipe rack. Have all tools needed for installation within easy reach near the well.
3. If a support cable is being used, begin by attaching the support cable to the pump. Remove the pump from its outer packaging but leave it inside of the poly bag sleeve if possible. (Remove the Pump Certification tag sealed at the bottom of the bag, write the well ID number on the tag and retain it for documentation purposes.) Locate the support cable and confirm the well ID and cable length on the tag. Connect the looped end of the cable (the end with the cable clamp already attached) to the support bracket located on the top of the pump using the U-shaped stainless steel shackle. Tighten the shackle pin with needle nose pliers. Strip about 6" of the support cable outer coating from the other end of the cable. (See cable stripping procedure below.) Set the cable aside with the pump.
4. Install the drop tube barb fitting and bushing into the pump inlet.

NOTE: *If the pump has wrench flats on the inlet (ST1000 and T1300 models), a wrench must be used to hold the inlet stationary while installing and tightening the fitting. Failure to do so will result in damage to the bladder assembly inside the pump, which is not covered by the product warranty.*

5. Attach the twin-bonded pump tubing to the discharge and air supply fittings on the top of the pump. For pump models where the discharge fitting is taller than the air fitting, it's best to separate the ends of the twin-bonded tubing about 8-12 inches (20-30 cm) and shorten the discharge tubing by measuring the difference between the fitting heights and cutting off this amount from the discharge tubing.
6. For pumps with compression-type fittings, first install a tubing insert inside the end of the discharge tubing, then insert the tubing fully into the fitting before tightening the fitting nut. The air fitting doesn't require a tubing insert. For barb-type fittings, place the pinch clamps onto the ends of the air supply and discharge tubing BEFORE pushing the tubing onto the barbs. Install each tubing by pushing it over the barb fittings as far as possible, then positioning the clamp over the barb and tightening the clamp with the pinch clamp tool. Set aside the pump with tubing and support cable connected in a clean area.
7. Locate the drop tube weight kit. Some systems may use more than one weight, but most use just one – refer to the Well Wizard data sheet for the correct number of weights for each well. Install the pump inlet screen on the bottom of the weight.
8. Locate the drop tubing bundle, matching the well ID tag with the well.

9. Connect the tubing onto the fitting on the drop tube weight, following the same procedures as in #6 above for either compression or barb fittings.
10. Insert the drop tube weight assembly into the well and begin lowering the tubing. Be sure to control the rate of descent – do not let the tubing free fall into the well. Lower the weight until just a few feet of tubing remains out of the well.
11. Connect the top end of the drop tubing to the fitting on the pump inlet, following the same procedures as in #6 above for either compression or barb fittings.
12. Carefully raise the pump for installation into the well. Be sure to allow enough tubing slack to prevent the tubing from kinking, but don't allow it to touch the ground.
13. Begin lowering the pump into the well by spooling off the twin-bonded tubing and support cable. Have the support cable positioned so it can easily feed into the well without tangling or kinking.
14. When the pump is lowered to the point where only a few feet of tubing and cable remain, hold or clamp the tubing to prevent it from slipping and install the well cap.
15. Separate about 8-12" (20-30 cm) of the twin-bonded tubing. Push the discharge tubing through the compression fitting on the cap to the appropriate height based on the cap design. Refer to the separate instruction sheet included with the well cap.
16. Cut the air supply tubing to the proper length to fit either over the air connection barb fitting or inside the air connection compression fitting (varies with well cap model).
 - If a barb connection, slide the pinch clamp over the air tubing first, and then push the tubing fully onto the barb. Slide the clamp into place over the barb and tighten it with the clamp tool.
 - If the air supply on the cap uses a compression fitting connection, push the air tubing fully into the fitting, and then tighten the nut to compress the brass ferrule and retain the tubing.
17. QED recommends testing for proper operation of the pump before moving on to the next well.

Installing Support Cables

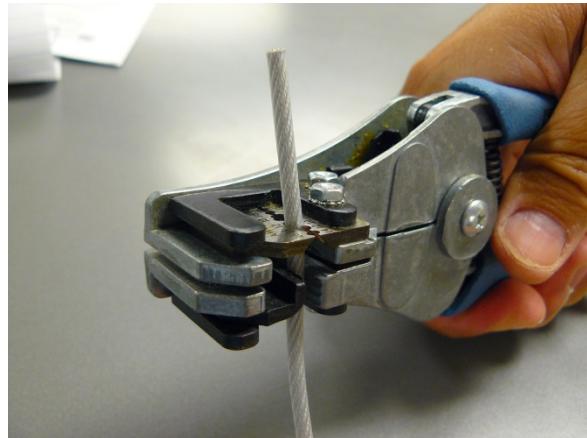
If a support cable is being used, begin by attaching the support cable to the pump. Remove the pump from its outer packaging but leave it inside of the poly bag sleeve if possible. (Remove the Pump Certification tag sealed at the bottom of the bag, write the well ID number on the tag and retain it for documentation purposes.) Locate the support cable and confirm the well ID and cable length on the tag. Connect the looped end of the cable (the end with the cable clamp already attached) to the support bracket located on the top of the pump using the U-shaped stainless steel shackle. Tighten the shackle pin with needle nose pliers. Strip about 6" of the support cable outer coating from the other end of the cable. (See cable stripping procedure below.) Set the cable aside with the pump.

Support Cable Insulation Stripping Procedure

PREFERRED METHOD – WIRE STRIPPER TOOL



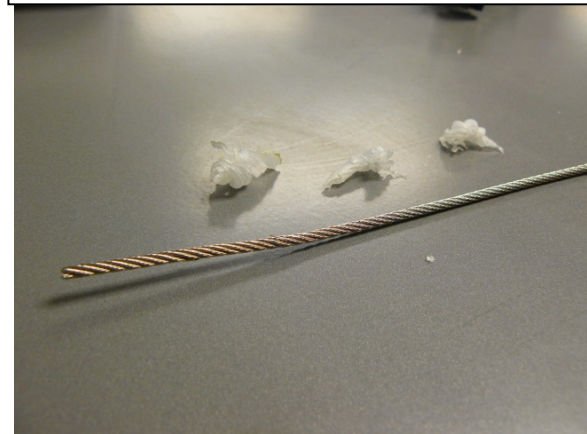
1. Use a wire stripper provided by QED or purchased from a hardware store or electrical supply house. You will need one that has a 12 gauge wire size.



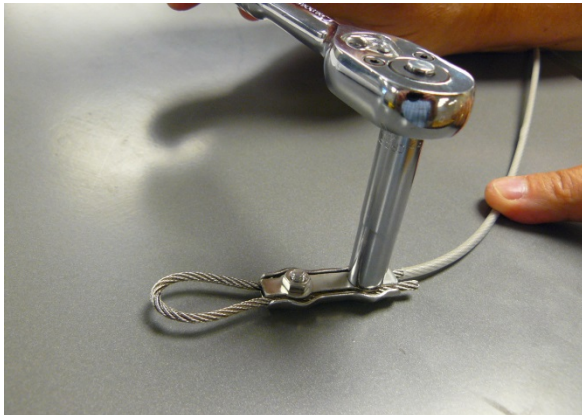
2. Place about 1" to 1-1/2" of cable into the wire stripper in the #12 groove. Squeeze the handle to remove the coating.



3. Repeat while moving the tool along toward the end of the cable until coating is removed.



4. Support cable with 6" of coating removed.



5. Place the cable in the support cable bracket. Tighten the nuts with a 9/32" socket wrench or nut driver.



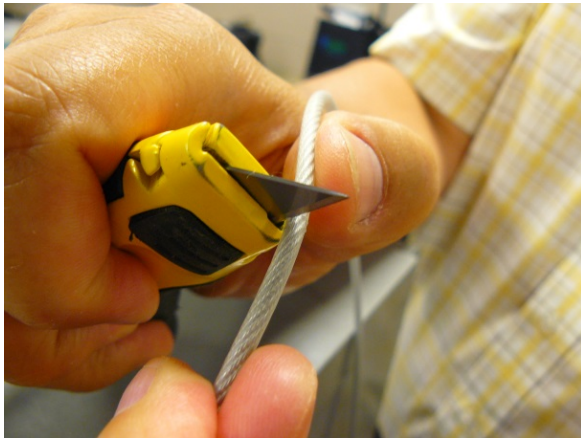
6. When finished your support cable loop should look like this.

ALTERNATIVE CABLE STRIPPING METHOD

(NOTE: Do not use this method where health and safety requirement do not permit the use of a utility knife or exposed blade at the site. Always wear cut-proof gloves when using knives, blades or other sharp tools.)



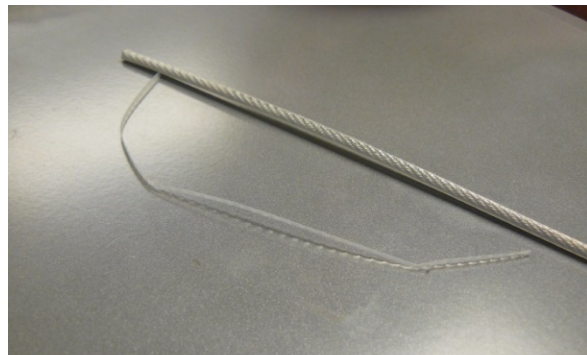
1. Measure back 6" from the end of the cable



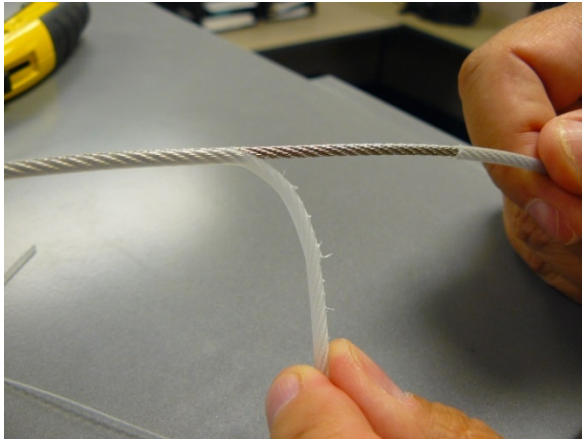
2. At the 6" mark, cut in a circular direction to score through the polyethylene coating



3. At the circular cut flay the top of the coating.



4. You should have a small piece of plastic stripped from one side of the support cable.



5. You will now be able to grab the edge at the circular cut and peel the coating off.

Pump Testing Procedure

Each pump installed should be tested to ensure proper operation before used for sampling. The purpose of testing is to determine proper pump discharge and refill operation and identify any air or water leaks.

Controller and air supply connections

- Connect the HR3500 Quick Exhaust Valve hose to the quick-connect air supply fitting on the well cap.
- Connect one end of the red air supply hose to the HR3500 valve; connect the other end to the pump air supply fitting on the MP Series controller.
- Air supply – use only an oilless type air compressor. The minimum compressor output required for the larger P1500 Series pumps is 10 SCFM at 90 PSI; the minimum compressor output for the T1200 Series pumps is 3.5 SCFM at 90 PSI. Connect the air supply hose from the compressor to the air inlet connection on the MP Series controller.

Controller operation

1. Before starting the compressor and actuating the controller cycling, set up a discharge test bottle for the pump. Take a small sample bottle (250 ml to 1 L size), fill halfway with clean water, and place the end of the pump discharge tubing into the bottle. This will allow you to watch for bubbles coming from the first discharge cycle of the pump and subsequent cycles until the pump discharge tubing fills with water to the surface.
2. Using the CPM button on the MP controller panel, set the controller to CPM 1 (one cycle per minute). The LCD display should show 30 seconds Refill and 30 seconds Discharge cycle times.
3. Start the compressor. Before cycling the pump, set the pump pressure regulator on the controller to approximately 50% of the pump depth in the well. For example, if the pump is set at 160 feet, the pressure should be about 80 to 90 PSI. Using the CYCLE Start/Stop button, begin cycling the pump.
4. Be sure to watch the discharge test bottle right away for bubbles resulting from the first discharge cycle of the pump. Following the first discharge cycle, the pump should refill for 30 seconds, then a second discharge cycle should push air bubbles into the discharge test bottle again. This cycling and bubbling from the discharge should continue until the tubing fills with water to the surface. To calculate the approximate number of pump cycles needed to fill the tubing, multiply the depth to water below the top of the well casing by the tubing volume factor in the table below, then divide by the maximum bladder volume for the specific QED pump model (see table below Step 5).

Tubing OD (inches)	Tubing ID (inches)	Tubing Volume per Foot (mL)	Tubing Volume per Meter (mL)
0.250	0.170	4.5	15
0.375	0.250	10	33
0.500	0.375	22	72
0.625	0.500	39	128
0.750	0.625	60	197

5. Once water is discharging from the pump, use a graduated cylinder or measuring cup to determine the bladder discharge volume. Use the HOLD/SAMPLE/CYCLE button on the controller to first put the pump into a long refill cycle (at least 60 seconds) and then switch to a long discharge cycle to completely empty the volume of the bladder. Maximum bladder capacity for Well Wizard and Sample Pro pumps is shown in the table below.

Pump Model Number	Maximum bladder volume (mL)
P1101 (all versions)	395
P1150	130
T1100	395
T1200 (all versions)	495
T1250	100
ST1102 (all versions)	395
P1500	1,400
T1300	220
Sample Pro 1.75" (PE bladder models)	100
Sample Pro 0.75"	15
ST1000	60

Air pressure test (leak testing)

1. Using the "Hold/Sample/Cycle" button on the lower left corner of the keypad, press until the pump is in the discharge cycle, as indicated on the LCD display by an arrow.
2. Allow the bladder to fully discharge, then observe the pressure reading on the gauge.
3. Leaving the controller in discharge mode, turn off the air source but DO NOT disconnect the air source supply hose.
4. Observe the pressure gauge - it should remain steady for at least a minute (a very slow decay in the pressure is acceptable)
5. Observe the pump discharge tubing - there should be no discharge of water or air bubbles.

Initial Troubleshooting

NOTE: See Well Wizard Troubleshooting Guide for more details

If the pump delivers a stream of bubbles on the first discharge cycle but fails to produce bubbles on the second and subsequent cycles and the discharge tubing isn't filling with water, the pump bladder may not be refilling. This is most likely due to the pump intake sitting on the bottom of the well, but it could also be caused by the drop tubing kinking in the well. To test this, with the controller connected to the pump and the compressor running, lift the well cap and raise the pump in the well about 5 feet or so. Place the discharge tubing into the discharge test bottle and watch for pump cycling (bubbles). Start cycling the pump again. If you see bubbles in the test bottle, or you see water come up the discharge tubing, then the pump intake was restricted by sediment or the drop tubing being kinked. There are two possible causes:

1. There is sediment on the bottom of the well sufficient to interfere with the desired intake depth. Evidence of this would be a bottom depth measurement that is less than expected based on the well data sheet or well construction log, and a "soft" bottom felt when sounding the well depth.
2. There is sufficient tubing stretch to result in the intake sitting on the bottom of the well when installed. If the well depth measurement matches the well data sheet and the total length of the tubings, pump and drop tube weight match the desired intake point, then tubing stretch is the most likely cause.

Solutions:

- If the amount of silt accumulated in the well is significantly less than the well screen length and the sample can still be obtained from within the well screen zone, the pump tubing or drop tubing length can be shortened to raise the pump intake point. NOTE: This course of action should be confirmed with project staff or management to ensure compliance with the groundwater sampling program. It may be preferable to remove the silt through well development to maintain the target sampling depth or to ensure the longevity of sampling and avoid additional silt buildup that might interfere with pump operation later.
- If the issue appears to be tubing stretch, adjust the tubing length to place the pump at the desired intake location. Since the actual length of the tubing cannot be determined, it is easiest to lower the pump slowly until it just touches the bottom of the well and then bring the pump up by the desired amount to match the original target intake depth.

If the pump is producing water with each discharge cycle but the total flow rate appears to be low and the measured discharge volume of the bladder is less than 80% of the rated maximum capacity, see the Well Wizard Troubleshooting Guide for details on optimizing the controller settings.

Bladder Pump Operation in Low-Submergence Wells

Pump submergence is defined as the height of the static water column above the top of the pump. In wells in which this water column height is 5 feet or less, the pump is considered to be in a low-submergence application.

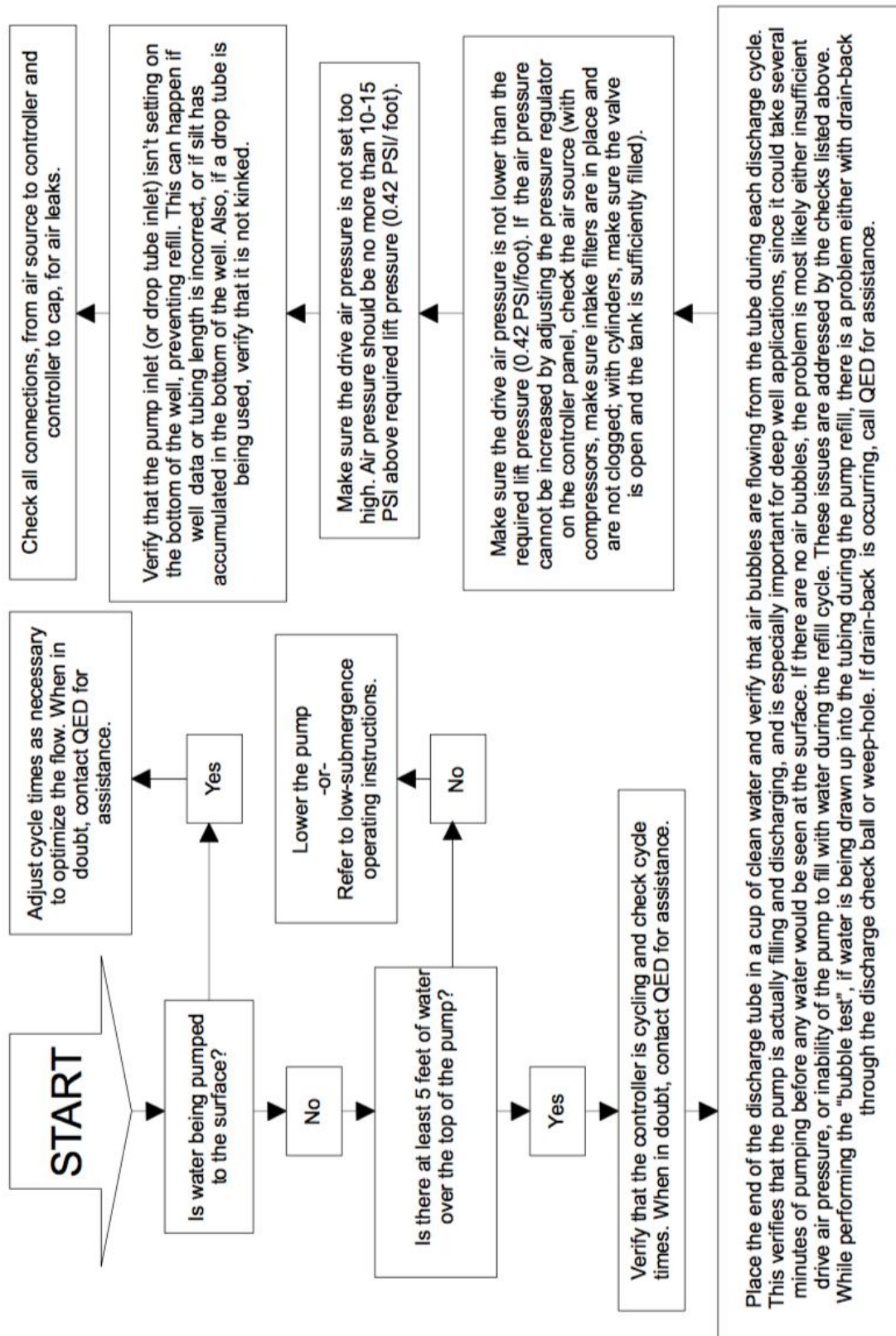
Well Wizard bladder pumps fill by hydrostatic pressure. As the inside of the bladder fills with water, the bladder expands. This filling and expanding of the bladder is referred to as the “refill” cycle. When air pressure is applied to the outside of the bladder, the bladder is squeezed, forcing the water up the discharge tubing. This is referred to as the “discharge” cycle.

In low-submergence applications, there is less water pressure available to expand the bladder during the refill. This can result in a smaller volume of water being pumped with each pump cycle because the bladder may not fully expand.

In low submergence wells, **it is critical that the air pressure driving the pump not be more than 10-15 PSI greater than the minimum requirement of 0.42 PSI per foot of pump depth.** Higher pressures than this can cause the bladder to be squeezed too tightly during discharge, a condition which can prevent the bladder from expanding during refill. To avoid this condition in deeper wells, it is suggested that the air pressure applied to the pump be gradually increased as the water level in the pump's discharge tubing rises. It is recommended that the air pressure be set at 15 – 20 PSI initially, and then slowly increased in increments of 10psi as needed until the water reaches the surface.

As a result of the lower volume per discharge cycle, more time will be required to initially bring water to the surface. An easy way to verify that the pump is working, prior to the water reaching the surface, is to submerge the discharge tubing in clean container of water. Each time the pump goes into a discharge cycle, air in the discharge tubing, which is displaced as the water level in the tubing rises, can be seen as air bubbles coming from the end of the tubing. To optimize the pumping rate, the refill time should be set long enough to achieve the maximum volume of air bubbles on each pump cycle, and the discharge time should be set long enough to ensure that the air has stopped bubbling out of the tube before the pump controller switches back into refill

Sampling Pump Troubleshooting Guide



QED Groundwater Sampling Products Warranty

Q.E.D. ENVIRONMENTAL SYSTEMS, INC. ("QED") warrants to the original purchaser ("Purchaser") of its groundwater sampling products ("Products") that the products shall be free of defects in materials and workmanship on the date of sale, subject to the limitations below. Any failure of the products to conform to this warranty will be remedied by QED in the manner provided herein.

This warranty shall be limited to the duration and the conditions set forth below. Warranty duration is calculated from the original date of purchase.

1. **Dedicated-Use System Products** – Ten (10) year warranty on Well Wizard® dedicated bladder pumps with PTFE (Teflon®) bladders equipped with original equipment inlet screens and used in periodic, non-continuous groundwater sampling (up to 52 samples events per year.) Five (5) year warranty on dedicated bladder pumps using Teflon-free proprietary polymer bladders. Ten (10) year warranty on all Snap Sampler modules, pneumatic trigger actuators and manual trigger lines. Snap Sampler bottles are warranted for single use for up to one (1) year. All other components, equipment and accessories are warranted for one (1) year except as stated below.
2. **Portable Systems and Controls** - Sample Pro portable-use pumps, MicroPurge Controllers and Water Level and Drawdown Meters are warranted for one (1) year. Hose reel and caps are warranted for ninety (90) days. Tubing used in a Portable System is covered by a ninety (90) day material and workmanship warranty. There will be no warranty for application on tubing when used as part of a Portable System.
3. **Separately Sold Parts, Spare Parts Kits and Repairs** - Separately sold parts and spare parts kits are warranted for ninety (90) days. Repairs performed by QED are warranted for ninety (90) days from date of repair or for the remaining term of the original warranty, whichever is longer.
4. **Flow Cell Systems** – The Sonde, OEM Handheld Display and Sensors are warranted for three years from date of purchase. Aftermarket handheld displays (e.g., ruggedized tablet devices) are covered by the aftermarket device standard limited warranty. This warranty does not apply to batteries of any type or any other items that carry shelf lives (i.e. calibration solutions). Also the warranty does not cover products damaged by improper installation, or application, misuse, abuse, neglect or accident. **NOTE: THE FLOW CELL SYSTEMS WARRANTY EXCLUDES COVERAGE OF COMPONENTS CONSUMED THROUGH NORMAL USE, SUCH AS REPLACEMENT OF REFERENCE ELECTRODE JUNCTION OR SOLUTION.**

Purchaser's exclusive remedy for breach of said warranty shall be as follows:

If Purchaser notifies QED in writing within the applicable warranty period of a claimed defect in the Product and QED determines after inspecting the Product that the defect is covered by the warranty, QED will repair the Product without charge to Purchaser. If QED for any reason cannot repair a Product determined by QED to be covered by this warranty within four (4) weeks after receipt of the defective Product, then QED's sole responsibility shall be, at its option, either to replace the defective Product with a comparable new unit at no charge to Purchaser or to refund the purchase price paid by Purchaser. QED's obligation to repair, replace or refund are conditioned upon the Purchaser's return of the claimed defective Product to QED, after receiving authorization to do so from QED. In no event shall claimed defective Products be returned to QED without its authorization. If the Product is determined not to be defective within the terms of this warranty, then all costs for repair, parts and labor that are authorized by Purchaser shall be borne by Purchaser.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY (INCLUDING BUT NOT LIMITED TO THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY. QED neither assumes, nor authorizes any person to assume for it, any other obligation or liability in connection with the Products. Purchaser agrees that in no event will QED be liable for incidental, consequential or special damages (including but not limited to lost profits, lost sales, or injury to persons or property) and that Purchaser's sole remedy is the above warranty.

This warranty will be void in the event of unauthorized disassembly of component assemblies. This warranty will also be void if the defect in a Product results from abuse; operating, installing or maintaining the Product in a manner other than in accordance with QED's written recommendations; uses or

applications other than the intended use or application, as indicated in the manual; or exposure to chemical or physical environment beyond the designated limits of materials and construction. This warranty does not cover, and QED shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, substitution of non-QED component parts, or the selection of improper material or product configuration for Purchaser's application. Nor shall QED be liable for malfunction, damage or wear caused by the incompatibility of QED equipment with structures, accessories, equipment or materials not supplied by QED, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by QED. QED shall be released from all obligations under all warranties if any Product covered hereby is repaired or modified by persons other than QED's service personnel unless such repair by others is made with the written consent of QED.

RESPONSIBILITY OF THE PURCHASER

Purchaser is responsible for notifying QED of the defect, malfunction, or other manner in which the terms of this warranty are believed to be breached. In the event of a warranty claim, Purchaser must contact the Customer Service Department of QED and:

1. Identify the product involved (by model or serial number or other sufficient description that will allow QED to determine which product is claimed defective);
2. Specify where, when, and from whom the Product was purchased;
3. Describe the nature of the defect or malfunction; and
4. Send the malfunctioning component, after authorization by QED, to:

QED Environmental Systems, Inc.
2355 Bishop Circle West
Dexter, MI 48130
Toll Free North America: (800) 624-2026
Company Main: (734) 995-2547
Fax: (734) 995-1170
Web: www.qedenv.com
Email: info@qedenv.com