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Leaders in Environmental Compliance Products

Genie®

Genie® Controllerless System

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Ann Arbor, Michigan 48106-3726

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Document No. **600258-07**

The equipment in this manual is protected under U.S. and foreign patents issued and pending:

U.S. Patents:

Selective Oil Skimmer (SOS)	4,497,370
Specific Gravity Skimmer (SPG)	4,663,037
AutoPump (AP)	5,004,405
Specific Gravity Skimmer (SPG) Product Sensing	5,474,685
Vacuum/Pressure Hydrocarbon Recovery System	4,761,225
SPG PSR technology	5,474,685
AP-2	5,641,272
Genie System	5,704,772

Canada Patent:

Specific Gravity Skimmer (SPG)	1,239,868
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Introduction

Welcome to QED Environmental Systems' Genie® manual.

To ensure the best operator safety and system performance, it is strongly recommended that the operators read this entire manual before using the system.

This manual reflects our many years of experience and includes comments and suggestions from our sales and service personnel and most importantly from our customers. The chapters, their contents and sequence were designed with you, the user and installer, in mind. We wrote this manual so it can be easily understood by users who may not be familiar with systems of this type or are using a *QED* system for the first time.

Safety

Safety has been a cornerstone of our design which has been proven over fifteen years of building and shipping systems throughout the world. Our high level of performance is achieved by using quality components, building in redundancies or backup systems, and not compromising our commitment to quality manufacturing. The net result is the highest quality and safest pneumatic pump recovery system on the market. We feel so strongly about safety, based on years of working with the hydrocarbon industry, that it is the first chapter in all of our manuals.

How to Contact *QED*

If for any reason you are unable to find what you need in this manual please feel free to contact the *QED* Service Department at any time.

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***QED* can be reached 24 hours a day**

We welcome your comments and encourage your feedback regarding anything in this manual and the equipment you have on site.

Thank you again for specifying *QED* remediation equipment.

Chapter 1: Safety

Safety has been a prime consideration when designing the Genie System. Safety guidelines are provided in this manual, and the Genie System safety features are listed below. Please do not attempt to circumvent the safety features of this system.

We have also listed some possible hazards involved when applying this system to site remediation. Nothing will protect you as much as understanding the system, the site at which it is being used, and the careful handling of all the equipment and fluids. If you have any questions, please contact the QED Service Department for guidance.

As you read through this manual, you will encounter three kinds of warnings. The following examples indicate how they appear and their purpose.

Note:	Information of interest.
Caution:	Ways to avoid damaging equipment.
WARNING:	Personal safety.

A Partial List of Safety Procedures

WARNING:

The air compressor and any other electrical equipment used with this pneumatic system must be positioned outside of any area considered hazardous because of possible combustible materials.

These safety procedures should be followed at all times when operating QED equipment on or off site, and should be considered as warnings.

- Wear safety goggles when working with the Genie System to protect eyes from any splashing or pressure release.

- Wear chemically resistant rubber gloves, boots and coveralls when handling the Genie and fluid discharge hose to avoid skin contact with the fluid being recovered.
- Point all hoses away from personnel and equipment when connecting or disconnecting.
- Refer to **Chapter 3: Equipment**, for a list of parts and hoses supplied with the Genie System.

The Genie System minimizes the potential for accidents with the following safeguards:

Fire and Explosion Protection

Almost all of QED underground fluid extraction systems are pneumatic. This offers many fire and explosion protection features:

- Compressed air lines eliminate electrical wiring in hazardous areas.
- Aluminum or fiberglass enclosures help to prevent sparking.
- Standard systems use brass fittings, which help to eliminate sparking hazard.

Personal Protection

On-site, service and maintenance personnel can safely use QED equipment. Safety-in-use is the primary design feature in all systems. Following are some samples:

- All standard high pressure air hoses have automatic shut off quick-connects on the supply side which prevents injury due to hose whip or air blown particles.
- Metal regulators and filter bowls are rated at 150 psi. The metal air filter bowl is made of aluminum, providing greater pressure and chemical resistance than plastic bowls and it is less prone to damage if dropped.

Spill Protection

On-site spills cannot always be prevented. *QED* equipment is designed to take into consideration such unpredictable occurrences that may happen despite strict adherence to standardized safety practices.

- Static grounded wire reinforced product hoses are available. These are rated at over 5,000 psi burst pressure. The 1/4-inch hose is rated at 18,000 psi.
- The standard air hoses are rated at over 800 psi burst pressure.
- Down well quick-connects have locking features to prevent accidental disconnections.
- The controls are located underground in the Genie System to guard against freezing.
- In an optional TFSO System, two independent product tank-full sensors inform the Genie System when the product recovery tank is full, halting operation of the pumping system, and preventing overflow of the product recovery tank. The system shuts down if connections or hoses are vandalized. In addition, should all sensors fail, a fail-safe overflow option directs the product to an overflow vessel or secondary containment.

Chapter 2: Overview

The Genie® is a versatile downwell remediation pump. It can be used on a number of different applications: product only, dual pump, or total fluids recovery.

Therefore, the equipment will vary by application and site specifications. **(See Chapter 3)** Although this manual contains operating information for the three applications, the product only application is the more typical, and therefore will be mentioned primarily. In any case, be sure to look for the correct heading for your specific application.

Method of Operation

The Genie System (when coupled with any one of QED's floating intake skimmers) recovers free floating hydrocarbon from the surface of groundwater, without producing any water, in wells two inches (2 in.) or larger and depths down to one hundred and fifty feet (150 ft.).

A skimmer attaches below the pneumatic Genie pump. An adjustable, automatic pulser unit in the Genie cycles the pump section. The pump draws oil into the skimmer floating intake and drives it out of the well.

Hydrocarbon can be recovered from one well or the system can easily be expanded to capture free phase fuels from multiple wells. Product can be recovered from more than one well by incorporating a common pump air line and a common pump discharge line.

A Genie pump and floating intake skimmer go in each well, and the air and product hoses tee off to each well. This gives you a low-cost, expandable option when responding to fuel spills and specific site needs.

Genie System Configurations

Depending on site specifics and the resulting intake configuration, the Genie can be used in the following applications:

- Product Only
- Dual Pump Recovery
- Total Fluids

Major Genie System Features

- **Versatile.** Can be used in any one of the different applications (as previously listed), and many intake types including the different floating intake skimmers.
- **Low Air Consumption.** Consumes less than 0.109 CF per cycle. It can be cycled as seldom as once per hour.
- **Safe Pneumatic Construction.** The entire system is pneumatically powered with no electrical components, thus avoiding sparks in control power and sensing devices.
- **Small Well Operation.** The Genie System can operate in a 2-inch well and larger.
- **Rugged Construction.** Stainless steel casing and durable internal parts ensure long system life, even under harsh conditions.
- **Small and Lightweight.** Weighs only 6 pounds and is as short as 24 inches by 1.875 inches in diameter.

Figure 1 on the next page illustrates a SPG AutoGenie System (Genie coupled with SPG-2 skimmer).

The Genie System provides everything required for pumping fluid from the well except the air source.

The system is designed to perform for years. *An automatic drain on the compressor (available from QED) is highly recommended* since it dramatically decreases air filter maintenance.

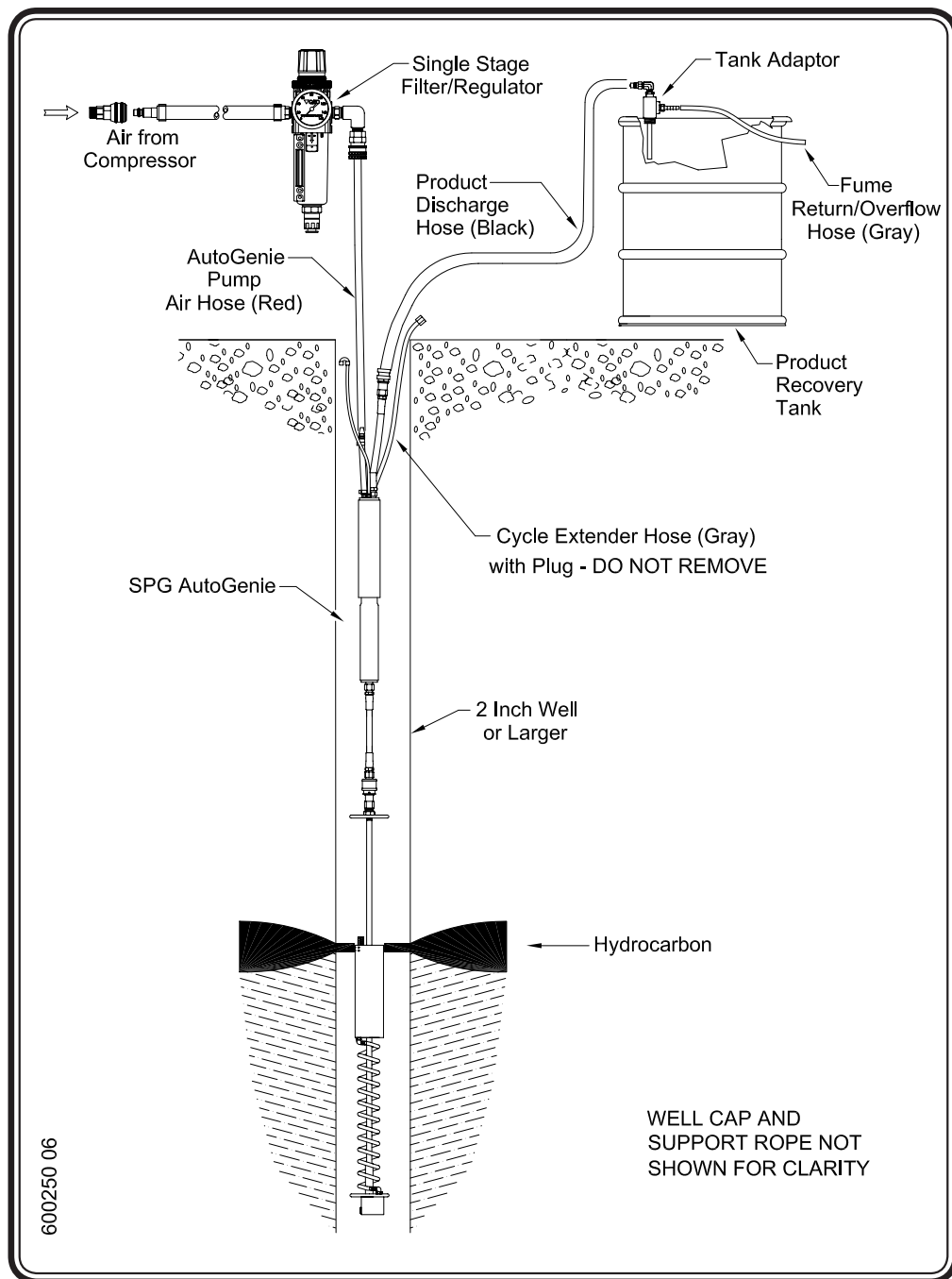


Figure 1 - Overview of a Typical Configuration (SPG AutoGenie)

Alteration of the System

Do not change or modify the system without the express written approval of *QED*. To meet the many different needs of users, additional sensors can only be added to the system by *QED*.

Optional Systems/Accessories

The following options are available from *QED*. Contact your regional office for more information.

- **Tank-Full Shut-Off (TFSO) – (See Appendix A)**
- **High-Water Shut-Off (HWSO) – (See Appendix A)**

Chapter 3: Equipment

Equipment List

The equipment list will vary depending on application type, but the following list is a *base* Genie configuration:

1. Genie Controllerless Pump consisting of:
 - Automatic pulser unit
 - Bladder pump located below pulser unit
2. Single stage filter/regulator consisting of:
 - 5 micron filter with auto drain trap
 - Pressure regulator with gauge
3. Tank adapter
4. Hoses:
 - Product discharge hose (black)
 - Genie pump air hose (red)
 - Air exhaust tubing (black)
 - Fume return/overflow hose (gray)
 - System air supply hose (blue)
 - Cycle extender hose (gray)
5. Well support system:
 - Well cap
6. Intake Configurations: In addition to the *base* configuration, there are two other intake configurations. Based on the application type one of the following equipment are used with the noted configurations.
 - a. Floating intake skimmer:
 - Product only
 - Dual Pump Recovery

- b. Top-loading cup:
 - Total fluids
- c. Inlet screen:
 - Dissolved fluids

Specifications

Equipment	L (Inches)	O.D. (Inches)	Weight (Pounds)	Max GPD	Max Depth (Feet)	Min Well ID Req (Inches)	Min Air Pressure (Psi)	Max Air Pressure (Psi)*
Genie:								
12-inch	52	1.875	6	80	150	2	40	100
24-inch	64	1.875	11	160	150	2	40	100
48-inch	88	1.875	13	320	150	2	40	100
Filter/Reg	13.4	5.4	NA	NA	NA	NA	NA	120
Hoses	See Page 20							
Skimmers	See Appendix C							

* Higher pressure systems available.

The following sections describe each of the basic components and the applications used to operate them.

Genie Controllerless Pump

Automatic Pulsar Unit

The pulser combines timers and an air valve and is mounted above the bladder pump. The timer located inside the pulser governs how often and for how long the pump is pressurized. (See **Figure 3** and **Figure 4**)

The pulser supplies air to the pump and exhausts the pump using an internal pneumatic circuitry. This is done with one adjustment on the unit when setting the cycle on the pump.

With a flathead screwdriver, turn the cycle adjustment screw (See **Figure 2**) inside the pulser unit clockwise to increase the cycle time, and counterclockwise to decrease the cycle time.

The Genie is preset at the factory to a 30 second cycle time using 80 psi air pressure. This means the pump is pressurized (fluid pushed out) and exhausted (fluid drawn in) within 30 seconds. If the cycle rate is adjusted to another time, ensure ample time for desired fill and discharge is allowed. The cycle time is apportioned with 30% to 35% to the pressurization phase and 65% to 70% to the exhaust phase. The shortest cycle time used is about 10 seconds, but this is rarely needed. If the pump is cycled more times than necessary, compressed air is wasted and the time life of the bladder (about 3 million cycles) will be shortened. The Product Recovery Rate chart in Chapter 5 shows cycle times, pump sizes, and the resulting flow rates.

Cycle times can be increased or decreased by adjusting the timing adjustment screw in the Genie driver, changing the volume of the Cycle Extender Hose and by varying the air pressure. All of these are discussed later in **chapter 5**.

The approximate volume per cycle of the Genie pumps are as follows:

12-inch pump = 45 cc
24-inch pump = 110 cc
48-inch pump = 280 cc

Bladder Pump

The bladder pump attached to the automatic pulser unit removes fluids from as deep as 150 feet. The pump is designed to draw product from a skimmer and push it up and out of the well.

(See Figure 2 and Figure 3)

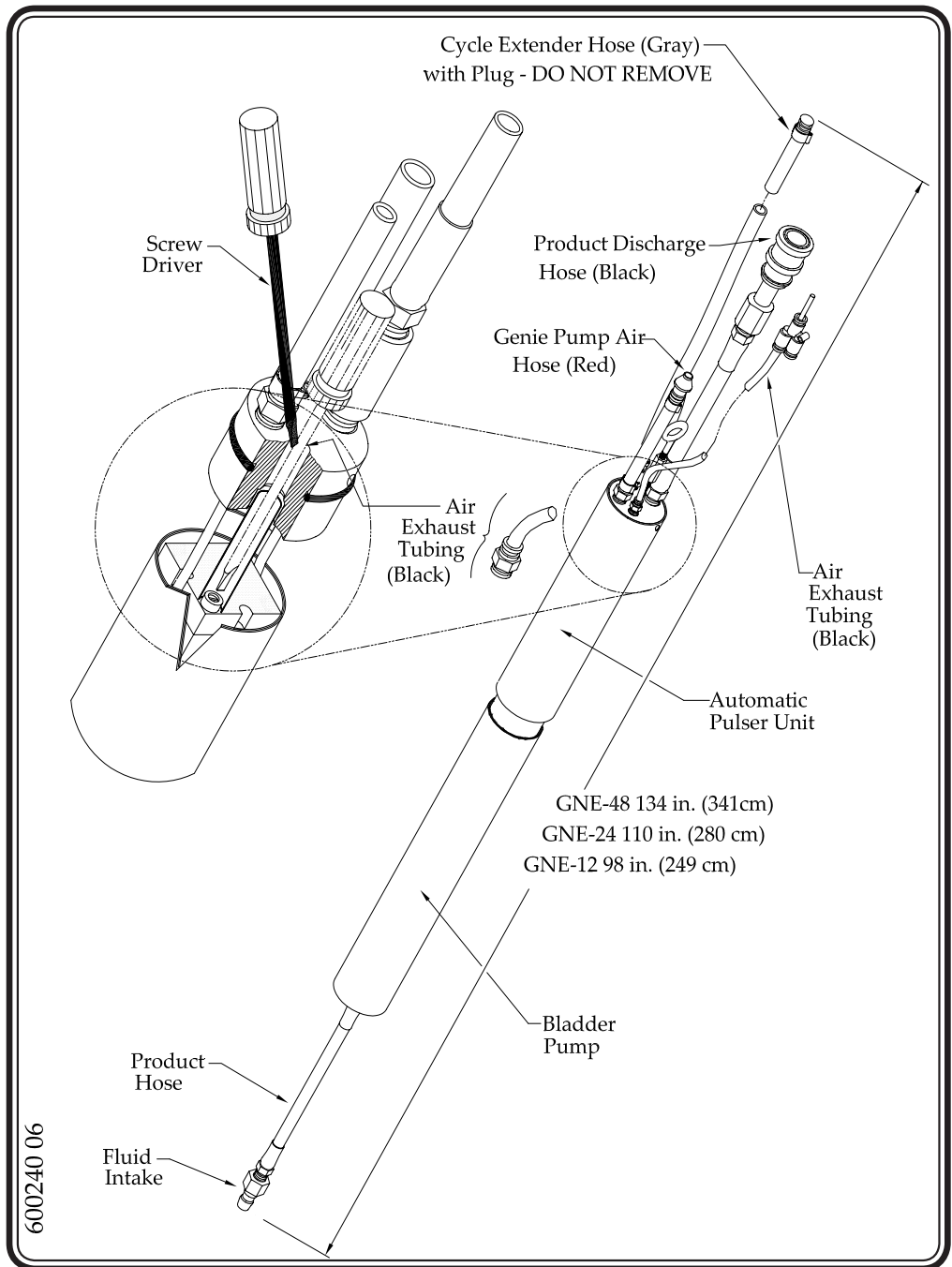
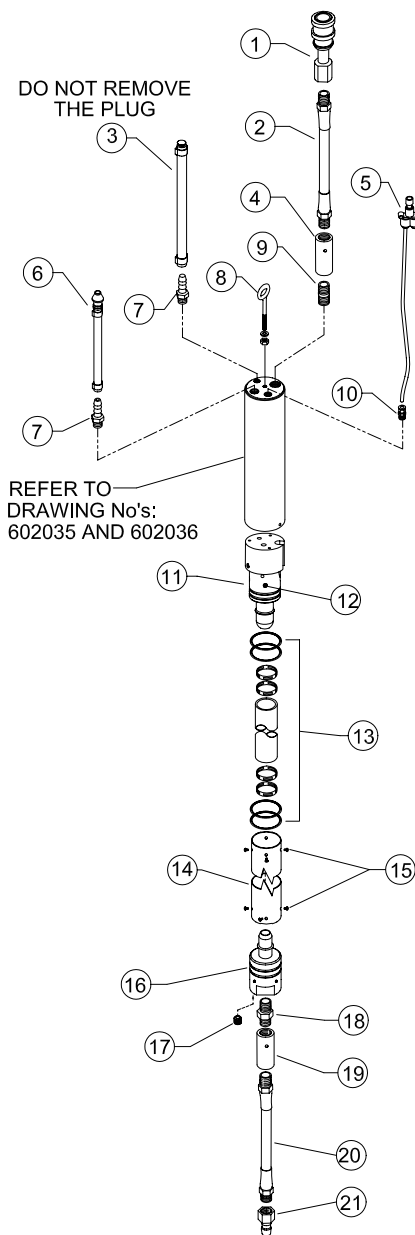


Figure 2 - Genie Controllerless Pump

PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Discharge Quick-Connect	1
2	302764	GNE/Blad Disch. Swaged Hose	1
3	301285	Cycle Ext. Gray Hose Assy.	1
4	300723	Discharge Viton Check Valve	1
5	301286	GNE Air Exhaust Tube Assy.	1
6	301276	GNE Air Hose Assy.	1
7	200724	1/8" MPT X 1/4" HB	2
8	200884	GNE Eyebolt and Hardware	1
9	200682	1/4" Nipple S.S.	1
10	202605	Exhaust Tube Connector	1
11	201055	GNE Bladder Disch. End	1
12	201258	10-32 Plug	1
13	301635	GNE-12 Bladder Tube w/Clamps and Bladder Casing O-Rings	1
	301636	GNE-24 Bladder Tube w/Clamps and Bladder Casing O-Rings	
	301637	GNE-48 Bladder Tube w/Clamps and Bladder Casing O-Rings	
14	201336	GNE-12 Bladder Casing	1
	201337	GNE-24 Bladder Casing	
	201462	GNE-48 Bladder Casing	
15	202195	Bladder Casing Screw	8
16	201054	GNE Intake End	1
17	201258	10-32 Drain Plug	1
18	204998	1/4" S.S. Hex Nipple	1
19	300722	IntakeTeflon Check Valve	1
20	302763	GNE/Blad Int. Swaged Hose	1
21	200878	Intake Quick-Connect	1



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Figure 3 - Genie Controllerless Pump – Exploded View

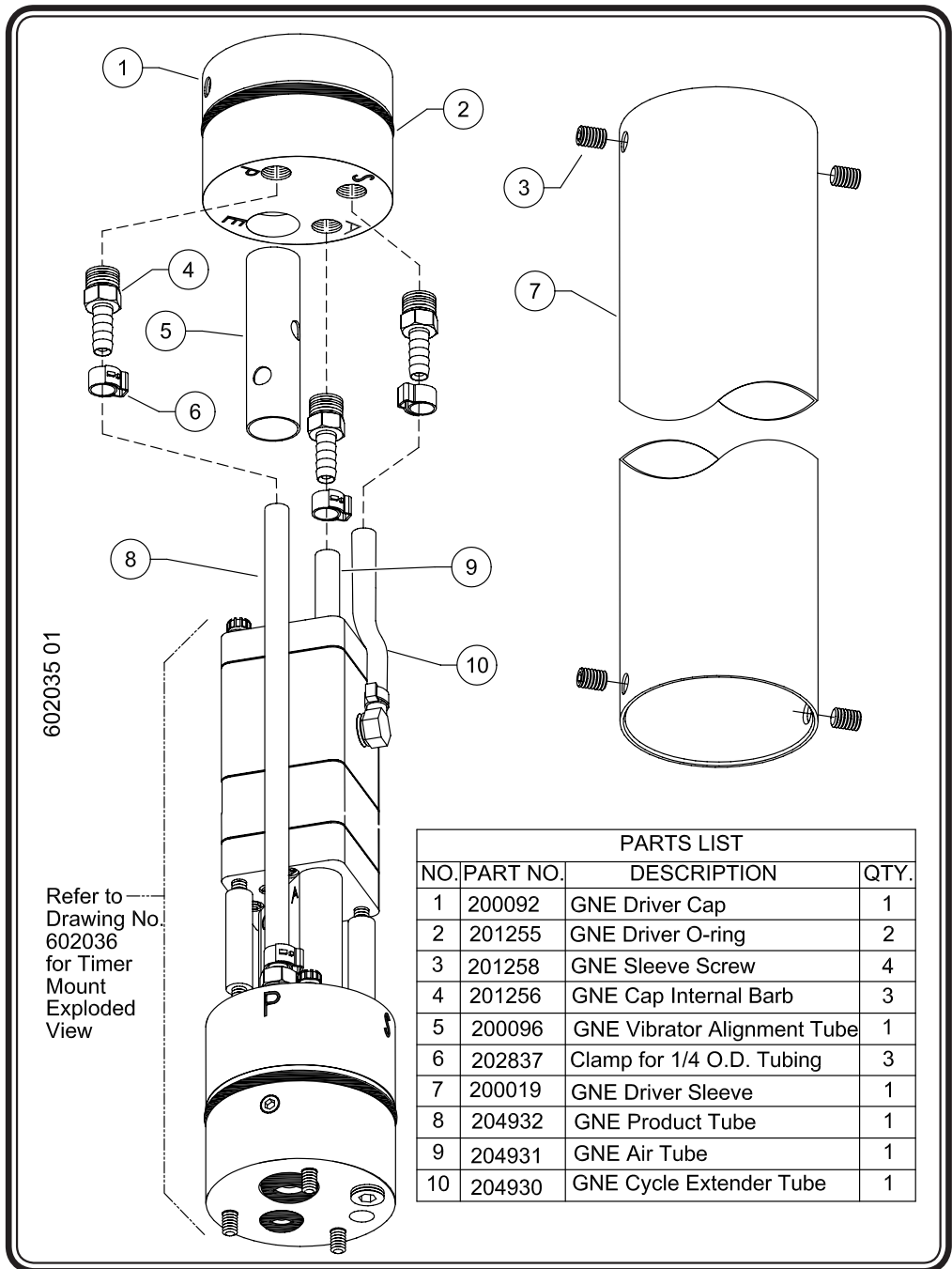


Figure 4 - Genie Pulsar Unit

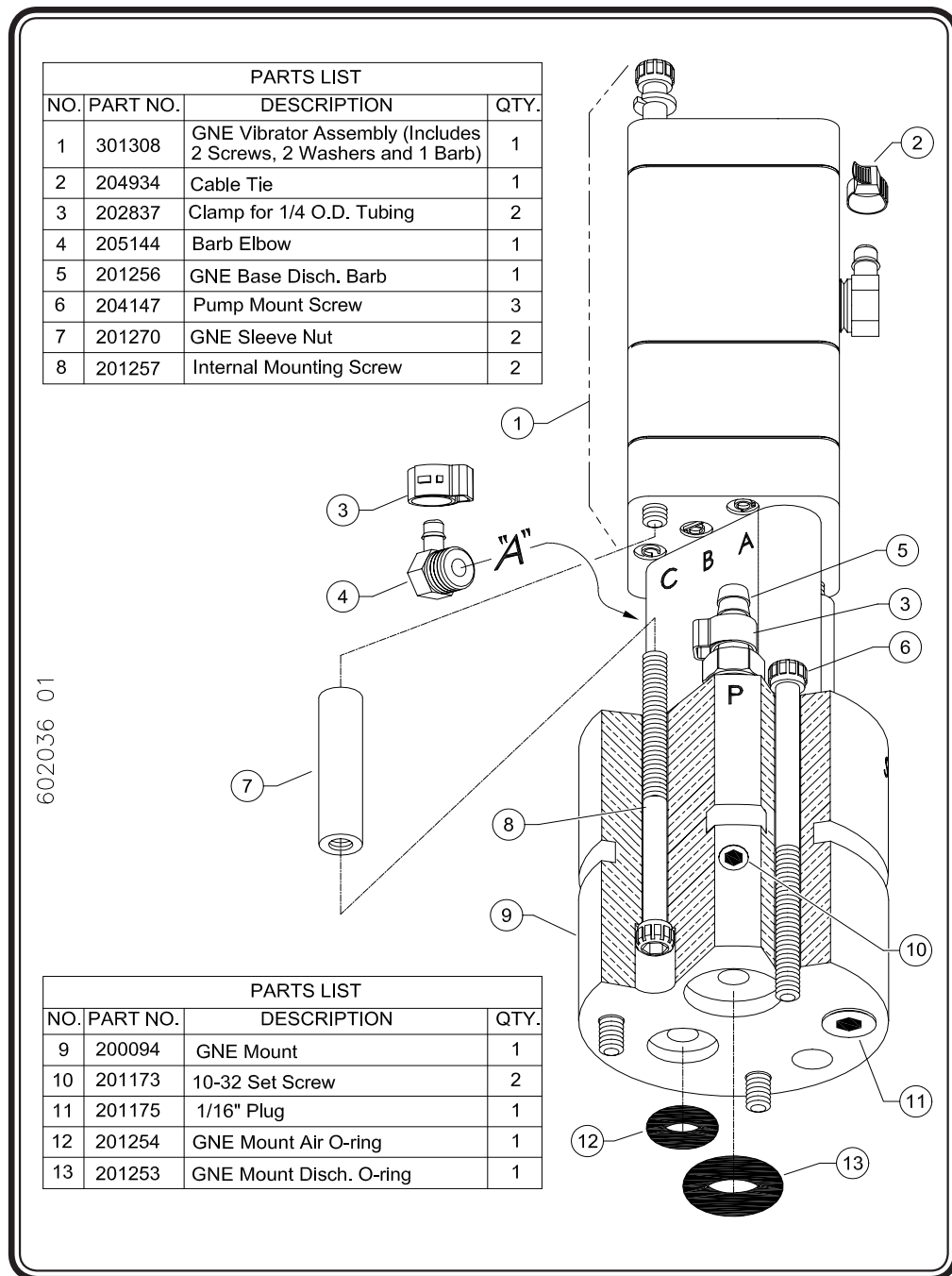


Figure 5 - Genie Timer and Base- Exploded View

Single Stage Filter/Regulator

The single stage 5 micron air filter/regulator has an automatic drain and is mounted outside of the well. The filter/regulator removes particles, water droplets, and some oil mist from the air passing to the Genie pump. The regulator should produce at least as much pressure as required to move the fluid from the depth at which the pump is installed. (See Figure 6)

Note:

Too much air pressure can result in low pump efficiency.

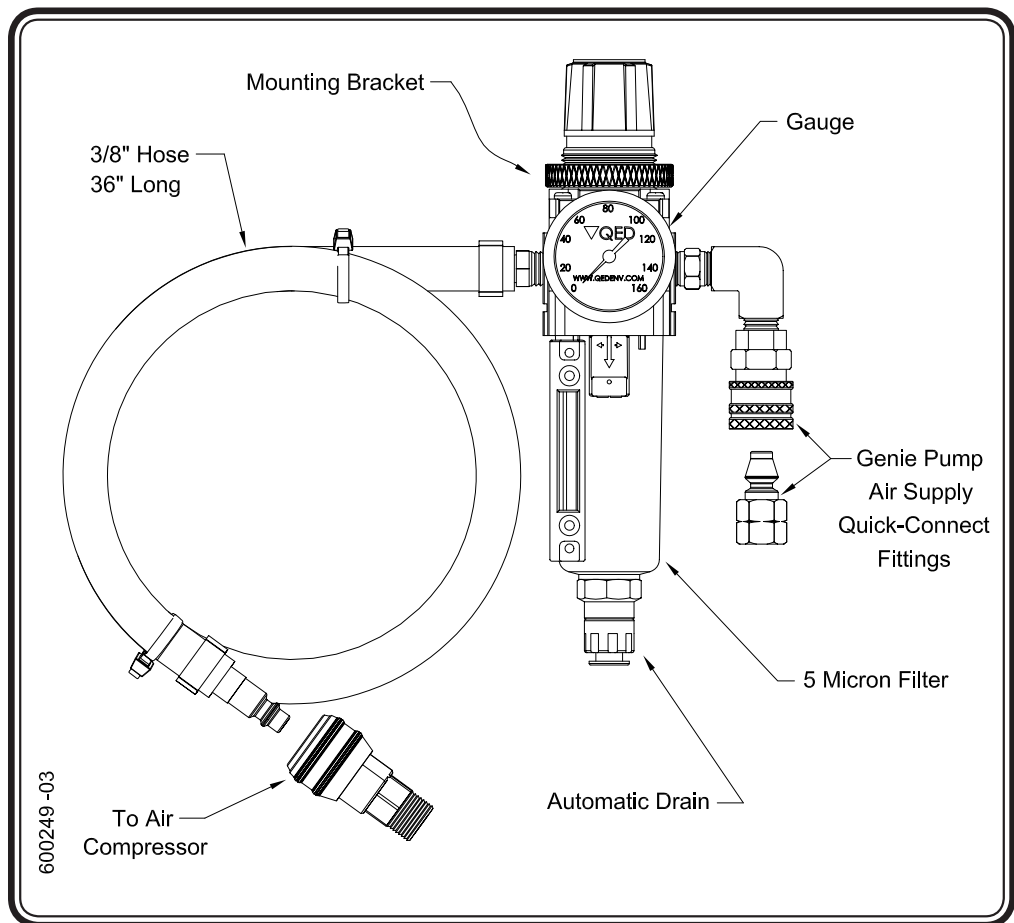


Figure 6 - Single Stage Filter/Regulator

Tank Adapter

The tank adapter threads into the product recovery tank to act as an intake and vent/overflow fitting. It has 3/4 inch NPT threads made of brass to reduce spark hazard. (See Figure 7)

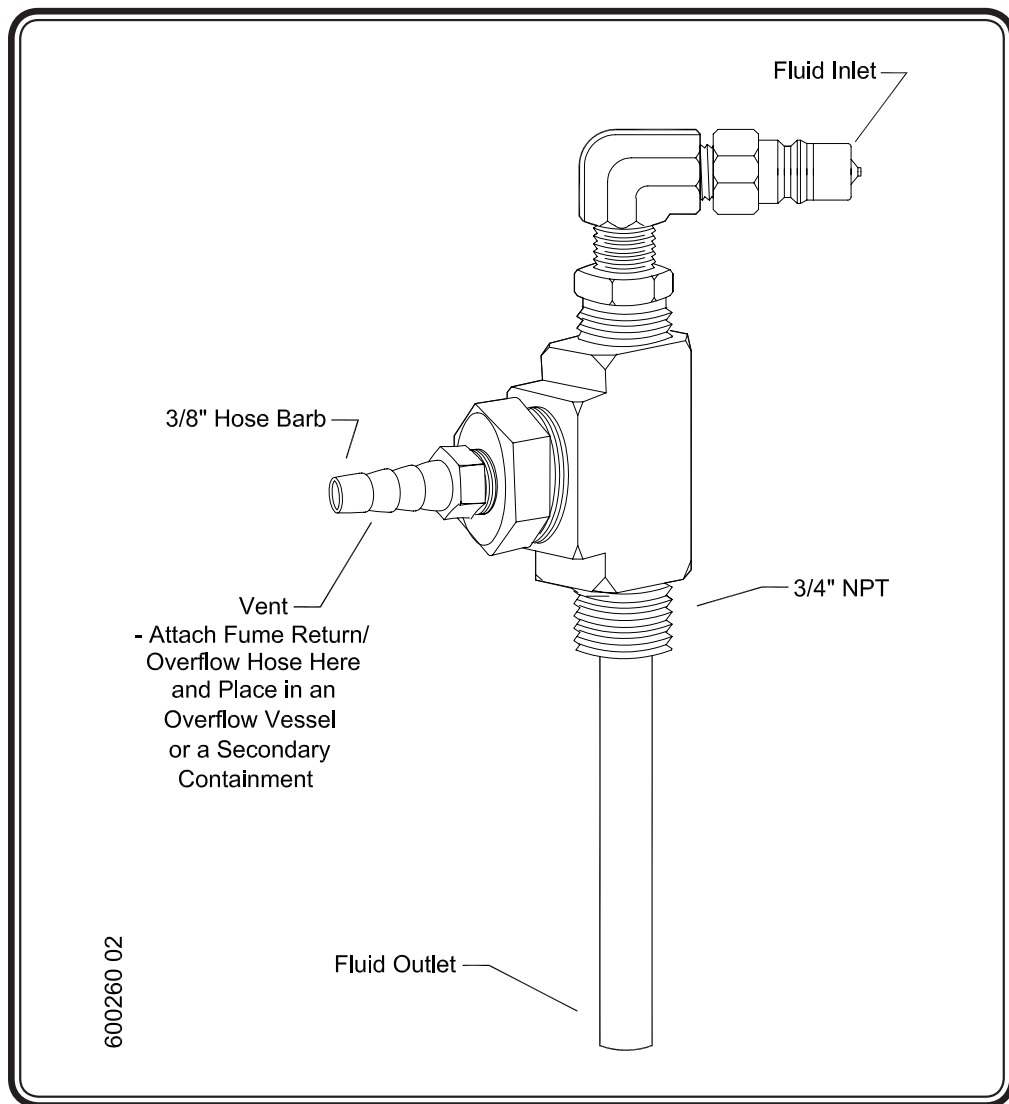


Figure 7 - Tank Adapter

Hoses and Fittings

Hose is usually supplied with the Genie System. The table below shows the normal hose colors and sizes, and, the air exhaust tube. These may change due to application or need.

Hose Color Code Table

Color/Material/Size	Name	Function	Fittings
Hose: Black/Wire-Reinforced Hydraulic hose with Nylon core Size: 1/4" I.D.	Product Discharge	Transport product from the Genie pump to the discharge point	Hose barb and clamp or straight-through quick-connects
Hose: Red/Nitrile, PVC Size: 1/4" I.D.	Genie Pump Air	Supplies air from the single stage filter/regulators to the Genie pump	Hose barb and clamp or one-way quick-connect fitting
Tubing: Black/Nylon Size: 1/4" O.D.	Air Exhaust Tube	Exhausts air from the Genie pump	Hose barb and clamp or straight-through quick-connect
Hose: Blue/Nitrile Size: 3/8" to 1/2" I.D.	System Air Supply	Supplies air from the compressor to the single stage filter/regulator	Hose barb and clamp or one-way quick-connect fitting
Hose: Gray/Nitrile Size: 3/8" I.D.	Fume Return/Overflow	Returns product overflow from the product recovery tank to overflow vessel or secondary containment	Hose barb and clamp or straight-through quick-connect fitting
Hose: Gray/Nitrile Tubing: Gray/Nylon Size: 1/4" I.D.	Cycle Extender	Increases the cycle time of the GNE driver timer	Hose barb

The cycle extender hose's upper end is sealed by a brass barb plug. The hose should not be removed from the driver, nor the plug from the end of the hose, unless the operator wishes to add a length of the hose to further extend the cycle time. If a longer cycle time is desired, please contact the factory.

If optional quick-connects are used, the flow of air and fluid in the hoses runs *into* the male plug and *out* of the female socket.

The quick-connect fittings will not interchange, so one cannot connect a hose to an incorrect fitting.

Note:

The down well hose fittings normally have locking quick-connects. On sites with water depths over 50 feet, special consideration may be required to support the hoses. Consult with QED regarding such applications.

Well Support System

To safely support the product discharge hose, Genie pump, and floating intake skimmer, a well support system is provided.

Included in the system are a well cap (holes drilled through the cap without fittings), hose clamp, cable ties and eyebolts that secure the hose, Genie pump and skimmer in the well.

See page 47 for a description of how to connect the well support system.

Intake Configurations

Skimmers

QED Environmental Services manufactures two types of floating intake product skimmers. The floating intake allows the skimmer to move freely up and down within the well bore following groundwater level fluctuations. The two skimmer types are: the Selective Oil Skimmer (SOS) and the Specific Gravity Skimmer (SPG).

Selective Oil Skimmer (SOS)

- The SOS uses a hydrophobic-oleophilic (selective) screen which repels water but allows the passage of fuels. Product that enters through the selective screen is drawn out by the Genie pump and removed from the well. **(See figures 9, 10, 11 and 12)**
- The SOS can remove the product layer down to a sheen (≤ 0.01 inch) if the product is not too thick or viscous. The product should be about SAE 20 weight or less for good performance.

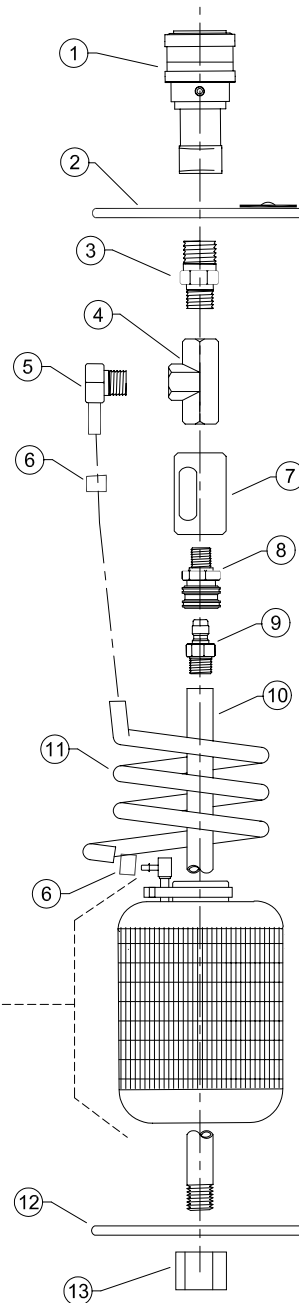
- There is a shorter tube section at one end of the selective screen and a longer section at the other end. When the shorter tube section is placed on the bottom, the product is removed to a sheen. When the longer section is down, the skimmer leaves a little more oil in the well. This can enhance oil movement into the well.
- There are two screen sizes available (55 and 110 mesh). The 110 mesh is standard and shipped with the SOS unless the 55 mesh is requested. The 55 mesh screen is used when more viscous oils (e.g. No. 2 fuel oil) must be recovered.
- The SOS will resist water intrusion up to several inches of water column. If the SOS is submerged, the hydrostatic water pressure will overcome the water repulsion ability of the screen and water will enter the skimmer. If this happens, rinse the green screen in the recovered hydrocarbon to wash off the water and reinstall the screen into the skimmer.
- If the product contains a lot of very small suspended solids or biological growth, the outer debris screen and perhaps the selective screen on the skimmer may require periodic service or cleaning.

Caution:

Do not scrub the screen, this could destroy its selective properties.
(See Chapter 6: Maintenance, page 54)

PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	300062	SOS-4 Disk/Patent Assembly	1
3	200865	1/4" X 1/8" Brass Nipple	1
4	201153	1/8" Brass Tee	1
5	201203	Modified Barb	1
6	200446	1/4" O.D. Tube Clamp	2
7	200097	Quick Connect Shield	1
8	200668	1-ST S.S. Socket	1
9	200859	1-ST S.S. Plug	1
10	205954	SOS4 Bott. Skr. Guide Rod	1
11	205958	Coiled Tubing for SOS-4 Bottom Skimmer 12" Travel	1
12	200089	SOS-4/SPG-4 Disk	1
13	202361	Brass Cap	1

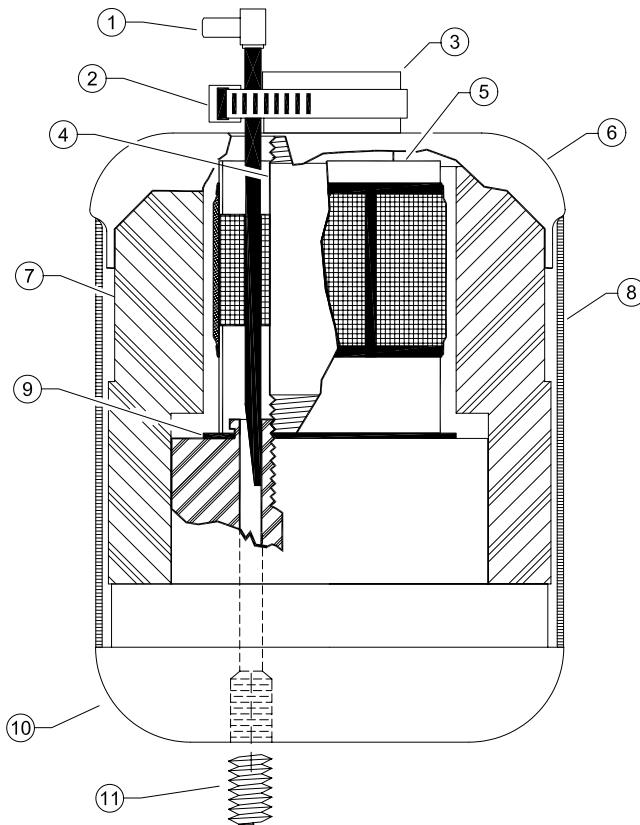
Refer to Drawing
No. 602071



602070 01

Figure 8 - Four-Inch Selective Oil Bottom Skimmer 12" Travel (P/N 302524)

PARTS LIST							
NO.	PART NO.	DESCRIPTION	QTY.	NO.	PART NO.	DESCRIPTION	QTY.
1	300655	SOS4 Bott. Skr. Int. Assy.	1	7	200103	SOS4 Float Collar	1
2	200657	Cable Tie	1	8	200106	SOS4 Debris Screen	1
3	200100	SOS4 Nut	1		200758	Large-Hole Debris Screen	
4	200098	SOS4 Post	1	9	201657	SOS4 Float Gasket	1
5	204254	100-mesh Selective Screen	1	10	200099	SOS4 Float Base	1
	204256	55-mesh Selective Screen		11	200954	SOS4 Float Plug	1
6	201672	SOS4 Dome Cover	1				



FLOAT / INTAKE ASSEMBLY DETAIL

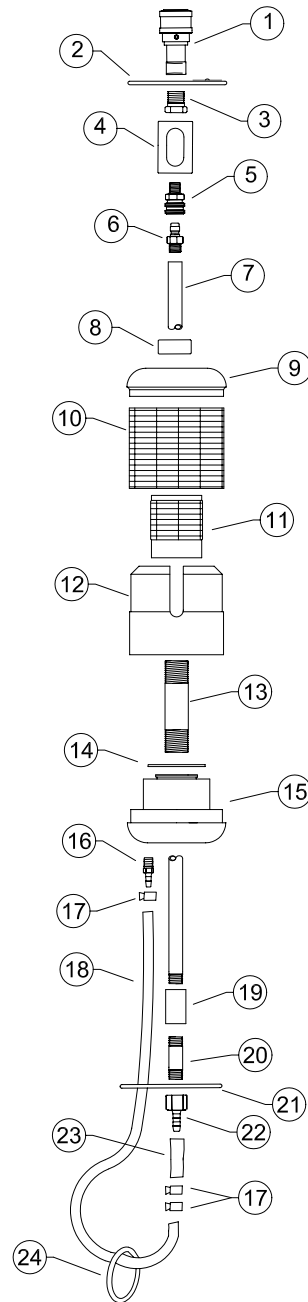
NOTE:

-ENSURE THAT THE ANGLE TIP OF THE INTAKE ASSEMBLY
(ITEM #1) GOES INTO THE HOLE ON THE FLOAT BASE

602071 01

Figure 9 - Four-Inch Selective Oil Bottom Skimmer Float Assembly

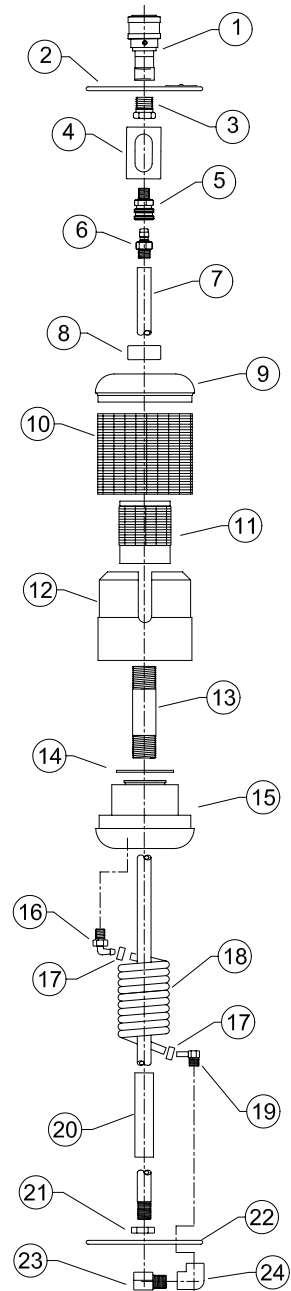
PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	300062	SOS-4 Disk/Patent Assembly	1
3	200660	1/4" X 1/8" Brass Reducer	1
4	200097	Quick Connect Shield	1
5	200668	1-ST S.S. Socket	1
6	200859	1-ST S.S. Plug	1
7	200111	STD. SOS-4 Guide Rod	1
8	200100	SOS-4 Float Nut	1
9	201672	SOS-4 Dome Cover	1
10	200106	SOS-4 Debris Screen	1
	200758	SOS-4 Large-Hole Debris Screen	
11	204254	100-Mesh Selective Screen	1
	204256	55-Mesh Selective Screen	
12	200103	SOS-4 Float Collar	1
13	200098	SOS-4 Post	1
14	201657	SOS-4 Gasket	1
15	200099	SOS-4 Base	1
16	200655	1/4" X 1/8" Black Barb	1
17	200657	Cable Tie	3
18	201134	SOS4 Loop 24" Travel-Tubing	3.75 Ft
19	200863	1/4" S.S. Coupling	1
20	200864	2" S.S. Nipple	1
21	200089	SOS-4/SPG-4 Disk	1
22	201098	1/4" X 1/4" FPT Barb	1
23	200658	5/16" X 7/16" X 2" Tube	0.13 Ft
24	200107	SOS4 Ring Weight	1



600254 -04

Figure 10- Four-Inch Selective Oil Skimmer Looped Tube (P/N 300028)

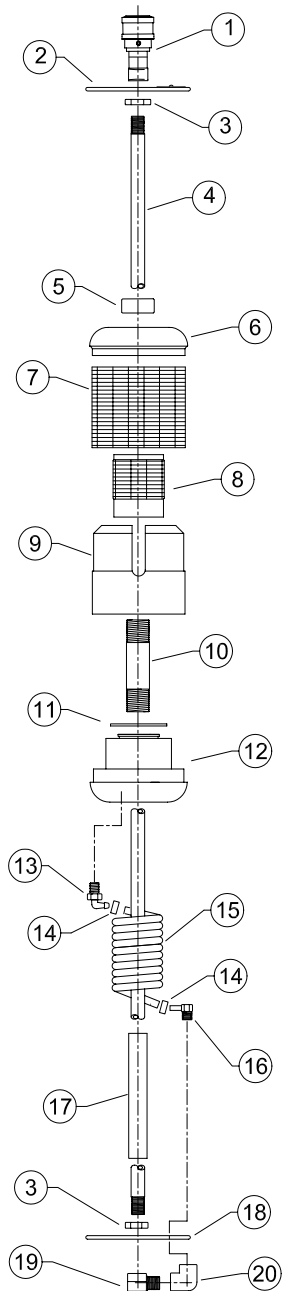
PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	300062	SOS-4 Disk/Patent Assembly	1
3	200660	1/4" X 1/8" Brass Reducer	1
4	200097	Quick Connect Shield	1
5	200668	1-ST S.S. Socket	1
6	200859	1-ST S.S. Plug	1
7	205953	SOS-4 24" Travel Guide Rod	1
8	200100	SOS-4 Float Nut	1
9	201672	SOS-4 Dome Cover	1
10	200106	SOS-4 Debris Screen	1
	200758	SOS-4 Large-Hole Debris Screen	
11	204254	100-Mesh Selective Screen	1
	204256	55-Mesh Selective Screen	
12	200103	SOS-4 Float Collar	1
13	200098	SOS-4 Post	1
14	201657	SOS-4 Gasket	1
15	200099	SOS-4 Base	1
16	200872	1/8" X 1/8" White Barb	1
17	200446	Tube Clamp	2
18	205531	Coiled Tubing for 24" Travel	1
19	202023	Modified Barb Elbow	1
20	205954	Standoff	1
21	200669	Brass Nut	1
22	200089	SOS-4/SPG-4 DISK	1
23	205369	Brass Street Elbow	1
24	203219	Brass Elbow	1



602072 -01

Figure 11- Four-Inch Selective Oil Skimmer - 24" Travel (P/N 302525)

PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	300062	SOS-4 Disk/Patent Assembly	1
3	200669	Brass Nut	2
4	200219	SOS-4 45" Travel Guide Rod	1
5	200100	SOS-4 Float Nut	1
6	201672	SOS-4 Dome Cover	1
7	200106	SOS-4 Debris Screen	1
	200758	SOS-4 Large-Hole Debris Screen	
8	204254	100-Mesh Selective Screen	1
	204256	55-Mesh Selective Screen	
9	200103	SOS-4 Float Collar	1
10	200098	SOS-4 Post	1
11	201657	SOS-4 Gasket	1
12	200099	SOS-4 Base	1
13	200872	1/8" X 1/8" White Barb	1
14	200446	Tube Clamp	2
15	205533	Coiled Tubing for 45" Travel	1
16	202023	Modified Barb Elbow	1
17	202636	Standoff	1
18	200089	SOS-4/SPG-4 DISK	1
19	205369	Brass Street Elbow	1
20	203219	Brass Elbow	1



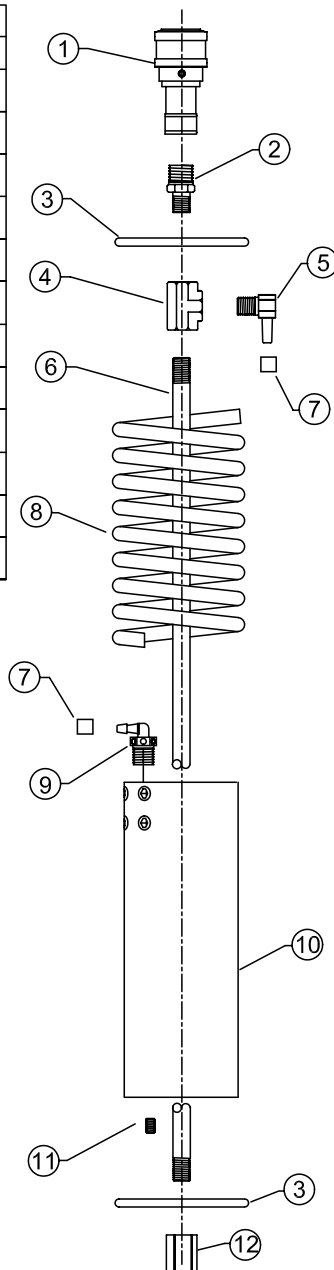
602073-01

Figure 12 - Four-Inch Selective Oil Skimmer Coiled 45" Travel (P/N 300776)

Specific Gravity Skimmer (SPG)

- The SPG uses the difference in density to distinguish between water and product. The floating intake has a specific gravity of about 0.94. So, it floats in water, but sinks in most products. Because the product intake is on the top of the float, it recovers only product.
- By design, the SPG does not usually remove all of the product on the surface of the water. It typically leaves about 1.5 to 2 inches of product in the well at all times. The amount of fuel or oil left in the well depends mainly on the specific gravity of the product. This residual product can enhance the influx of additional product into the well.
- As the specific gravity of the product increases or approaches the specific gravity of the skimmer float, more product is left in the well. The skimmer has variable inlet holes on the side of the float that allow the user to adjust the intake level of the skimmer. This is usually done when the specific gravity of the product is greater than 0.85 or when there is an emulsion.
- The SPG will perform better than the SOS when the product is emulsified, viscous, or dirty.
- The SPG is available in two diameters to fit 2-inch and 4-inch wells. The SPG usually requires 1.5 to 2 inches of fuel in the well to begin recovering. If it is submerged by a high-water condition in the well, and is not controlled by the HWSO system, water will pass to the Genie pump.

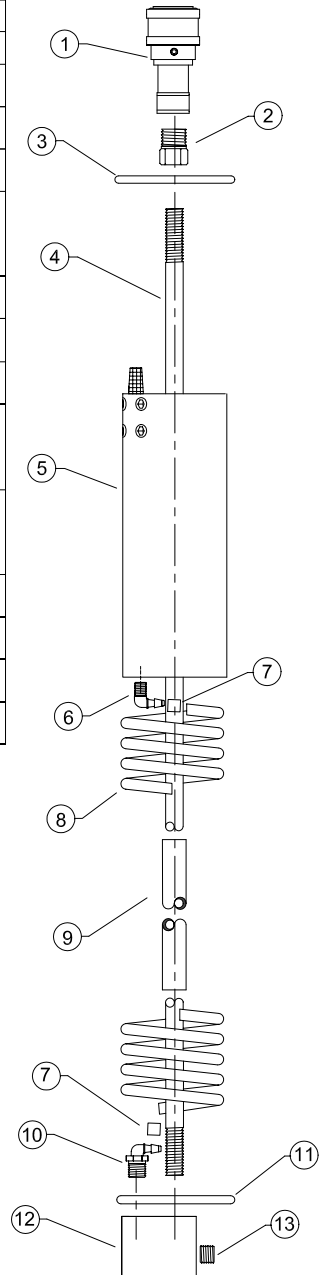
PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	200865	1/4" X 1/8" Hex Reducing Nipple	1
3	200318	SPG-2 Upper Disk	2
4	201153	SPG-2 Bottom Skimmer Tee	1
5	201203	Modified 1/8" Brass Barb Elbow	1
6	200322	SPG-2 Guide Rod	1
7	200446	1/4" O.D. Tube Clamp	2
8	205537	Coiled Tub. for 2" Skr. 12"-14" Trav.	1
9	201850	Modified 1/8" Nylon Barb Elbow	1
10	302549	SPG-2 Float V.I. with Screws	1
11	201258	SPG2 Bottom Skimmer Plug	1
12	200978	1/8" Brass Cap	1



602068 -01

Figure 13 - Two-Inch Specific Gravity Bottom Skimmer - 12" Travel (P/N 300440)

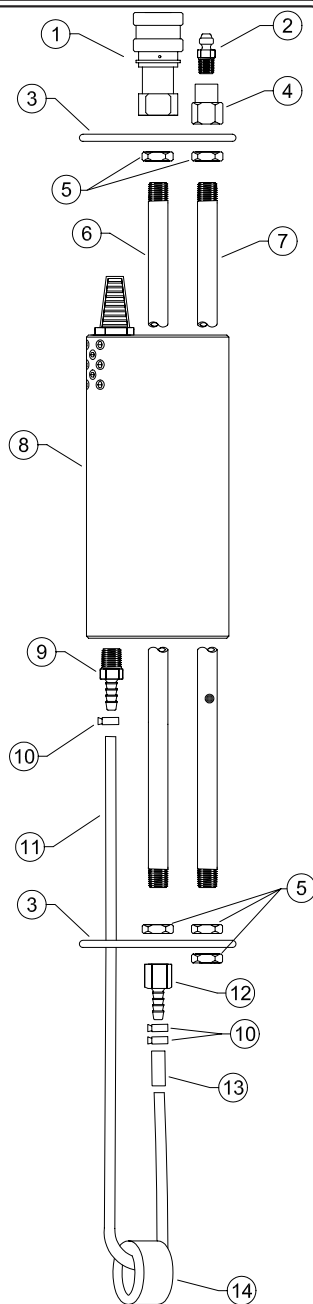
PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	200660	1/4" X 1/8" Bushing	1
3	200318	SPG-2 Upper Disk	1
4	202047	SPG-2 24" Travel Guide Rod	1
	200274	SPG-2 45" Travel Guide Rod	
5	300854	SPG-2 Float Assembly	1
6	200867	1/8" Nylon Barb Elbow	1
7	200446	1/4" O.D. Tube Clamp	2
8	205538	24" Travel SPG-2 Coiled Tube	1
	205540	45" Travel SPG-2 Coiled Tube	
9	204026	24" Travel SPG-2 Coiled T. Standoff	1
	204027	45" Travel SPG-2 Coiled T. Standoff	
10	200872	1/8" X 1/8" Barb Elbow	1
11	200124	SPG-2 Lower Disk	1
12	203538	SPG-2 Coiled Tubing "U" Ftg	1
13	200954	1/8" Brass Plug	1



602069 01

Figure 14 - Two-Inch Specific Gravity Skimmer with Coiled Tubing
24" Travel (P/N. 300592) and 45" Travel (P/N 300747)

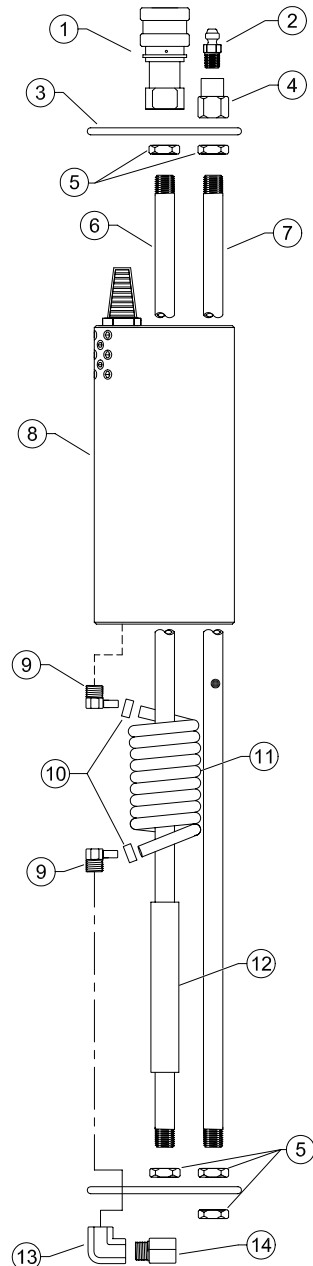
PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	200671	Plug 1/8" MPT	1
3	200671	SPG-4 Disk	2
4	204846	1/4" X 1/8" Brass Reducer	1
5	200669	Brass Nut	5
6	205950	SPG-4 Loop 24" Travel Guide Rod	1
7	205949	SPG-4 Loop 24" Travel Guide Rod with HWSO Bubbler Hole	1
8	301391	SPG-4 V. I. Float	1
9	202355	Barb X 1/4" MPT	1
10	200657	Cable Tie	3
11	205955	SPG-4 Looped 24" Travel Tube	1
12	202363	Barb X 1/4" FPT	1
13	200678	3/8" X 1/2" X 2" Tube Sleeve	.17 ft
14	200245	SPG-4 Weight	1



600257 -03

Figure 15 - Four-Inch Specific Gravity Skimmer with Looped Tubing (P/N 302522)

PARTS LIST			
NO.	PART NO.	DESCRIPTION	QTY.
1	200130	Socket 1/4" FPT	1
2	200671	Plug 1/8" MPT	1
3	200671	SPG-4 Disk	2
4	204846	1/4" X 1/8" Brass Reducer	1
5	200669	Brass Nut	5
6	204260	SPG-4 Coiled 24" Travel Guide Rod	1
	200580	SPG-4 Coiled 45" Travel Guide Rod	
	302562	SPG-4 Coiled 60" Travel Guide Rod	
7	202461	SPG-4 Coiled 24" Travel Guide Rod with HWSO Bubbler Hole	1
	200579	SPG-4 Coiled 45" Travel Guide Rod with HWSO Bubbler Hole	
	302563	SPG-4 Coiled 60" Travel Guide Rod with HWSO Bubbler Hole	
8	301391	SPG-4 V. I. Float	1
9	202355	Barb X 1/4" MPT	1
10	200657	Cable Tie	3
11	205531	Coiled Tube for 4" Skr. w/24" Travel	1
	205533	Coiled Tube for 4" Skr. w/45" Travel	
	205956	Coiled Tube for 4" Skr. w/60" Travel	
12	205954	Standoff for 4" Skr. w/24" Travel	1
		Standoff for 4" Skr. w/45" Travel	
	205957	Standoff for 4" Skr. w/60" Travel	
13	203219	1/4" Elbow	1
14	205369	1/4" Street Elbow	1



602074 -01

**Figure 16 - Four-Inch Specific Gravity Skimmer with Coiled Tubing and HWSO
14" Travel (P/N 301226), 45" Travel (P/N 300728) and 60" Travel (P/N 302523)**

Inlet Screen

An intake screen may be attached to the inlet of a Genie Pump for Total Fluids Recovery. (See figures 17 and 20)

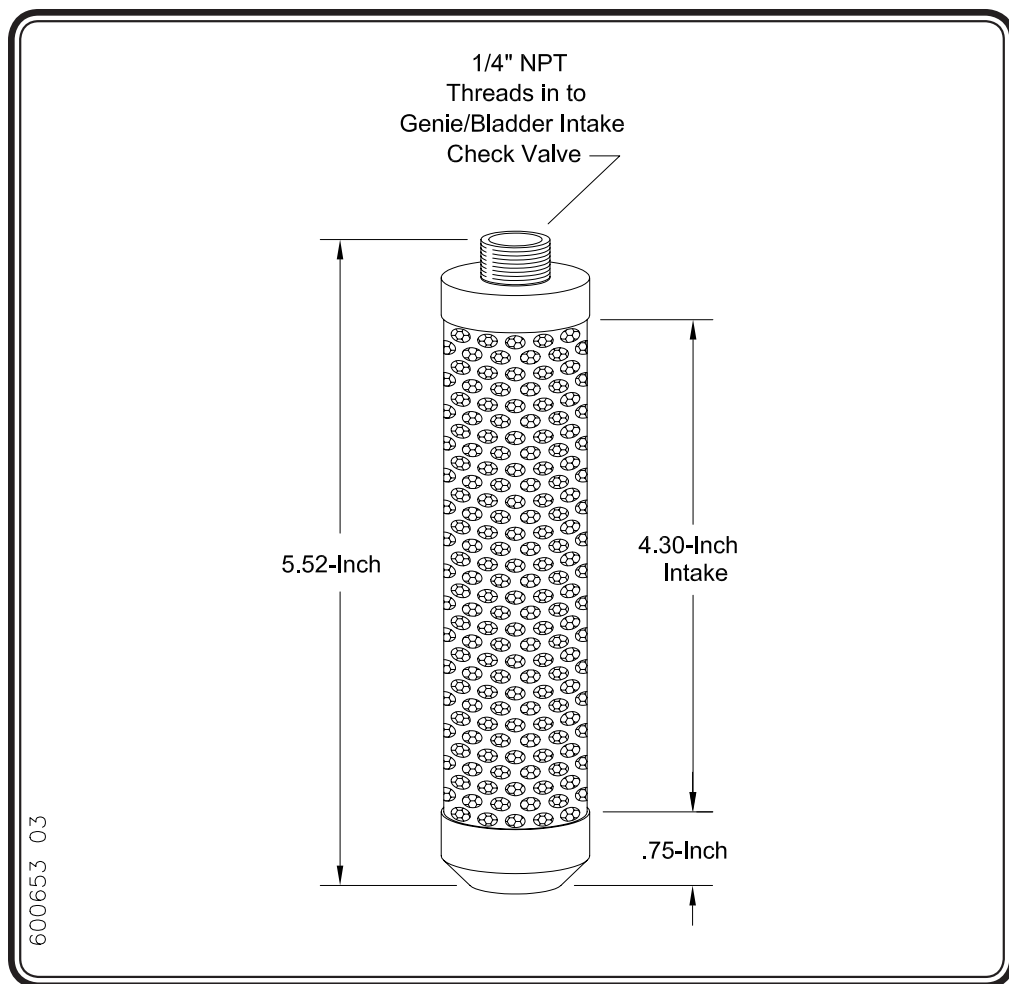


Figure 17 - Stainless Steel Inlet Screen

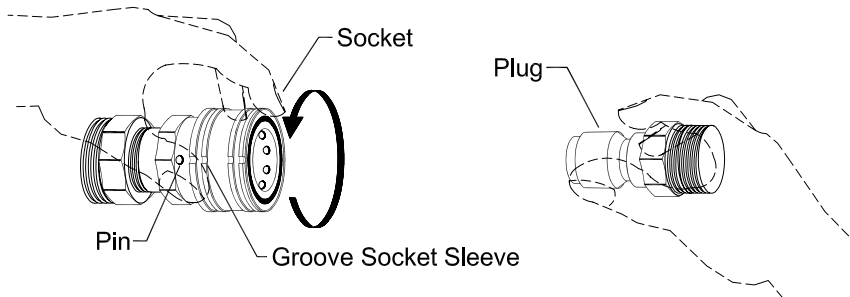
Chapter 4: Assembly & Installation

Cautions

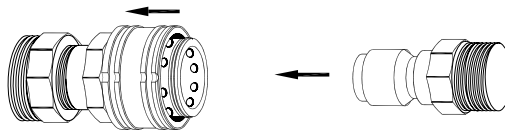
Note:

Follow the instructions on **Figure 18** (following page) for properly securing the locking quick-connects.

- Do not use PVC pipe for compressed air conduit. It is not considered a safe use of the material.
- Cover the hose ends with tape if they are being pulled through trenches. Be sure the ends of the hoses that connect to the air compressor and fluid discharge have the correct fitting leading out of the well. If you are unsure, look at the respective fittings on the pump.
- Blow out all compressed air conduits (trunk lines, sensor hoses, air supply hoses etc.) and fluid lines for at least 10 seconds before connecting them to the system.
- When running hoses in conduit, include a rope to pull additional hoses in case they are needed at a later date.
- Protect the Genie from freezing conditions. If possible, maintain the temperature above 45° F. This is usually accomplished because the system is positioned inside the well, which is warmed by the groundwater. Other adverse conditions such as rain, dust and vibration usually have little or no effect on the system.
- If solid metal piping is used for compressed air conduit, it is advised that an air filter or a “Y” strainer with a fine mesh screen (80 mesh or finer) be placed at the downstream end of the piping. Metal flakes, rust, galvanizing material, dirt, etc. can be dislodged from such metal piping and travel to the pump or controls.



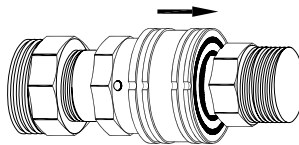
- a. Rotate socket sleeve until groove is aligned with the pin close to the hex.



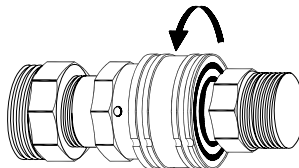
- b. Pull socket sleeve against the hex (the pin will be totally covered). Hold in this position for plug insertion.



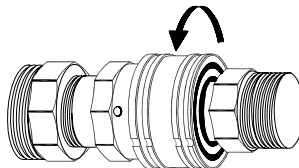
- c. Push plug into socket until the plug is almost covered.



- d. Let the socket sleeve go in. It must slide all the way until the pin is visible again.



- e. Rotate the socket sleeve so the groove does not align with the pin. To test, gently pull hexes of both fittings in opposite directions. Fittings must remain attached.



600259 02

Figure 18 - Locking Quick-Connect Instructions

- Cut the tie-wrap that holds the ring weight to the bottom of the skimmer.
- Cut the tie-wrap that prevents the skimmer float from moving on the guide rod during shipping.

Compressed Air Supply

The Genie System includes two air lines—one from the compressor to the air regulator and the other from the air regulator to the GNE system. Both have quick disconnect fittings, unless hose barbs were specified by the client.

There is a distinct air inlet on the Genie. This fitting has a female counterpart on the air inlet hose. The air inlet must be connected for the Genie System to function. Do not lubricate the compressed air coming out of the compressor. The Genie does not require lubrication and excess oil may foul the filter/regulator.

The filter and regulator accepts a maximum of 150 psi air pressure from the compressor. The maximum outlet air pressure setting on the regulator is 125 psi. The maximum pressure rating for the GNE, however, is 100 psi.

Cold Weather

Freezing conditions may cause problems that could require assistance from QED.

The Genie System was designed to solve freezing of the pump controls in cold (<40° F) weather. Since the controls are in the well with the pump, usually freezing does not occur because the ground water maintains the temperature in the well above freezing. The compressed air traveling to the well casing may need protection from freezing.

If you are operating the system in freezing weather, take precautions so that moisture does not freeze in the pneumatic lines.

Actions To Take

- Use water traps and automatic compressor tank drains. These are available at industrial distributing companies (e.g., Grainger®).
- Bury air hoses below the frost line. Insulate and heat with heat tape or run through a PVC pipe with warm air being blown through it.

- Remove all the moisture you can from the air by using drains on the compressor, filter, and low points in the air line. Use an electrical or desiccant air dryer, and pull only cold, dry air into the compressor.
- During freezing conditions regulators may fail “open”, allowing high pressure (e.g. 150 psi from the compressor) to enter components (e.g. gauges, hoses, fluid receptacles) that may be damaged, cause a safety problem, or release contaminating material. Be sure the regulator is protected from freezing.
- A pneumatic or electric air drier can be installed between the air compressor and control box. This unit reduces the water content of the air so condensation and freezing is reduced significantly. If an electric air drier is used, it must be outfitted with explosion-proof controls or placed away from the Genie pump and product recovery tank.

Base Configuration Component Assembly

STEP 1 - Install Genie Pump Air Hose (red)

- a. Attach the male fitting of the Genie pump air hose to the single stage filter/regulator. (See Figure 19)
- b. Attach the female fitting of the Genie pump air hose to the air supply fitting on the Genie pump.

STEP 2 - Install Air Exhaust Tubing (black)

- a. Push the air exhaust tubing into the red-collared tubing fitting on the pump. (See Figure 19)
- b. Secure the exhaust tubing to the air hose and the cycle extender hose with a cable tie so it does not wander freely in the well.

STEP 3 - Install Tank Adapter

- a. Thread the tank adapter into a 3/4 inch NPT fitting on the top of the product recovery tank. (See Figure 19)

STEP 4 - Install Fume Return/Overflow Hose (gray)

- a. Attach the fume return/overflow hose to the tank adapter via hose barb and clamp. **(See Figure 19)**

STEP 5 - Install Product Discharge Hose (black)

- a. Attach the female fitting of the product discharge hose to the tank adapter in the product recovery tank. **(See Figure 19)**
- b. Attach the male fitting of the product discharge hose to the Genie pump.

STEP 7 - Install System Air Supply Hose (blue)

- a. Thread the air hose socket with 3/8 inch MPT to the compressor. Use teflon tape or sealant on the threads.
- b. Attach the air hose plug end of the system air supply hose to the socket now attached to the compressor.
- c. Attach the socket on the discharge end of the hose to the single stage filter. **(See Figure 19)**

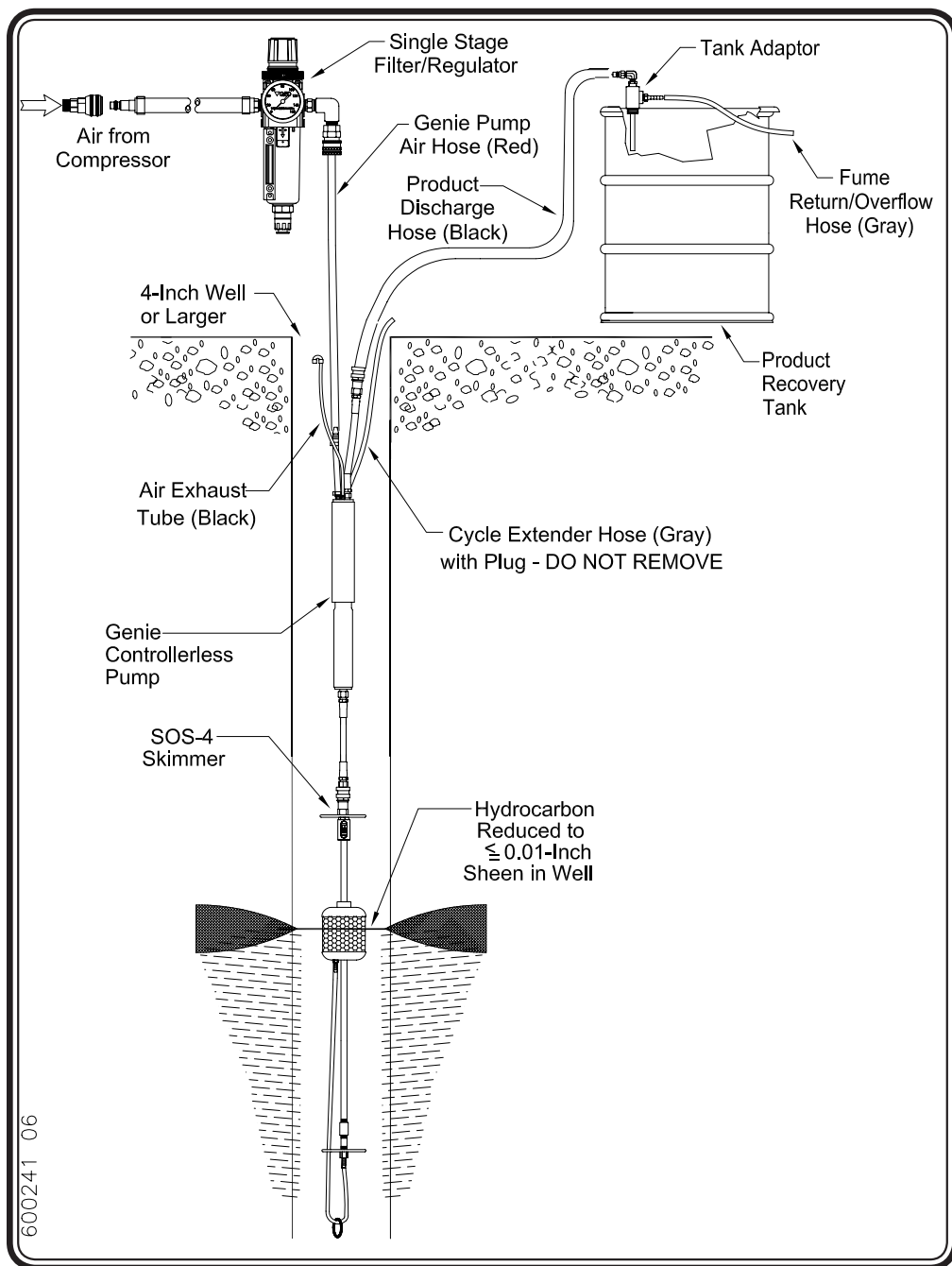


Figure 19 - Genie System with Floating Intake Skimmer (for Product Only)

In addition to the *base* configuration, there are six intake configurations depending on site specifics and application. First assemble the base configuration. Next, find the appropriate heading below, and then follow its instructions.

Product Only

- Attach the Skimmer to the inlet of the Genie pump.
(See Figure 19)

Total Fluids

- Connect the male fitting on the end of the Genie bladder pump intake hose to the female fitting on the intake screen. (See Figure 20)

Dual Pump Recovery

- Attach the skimmer to the male product hose quick connect fitting beneath the Genie pump. (See Figure 21)
- Water is removed with an AutoPump (AP). The skimmer is used to attach the water draw down sensor or it is strapped alongside the bottom loading AutoPump (AP/BL) with the trigger level of AP at 4 inches above the lowest level of the skimmer intake. (See Figure 21)

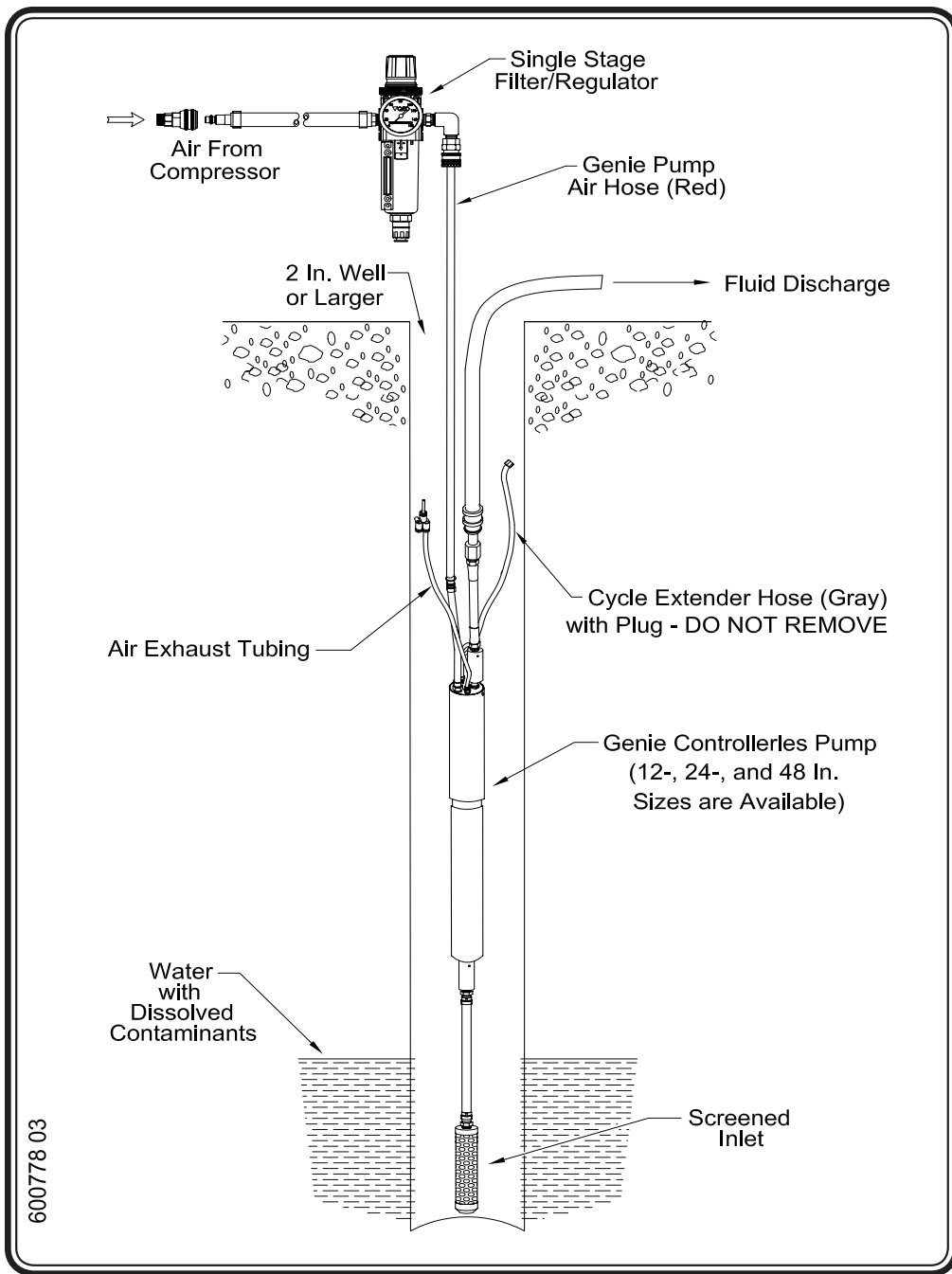


Figure 20 - Genie System with Inlet Screen

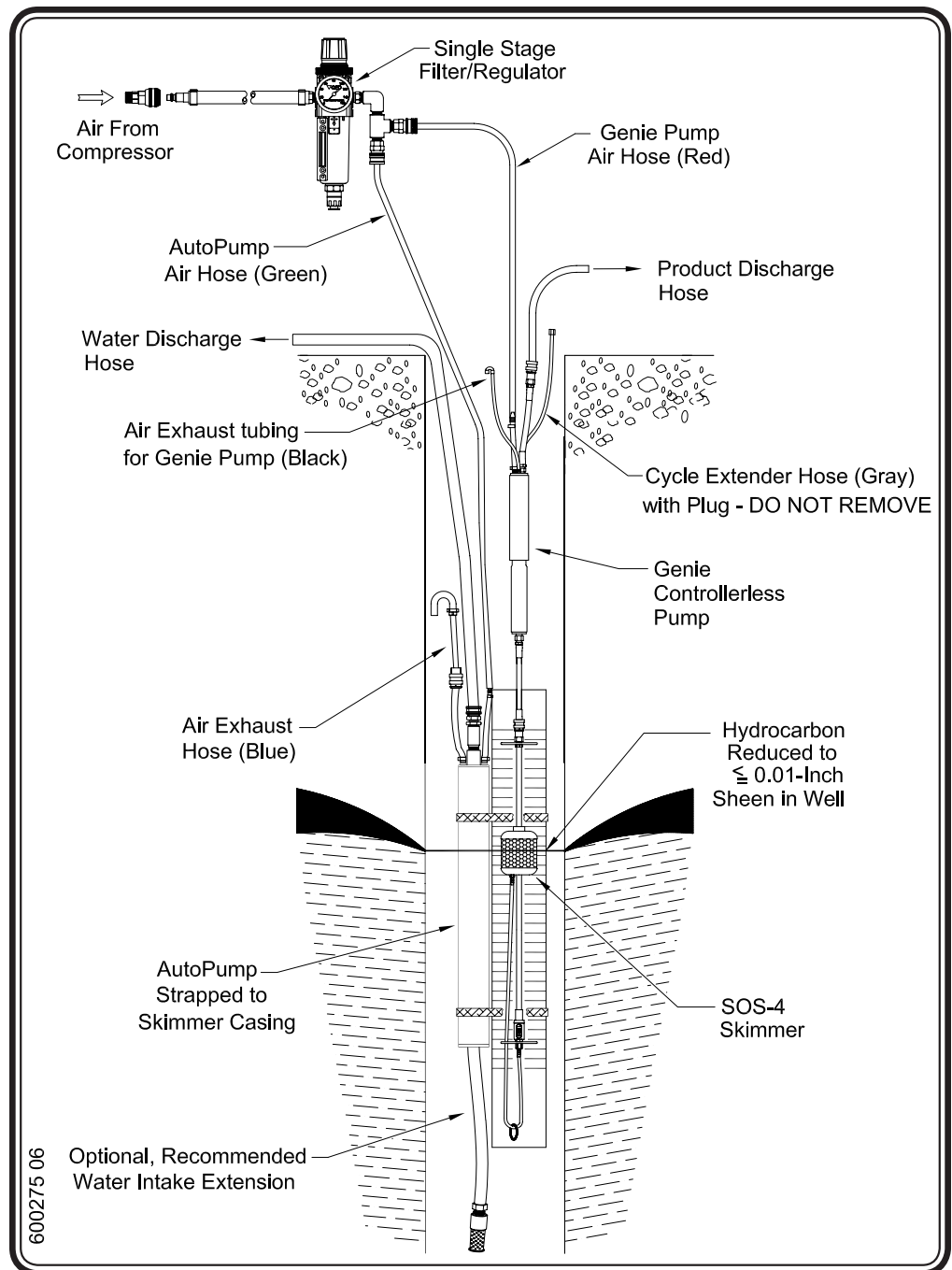


Figure 21 - Genie System with Dual Pump Recovery: (AP-4)

- The following hoses are included with the dual pump recovery configuration:
 - Water discharge hose
 - Water pump air hose

Dry Test

Before installing the skimmer and Genie pump assembly in the recovery well, it is important to test the Genie System for proper operation. Before beginning this test, make sure that all hoses are properly connected as described in the previous section.

STEP 1 - Turn on the Air Compressor

- Turn on the air compressor. Allow it to charge the reservoir tank and automatically turn off.

STEP 2 - Connect the Air Hose to the Genie

- Connect the system air supply hose to the Genie pump.
- Ensure that there is at least 40 psi to the Genie System.

STEP 3 - Test the Automatic Pulser Unit

- Allow the pulser unit to pressurize and exhaust itself.

STEP 4 - Check the Cycle Rate

- The cycle rate has been factory set at 30 seconds for the complete pressure/exhaust cycle at 80 psi.

STEP 5 - Test the Suction and Discharge

- Test for suction and discharge pressure at intake and discharge of Genie. Remove the skimmer from the intake end of the pump and the discharge hose from the discharge end. Because the quick-connect fittings have internal valves, they must have their mating fittings be attached or be removed before a suction or pressure can be felt or measured. Pressure can be felt by closing off the inlet with a thumb, or a vacuum gauge can be attached.



- The discharge pressure can be felt in the same manner, or by attaching a pressure gauge to the discharge. Which ever end is being tested, the other end should be open so there is no resistance to building up pressure or discharge. To measure the maximum pressure, the pump should be filled with water.

If the Genie System does not pass this test, check all fittings and hoses to make sure they are not twisted and that all connections are correct.

Adjust the pulser to desired rate and allow it to cycle several times.

Hose Bundling Assembly

In addition to supporting the down-well equipment with a support rope, it is important to support the down-well hoses. In many cases the down-well hoses weigh more than the equipment itself, particularly in wells over 50 feet deep with fluid inside the discharge hose. Hose support is necessary to avoid the following problems:

- Hoses may kink at the pump
- Hoses could coil and get caught in the well
- In some cases the hoses are supporting the down-well equipment leaving the support rope hanging free in the well, placing tension on the hoses.
- Tension on the hoses may exceed its design limits

Hose bundling reduces equipment entanglement at the well surface, and aids the removal of the pump from the well. Bundling also assists in positioning the pump and down-well hose assembly against one side of the well casing. Maximum space is created for other items, such as probes, to be periodically placed inside the well.

For well caps without barbs or compression fittings (e.g. holes through which the hoses or tubing pass), a support rope needs to be used to prevent kinking of the hoses as they pass up and out of the well cap. Bundle the hoses with the support line. (See figure 22)

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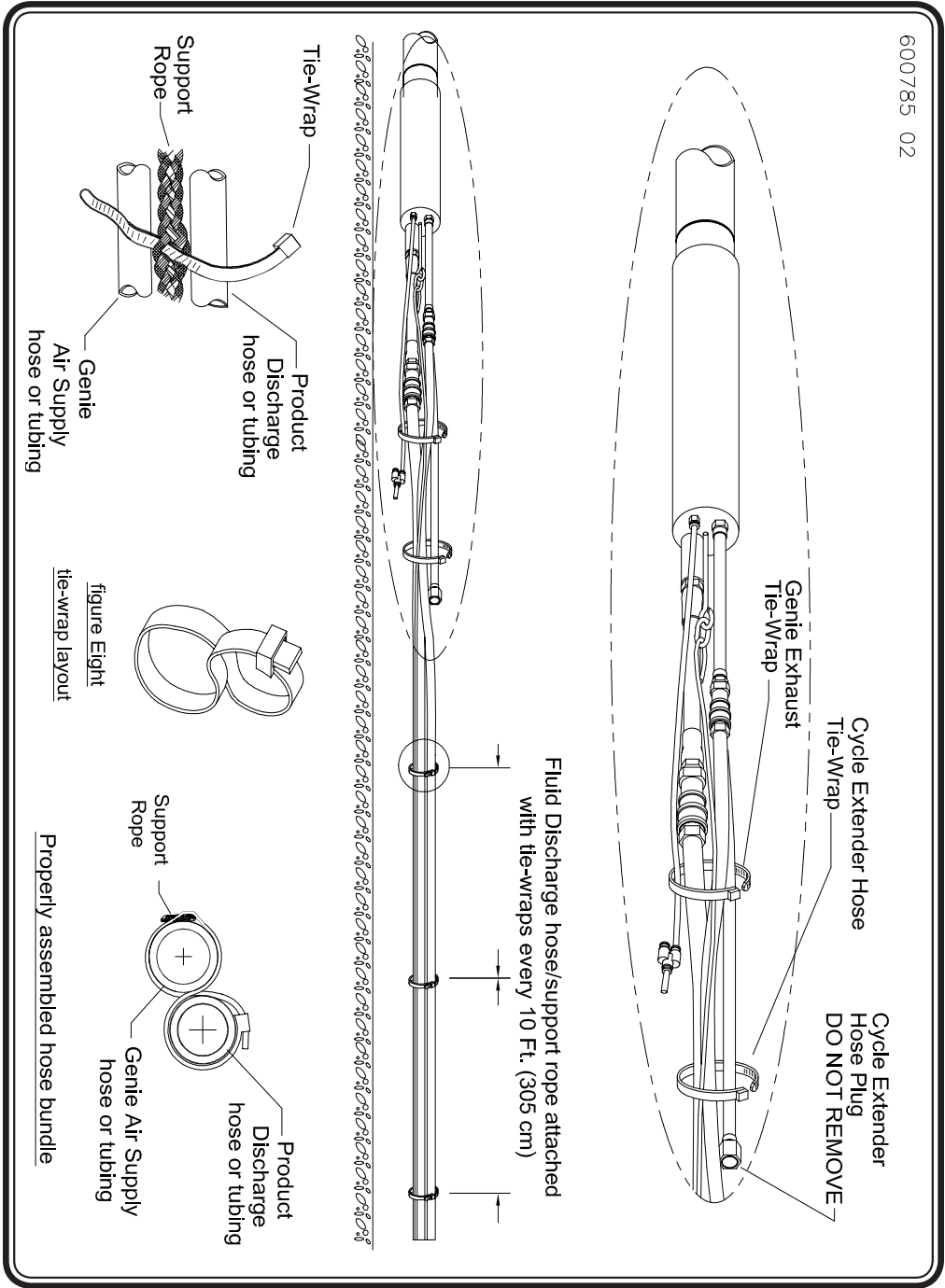


Figure 22 - Hose Bundling

Genie Installation

This section describes the installation of the Genie pump, skimmer, and well support system.

Once the assembly and hose bundling of the Genie pump and skimmer are completed, you may begin to install them in the recovery well. If the recovery well is much larger than the skimmer, we strongly suggest that a well screen casing be used. This protects the skimmer from hanging up on the other hoses in the well. A 2-inch skimmer will need a 2-inch casing and a 4-inch skimmer will need a 4-inch casing. (PVC well casing can be used. Perforated stainless steel tubing can be used if the PVC well casing will not fit).

STEP 1 - Lower Genie Controllerless Pump and Skimmer into Well

- Lower the skimmer and Genie pump down the recovery well until the midpoint of the skimmer's guide tube(s) is located at the fluid level in the well. This provides the skimmer with ample rise and fall travel to accommodate reasonable fluctuation in the water table.

For product thickness of 6 to 12 inches, the midpoint of the guide tube(s) can be positioned halfway into the product. For thicker layers, the position can be calculated using the specific gravity of the product.

- i. Multiply the specific gravity of the product times the product thickness.
- ii Subtract the above results from the depth-to-water. Place the midpoint of the guide tube at this point.

Example:

- Gasoline with a specific gravity of 0.75 is in a 5 foot thick lens. The water level (below the product) is 10 feet below ground level. The midpoint of the Selective Oil Skimmer guide tube should be positioned $[10 - (.75 \times 5)]$ or 6.25 feet below ground level.
- When the specific gravity of a product is not known, use 0.8. Gasoline will generally be in the range 0.70 to 0.75, while diesel oil is 0.8 to 0.85. The specific gravity of a leaked product will increase over time due to the loss of the lighter weight hydrocarbons to the soil, water and evaporation.

STEP 2 - Install Well Cap

Note

If wire-reinforced discharge hose is ordered from QED, it will not stretch or kink from the weight of the skimmer and Genie Pump.

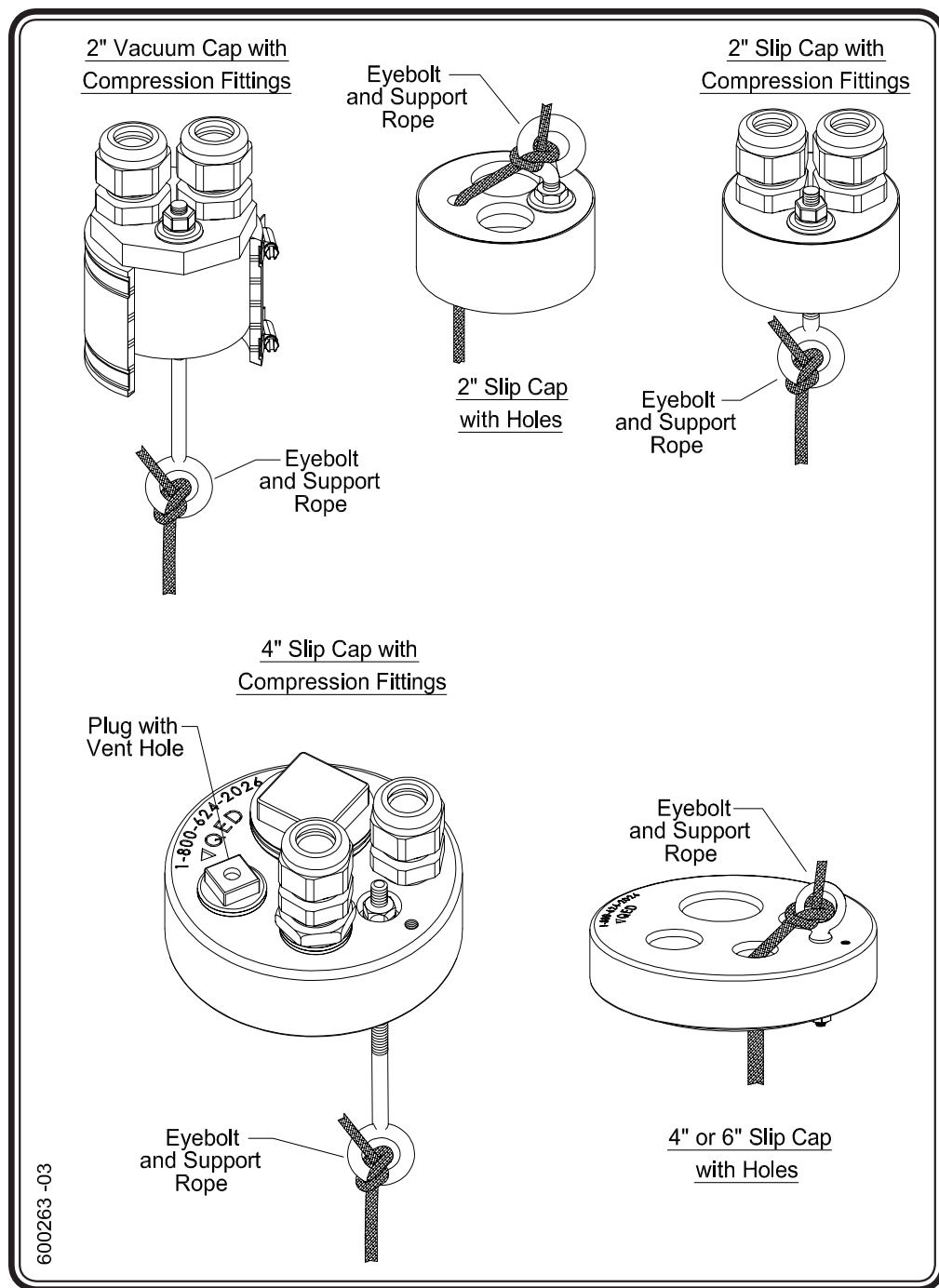


Figure 23 - Well Caps

Chapter 5: Start Up and Operation

Start Up Checklist

In normal operation, the Genie System requires little attention. Conduct a routine inspection of the product recovery tank to record the rate of product recovery and to ensure that the water is not entering the skimmer.

Before regulating the air pressure to the desired operating pressure, ensure that the following conditions exist:

1. Personal Protective Equipment (PPE) is being used by all personnel.
2. All hoses are connected.
3. The air filter is mounted vertically to allow the filter to operate properly.
4. All out-of-well air and fluid valves are in their correct positions.

A method of rapid disconnect and exhaust (or at least a shut off) of compressed air to the pump is available in case of an unexpected occurrence.

Only the automatic pulser unit potentially needs to be adjusted to fit the site conditions. Everything else is automatic.


Adjusting Genie Cycling

First determine what cycle rate is needed to obtain the desired flow rate by using the chart below. The effects of using the adjustment screw in the Genie pulser, the addition of hose and changes in pressure are discussed below.

Adjusting Cycle Rate by using the Adjustment Screw

The cycle adjustment screw has about 5-1/2 turns from full open to full closed. All settings are measured from full open (where the screw stops when turning counterclockwise). Beyond 4 turns from full open, the opening in the air passage becomes very small and timing may be shut off entirely.

Once the cycle time is set, an increase of 20 psi in the air supply pressure will increase the cycle time about 8 to 9%. A decrease of 20 psi will decrease the cycle time the same amount.

- 
- STEP 1 - Remove the exhaust tubing from the head of the pump by pushing on the red collar and pulling on the tubing
- STEP 2 - **Slower or Faster:** Insert a small flathead screwdriver (0.13-inch wide, 6-inch long - included with the system) through the exhaust fitting on top of the pulser unit and into the cycle adjustment screw in the automatic pulser unit. To slow down the cycling rate (decrease the pump rate), turn the cycle adjustment screw clockwise. To speed up the cycle rate (increase the pump rate), turn the screw counterclockwise. **(See Figure 2 on page 13)**

WARNING:

See the table below for examples of settings.

- STEP 3 -** Time the cycle rate for two complete cycles to ensure it is what you want and the replace the exhaust tubing into the push-lock fitting in the head of the pump.

Note:

It is recommended that the cycle time is set between 15 and 60 seconds.

The further closed the adjustment screw is turned the smaller the timing air passage will be. Too small of an opening can result in debris being trapped in the opening and severely changing the cycling rate. On the other hand, if the cycle time is too short, the pump bladder will not have enough time to fill or empty completely.

With the standard five foot 1/4-inch Cycle Extender Hose and an air supply of 80 psi, the following are the approximate cycle times to be expected at the respective adjustment screw setting:

Turns From Full Open	Cycle Time in Seconds
2.5	9
3	13
3.5	26
4	114

Note:

All cycle times given here are approximate due to the variations in adjustment screw, adjustment screw seat and air passage construction in the pulser unit. Humidity and temperature will also affect cycle timing.

Additional hose added to the Cycle Extender Hose will result in longer cycle times without changing the adjustment screw setting.

Formulas for Hose Extensions	
Hose Extension I.D.	C = Original cycle time F = Feet of additional hose N = New cycle time
1/4"	$N = C (0.176) F + C$
3/8"	$N = C (0.34) F + C$
1/2"	$N = C (0.58) F + C$

Example: With an air supply pressure of 80 psi and the cycle time set at 30 seconds:

- For every ten feet of 1/4-inch I.D. hose, the cycle time increases by about 53 seconds.
- For every ten feet of 3/8-inch I.D. hose, the cycle time increases by about 1.7 minutes.
- For every ten feet of 1/2-inch I.D. hose, the cycle time increases by about 2.9 minutes.

Maximum Product Recovery Rates at various cycle times			
Cycle Time	Gallons Per Day (GPD) 12-inch Pump	Gallons Per Day (GPD) 24-inch Pump	Gallons Per Day (GPD) 48-inch Pump
15 Seconds	68	168	375*
30 Seconds	34	84	212
60 Seconds	17	42	106
90 Seconds	11	28	70
30 Minutes	0.5	1.4	3.5

* At this cycle rate, this pump could not fill and empty completely. A Genie using a four-inch skimmer (SOS-4 or SPG-4) may be needed to obtain this value.

All flow rates depend upon the availability and viscosity of the product, the depth to the water table, the air pressure to the system, flow resistance and the pressure in the receiving piping. When pumping gasoline, all QED skimmers are capable of delivering the flow rates in the tables. If greater flow rates are desired, consult the factory.

The Genie System cannot remove product faster than the soil will give it up. Most spills are recovered at less than 30 gallons per day.

Air Use

Using a standard Genie Cycle Extender Hose of 1/4 inch I.D. and 5 feet long, the average air used per cycle in standard cubic feet is:

Pump Size	12-inch	24-inch	48-inch
Pressure			
60 psi	0.05	0.09	0.17
80 psi	0.06	0.11	0.22
100 psi	0.07	0.13	0.26

For larger Cycle Extender Hoses add the additional volume of the hose multiplied by the compression ratio of the air pressure (i.e. air supply psi \div 14.7) to obtain the additional air use for each cycle.

Observation of System Operation

After installing the system in the well, listen for the cycling of the pulser unit. By listening near the well, the exhaust cycle should be audible. Monitor the output of the fluid hose by removing the tank adapter and holding the output over the opening in the tank. If the product is flowing easily into the skimmer, a 1/4-inch I.D. product hose will fill at the rate of about 10 feet per cycle (using a 24-inch bladder pump). Thus a 100 feet hose may require 10 cycles before any fluid exits the hose.

It may be advisable to leave the tank adapter in a bucket until product appears. The time required for product to be first discharge depends on the pump size, hose size and length, cycle rate, and the amount of product available.

After the entire site is operating, return to each well to ensure that the pump is functioning properly. The addition of other pumps and possible system back pressure may necessitate air pressure readjustment.

Special Operating Conditions

Conditions may exist that require adjustment or adaptations to the equipment. Below is a list for some of these conditions, possible effects and a brief description of an adjustment which may solve the problem.

Since every site is different, please contact QED for detailed assistance if needed.

- 1. The well is under vacuum:** The pump will operate normally if the air exhaust is *in the well*. If the exhaust is ducted *outside the well* to atmospheric pressure, and if the vacuum in the well is 4 inches Hg (About 5 ft. W.C.) or less, the pump will function.
- 2. Abrasive particles in the well:** These may cause excessive wear on the check valves and other parts of the pump. Material changes to resist abrasion can be made. A filter “sock” can be placed over the pump intake to filter out the particles. This does not apply to skimmers. A finer mesh inlet or debris screen may be used on skimmers.
- 3. Aggressive chemicals and/or corrosive environments:** These may cause pump parts to deteriorate.
- 4. Hard pipe connections to the pump:** These can cause debris and scale to travel down the pump. Blow out all of the hard pipe before connecting to pump.

Other site conditions such as highly viscous material, deep (>150 feet) applications, high flow rates for LNAPL application, intermittent air supply high dissolved solids and high temperature can be addressed also. Please contact QED for guidance.

Genie Shutdown and Removal

If the Genie is to be shut down and left in the well, raise the pump above the highest fluid level and shut off the air to the pump. Also close the fluid discharge valve if one is present.

Chapter 6: Maintenance

General Maintenance

The Genie System should be relatively free of maintenance. The frequency of maintenance depends upon the nature of the fluids being pumped. Following are some general maintenance checks that can be done periodically.

- Periodically inspect all hoses and connections for damage. Make sure that the hoses are not split or cracked and listen for leaks in the system.
- Soapy water can be sprayed (using a squirt bottle) on the components and fittings to locate leaks. Dish detergent in water will not damage the system.

Caution:

Do not get soapy water on a skimmer's selective screen. Soap causes the screen to lose its hydrophobic properties. Rinse the screen, and then soak it in clean product to return its hydrophobic properties.

- If water enters the Genie pump via the compressed air (from the compressor), it can cause the pulser unit to malfunction. The unit can stall in the pressurizing mode. Most of the time this does not cause a problem, but if it does, use a clean, dry air source to blow out the system. Remove the small drain plug from the intake end of the Genie pump and blow out any oil and moisture that may have accumulated in the pump. Once the controls begin functioning, check the pulser and allow the system to operate for an hour before returning it to service.
- Even if a little oil and water enters the air hose, the Genie System should perform reliably for years.

- Check the air filter and filter bowl drain on the single stage filter/regulator for saturation and operation every few weeks.
- Drain the air filters on the air hose to the pumps of collected particles, water and oil periodically to prevent the filter from clogging up or being otherwise damaged. Check the regulator to ensure the pressure setting has not drifted appreciably.
- An automatic drain on the compressor is highly recommended, since such an addition can dramatically increase air filter life and decrease maintenance. Automatic drains are available from *QED*.

Maintenance Table

Maintenance is recommended at least once every two weeks, but some site environments may demand more frequent service. The following table outlines the recommended minimum maintenance schedule for the Genie System.

Maintenance	Weekly	Biweekly
Air Quality Check - Single Stage Filter/Regulator		X
Check Genie Pump		X
Check Skimmers - SPG Skimmer - SOS Skimmer	X	X

The following sections describe each of these maintenance activities in detail.

Air Quality Check

Single Stage Filter/Regulator Maintenance

If the incoming air is clean and dry, the AutoPump System should operate trouble-free for years. The air filter is normally a 5 micron filter with a replaceable element.

To replace the element in the air filter on the single stage filter/regulator use the following procedure:

STEP 1 - Disconnect Air Source

- Valve off the air supply and drain the downstream air to the air filter. Or disconnect the blue system air supply hose from the single stage filter/regulator. The air filters will depressurize, allowing them to be safely serviced.

WARNING:

Do not remove a filter bowl that is pressurized.

STEP 2 - Remove Filter Bowl

- Remove the bowl of the air filter by sliding the silver button downward and twisting the bowl about 1/8 of a turn. The bowl should slide downward from the upper portion of the filter revealing the filter element. Unscrew the element as you would unscrew a light bulb. Hand tighten the element after replacing it.

STEP 3 - Bowl Drain

Standard Float Drain

- Wash out any deposits and oil buildup from the filter bowl with warm water and soap. To make sure the float drain is operating freely, shake it; the drain should rattle. Test the float drain by filling the bowl with water, assembling the bowl to the filter and reconnecting it to the air supply. The water should drain from the bowl. When under pressure, the drain should not leak.

Optional Manual Drain

- With water in the bowl, open the drain and ensure the liquid drains easily. When under pressure and closed, the drain should not leak.

Check Genie Pump

Check the Genie pump to ensure it is cycling properly and moving material. Check the suction vacuum and discharge pressure by connecting a vacuum gauge to the intake of the Genie pump and opening the discharge to atmosphere. Afterwards, open the intake and place a pressure gauge on the outlet. These gauges and fittings are available from QED.

With the discharge open, the pump should produce at least 15 inches Hg vacuum. Connect a pressure gauge to the discharge with the intake open and in water and the Genie pump full of water. The generated discharge pressure should be within 30 psi of the air pressure to the Genie pump.

With only air in the pump, the Genie should be able to produce over 60 psi using 100 psi air pressure.

If the pump does not perform correctly, follow the procedures in **chapter 7: Troubleshooting**.

Cleaning Skimmers

Specific Gravity Skimmer (SPG)

- The Specific Gravity Skimmer can be hosed off, scrubbed, or steam cleaned without damage.
- This skimmer can be left for weeks without servicing depending on the water iron content.
- Normal service includes ensuring the skimmer travels freely, passes fluid easily through itself and its flexible tubing, and that no leaks exist.

Selective Oil Skimmer (SOS)

- The Selective Oil Skimmer requires care in cleaning and should be checked about once per week. The selective screen should **not** be scrubbed because the water-repulsive coating may be damaged.
- If the selective screen is passing water, the skimmer can easily be taken apart. The recommended way to clean the screen avoids brushing, rubbing or abrasion.

STEP 1 - Soak the screen and gently shake it in the hydrocarbon product being recovered.

If the hydrocarbon is viscous and the screen is still not adequately clean, an additional soaking and shaking in a lighter hydrocarbon, such as gasoline, is recommended.

STEP 2 - Use soft rubber gloves to avoid accidental screen abrasion by finger nails.

STEP 3 - Direct a brief low pressure air blast around 15 psi from the inside of the screen out.

Caution:

Be careful to blow fluids away from you and others around you and do not breath the fumes.

STEP 4 - Wash off any biological growth from the skimmer.**Caution:**

Do not use soap on the selective screen.

On rare occasions, even with using the cleaning procedure, the screen may contain some difficult to remove debris. Follow these instructions:

STEP 1 - Use soft gloves or some other gentle nonabrasive material to very gently rub both the inside and outside of the screen. This removes the excess debris.

STEP 2 - Soak the screen and gently shake it in the hydrocarbon product being recovered.

Caution:

Replace the selective screen making sure it rests on the gasket and that the wide end of the screen faces up.

Replace the float and outer debris screen on the skimmer making sure the open end of the float's fluid slot faces up.

(See Figures 9, 10, 11 and 12)

STEP 3 - It is imperative that the doughnut shaped black gasket be positioned in the skimmer base prior to reassembling the skimmer.

Also, the cap nut should be threaded hand tight, putting pressure on the selective screen below, but not to the point where the dome cap is being crushed or indented.

(See Figures 9, 10, 11 and 12)

Chapter 7: Troubleshooting

Problems may usually be resolved by following these instructions. If you need assistance, please do not hesitate to call the *QED Environmental Systems (QED) Service Department* at (800) 537-1767.

Troubleshooting

I. Problem: System Not Cycling

Steps to take:

- STEP 1 -** Check that the air pressure reaching the Genie system is greater than any system back pressure by 30 psi.
- STEP 2 -** Check the timing adjustment by backing it out (counterclockwise) several turns and then turning it in to set the cycle time.
- STEP 3 -** Put the plugged end of the cycle extender hose under water. If bubbles are coming from the plug, tighten it or remove it and replug the hose. The hose must not leak if the driver is to cycle.
- STEP 4 -** There may be water or oil in the pulser unit. Pull the system out of the well.
 - a. Unscrew the small 10-32 drain plug at the fluid intake end of the Genie pump.
 - b. Let the system blow air and fluids out of the drain hole for a minute.
 - c. Disconnect the system air supply from the single stage filter/regulator.
 - d. Return the plug and reconnect the air supply.

END OF SECTION I.

II. Problem: **Genie Is Pumping Water With The Product**

Steps to take:

- STEP 1 -** Check if the floating intake head of the skimmer is free to move vertically in the well.
- STEP 2 -** Check for kinks in the flexible tube below the skimmer, obstructions on the skimmer tubes, and excess weight on the skimmer. Check for leaks in the following locations:
- the seal between the selective screen (on SOS only) and the gasket
 - between the flexible tube and its hose barbs
 - in the flexible tubing
 - the check valve and fittings
- STEP 3 -** Hand tighten the Selective Oil Skimmer nut to ensure screen is sealing on the gasket. In addition, tighten all fittings and replace flexible tube if a hole is found. Do not overtighten skimmer nut! (See Figures 9, 10, 11 and 12)
- STEP 4 -** Replace or clean the Selective Screen. (See page 59)

END OF SECTION II.

III. Problem: **System Is Cycling, But Not Pumping Fluid**

Steps to take:

- STEP 1 -** Check if air is getting to the pump:
- Listen to the cycling of the system. If the exhaust is at least 1 second long, air is reaching the pump.
- By holding the bladder pump in your bare hand, the vibration caused by the passage of air can be felt and heard.
- STEP 2 -** Check if the pump is drawing a suction by listening to the skimmer while the pump is cycling. The sound of drawing the last bit of liquid through a straw should be heard.

OR

Open the inlet to the bladder pump by inserting a female fitting into the male fitting. Ensure that the discharge is open.

Feel the intake suction by putting your finger over the intake. The suction can be measured by attaching a vacuum gauge on the intake fitting.

STEP 3 - Check if the Genie pump is pushing anything out:

- a. **First** - Disconnect the male quick-connect on the product hose from the Genie pump's female quick-connect. Ensure the pump inlet is open and clear.
- b. **Second** - Insert a male plug into the female end to open it up and attach a pressure gauge.

Pressure should build up over two or three cycles. Note there may be a closed valve, crushed hose or obstruction downstream of the pump. Ensure all discharge conduits on the site are open.

STEP 4 - Inspect the pump check valve for malfunctions:

- a. Open the inlet to the bladder pump and clean the check ball and seat.
- b. Clean the upper check valve on the top of the Genie System by removing it and blowing out the debris with compressed air.

STEP 5 - Inspect the bladder.

- a. Remove the eight screws from the pump casing and remove the casing.
- b. Check for a hole or a tear in the bladder, or, if it is completely collapsed.

It is rare that the bladder requires service, but if it must be replaced, the necessary parts and a clamp tool are available.

BLADDER REPLACEMENT KIT WITH BLADDER, CLAMPS, AND O-RINGS	
Part No.	Description
301635	GNE-12 Bladder Kit
301636	GNE-24 Bladder Kit
301637	GNE-48 Bladder Kit
205650	Bladder Clamp Tool

END OF SECTION III.

Returning Equipment for Service

If the equipment needs to be returned to *QED* for servicing, please follow these steps:

- STEP 1 -** Call the *QED* Service Department and obtain a Return Material Authorization (RMA) number. Please have available the customers contact person's name, company name and address, phone number, fax number, reason for the return, and the names of the chemicals to which the equipment has been exposed.
- STEP 2 -** Clean all equipment before shipping. See **Equipment Cleaning Requirements** at the end of this section.
If the equipment must be cleaned after it arrives at *QED*, the customer will be charged for the cleaning and disposal of material, if necessary. (Cost can be \$200.00 per piece of equipment cleaned.) Drain and dry all equipment after cleaning.
- STEP 3 -** Package the equipment so that it will not be damaged in shipment. Use bubble pack rather than styrofoam flakes as packing material.
- STEP 4 -** Ship the equipment via a carrier and service level (i.e., one-day, two-day shipping) in consideration of probable service time and return shipment time.
- STEP 5 -** It is recommended that such shipments be insured so if the shipment is badly damaged or lost, the customer can replace the equipment at little or no cost.
- STEP 6 -** Include the contact's name, company, phone number and RMA number given by *QED*.
- STEP 7 -** Write the RMA number on the outside of the packaging so it will be directed immediately to the *QED* Service Department.

Equipment Cleaning Requirements


If the equipment is to be shipped to another site or to the factory for service, it needs to be thoroughly cleaned before leaving the site. Cleaning the equipment protects the user (sender), the shipper, and the receiver from dirt and/or contaminants. If the equipment is not cleaned prior to shipping for servicing, it may be severely delayed, refused or the shipper may be charged a cleaning fee. Before packing and shipping, ensure that the equipment is dry inside and out.

The following is a list of equipment and how it should be cleaned prior to shipment.

Skimmers

Note:

With a Selective Oil Skimmer (SOS), remove the selective screen from the skimmer before using soap on the skimmer.

- 
- STEP 1 -** Pump clean water or water with a gentle soap solution through the skimmers to remove free product and particles.
- STEP 2 -** Rinse all soap off of the equipment.
- STEP 3 -** Soak and rinse the outside of the unit with water to remove loose debris and dirt.
- STEP 4 -** Steam clean inside and out to remove difficult dirt and contaminants.

Caution:

Use low pressure (less than 40 psi) when steam cleaning.

Bladder Pumps

- STEP 1** - Pump clean water or water with a gentle soap solution (e.g. Dish Soap) through the pump to remove free product and particles.
- STEP 2** - Rinse all soap off of the equipment.
- STEP 3** - Soak and rinse the outside of the unit with water to remove loose debris and dirt.
- STEP 4** - Steam clean inside and out to remove difficult dirt and contaminants.

Caution:

Do not steam clean the inside of the pump, as it may damage the bladder.

Hoses and Fittings

- STEP 1** - Pump clean water or water with a gentle soap solution (e.g. Dish Soap) through the pump to remove free product and particles.
- STEP 2** - Rinse all soap off of the equipment.
- STEP 3** - Soak and rinse the outside of the unit with water to remove loose debris and dirt.
- STEP 4** - Steam clean inside and out to remove difficult dirt and contaminants.

Caution:

Use low pressure (less than 40 psi) when steam cleaning.

Appendix A: Optional Systems/Accessories

The following Options may be added to the Genie System at any time. Contact your regional *QED* office for more information.

Wall Mount Tank-Full Shut-Off (TFSO-WM)

The TFSO System shuts down the Genie System in the event of a liquid level rise or a pressure increase in the product recovery tank. This system guards against contaminants in the compressed air supply, vandalism, inexperienced operators and accidental damage to the equipment. If any of the quick-connects are removed, the system will shut down.

- Included in the TFSO option is a TFSO control box with tank-full indicator and tank-full reset button.
- Also included are the dual TFSO sensor hose and TFSO tank unit. The hose runs from the control box to the tank unit on the product recovery tank.
- A fume return/overflow hose directs overflow, if it occurs, from the tank to an overflow vessel or secondary containment.
- Please see the Tank-Full Shut-Off (TFSO) manual for additional information.

Tank-Mount Tank-Full Shut-Off (TFSO-TM)

This control is similar to the TFSO-WM except that the unit screws directly into the top of the tank, and there is no dual sensor line. (See **Figure 24**)

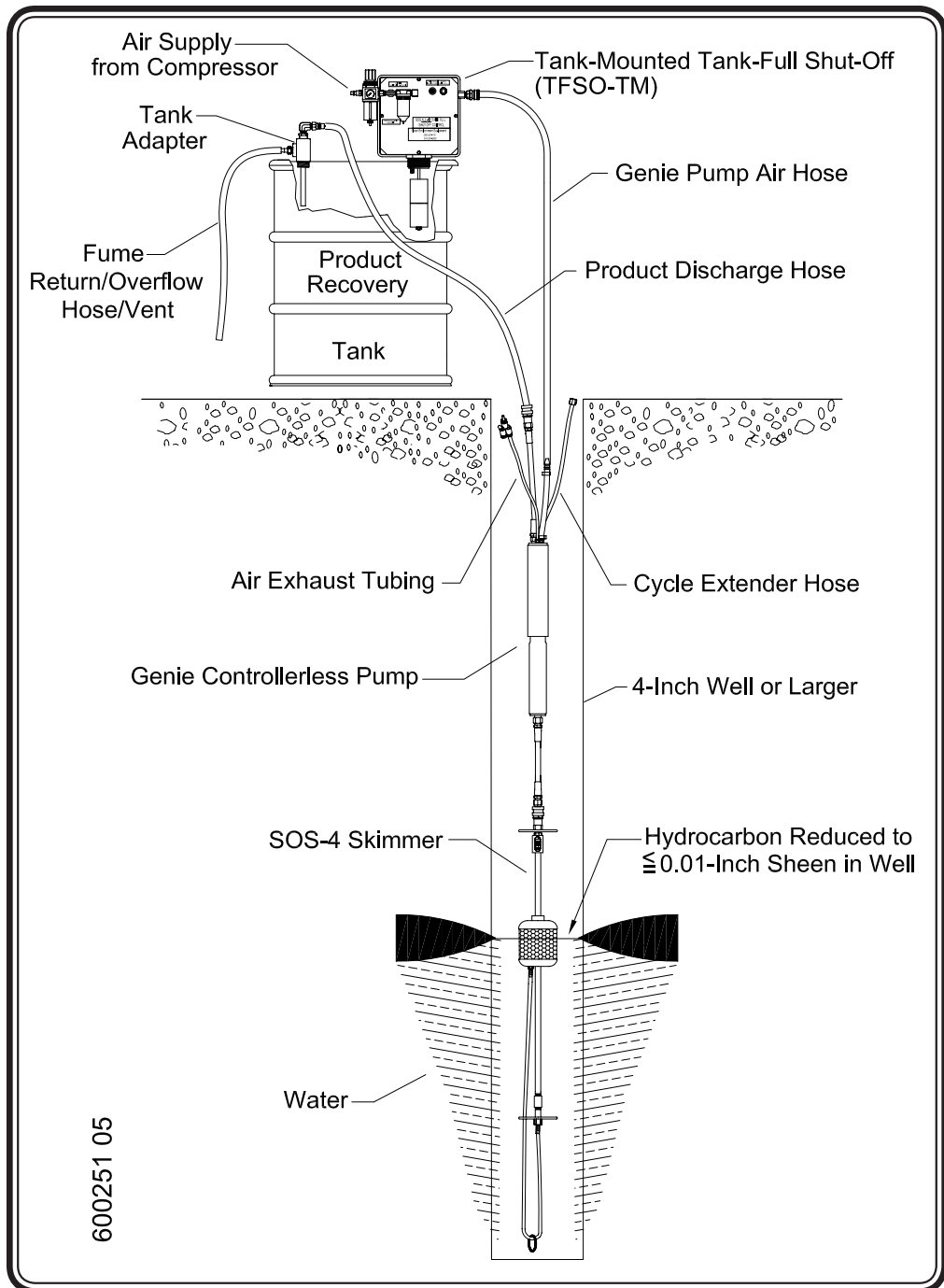


Figure 24 - Genie Systems with Optional Tank-Full Shut-Off (TFSO) Systems

High-Water Shut-Off (HWSO)

A High-Water Shut-Off (HWSO) option may be added to the Genie System. If a High-Water condition exists that causes the skimmer float to rise to its upper range of travel, air is turned off to the Genie pump. This prevents water from entering the product line. When the water level drops back to the normal range, the skimmer float starts dropping with the lower water level and the air is turned back on to the Genie pump.

- Included with the HWSO option is a well level sensor hose (yellow). This hose runs from the control box to the skimmer to sense the fluid level in the well.
- Also included is a High-Water Shut-Off (HWSO) indicator. This indicator is located on the outside of the control box. When the indicator is green, the system is ON; when the indicator is red, the fluid in the well has risen 11 inches above the level sensor bubbler hole on the skimmer, and the automatic cycling of the pump has been stopped. If more than one skimmer is being used, the operator must select the one to have the well level sensor hose. Unless the controls are modified, only one skimmer can be monitored.

Appendix B: Air Compressor

Installation

The air compressor provides the air necessary to drive the system. The compressed air normally passes through a single stage filter/regulator and then into the Genie. If the system receives clean, oil-free air from the compressor, maintenance will be significantly reduced.

Warning:

The air compressor and any other electrical equipment used with this pneumatic system must be positioned outside of any area considered hazardous because of the possibility of the presence of combustible materials.

Compressors start and stop automatically. Do not place hands or objects on or near any part of the compressor.

Follow the instructions that accompany your compressor. This appendix is only a general guide, not an in-depth manual for your compressor.

Warning:

When compressing air, parts of a compressor can get very hot. Do not touch the motor, compressor or piping until it has cooled down.

Caution:

The air compressor should be located outside and away from any area which may contain flammable fumes.

Note:

An automatic drain on the compressor receiver tank significantly reduces the load on the air filters, extends the life of the filter elements, and reduces system maintenance. If your air compressor is not equipped with an automatic drain, you can obtain one from QED.

Note:

The information on compressors is for reciprocating piston compressors. A centrifugal compressor produces about twice the air of a piston compressor for the same horsepower.

- As a general rule, a piston-type compressor should not start more than six times per hour. Also, a piston compressor should not operate more than 50% of the time.
- At a minimum, the air compressor should be in the 1 to 1-1/2 HP range with a 20 gallon holding tank.
- At sea level a 1 HP air compressor provides approximately 3.5 cubic feet per minute (SCFM) of free air.
- For compressor sizing, all down well and surface hosing and other resistance must be known.
- The 2 and 3 HP compressors should have 60 to 80 gallon tanks.
- A 5 HP compressor should have at least an 80 gallon tank, and the 7-1/2 HP and 10 HP compressors should have at least a 120 gallon tank.
- Storage tanks and automatic pressure shut-off switches provide a buffer so the compressor motor can cool between each time the tank is pressurized.
- Compressors are generally equipped with a pressure activated start/stop switch. This switch senses the pressure of the air in the holding tank (reservoir) of the compressor. The pressure difference between when the compressor starts and when it stops may need to be adjusted to maintain compressor starts to six times per hour. Refer to the compressor manufacturer for guidance.

Electrical Wiring for the Compressor

- All electrical connections should be made by a licensed electrician and in accordance with the electrical code for particular areas. The wiring should provide full motor nameplate voltage and current at the motor terminals during start-up.
- Wiring hookup must be made so that the compressor flywheel turns in the proper direction. There is usually an arrow on the flywheel to indicate the proper rotation direction.

Motor Overload Protection

- To prevent motor damage, provide all compressor motors with overload protection. Some motors are furnished with built-in thermal overload protection.
- To prevent motor damage due to low voltage or undue load imposed on the motor, use larger motors in conjunction with starters that include thermal overload units.
- To determine the proper thermal protection (thermal element), consider the load to be carried, the starting current, the running current, and the ambient temperature. Recheck electric current characteristics against nameplate characteristics before connecting wiring.

Caution:

Fuses are for circuit protection only and are not to be considered motor protection devices. Consult your local power company regarding proper fuse size.

Air Quality and Pressure

- In compressors requiring lubricating oil, do not use synthetic oil. Synthetic oil can adversely affect some materials. Non-detergent 30 Weight oil is recommended for compressor lubrication.
- Install an automatic drain on the compressor holding tank to periodically drain the water and oil which collects in the tank. This will help to extend air filter cartridge life.
- Do not lubricate the compressed air coming out of the compressor. QED equipment is designed to run without the aid of lubricated air.
- The compressor should provide between 70 and 150 pounds per square inch (psi) of air pressure to the system. The filter (with metal bowl) and regulator will accept a maximum of 150 psi air pressure. Air filters with plastic bowls will accept a maximum of 125 psi. Maximum output air pressure setting on the regulator is 125 psi.

Maintenance

Inspection - Check for possible damage in transit. Almost all compressors are shipped with the flywheel unmounted. Do not force the flywheel on the crankshaft. Use a wedge-in “slot” provided for easy assembly. Check belt alignment and tension carefully.

Placement - A compressor is a source of sparking. Place it out of what is considered a hazardous area by local and national fire and electric codes.

Mounting - Install in a clean, dry, well-ventilated location away from any source of heat such as a boiler or radiator. If the unit is to be fastened to a foundation, support and shim all four feet firmly to remove all stress from the unit. The compressor flywheel should be mounted towards a wall with a minimum clearance of 18 inches to allow for circulation of air and additional clearance if required for servicing.

Lubrication - Fill the crankcase to the level mark on the oil gauge with an industrial compressor oil having a minimum of 95 V.I. or SAE No. 30 non-detergent, single grade motor oil. Do not use synthetic oil, as these can damage the product pump.

Pressure and Speed - Never operate the compressor at pressures or speeds in excess of those recommended by the factory. Every compressor assembly must have a safety valve installed and should be set at either the maximum tank working pressure or 25 psi over the actual pressure of the pump, whichever is less.

Daily - Check for unusual noise, failure to compress, overheating, oil leaks, and vibration. Correct before serious damage can develop. Drain all condensate from receiver and traps.

Weekly - Examine intake filter elements and if they are dirty, remove and clean or replace them. Check oil level and add oil if necessary. Do not fill over level mark on sight glass. Keep compressor clean for efficient operation and appearance.

Monthly - Check and tighten all bolts and nuts as required. Check air connections for air leaks and tighten as required. Check belt tension.

Note:

These are standard maintenance procedures which the QED Environmental Systems “warranty” does not cover. QED does not manufacture compressors. Always use the manufacturer’s instructions and recommendations when installing, using and servicing the compressor. These notes are included as a general guide only.

Troubleshooting

I. Problem: Slow Pumping or Insufficient Pressure

Solutions:

- A. **Clogged filter element:** clean or replace.
- B. **Leaks in air lines:** retighten or replace.
- C. **Insufficient air capacity:** add compressor capacity, consult dealer.
- D. **Head valves:** clean or replace.
- E. **Slipping belts:** adjust or replace.
- F. **Power cord is too long for the power needed, causing a voltage drop:** use a short cord with large wires. Do not coil the power cord.

II. Problem: Excessive Oil Consumption

Solutions:

- A. **Too much oil:** drain out excess to level mark on sight glass.
- B. **Worn rings:** replace rings.
- C. **Clogged air intake filters:** clean or replace.

- D. **Improper Oil:** consult oil chart.
- E. **Oil leaks:** check and tighten all bolts and nuts to manufacturer's specifications. Replace gaskets if necessary.
- F. See "Overheating."

III. Problem: Overheating

Solutions:

- A. **Pump running backwards:** reverse rotation.
- B. **Inadequate ventilation or high ambient temperature:** move intakes to outside and install filters to protect against weather and foreign objects. Force air through enclosure if necessary.
- C. **Restricted air intakes:** clean or replace.
- D. **Loose or restricted valves:** retighten, clean, or replace.
- E. **Incorrect installation:** allow 18 inches minimum between wall and flywheel.
- F. **Insufficient air capacity:** consult dealer. Seal all air leaks.
- G. **Insufficient oil:** check level and consult dealer.

IV. Problem: Oil or Water in Air

Solutions:

- A. **Drain tank more often:** use an automatic drain.
- B. Reposition intake to take in cooler, drier air.
- C. Install water dropouts with automatic drains in the air lines.
- D. Install an after cooler prior to the air storage tanks.

Appendix C: Skimmers

The Genie System can use any of the skimmers listed below (one or more with each system). (See Figure 25, 26, 27, 28 and 29)

Description

- **SOS** – Selective Oil Skimmer skims oil to 0.01 inches.
- **SPG** – Specific Gravity Skimmer skims oil to 2 inches.
- **Bottom** – Allows intake as close as possible to the bottom of the well.
- **Passive** – Does not require a pump to collect oil.

Note:

A High-Water Shut-Off sensor can be built into most skimmers.

600500 -03

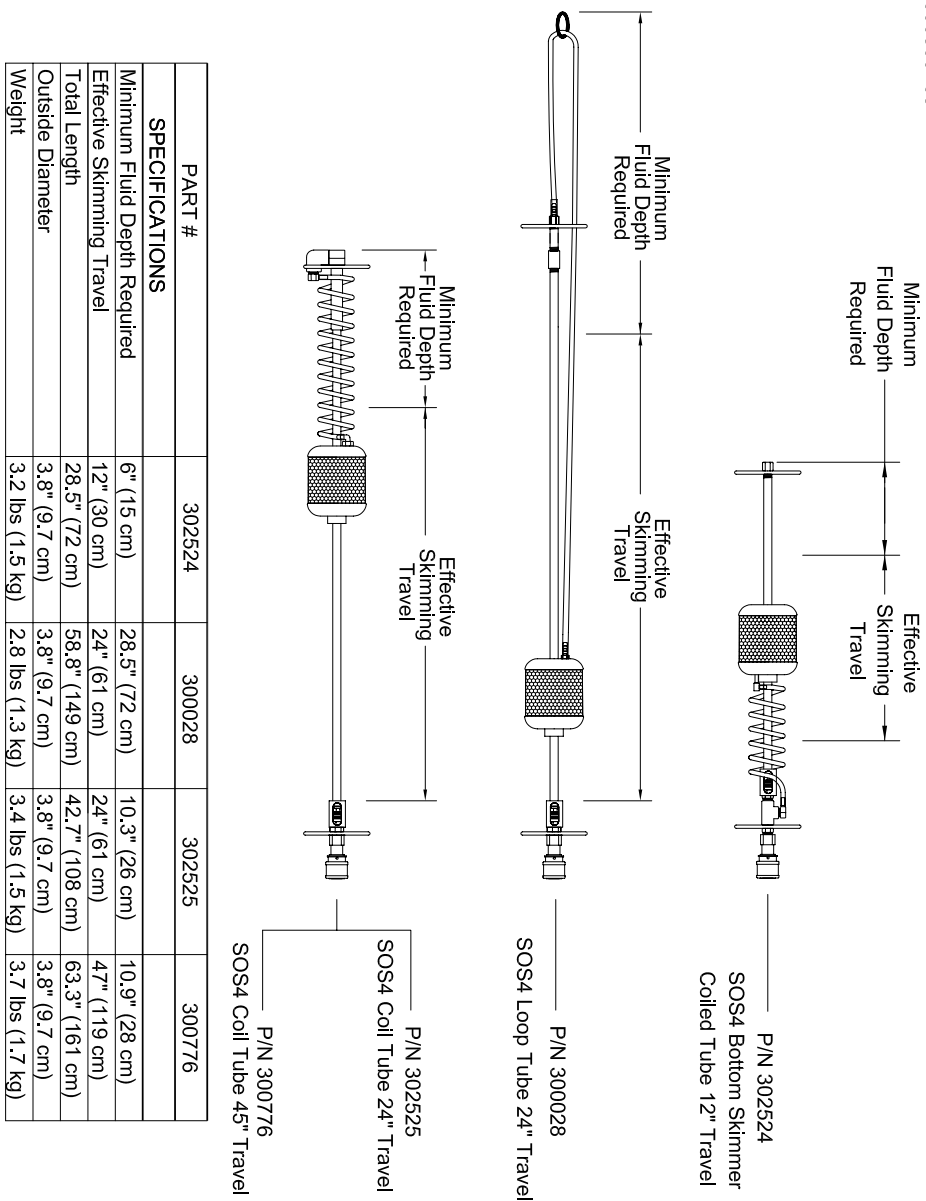


Figure 25 - 4-inch Selective Oil Skimmers (SOS-4)

600501 -04

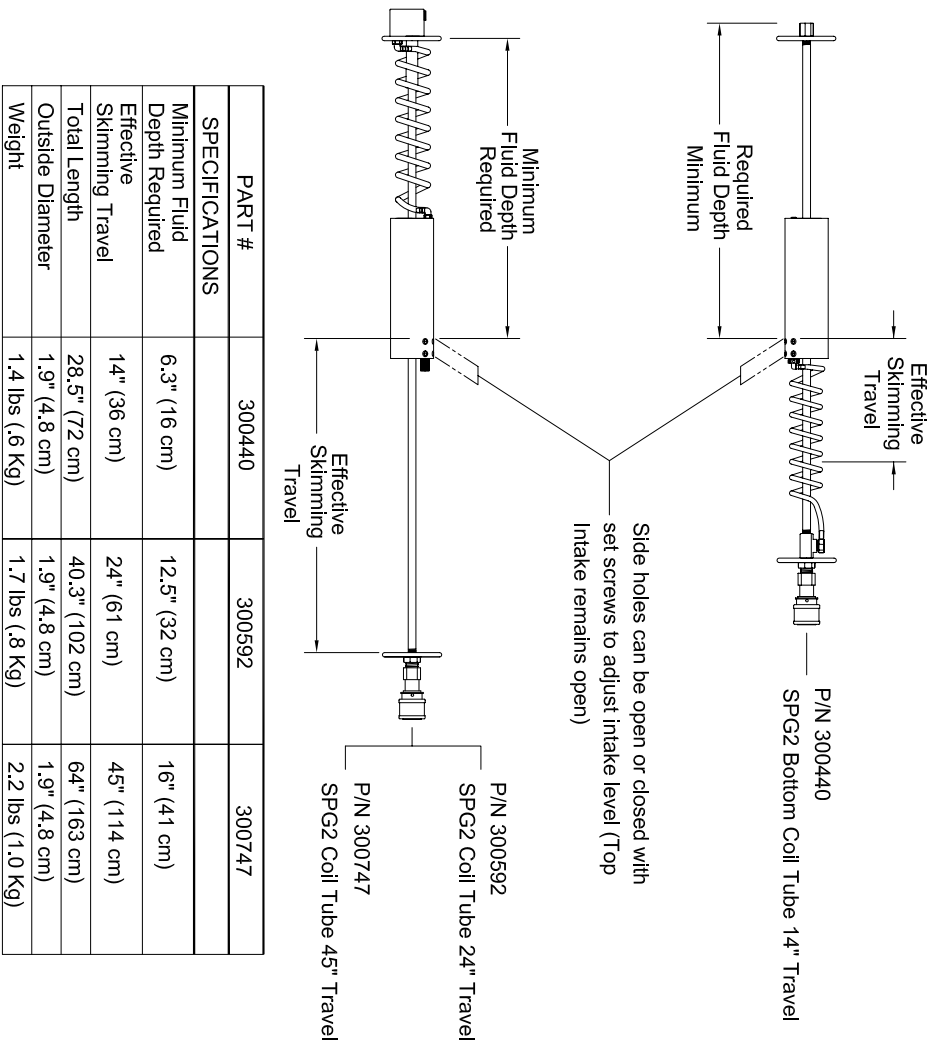
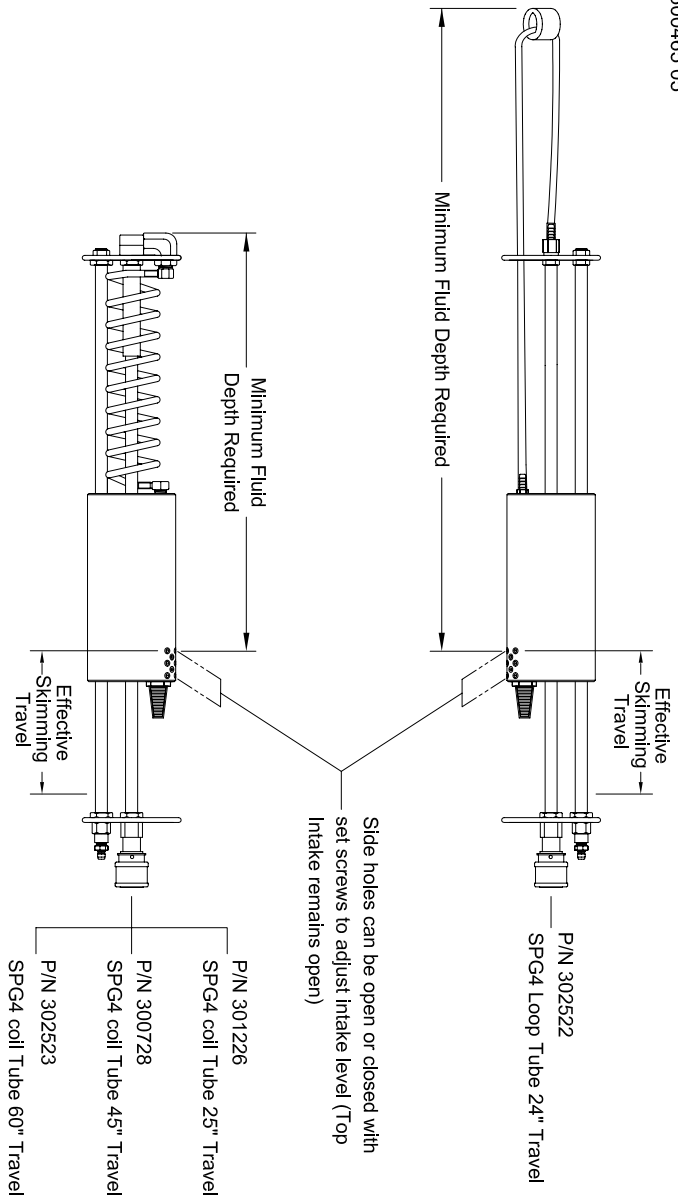


Figure 26- 2-inch Specific Gravity Skimmers (SPG-2)

600465 05



PART #	302522	301226	300728	302523
SPECIFICATIONS				
Minimum Fluid Depth Required	29" (74 cm)	13.5" (24.3 cm)	14.6" (37 cm)	16.7" (42.4 cm)
Effective Skimming Travel	24" (61 cm)	25" (63 cm)	45" (114.3 cm)	60" (152.4 cm)
Total Length	56.5" (144 cm)	43.1" (109 cm)	64.5" (163.8 cm)	79.2" (201 cm)
Outside Diameter	3.8" (9.7 cm)	3.8" (9.7 cm)	3.8" (9.7 cm)	3.8" (9.7 cm)
Weight	5.2 lbs (2.4 Kg)	5.6 lbs (2.5 Kg)	6.9 lbs (3.1 Kg)	8.3 lbs (3.8 Kg)

Figure 27- 4-inch Specific Gravity Skimmers (SPG-4)

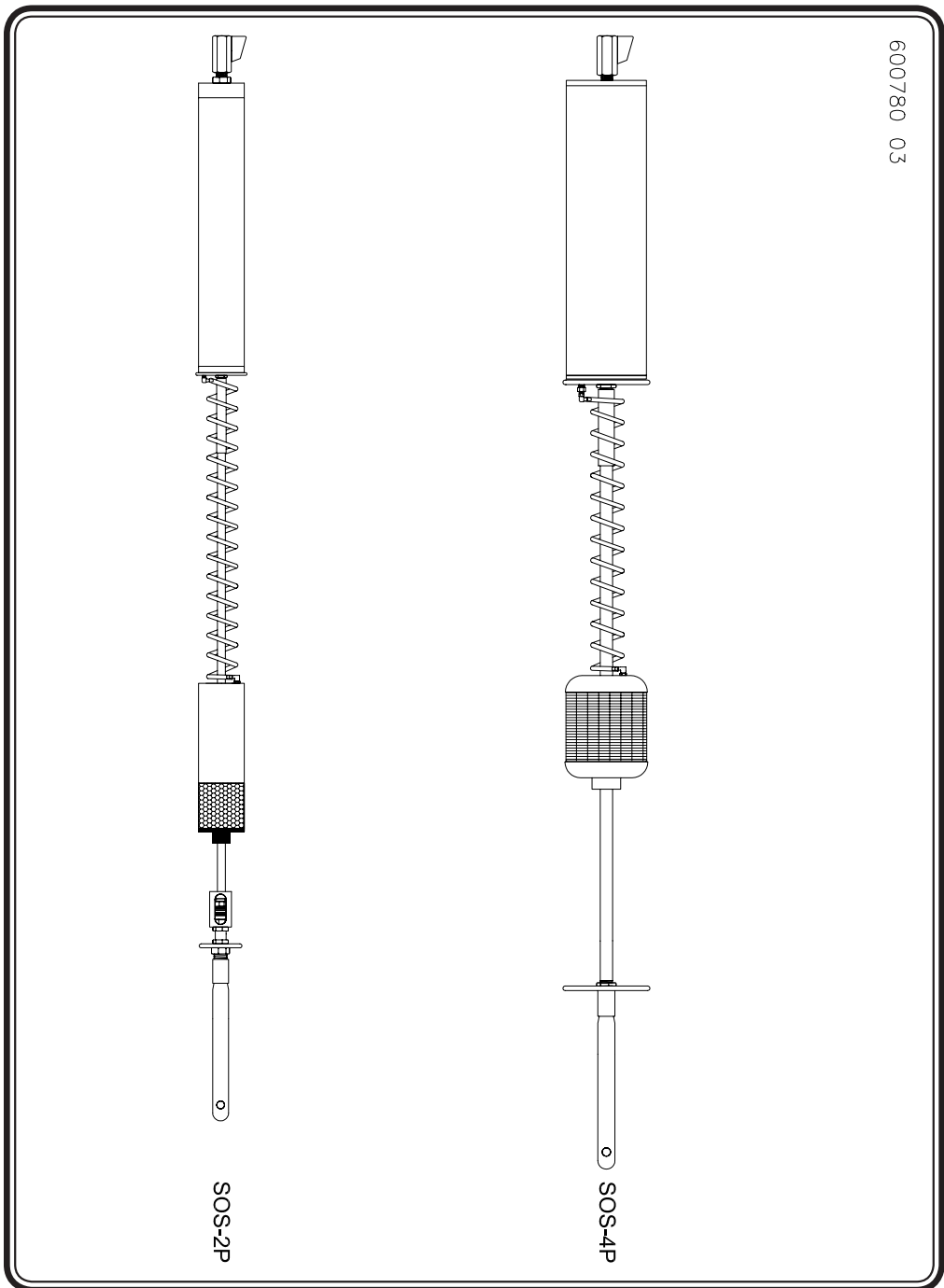


Figure 28- Passive Skimmers

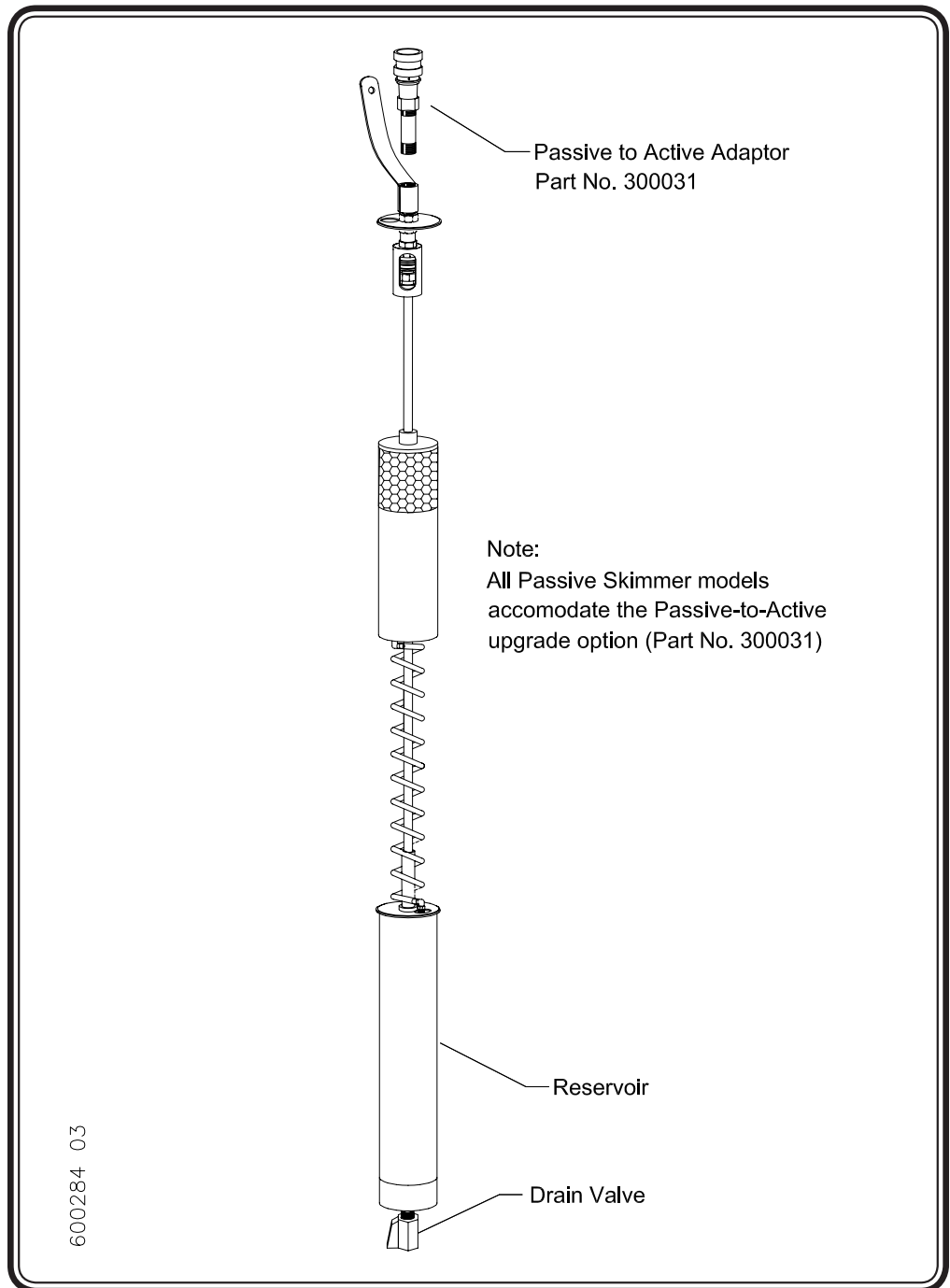


Figure 29 - Fully Automatic Product Recovery Upgrade Assembly Kit

Terms, Conditions, and Warranty

This limited warranty is in lieu of and excludes all other representations made by advertisements, distributors, agents, or manufacturers sales representatives, and all other warranties, both express and implied. There are no implied warranties of merchantability or of fitness for a particular purpose for goods covered hereunder.

QED Environmental Systems warrants to the purchaser of its products that, subject to the limitations and conditions provided within the Terms & Conditions of Sale, products, materials and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in material and workmanship.

All warranty durations are calculated from the original date of purchase-determined as beginning the date of shipment from QED facilities and the date QED is notified of a warranty claim. This warranty shall be limited to the duration and conditions set forth below.

1. **Pumps (other than AutoPumps), Skimmers, hose, tubing, fittings, heater, condensers and air filtration housings** - warranted for one (1) year: 100% material and 100% workmanship. There will be no warranty for application or material compatibility. The materials used vary depending upon application, and the customer is responsible for knowing the environment in which the equipment will be operating and informing QED of this.
2. **Pneumatic Data Modules / Logic Control Panels** - warranted for one (1) year: 100% material and 100% workmanship.
3. **Parts and Repairs** - warranted for ninety (90) days: 100% material and 100% workmanship; when repairs are performed by QED or its appointed agent; from date of repair or for the full term of the original warranty, whichever is longer. Separately sold parts are warranted for ninety (90) days: 100% materials and 100% workmanship.

This warranty will be void in the event of unauthorized disassembly of component assemblies, other than maintenance and conversion procedures detailed in the operations and maintenance manual. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, or use and applications other than for intended use will also void the warranty.

Chemical attack by liquids and/or abrasive substances contacting equipment and accessories shall not be covered by this warranty. A range of materials of construction is available from QED and it is the Buyer's responsibility to inform QED of the contaminants and their concentrations, including the presence of abrasives. QED will recommend materials of construction. QED will only warrant that the component materials will conform to published QED specifications and generally accepted standards for that particular material.

QED Environmental Systems shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED service personnel (unless such repair by others is made with the written consent of QED, or as stated in QED manuals or directions); resold to other parties; and/or moved to or used on a remediation site other than originally specified.

It is understood and agreed that QED Environmental Systems shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application. Liability under this warranty is limited to repair or replacement F.O.B. QED's factory, or its appointed agent's shop, of any parts which prove to be defective within the duration and conditions set forth herein, or repayment of the purchase price at the option of QED, provided the products have been returned in accordance with the duration and conditions set forth herein.

Subassemblies and Other Equipment Manufactured by Others

The foregoing warranty does not apply to major subassemblies, other equipment, accessories, or parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties, if any, supplied by their respective manufacturers. QED makes no warranty concerning products or accessories not manufactured by QED. In the event of failure of any such product or accessory, QED will give reasonable assistance to Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

Illustrations and Drawings

Reasonable Effort has been made to have all illustrations and drawings accurately represent the product(s) as it actually was at the time the illustrations and drawings were created.

However, products may change to meet user requirements and therefore may not be reflected in the literature. In addition, literature may be updated to reflect the most recent equipment revision(s). Changes to either or both equipment and/or literature can be made without notice.

Buyer's Remedies

The buyer's exclusive and sole remedy on account of or in respect to the furnishing of defective material or workmanship shall be to secure replacement thereof as aforesaid. QED shall not in any event be liable for the cost of any labor expended on any such product or material or for any special, direct, indirect or consequential damages to any one by reason of the fact that it shall have been deemed defective or a breach of said warranty.

Changes without Notice

Prices and Specifications are subject to change without notice.

Shipping Dates

Shipping dates are approximate and are subject to delays beyond our control.

F.O.B. Point and Title

All material is sold F.O.B. factory, unless otherwise agreed on writing. Title to all merchandise sold shall pass to Buyer upon delivery by Seller to carrier at factory. All freight insurance is the responsibility of the Buyer and shall be charged to the Buyer on the invoice unless directed otherwise in writing. All Freight claims are the Buyer's responsibility.

Terms

Payment terms are net 30 days; 1.5% per month past due.

State and Local Taxes

Any taxes, duties or fees which the seller may be required to pay or collect upon or with respect to the sale, purchase, delivery, use or consumption of any of the material covered hereby shall be for the account of the Buyer and shall be added to the purchase price.

Acceptance

All orders shall be subject to the terms and conditions contained or referred to in the Seller's quotation, acknowledgments, and to those listed here and to no others whatsoever. No waiver, alteration or modification of these terms and conditions shall be binding unless in writing and signed by an executive officer of the Seller. All orders subject to written acceptance by QED Environmental Systems, Ann Arbor, MI, U.S.A.

Warranty Claims Procedure (Responsibility of purchaser)

The original purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED or its appointed agent, of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. The purchaser may secure performance of obligations hereunder by contacting the Customer Service Department of QED or its appointed agent, and:

1. Identifying the product involved by model or serial number, or other sufficient description, that will allow QED, or its appointed agent, to determine which product is defective.
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. After obtaining authorization from QED, sending the malfunctioning component via a RMA# (Return Material Authorization number) to the address below or to its appointed agent:

QED Environmental Systems
550 Adeline Street
Oakland, CA 94607 USA

(800) 537-1767 Toll-Free in North America
(510) 891-0880 International
(510) 444-6789 FAX

e-mail: info@qedenv.com
website: www.qedenv.com

5. Equipment must be cleaned before shipment or it will be cleaned by QED before any work is performed. The customer will be charged for such cleaning.

If any product covered hereby is actually defective within the terms of this warranty, purchaser must contact QED, or its appointed agent, for determination of warranty coverage. If the return of a component is determined to be necessary, QED, or its appointed agent, will authorize the return of the component at Purchasers expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts, labor, and shipping and handling, as authorized by owner hereunder, shall be borne by the Purchaser. In no event shall such allegedly defective products be returned to QED, or its appointed agent, without its consent, and QED's, or its appointed agent's, obligations of repair, replacement or refund are conditional upon the buyer's return of the defective product to QED, or its appointed agent.

