CLIF MOCK™

LGS-1 Liquid and Gas Sample Pump

User Manual

Manual No. 9A-99104500147, Rev. 01

Important Safety Information

Symbols and Terms Used in this Manual

WARNING: This symbol identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

CAUTION: Indicates actions or procedures which if not performed correctly may lead to personal injury or incorrect function of the instrument or connected equipment.

Important: Indicates actions or procedures which may affect instrument operation or may lead to an instrument response which is not planned.

Symbols Marked on Equipment

Attention! Refer to manual

Protective (earth) ground

Technical Support Contact Information

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Section 1—Overview

Description

The LGS-1 Sample Pump is a pneumatically operated positive displacement pump designed to transfer samples of liquid or gas into a vented sample receiver or into a pressurized cylinder.

Pipeline pressure opens the sample pump inlet check valve, allowing pipeline fluid to enter and collect in the sample chamber. Once the pressure inside the sample chamber reaches pipeline pressure, the inlet check valve closes, sealing the sample chamber from the pipeline. When a signal is sent from the controller circuitry to the solenoid, instrument or plant air is diverted to the sample pump drive piston, and the fluid collected in the sample chamber is evacuated through the outlet valve to the sample receiver. This action completes a sampling cycle, and the pipeline fluid again enters the sample chamber, continuing the sampling process.

When the pump piston is in the retracted position, the inlet check valve is held open by pipeline pressure. The outlet check valve is held closed. This condition prevents the sample pump from filling the sample receiver while the sample chamber fills with the next sample volume.

See Table 1.1 for pump specifications.

Table 1.1—Specifications

SAMPLE MEDIA	
Fluid Viscosity Range	100 centistokes maximum
Fluid Temperature Range	-15° to 375°F (-26° to 190°C)
Maximum Particulate Size	0.005 in.
Fluid Flowing Pressure	30 to 1200 psi with 100 psi feed pressure; 30 to 1500 psi with 120 psi feed pressure
SAMPLE PUMP	
Maximum Supply Pressure to Sample Pump	120 psi
Minimum Operational Cycle Time	5 seconds
Liquid Sample Size Range	0.25 cc to 1.25 cc
Gas Sample Size	0.05 cc to 1.00 cc

Sample Size

The sample size is set by adjusting the knob on top of the pump. See Section 3—Setting the Sample Size, page 11, for step-by-step instructions.

The sample pump is adjustable for sample volumes ranging from .05 cc to 1.00 cc for gas applications and 0.25 cc to 1.25 cc for liquid applications. The default factory setting for sample size is 0.5 cc at 300 psi using gas. Calibration is available when operating conditions are supplied by the customer. If an application requires sample volumes outside the standard ranges, contact Cameron.

Section 2—Installation

Installation Preparations

Air Supply

The LGS-1 sample pump is actuated by an air supply. In gas applications, the line pressure is often sufficient to actuate the pump. However, in liquid applications and gas applications with a flowing pressure below 30 psi, air must be supplied externally. The pipeline pressure of the fluid to be sampled determines the minimum air pressure required to actuate the pump. It is the customer's responsibility to provide an air supply that is powerful enough to meet this requirement for any given application.

The chart in Figure 2.1 can be used to determine the air pressure requirement for a broad range of pipeline pressures.

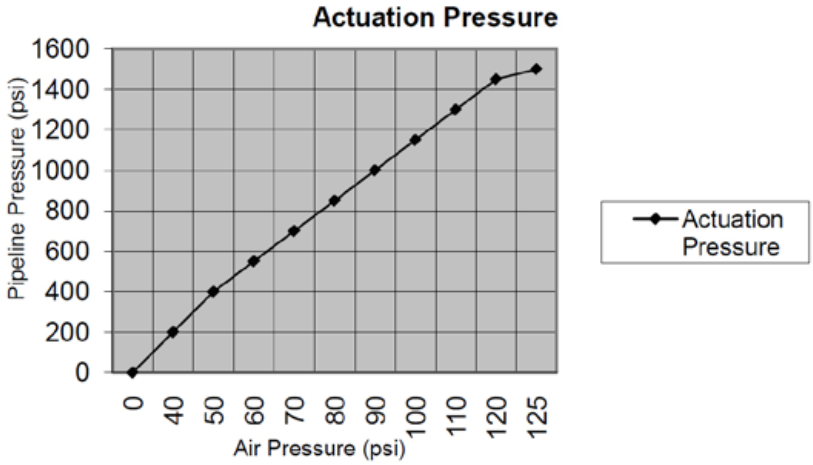

Figure 2.1—Pump actuation (air) pressure chart

Inline Filter

Use of an in-line filter between the probe and sample pump is recommended for optimum sampling performance. The purge valve manifold at the bottom of the sample pump (shown in Figure 2.2) is designed with a recess to accept a ½-in. OD basket filter (sold separately). A 40-micron filter is supplied as standard; other sizes are available upon request. To install a filter,insert it in the bottom inlet of the purge valve manifold before connecting the sample probe to the sample pump.

Figure 2.2—Basket-type filter fits inside inlet of purge valve manifold

Tubing Connections

Tubing arrangements will vary, depending on the product sampled (gas or liquid). At a minimum, 1/4-in. stainless steel tubing will be required to connect the air supply from the controller to the sample pump.

A 1/4-in. capped port is provided on the sample discharge outlet of the pump. Before operating the pump, a length of tubing should be installed between this outlet and a receiver.

Important **If a pressurized receiver is used, install an outlet check valve between the sample discharge outlet and the receiver to prevent the process fluid from flowing back back to the pump. The valve is an accessory supplied by Cameron (Part No. 9A-50142303543).**

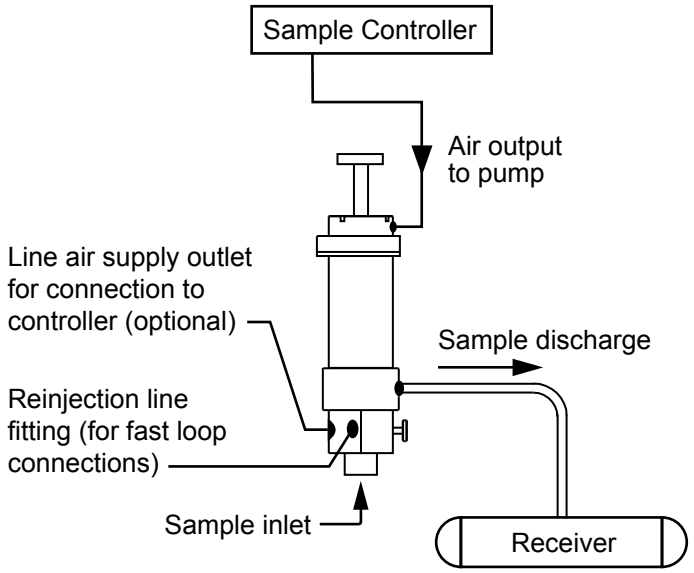

Figure 2.3—Sample pump tubing connections

Remote Mount Considerations

In remote-mount installations, tubing is required for connecting the sample probe to the purge valve manifold on the sample pump. When the controller is pipe-mounted, tubing should be sloped between the sample probe and the sample pump to prevent a water trap. The tubing between the sample probe and the sample pump should be as short as possible and should be insulated if extreme weather conditions exist.

Fast Loop Considerations

Under some flow conditions, a fast loop plumbing arrangement may be preferred to ensure that only fresh liquid flow is sampled. This configuration requires an orifice plate, flow straightener, or other flow obstruction in the pipeline to cause a small differential pressure to ensure that the sample probe collects fresh fluid with each sample grab. The fast loop should be as short as possible and should be constructed with ¼-in. stainless steel tubing. The fast loop itself cannot have any device or obstruction which could cause significant pressure drop. The fast loop should be insulated if extreme weather conditions exist.

Installation Procedure

Install tubing to make the following connections to the sample pump, using Figure 2.4 below for reference.

1. Connect the sample probe to the sample inlet either using a direct-mount, or with tubing if sampler is mounted remotely from the sample probe.

2. Connect the sample discharge outlet to the sample receiver. If a pressurized receiver is in use, install an outlet check valve at the sample discharge outlet. See Tubing Connections, page 8.
3. Connect the air output to the actuation pressure port of the pump. This supplies air pressure to actuate the pump.
4. If a fast loop piping configuration will be used, connect the reinjection line fitting in the side of the purge valve manifold to the low-pressure side of the orifice fitting in the pipeline.
5. Cover the vent hole in the side of the pump with 1/16-17 NPT screen, if necessary, to prevent buildup of debris in the hole.

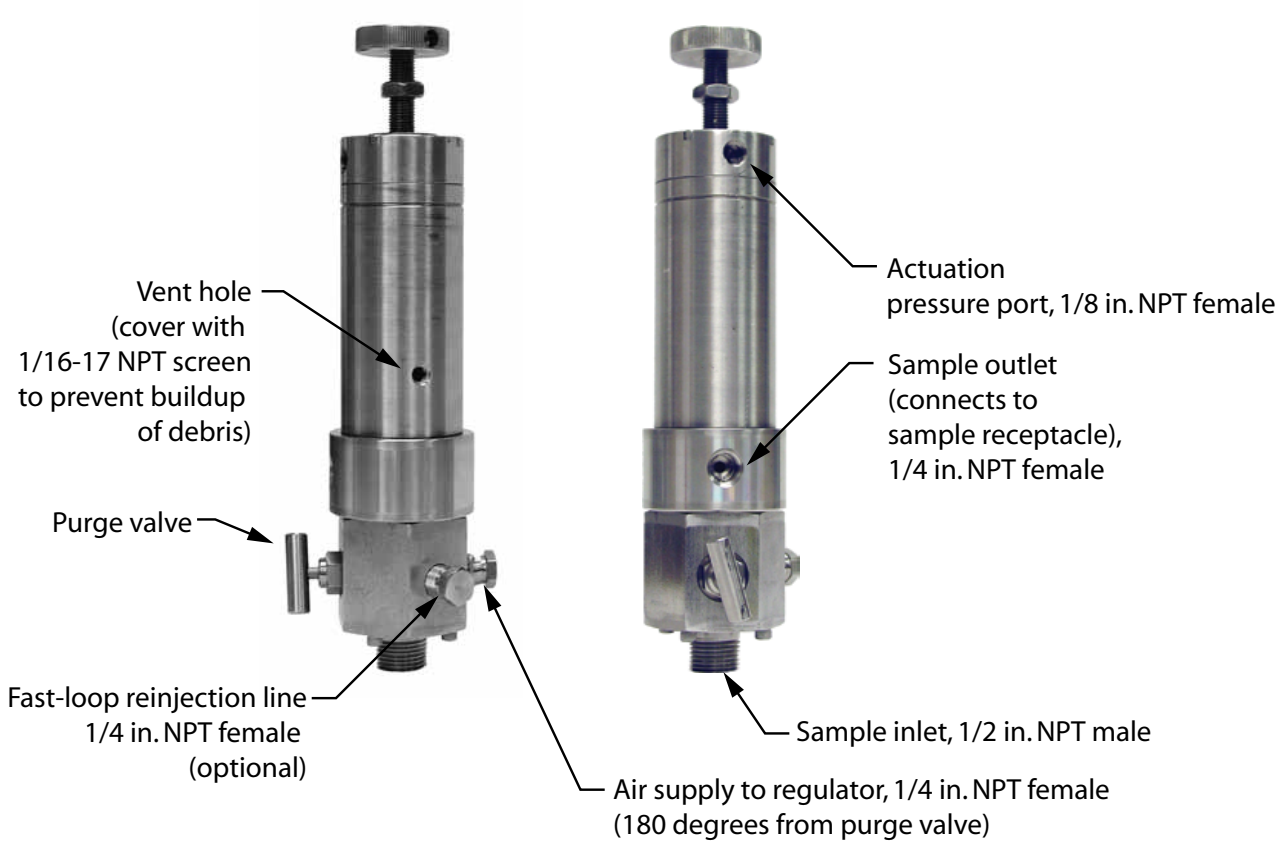

Figure 2.4—Pump tubing connections; note the photo at right is rotated 90 degrees from the position shown at left)

Integral Purge Valve

If desired, an operator can purge the contents of a sample cylinder using the purge valve manifold at the base of the pump. The purge valve shown in Figure 2.4, which is normally closed during sampling, can be opened to seal off the pump and purge the contents of a sample cylinder back to the pipeline. While this process is not required for most sampling operations, it may be desired when switching from one sample media to another.

Section 3—Setting the Sample Size

Sample size is set by adjusting the knob at the top of the sample pump to a predetermined height (“h”) above the flat surface of the pump. The height measurement required directly corresponds to the sample size desired. Charts for determining corresponding height measurements for liquid and gas samples are provided on a laminated card that is stored inside the controller enclosure. The card, shown in Figure 3.1, includes a ruler that can be placed beside the knob to measure the adjustment height.

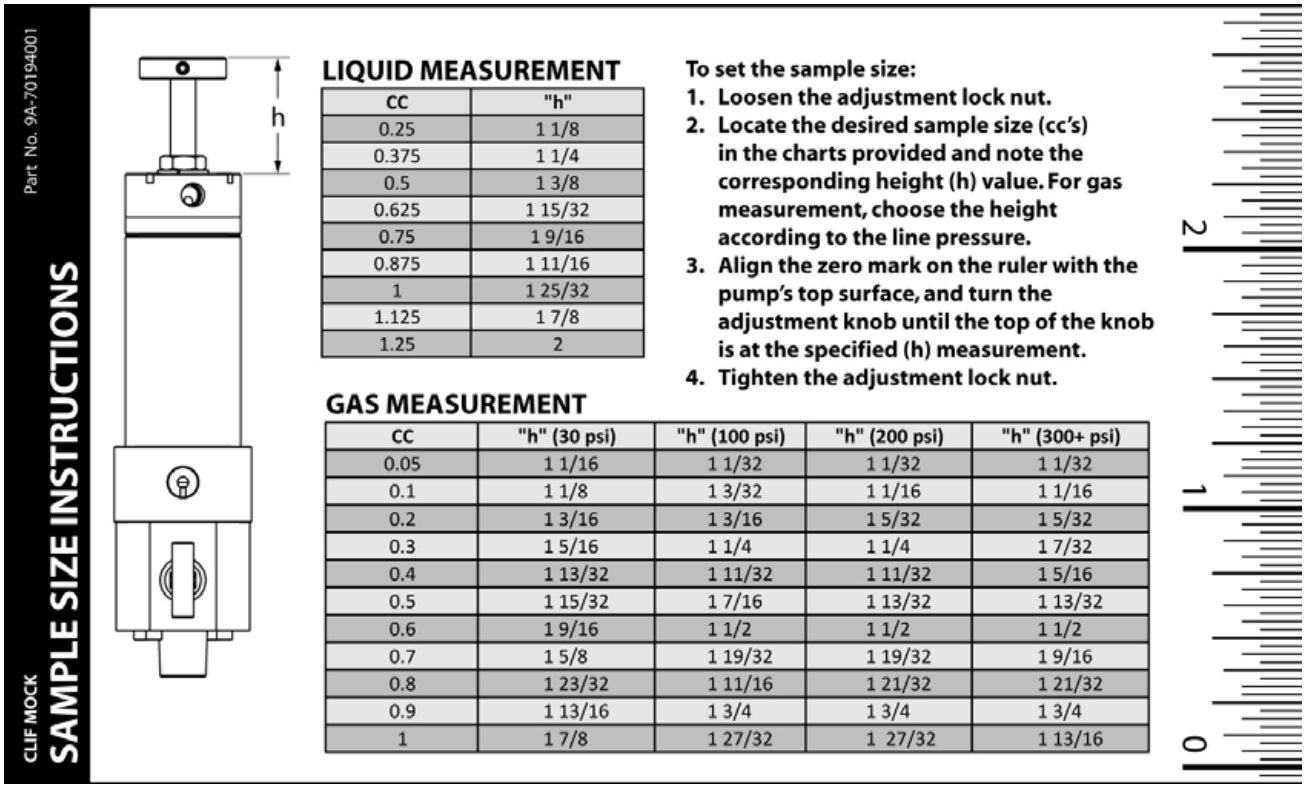

Figure 3.1—Laminated sample size card for adjusting sample size in the field

Liquid Service

To set the sample size for liquid sampling, perform the following steps:

1. Remove the laminated Sample Size Instructions card from the controller enclosure and locate the Liquid Measurement chart.
2. Loosen the adjustment lock nut.
3. Locate the desired sample size in the “CC” column of the Liquid Measurement chart and note the corresponding height (h) value.
4. Hold the card so that the zero point aligns with the flat surface of the pump, and turn the adjustment knob until its top is in line with the height measurement determined in step 3.
5. Tighten the adjustment lock nut.

Gas Service

To set the sample size for gas sampling, perform the following steps:

1. Remove the laminated Sample Size Instructions card from the controller enclosure and locate the Gas Measurement chart.
2. Loosen the adjustment lock nut.
3. Locate the desired line pressure in the Gas Measurement chart (CC column) and note the corresponding height (h) value. Find the value (h) that corresponds to the desired sample size and line pressure.
4. Hold the card so that the zero point aligns with the flat surface of the pump, and turn the adjustment knob until its top is in line with the height measurement determined in step 3.
5. Tighten the adjustment lock nut.

Due to the compressible nature of gas, slight adjustments may be required after initial installation to fine tune the sample pump based on the sampling requirements.

Section 4—Maintenance

Components

Refer to Figure 4.1 and Table 4.1 and Figure 4.2 and Table 4.2, page 15, when performing the procedures in this section.

The pump is essentially maintenance-free. Change the O-rings annually under routine operating conditions. If operating in a severe environment, inspect the O-rings more frequently and replace as necessary.

CAUTION **O-rings are a very fragile and integral part of the assembly. Always handle O-rings with extreme care to avoid slicing, extruding (force), tearing, or rolling an O-ring. Any damage to the O-ring will result in a loss of its sealing ability.**

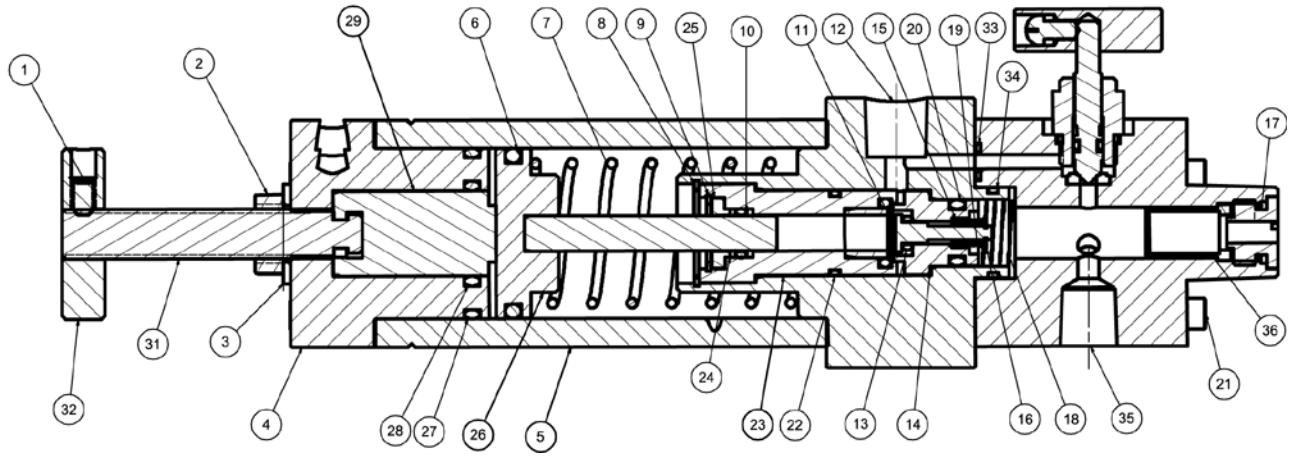

Figure 4.1—Sample pump components

Table 4.1—Pump Components

Item	Description	Qty
1	#10-32NF x 1/4” SOC SET SCREW	1
2	NUT, JAM, 7/16-20NC STD. SS	1
3	WASHER, FLAT, 7/16 STD. SS	1
4	END CAP, LGS-1	1
5	HOUSING LGS-1	1
6*	O-RING #218 VITON (REF: PISTON)	1
7**	SPRING, COMPRESSION, LGS-1	1
8	RETAINING RING, INTERNAL	1
9	RING, RETAINING K-2 300-62-SS2	1
10*	O-RING #011 VITON	1
11	POPPET, CHECK, LGS-1	1

Table 4.1—Pump Components

Item	Description	Qty
12	BODY INLET, LGS-1	1
13*	O-RING, VITON, #008	1
14	SEAT, LGS-1	1
15**	SPRING, COMPRESSION CHECK, LGS-1	1
16	RETAINING RING, EXTERNAL	1
17	RETAINER, FILTER BASKET	1
18**	SPRING, SEAT, COMPRESSION, LGS-1	1
19	GUIDE, CHECK SPRING	1
20*	O-RING, VITON, #110	1
21	#8-32NCx3.5” LG. SHCS, SST	4
22**	O-RING, VITON, #016	1
23**	SAMPLE CHAMBER ASSY, LGS-1	1
24*	RING, BACK-UP, TELFON, #011	2
25	RETAINER, O-RING, SAMPLE CHAMBER	1
26	PISTON ROD ASSY, LGS-1	1
27*	O-RING, #125, VITON	1
28*	O-RING #116 VITON	1
29	PISTON, STROKE ADJUSTMENT	1
30	SCREW, SOCKET HD CAP 8-32 X 1 SS	4
31	SCREW, ADJUSTING LGS-1	1
32	KNOB, ADJUSTMENT LGS-1	1
33*	O-RING, VITON, #007	1
34*	O-RING, BUNA-N, #017	1
35	VALVE, PURGE LGS-1	1
36	FILTER, (OPTIONAL)	1

*These items are contained in the Seal Kit listed in the Spare Parts list.
**These items plus the Seal Kit items are contained in the Overhaul Kit listed in the Spare Parts list.

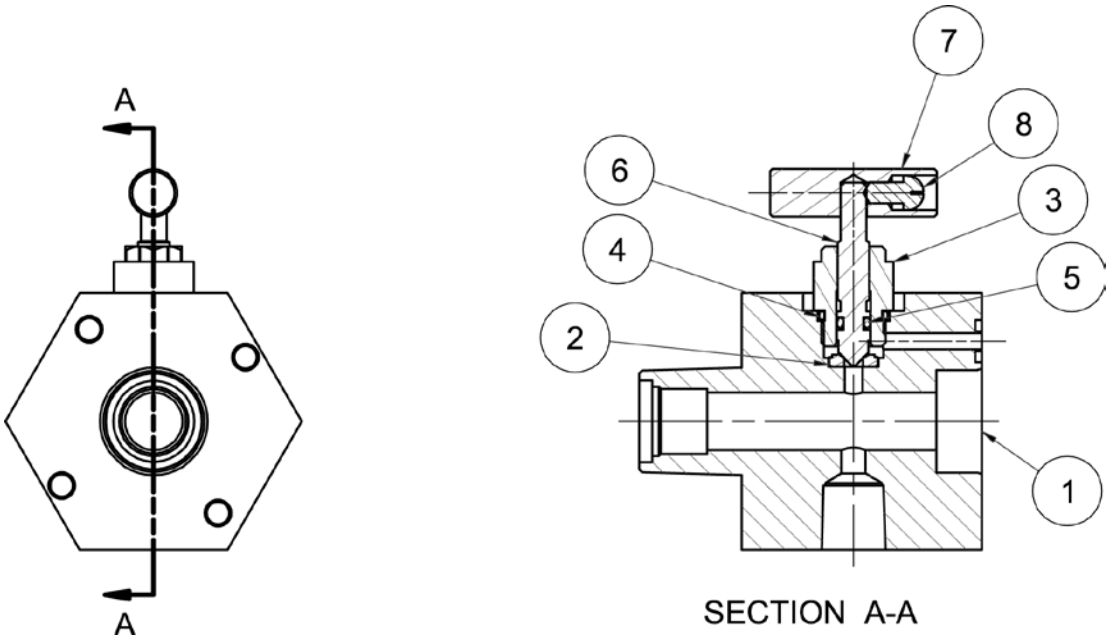

Figure 4.2—Purge manifold components

Table 4.2—Purge Manifold Components

Item	Description	Qty
1	VALVE, PURGE	1
2	SEAT, VALVE LGS MANIFOLD	1
3	NUT, BONNET LGS MANIFOLD	1
4*	O-RING, BUNA-N #013	1
5*	O-RING, VITON #007	1
6	STEM, VALVE LGS MANIFOLD	1
7	HANDLE, VALVE LGS MANIFOLD	1
8	SCREW, FILISTER HD SLT 8-32 X 5/16 SS	1

*These items are contained in the Seal Kit listed in the Spare Parts list on page 20.

Pump Disassembly

WARNING: Prior to disassembling the sample pump, remove pipeline pressure from the pump and cycle the pump several times to evacuate any gases that may be trapped in the sample chamber. Attempts to disassemble the pump without venting the sample chamber can result in bodily injury.

The following instructions reference item numbers that correspond to the numbers displayed in Figure 4.1 and Table 4.1, page 13, and Figure 4.2 and Table 4.2, page 15. Refer to these cutaway illustrations and tables frequently during sample pump disassembly.

Required Tools

The LGS-1 pump can be completely disassembled with a few simple hand tools. An Allen wrench, snap ring pliers, a small adjustable wrench (for removing the valve body on the purge valve), a flat punch, and a flat screwdriver are recommended.

Preparations for Disassembly

Prior to total disassembly of the pump, perform the following steps:

1. Loosen the nut (item 2) and back the adjustment screw (item 31) all the way out till it stops. This will reduce the spring return load to minimum.
2. Loosen the four (4) screws (item 21) 2 complete turns (do not over-loosen the screws). After the screws are loosened, the housing (item 5), the inlet body (item 12), and the purge valve (item 35) will separate slightly due to spring load.
3. Using your hands, grasp the housing and inlet body and push them together. There should only be a slight resistance of approximately 4 to 5 pounds required to bring the housing and inlet body in contact again.

WARNING: If you cannot bring the two parts in contact using minimal hand force, the sample chamber could contain trapped gases; retighten the four screws hand-tight and recycle the pump several times again, then repeat the procedure above. Never—under any circumstance—continue to disassemble the pump if pressure is retained in the sample chamber. Bodily injury could result. If you cannot evacuate the sample chamber gases after repeated attempts, contact Cameron for further instruction.

Housing Disassembly

1. To continue disassembly of the pump, remove the four (4) screws (item 21) from the purge valve (item 35). Hand pressure should be applied to the inlet body and the purge valve to hold them in place as the screws are removed to offset the force created by the compression spring (item 7) so the pump does not suddenly burst apart.
2. Slide the inlet body (item 12) and purge valve straight off the piston rod and remove the compression spring (item 7).

CAUTION **Do not remove the piston assembly (item 26) from the inlet body (item 12) side of the housing (item 5). Removal from this direction would require passing the piston O-ring over the vent hole in the housing which could cut the O-ring.**

3. Remove the four (4) screws (item 30) from the end cap (item 4) and slide the end cap out of the housing.
4. Remove the piston assembly (item 26) from the end cap side of the housing.

CAUTION **Do not remove the piston assembly (item 26) from the inlet body (item 12) side of the housing (item 5). Removal from this direction would require passing the piston O-ring over the vent hole in the housing which could cut the O-ring.**

5. Remove the O-ring (item 6) from the piston assembly.

End Cap Disassembly

1. Remove O-ring (item 27) from the end cap.
2. To remove the stroke adjustment (item 29) requires removal of the nut (item 2) and washer (item 3).
   a. Remove the set screw (item 1).
   b. Remove the adjustment knob (item 32).
   c. Remove the nut and washer.
   d. Replace the adjustment knob on the adjustment screw.
   e. Replace the set screw and retighten.
3. Rotate the adjustment knob clockwise until the stroke adjustment completely extends beyond the end cap.
4. Remove the stroke adjustment from the adjustment screw.
5. Remove the adjustment screw from the end cap.
6. Remove the O-ring (item 28) located inside the end cap.
7. Remove the set screw from the adjustment knob.
8. Remove the adjustment knob from the adjustment screw.

Inlet Body Disassembly

1. Remove O-ring (item 34).
2. Remove O-ring (item 33).
3. Remove the internal retaining ring (item 8).
4. Carefully remove the sample chamber assembly (item 23) and the seat assembly from the inlet body.
   a. To accomplish this use a flat punch and gently apply pressure to the check poppet (item 11) stem.
   b. Slowly push the two assemblies through the inlet body until the O-ring (item 22) clears the bore.

c. Once the O-ring clears the bore the two assemblies can be easily removed from the inlet body by gently dumping them in your hand.

5. Remove the internal retaining ring (item 9) from the sample chamber assembly.
6. To remove the O-ring retainer (item 25) from the sample chamber assembly, hold the sample chamber assembly so the O-ring retainer is facing down and very gently tap the sample chamber assembly against a hard clean surface.
7. Remove the back-up ring (item 24) and O-ring (item 10) from the sample chamber assembly.
8. Remove O-ring (item 22).
9. Disassemble the seat assembly as follows:
   a. Carefully remove the external retaining ring (item 16) from the check poppet (item 11).
   b. Remove the compression spring (item 15).
   c. Remove the check poppet.
   d. Remove O-ring (item 13) from the check poppet.
   e. Remove O-ring (item 20) from the seat (item 14).
10. Disassembly of the sample pump is complete.

Purge Valve Disassembly

See Figure 4.2 and Table 4.2, page 15, for item numbers marked with an asterisk (*).

1. Remove the purge valve assembly (item 35) from the inlet body (item 12).
2. Remove the compression spring (item 18).
3. Remove the filter basket retainer (item 17) from the purge valve assembly (item 35).
4. Remove the bonnet nut (item 3*) from the purge valve (item 1*).
5. Remove the seat (item 2*) from the purge valve (item 1*).
6. Remove the screw (item 8*) and the handle (item 7*) from the stem (item 6*).
7. Remove the stem (item 6*) from the bonnet nut (item 3*).
8. Remove O-rings (item 4* & item 5*).

Pump Assembly

The following instructions reference item numbers that correspond to the numbers displayed in Figure 4.1 and Table 4.1, page 13, and Figure 4.2 and Table 4.2, page 15. Refer to these cutaway illustrations and tables frequently during sample pump assembly.

Purge Valve Assembly

See Figure 4.2 and Table 4.2, page 15,for item numbers marked with an asterisk (*).

1. Place O-ring (item 5*) on the stem (item 6).

2. Place O-ring (item 4*) on the bonnet nut (item 3*).
3. Install stem (item 6*) into the bonnet nut (item 3*).
4. Install the seat (item 2*) into the purge valve (item 1*).
5. Install the bonnet nut (item 3*) into the purge valve (item 1*).
6. Install the handle (item 7*) and the screw (item 8*) to the stem (item 6*).
7. Install the filter (item 36, optional) into the purge valve assembly (item 36).
8. Install the retainer (item 17) into the purge valve assembly (item 36).

Inlet Body Assembly

1. Place O-ring (item 20) on the seat (item 14).
2. Place O-ring (item 13) on the check poppet (item 11).
3. Place the check poppet in the seat.
4. Install the compression spring (item 15) over the stem of the check poppet.
5. Carefully replace the external retaining ring (item 16) over the check poppet (item 11).
6. Install O-ring (item 22) onto the sample chamber (item 23).
7. Insert the O-ring (item 10) and back-up ring (item 24) into the sample chamber assembly.
8. Replace the O-ring retainer (item 25) in the sample chamber assembly.
9. Install the internal retaining ring (item 9) in the sample chamber assembly.
10. Replace the seat assembly and sample chamber assembly into the inlet body as follows:
    a. First, place the seat assembly into the inlet body and use your finger to gently push it all the way in until it bottoms inside the body.
    b. Insert the sample chamber assembly into the inlet body until it bottoms.
11. Install the internal retaining ring (item 8).
12. Install O-ring (item 34).

End Cap Assembly

1. Install the O-ring (item 28) located inside the end cap.
2. Install the adjustment knob (item 32) on to the adjustment screw (item 31).
3. Install the setscrew (item 1) in the adjustment knob.
4. Install the adjustment screw in the end cap and thread all the way in until the groove end of the adjustment screw clears the opposite end of the end cap.
5. Install the stroke adjustment (item 29) on the adjustment screw.
6. Rotate the adjustment knob counterclockwise until the stroke adjustment is completely retracted inside the end cap.

7. Remove the set screw and adjustment knob to place the washer (item 3) and nut (item 2) on the adjustment screw. Replace the set screw and adjustment knob on to the adjustment screw.
8. Install O-ring (item 27) on to the end cap.

Housing Assembly

1. Install the O-ring (item 6) on the piston assembly.
2. Install the piston assembly (item 26) from the end cap side (grooved end) of the housing (item 5). Do not install the piston assembly from the inlet body side of the housing. Installation from this direction could cut the piston O-ring as it passes over the vent hole in the housing.
3. Slide the end cap inside the housing and install the four (4) screws (item 30). Hand-tighten only.
4. Install the compression spring (item 7) onto the piston assembly. Slide the inlet body straight on to the piston rod. Be careful not to cut the piston rod O-ring (item 10) located inside the sample chamber assembly.
5. Install the compression spring (item 18) between the inlet body (item 12) and the purge valve (item 35).
6. Install the O-ring (item 33).
7. Install the four (4) screws (item 21) on to the purge valve (item 35), through the inlet body (item 12), and into the housing, such that the purge valve's (item 35) handle is inline with the sample out port on the inlet body (item 12). Hand-tighten the screws only. DO NOT OVERTIGHTEN THE SCREWS.

Spare Parts

A seal kit and an overhaul kit provide all of the parts required for maintenance of the LGS-1 sample pump. See the Table 4.3 below for part numbers.

Table 4.3—Spare Parts

Qty	Part Number	Description
1	9A-50142150715	Overhaul Kit (contains O-rings and springs for full overhaul of the LGS-1 pump
1	9A-50142150708	Seal Kit (contains O-rings for the LGS-1 pump and purge valve manifold
1	9A-50142200643	Filter, LGS-1, 40-micron

An outlet check valve, recommended for any pump that is to be installed with a pressurized receiver, is also supplied by Cameron (Part No. 9A-50142303543). See Tubing Connections, page 8, for details.

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