



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER ESSENTIALS™ CRUDE OIL SAMPLER

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IMPORTANT SAFETY INFORMATION

READ ALL INSTRUCTIONS



Notes emphasize information and/or provide additional information to assist the user.



Caution messages appear before procedures that could result in damage to equipment if not observed.



Warning messages appear before procedures that could result in personal injury if not observed.

This manual is intended to be used as a basic installation and operation guide for the Welker Essentials™ Gas Sampler. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in Appendix A of this manual.

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker equipment described in this manual. Correct installation and operation, however, are the responsibility of the end user. Welker reserves the right to make changes to this manual and all products in order to improve performance and reliability.

BEFORE YOU BEGIN

Read these instructions completely and carefully.

IMPORTANT - Save these instructions for local inspector's use.

IMPORTANT - Observe all governing codes and ordinances.

Note to Installer - Leave these instructions with the end user.

Note to End User - Keep these instructions for future reference.

Installation of this Essentials™ Gas Sampler is of a mechanical and electrical nature.

Proper installation is the responsibility of the installer. Product failure due to improper installation is not covered under the warranty.

If you received a damaged Essentials™ Gas Sampler, please contact a Welker representative immediately.

Phone: 281.491.2331

Address: 13839 West Bellfort Street
Sugar Land, TX 77498

SECTION 1: PRODUCT INFORMATION

1.1 Introduction

We appreciate your business and your choice of Welker products. The installation, operation, and maintenance liability for this equipment becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance (IOM) Manuals* prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use.*

If you have any questions, please call Welker at 1-281-491-2331.

**The following procedures have been written for use with standard Welker parts and equipment. Assemblies that have been modified may have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker *Essentials™ Crude Oil Sampler* is a low-cost probe-mounted sampler designed for low-pressure and low-viscosity sampling applications.

The Essentials™ Crude Oil Sampler is comprised of a Welker SP Sample Probe, a Welker Volume Regulator, and a solenoid. The sample volume of the Volume Regulator can be adjusted externally to collect up to 10 cc per actuation. The remotely actuated solenoid can be set for timed or proportional to flow collection. When the solenoid is energized, the Volume Regulator is opened to the process, allowing pipeline pressure to fill the Volume Regulator with sample; when the solenoid is de-energized, the Volume Regulator is opened to the atmospheric sample container, allowing the Volume Regulator to empty.

Welker may custom design the Essentials™ Crude Oil Sampler to suit the particular application and specifications of each customer.

1.3 Specifications



The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. **Please note that the specifications may vary depending on the customization of your equipment.**

Table 1: Essentials™ Crude Oil Sampler Specifications

Products Sampled	Low Viscosity Liquids at Low Pressure
Materials of Construction	316/316L Stainless Steel, PTFE, and Viton®
Maximum Allowable Operating Pressure	125 psig @ -20 °F to 120 °F (8 barg @ -28 °C to 48 °C)
Minimum Pipeline Pressure Required	50 psig (3 barg)
Connections	Pipeline: ¾" MNPT Sample Outlet: ¼" FNPT
Insertion Length	8"
Electrical Connection	DC 12 V DC 24 V
Sample Volume	With Spring Energizer: 2–5 cc Without Spring Energizer: 2–10 cc
Features	3-Way Solenoid Valve Scooped Probe Tip Welker SP Sample Probe Welker Volume Regulator

1.4 Equipment Diagrams

Figure 1: Essentials™ Crude Oil Sampler Diagram

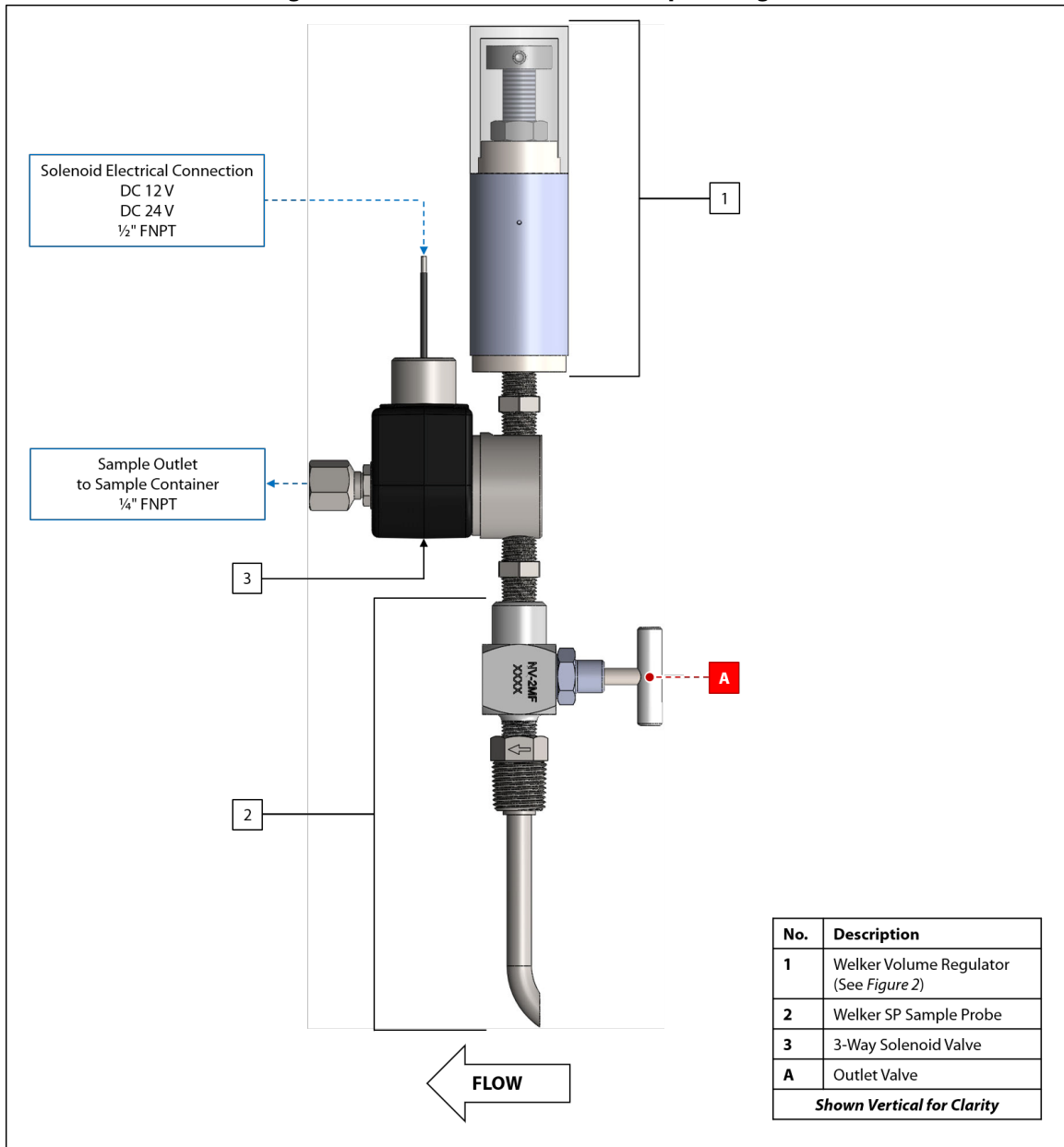
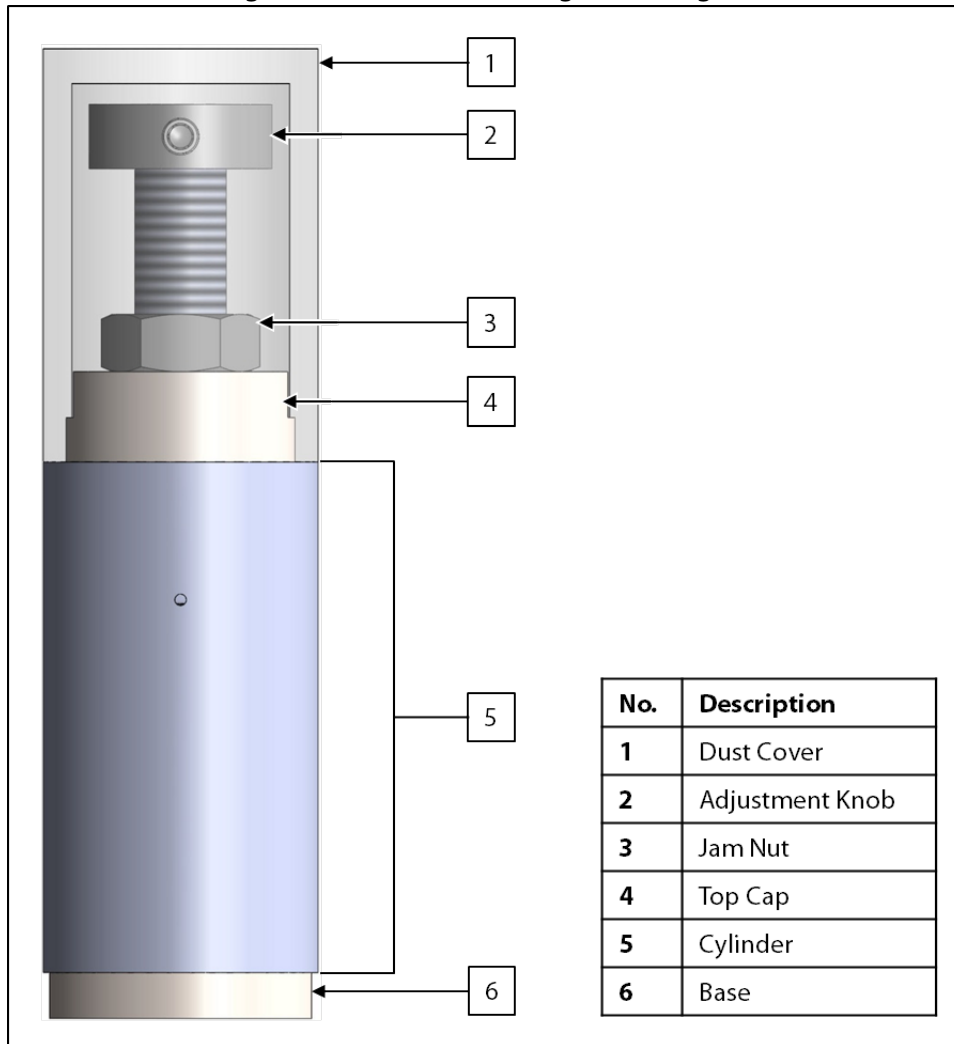


Figure 2: Welker Volume Regulator Diagram



SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin



After unpacking the unit, check the equipment for compliance and any damage that may have occurred during shipment. Immediately contact a Welker representative if you received damaged equipment.



When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

1. Welker recommends that the unit be installed to the side of the pipe and inserted into the center one-third ($\frac{1}{3}$) of the pipeline in a location where the product is well-mixed and will yield an accurate and representative sample.
2. Locate the unit two to four pipe diameters (2–4D) downstream of an inline static mixer or other flow conditioning system.

2.2 Installation and Operation

1. Depressurize the pipeline.



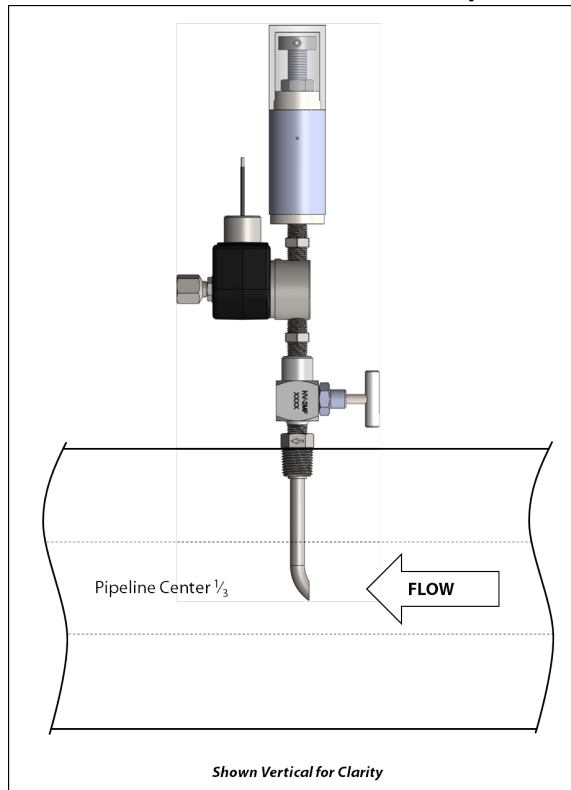
The pipeline must be depressurized prior to installing and removing the unit.

2. Ensure that outlet valve A is closed (*Figure 1*).
3. Wrap the threads of the threaded pipeline connection with PTFE tape.
4. Determine the direction of product flow in the pipeline. For the Essentials™ Crude Oil Sampler to function correctly, it must be installed so that the scooped probe tip is open against the direction of product flow (*Figure 3*).



As necessary, refer to the flow direction stamped below outlet valve A to determine correct orientation before installing the Essentials™ Gas Sampler to the pipeline.

Figure 3: Correct Essentials™ Crude Oil Sampler Installation



5. Install the Essentials™ Crude Oil Sampler to the pipeline.
6. Using 1/4" or 3/8" tubing, connect from the sample outlet to an atmospheric sample container (*Figure 1*).



Customer-supplied tubing must slope downward from the Essentials™ Crude Oil Sampler to the sample container.

7. Connect an appropriate electrical supply to the 3-way solenoid (Figure 1).
8. Set the customer PLC to actuate the solenoid at the desired sampling frequency based on the sampling equations provided (Figure 4).



For this manual, the term "PLC," or Programmable Logic Controller, will be used to refer to the PLC, DCS, or other signal control system used by the customer to activate and operate the solenoid.

Figure 4: Sampling Frequency Equations

Liquid Sampling, Proportional to Flow Collection	
<p>Equation 1: Number of Samples Needed</p> $\text{Number of Samples Needed to Fill to 80\%} = \frac{(\text{Container Size (cc)} * 0.8)}{\text{Bite Size (cc)}}$	
<p>Equation 2: Proportional-to-Flow</p> $\text{Volume of Flow Between Sample Grabs} = \frac{\text{Batch Size (Total Volume to be Sampled)}}{\text{Number of Samples Needed (Eq. 1)}}$	
<p>Use Equation 1 to determine the number of actuations needed. Use Equation 2 to determine how often (after what volume of flow) to take each sample.</p>	
Liquid Sampling, Timed Collection	
<p>Equation 1: Number of Samples Needed</p> $\text{Number of Samples Needed to Fill to 80\%} = \frac{(\text{Container Size (cc)} * 0.8)}{\text{Bite Size (cc)}}$	
<p>Equation 2: Timed Sampling</p> $\text{Time Between Sample Grabs} = \frac{\text{Total Time in Sample Period}}{\text{Number of Samples Needed (Eq. 1)}}$	
<p>Use Equation 1 to determine the number of actuations needed. Use Equation 2 to determine how often (after what amount of time) to take each sample.</p>	



Never fill the container above 80% of its capacity. Allow at least 20% room for product expansion should the container be exposed to increased temperatures.



Note the 0.8 in Equation 1 represents the 80% volume limit for liquid sampling.



The Welker Volume Regulator is adjustable between 2–10 cc per actuation.

9. Set the sample volume on the Welker Volume Regulator. See Section 2.3, *Setting the Sample Volume*, for instructions on setting the sample volume.
10. Pressurize the pipeline.
11. Open outlet valve A (Figure 1).
12. From the PLC, energize the solenoid to actuate the Essentials™ Crude Oil Sampler and begin sampling.
13. Continue sampling until the desired volume of sample has been obtained.
14. From the PLC, de-energize the solenoid to stop actuating the Essentials™ Crude Oil Sampler and halt sampling.

2.3 Setting the Sample Volume

1. Remove the dust cover from the top of the Volume Regulator (*Figure 2*).
2. Loosen the jam nut on the adjustment screw (*Figure 2*).
3. Screw the adjustment knob clockwise to set the sample volume at 2 cc.
4. Screw the adjustment knob counterclockwise to increase the sample volume to the desired amount (*Figure 2*).



One full rotation of the adjustment screw is approximately 0.9 cc.

5. Welker recommends verifying the sample volume prior to sampling. See *Section 2.4, Verifying the Sample Volume*, for instructions on verifying the sample volume.
6. Once the desired sample volume has been attained, tighten the jam nut to secure the adjustment screw (*Figure 2*).
7. Return the dust cover to the Volume Regulator (*Figure 2*).

2.4 Verifying the Sample Volume

1. Ensure that the pipeline is pressurized.
2. As necessary, connect an atmospheric sample container to the sample outlet (*Figure 1*).
3. Decide how many actuations will be taken into the sample container to verify the sample volume.



Welker recommends a minimum of ten (10) actuations to verify the sample volume.

4. From the PLC, energize the solenoid to actuate the Essentials™ Crude Oil Sampler.
5. Capture product in the connected atmospheric sample container until the predetermined number of actuations has been taken.
6. Once the predetermined number of actuations has been taken, de-energize the solenoid to stop actuating the Essentials™ Crude Oil Sampler.
7. Disconnect the atmospheric sample container from the sample outlet.
8. Calculate the sample volume by dividing the volume of product captured in the atmospheric sample container by the number of actuations taken.
9. As necessary, adjust the sample volume on the Volume Regulator. See *Section 2.3, Setting the Sample Volume*, for instructions on setting the sample volume.

3.1 Before You Begin

1. **Welker recommends that the unit have standard yearly maintenance under normal operating conditions.** In cases of severe service, dirty conditions, excessive usage, or other unique applications that may lead to excess wear on the unit, a more frequent maintenance schedule may be appropriate.
2. Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit available for repairs of the system in case of unexpected wear or faulty seals.



New seals supplied in spare parts kits should be lightly lubricated before being installed to ease the installation of the seals and reduce the risk of damage when positioning them on parts. Wipe excess lubricant from the seals, as it may adversely affect analytical instrument results.



For sample-exposed seals, Welker recommends non-hydrocarbon-based lubricants, such as Krytox®. For non-sample-exposed seals, Welker recommends either non-hydrocarbon-based lubricants or silicone-based lubricants, such as Molykote® 111.



After the seals are installed, the outer diameter of shafts and inner diameter of cylinders may be lubricated to allow smooth transition of parts.

3. All maintenance and cleaning of the unit should be performed on a smooth, clean surface.
4. Welker recommends having the following tools available for maintenance. Please note that the exact tools required may vary by model.
 - a. Adjustable Wrench (Qty. 2)
 - b. Crescent Wrench
 - c. Hex Key Set

3.2 Maintenance

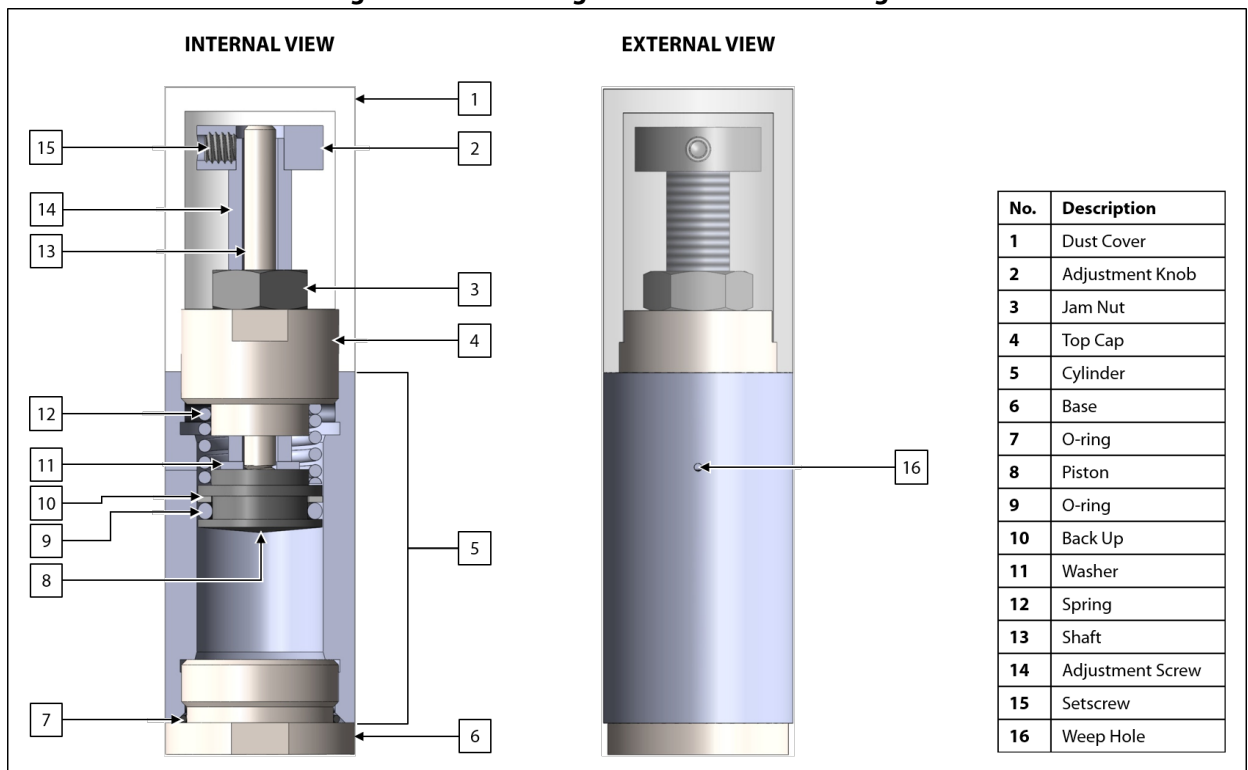
1. Depressurize the pipeline.



The pipeline must be depressurized prior to installing and removing the unit.

2. Close outlet valve A (Figure 1).
3. Turn OFF electrical power to the solenoid.
4. Disconnect the electrical supply from the solenoid.
5. Disconnect the atmospheric sample container from the sample outlet.
6. Remove the Essentials™ Crude Oil Sampler from the pipeline.
7. Unscrew the Volume Regulator from the top of the unit.

Figure 5: Volume Regulator Maintenance Diagram



8. Remove the dust cover from the Volume Regulator.
9. Remove the setscrew from the adjustment knob, and then remove the adjustment knob from the adjustment screw.
10. Remove the jam nut from the adjustment screw.
11. Unscrew the adjustment screw from the top cap.
12. Unscrew the top cap from the cylinder.
13. Carefully pull the shaft from the cylinder. Note that the washer, spring, and piston will also be removed from the cylinder at this time.
14. Inspect the piston for scratches. Replace as necessary.
15. Inspect the shaft for scratches or other damage. Replace as necessary.

16. Replace the O-ring and back up on the piston.
17. Unscrew the cylinder from the base.
18. Clean the cylinder, and then inspect the inner diameter of the cylinder for scratches. If scratches are present, the cylinder needs to be replaced.
19. Replace the O-ring on the base.
20. Screw the cylinder onto the base.



The cylinder must be installed to the base with the weep hole pointing up to ensure the release of air from the cylinder as the piston moves. Installing the cylinder to the base with the weep hole pointing down will cause product to seep from the Volume Regulator.

21. Insert the piston with shaft and spring installed into the cylinder.
22. Screw the top cap into the cylinder.
23. Lightly lubricate the adjustment screw, and then screw the adjustment screw into the top cap.
24. Return the jam nut to the adjustment screw.
25. Return the adjustment knob to the adjustment screw.
26. Return the setscrew to the adjustment knob and tighten.
27. Return the dust cover to the Volume Regulator.
28. As necessary, refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the 3-way solenoid for instructions on maintaining the solenoid.
29. As necessary, refer to the *Installation, Operation, and Maintenance (IOM) Manual* for the Welker SP Sample Probe for instructions on maintaining the probe.
30. Once maintenance has been performed on component parts, screw the Volume Regulator onto the top of the unit.
31. The Essentials™ Crude Oil Sampler is now ready to be installed to the pipeline. See *Section 2.2, Installation and Operation*, for instructions on installing the unit to the pipeline and returning the unit to operation.



Check valves for leaks and repair as necessary during reinstallation.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

Welker *Installation, Operation, and Maintenance (IOM) Manuals* suggested for use with this unit:

- IOM-035: Welker SP-1, SP-1W, SP-2, SP-3, and SP-5 Sample Probes
- IOM-105: Welker NV-1 and NV-2 Instrument Valves

Other *Installation, Operation, and Maintenance (IOM) Manuals* suggested for use with this unit:

- Parker Hannifin Corporation 71313, 71315, 71335, 71385, 71395, 7131V, and 7133V 3-Way Solenoid Valves (Welker IOM-V016)

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD489AO.2

