

# SERAPHIN® SERIES J VOLUMETRIC TRAILER

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## OPERATING AND MAINTENANCE INSTRUCTIONS

**Seraphin® Test Measure**  
A Division of Pemberton Fabricators, Inc.  
Rancocas, NJ



**JULY, 2004**

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**Description:**

The Seraphin mobile prover system is made up of a precision volumetric stainless steel Prover connected to a pump-off system and mounted on an over the road trailer. The prover drain valve is plumbed to piping that can be routed via butterfly valves to a gravity drain or to the pump. A manual hose reel, with hose and nozzle, is connected to the pump. The hose is used to route the petroleum to an above ground storage tank or up into a tank truck.

**Operation:****Reference:**



For officially recognized petroleum measurement procedures and methods--reference **API Manual of Petroleum Measurement Standards, Chapter 4, Section 4 (Tank Provers) and Section 8 (Operation of Proving Systems).**

**Figures:**

**Figure 1** is a schematic diagram of the Mobile Prover System piping. Component parts including valves and fittings are labeled. Refer to Figure 1, on page 7, when aligning the system for filling or draining.

**Set-up Procedure:**

1. Electrically ground the trailer unit, to a proper earth ground, using the 50 ft. of grounding cable enclosed in a retractable reel, which is mounted on the trailer bed. This will dissipate any static electricity that could be generated during the filling of the prover.

**Stop Static.**

**WARNING:** *The prover/trailer system must be properly grounded prior to conducting petroleum measurement testing to prevent possible static electricity from sparking which could ignite a flammable product Follow all safety measures.*

2. Ensure the prover drain valve is closed.
3. Close the pump isolation valve and the gravity drain isolation valve.
4. Visually inspect, from the top neck opening, the interior of the prover to ensure it is free of debris, which could affect the accuracy of the liquid volume measurement.

### Prover Wetting Procedure:

1. If the prover is clean and free of debris, fill the prover with liquid from the meter device being checked. Fill the prover until the amount on the meter reads the nominal capacity of the prover.

**NOTE:** *The prover must be filled once and drained in order to wet the internal sides of the prover body. Wetting the internals of the prover helps ensure consistency in the amount of liquid that clings to the sides, from one test to the next.*

2. Align the drain valve and the isolation valves to either the pump or the gravity drain as required using the draining procedures outlined below.



**CAUTION:** *Under no circumstances should both the gravity drain isolation valve and the pump isolation valve be open at the same time.*

### Draining the Prover through Gravity Drain Connection:

1. Ensure prover drain valve is completely closed.
2. Connect a petroleum drain hose (not provided) to the gravity drain quick connect fitting.
3. Route the hose to the below ground storage tank inlet piping.
4. Verify that the pump isolation valve is closed.
5. Open the gravity drain isolation valve.
6. Ensure gravity drain hose is attended or secured in storage tank inlet.
7. Open the prover drain valve and begin draining back to the storage tank.
8. While draining, visually observe the flow of the petroleum through the drain sight glass just down stream of the prover drain valve. Once the main flow through the sight glass breaks and becomes a trickle—leave the prover drain valve open for 30 seconds and then close it.

### Draining the Prover via the Pump System:

1. Ensure the prover drain valve is completely closed.
2. Verify that the gravity drain isolation valve to the gravity drain connection is closed.
3. Pull off as much hose as needed from the hose reel to reach the above ground storage tank or tank truck inlet. Stick the hose nozzle in the storage tank receptacle. Be sure someone is attending the nozzle or that it is safely secured in place so as not to allow it to accidentally fall out, potentially causing a spill.
4. Open the pump isolation valve.
5. Open the Prover drain valve allowing petroleum to reach the pump inlet.



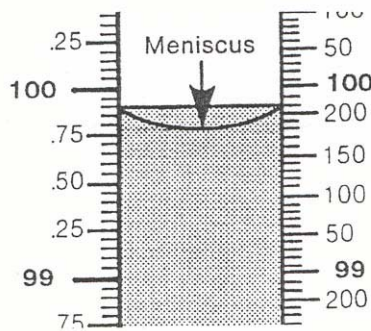
**WARNING:** *Always use caution when working with electrical circuits – Failure to use caution can result in serious personal injury or death.*

6. Turn on the pump at the on/off switch at the motor controller.
7. While draining, visually observe the flow of the petroleum through the sight glass just down stream of the prover drain valve. Once the main flow stops, then after 30 seconds close the prover drain valve.
8. Turn off pump when all fuel is drained from the interconnect piping.
9. Close the pump isolation valve.

### Testing Procedure:

1. Ensure the trailer is grounded to a proper earth ground using the retractable grounding cable attached to the trailer.
2. Verify that the prover drain valve is closed.
3. Fill the prover until the meter being checked reads the nominal capacity of the prover.

4. Select the proper fill method for which your prover is equipped:
  - Through the top of neck opening
  - Top Loading Bottom Fill pipe
  - Bottom Loading Fill connection
  - Drybreak fitting
5. Make the connection from the petroleum dispenser to the appropriate fill fitting in which your prover is equipped.
6. Fill the prover until the meter you are checking reads the nominal capacity of the prover.
7. Identify the volume measurement on the scale by reading the meniscus in the gauge glass. Look directly from eye level to a horizontal line tangential to the bottom of the meniscus. Record the result.



8. Compare the volume amount read on the meter to what the actual volume is on the scale.
9. Drain the prover back to a storage tank via gravity drain or through the pump-off system as outlined in the procedures above.



**CAUTION:** *Disposal of drained fluid should be done in an environmentally safe and responsible manner in accordance with good industry practices and in compliance with OSHA regulations*

## Schematic Diagram of Mobile Prover System Piping

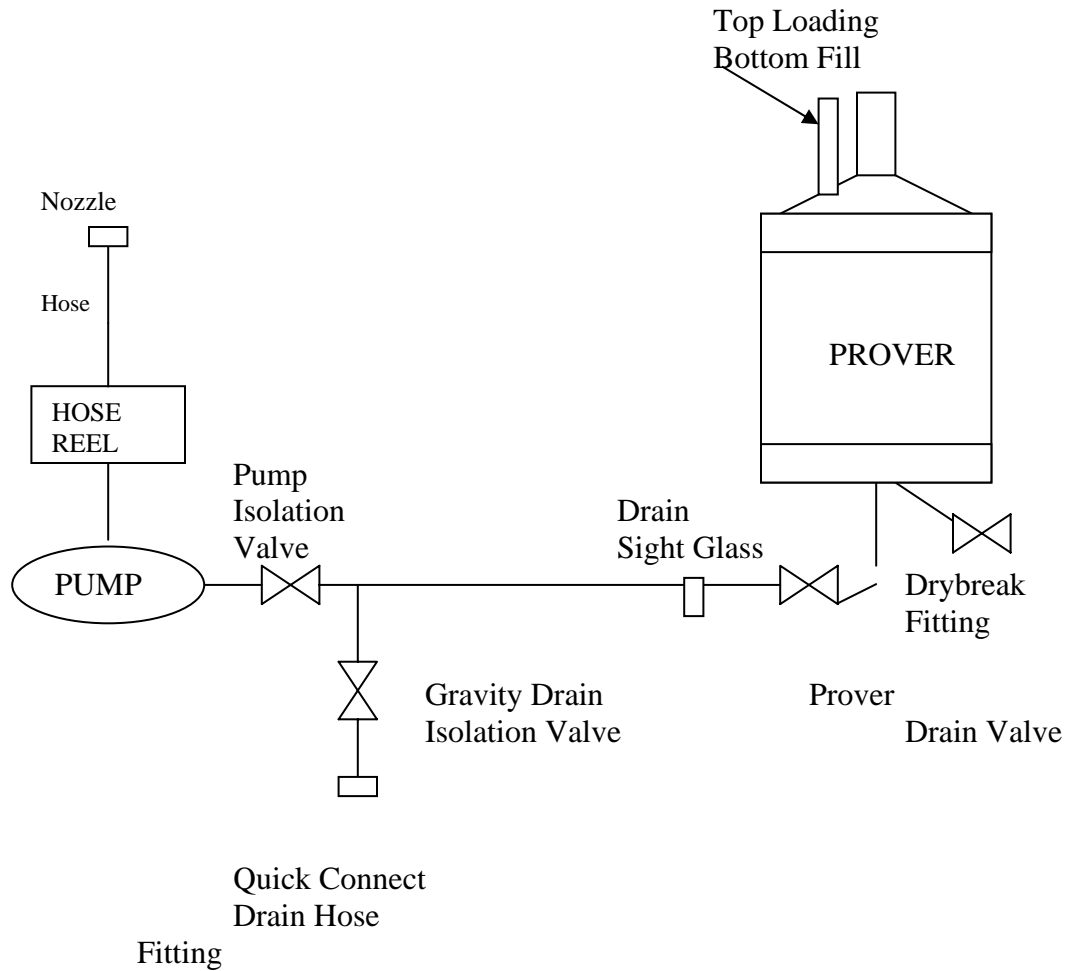


FIGURE 1

## Care and Maintenance of Provers

1. Check pump, provers, valves and piping periodically for dents and leaks at the seams, joints, connections and gauge assembly. If a leak is detected, call SERAPHIN® for authorized repair parts.

## Maintenance and Care of Seraphin® Trailers

### Tires

1. Make sure the trailer tires and wheels are of the same size, type, tread design and load carrying capacity. Differences may adversely affect trailer handling and could increase a risk of loss of vehicle control.
2. Inflate tire pressure to manufacturers specifications and check weekly, when cool, before you drive. Failure to maintain the proper recommended pressure can adversely affect the way your trailer handles. If one tire looks lower than the others, use a tire gauge to check pressure, and adjust if required. Check the tire pressure every few weeks (including spare).



**WARNING:** *Under-inflation is the most common cause of tire failures and may result in severe tire cracking, tread separation or “blowout”, with unexpected loss of vehicle control and increased risk of injury. Under-inflation increases sidewall flexing and rolling resistance, resulting in heat buildup and internal damage to the tire. It may also result in unnecessary tire stress, irregular wear, loss of vehicle control and accidents. A tire can lose up to half of its air pressure and not appear to be flat!*

3. Periodically inspect the tire threads and remove stones, nails, glass or other objects that may be wedged in the tread grooves. Check for holes or cuts that may permit air leakage from the tire and make necessary repairs.
4. Inspect the tire sidewalls for cuts, bruises and other damage every 3 months or 3,000 miles. If internal damage to the tire is suspected, have the tire demounted and inspect in case it needs to be repaired or replaced.
5. Check that wheel nuts and bolts are tight every 3 months or 3,000 miles.

### Lights

1. Make sure that all running lights, brake signals and hazard lights are operational with each use.
2. To replace trailer lamps, carefully pull the lamp from the assembly, remove the defective bulb from the socket and replace with a similar bulb.



## **Brakes**

1. Inspect brake to be sure they are operational with each use.
2. Adjust brakes to proper operating clearance every 3 months or 3,000 miles
3. Inspect brake linings for wear and contamination annually or every 12,000 miles.
4. Inspect brake magnets for wear and current draw every 6 months or 6,000 miles.
5. Check brake cylinders for leaks and sticking annually or every 12,000 miles.
6. Check brake controller for correct amperage and modulation every 6 months or 6,000 miles.
7. Inspect trailer brake wiring for bare spots, fray etc. annually or every 12,000 miles

## **Axle**

1. Inspect hub/drum for abnormal wear or scoring annually or every 12,000 miles
2. Inspect wheel bearings and cups for corrosion or wear. Clean and repack annually or every 12,000 miles.
3. Inspect the seals for leakage. Replace if removed annually or every 12,000 miles.
4. Inspect springs for wear or loss of arch annually or every 12,000 miles.
5. Inspect suspension parts for bending, loose fasteners or wear every 6 months or 6,000 miles.
6. Inspect hanger welds annually or every 12,000 miles.

## **Hitching the Trailer to the Truck**

1. Park the trailer on a level surface. Crank the front jack to an appropriate height, above the vehicle's hitch. Lower the jack, adjusting the ball and the hitch so that the tongue securely fastened.
2. Raise the tongue jack high enough so that it can not hit while being transported
3. Connect the safety chains to the hook retainers of the vehicle hitch. To connect the trailer's safety chains, cross the chains under the trailer tongue and allow slack for turning corners. **Do not attach safety chains to the bumper.**

## Trailer Connector

1. Seraphin supplies a thermo-plastic 7-way RV Connector that has brass contacts to prevent corrosion. It is interchangeable with other 7-way RV Connectors. 12 volts, 30 amps

### Typical Wiring Diagram for 7-Pole Connector



1. Ground	White
2. Electric Brakes	Blue
3. Tail Running Lights	Green
4. Battery	Black
5. LH Stop & Turn	Red
6. RH Stop & Turn	Brown
7. Auxiliary	Yellow

**Note:** *Locate wires by function only. Color coding is not standard among all manufacturers.*

## Vehicle Loading

1. Properly loading your trailer will provide maximum return of trailer design performance. The maximum recommended loaded trailer weight, GVWR (Gross Combined Vehicle Rating) is the highest possible weight of a fully loaded trailer. You can find this listed on the trailer identification plate on the tongue of the trailer.
2. The GCW (Gross Combined Weight) is the weight of the loaded vehicle (GVW) plus the weight of the fully loaded trailer. The GCW (Gross Combined Weight) must never exceed the GCWR (Gross Combined Weight Rating) which can be found by consulting your truck dealership or in the truck owners guide.



**WARNING:** *Do not use replacement tires with lower load carrying capacities than the originals because they may lower the trailer's GVWR limitation. Replacement tires with a higher limit than the originals do not increase the GVWR.*

3. Towing a trailer places an additional load on your vehicle's engine, transmission, axle, brakes and suspension. Inspect these components carefully prior to and after any towing operation.

## Maintenance and Care of Pumps

### General Safety

1. Read the instruction, Operation and Maintenance Manual for your pump before installing, operating or performing maintenance on the pump or its related equipment.



**CAUTION:** *Remember that pump safety is the responsibility of the user. Failure to comply with advised safety rules can lead to injuries and/or damage to equipment*

2. Overheated pumps can cause severe burns and injury. If overheating of pump casing occurs:
  - a) Stop pump immediately.
  - b) Allow pump to cool to air temperature.
  - c) Slowly and cautiously vent pump at drain plug.
  - d) Refer to Manufacturer's Installation, Operation and Maintenance Manual before restarting.
3. Do not operate pump without all guards and shields in place.
4. Cautiously approach any pump that has been in operation.
5. Pump only liquids for which the pump was designed.
6. Do not pump flammable or corrosive liquids unless pump and piping are designed for such.
7. Operating pump with suction and/or discharge closed is one cause of severe overheating.
8. Note direction of rotation - operating pump in wrong direction may cause impeller to unscrew and damage pump casing or other pump parts.
9. Locate the pump in an accessible location, as close as safely possible to the liquid to be pumped.
10. Check all lubricants before installation and operation and in accordance with maintenance programs.
11. When lifting pumps, use only lifting equipment in good repair with adequate capacity.

12. Never operate a self-priming pump unless the pump casing is filled with liquid. Doing so may damage the pump. The pump will not prime unless the pump casing is filled with liquid.



**CAUTION:** *Never operate a self-priming pump unless the pump is filled with liquid. This can damage the pump.*

13. Do not remove the coverplate, fill port cap, gauge port plug, or drain plug from any overheated pump. Allow pump to cool to air temperature. Check pump temperature before opening coverplate, fill port, gauge port plug or drain plug.
14. Do not operate pump against a closed valve.
15. Check the suction strainer regularly to be sure that it is not clogged.
16. Secure the pump so that it cannot move after it is in its operating position.
17. Never operate pumps in explosive or volatile atmospheres unless they are designed to be operated in these environments.
18. Check the pump thoroughly upon delivery for any shipping damage.
19. Never wear loose clothing around machinery.
20. Always read and keep the Installation, Operation and Maintenance Manual for your pump.
21. When overhauling pumps, never remove or cover warning tags and labels.
22. Be sure that only experienced personnel operate machinery.
23. Before working on pumps with electric motors and panels, LOCK control panel in the OFF position:
  - a) If control panel cannot be locked, pull main fuse or circuit breaker.
  - b) Remove all V-belts.
  - c) Disengage drive coupling.
24. Drain pump completely of water before freezing weather.
25. Do not work in underground pump systems alone or without adequate ventilation

# Terminology

**Bottom loading:** Method of filling a volumetric vessel. Intake is made with a bottom load adapter.

**Capacity, nominal:** The nominal capacity of a field standard test measure or prover is the volume used to designate the measure or prover. The volume is determined by the nominal mark on a graduated upper neck gauge and between the nominal mark on the graduated upper neck gauge and the lower shut off valve or zero mark on a lower neck gauge on a prover.

***NOTE:** The nominal capacity of the prover has be set at the Seraphin<sup>®</sup> facility using Standards that are traceable to the National Institute of Standards and Technology (NIST). If uncertainty values or a higher order of calibration is needed the unit should be sent to a certified calibration laboratory.*

**Cubical coefficient of thermal expansion:** Three dimensional expansion or contraction of a material due to temperature change, expressed °C<sup>-1</sup> or °F<sup>-1</sup>

**Field standard test measure:** A measure that can be hand held and is usually less than 40 Liters (10 Gallons).

**"High Resolution" standard:** A standard with a small diameter neck for improved resolution in reading the meniscus. Generally used in the laboratory as a standard or check standard for measurement control of a primary standard.

**Main flow cessation:** The moment when a full discharge stream "breaks" and becomes a trickle or a drip.

**Prover:** Bottom drain is implied. Filled from the top or bottom loading, depending on intended use. May be free standing, mounted permanently, or on truck or trailer and not hand held.

**Reference temperature:** The temperature at which the measure is intended to contain or to deliver its nominal capacity.

**Sight-flow-indicator:** A fitting with windows to visually observe the flow through a pipe.

**Submerged fill pipe:** Pipe used in top filling to minimize foaming of liquids, such as fuel oil and milk, by discharging the product into the bottom of a prover.

**To contain:** An indication that the standard is adjusted to contain its intended volume when filled from its empty condition at a reference temperature. (the empty condition is "dry" and test measures or provers are generally not used in this condition).

**To deliver:** An indication that the standard is adjusted to deliver its intended volume at a reference temperature. Provers used in a "wet" condition are marked To Deliver.

**Tolerance:** Maximum permissible error. A value fixing the limit of allowable error or departure from the true performance or value.

**Vapor recovery:** A system for entrapping and collecting vapors for return to the tank to prevent expulsion into the atmosphere.

# SAFETY

The use of a test measure or prover standard may involve hazardous materials, operations, and equipment. Seraphin does not purport to address all safety problems associated with the use of each product. It is the responsibility of the user of the standard to establish appropriate safety and health practices and determine the applicability of local and federal regulatory limitations prior to use. Specific safety information is documented in the various trade references (e.g. American Petroleum Institute and Petroleum Equipment Institute).

Commercial liquid measuring devices, tested with provers, are typically used to measure quantities of petroleum products. Petroleum products are known hazardous materials and hazardous wastes. The user is encouraged to obtain Material Safety Data Sheets (MSDS) from the manufacturer of any product encountered. Federal, state and local safety and disposal regulations concerning hazardous materials encountered should be reviewed by the user.

Safety devices and locks should be installed to prevent inadvertent operation of, or unauthorized tampering with, equipment. All automated or power-operated meter proving systems should have emergency manual operators for use during an accident or power failure. Grounding devices should be provided to protect against electrical shock or static discharge in both tank prover and \ electrical instrumentation.

All electrical connections must be explosion proof. All wiring, including low voltage wiring shall meet the requirements of Article 300, 500, Group D, Class 1, Division 1, and 250.45 and/or other applicable articles of the latest edition of the National Electrical Code.

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