

TOTAL CONTROL SYSTEMS

"The Standard of Measurement"



Listing No. MH45225

700-LP Series Rotary Meter Liquefied Petroleum Gas (LPG)

Installation, Operation & Maintenance Manual

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WARNING: This equipment is for service on flammable liquid and gas under pressure and must be installed, operated, maintained, and serviced only by qualified personnel fully trained in all safety procedures and applicable federal, state, local, and industry codes. Failure to follow proper procedures for this class of equipment can result in property damage, serious injury or death from burns, fire, explosion or other hazards.

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Warning Symbols



CAUTION

Follow the warning instructions within the following information to avoid equipment failure, personal injury or death.



TURN POWER OFF

Before performing any maintenance, be sure to turn system power off to avoid any potential electric spark



FLAMMABLE

Flammable liquids and their vapors may cause a fire or explosion if ignited.



EYE PROTECTION

Pressurized systems may cause hazardous leaks and spray that may be dangerous for your eyes. Always wear eye protection around pressurized systems and its hazardous liquids.



INJURY

Wear gloves for protection from hazardous liquids that may cause irritation or burns.



READ

Read and understand all related manuals thoroughly. The Engineering and OIM manuals will provide the knowledge for all systems, maintenance and operation procedures. If you have any questions, please consult the factory.

Receipt & Inspection

Upon receipt of your meter, be sure to inspect the packaging and the flow meter assembly for any damage before signing the receipt for the shipment. If damage is evident or suspected, notify the delivery company and refuse receipt of the shipment.

Meters are individually boxed and are protected with packing material. Each package is identified with the flow meter assembly part number, description, direction of flow and serial number. Verify that the meter Identification Plate reflects the same model, size, and configuration as ordered. Contact your distributor if there is any discrepancy.

Meter assemblies should be handled with methods appropriate for the shape, size and weight involved. Appropriate clothing and shoes should be worn. Transport the meter package to the installation site with appropriate transportation methods, being careful not to damage the flow meter.

Be careful of any loose or protruding staples from the packaging, as they can be very sharp and may potentially cause injury.

If foam has been used to protect the meter, carefully remove top foam layer before attempting to remove the meter assembly from the box. Foam packaging may be formed around the meter assembly making it difficult to remove. If meter is bolted to a wood pallet, remove bolts while being careful not to let the meter tip over when the support has been removed. Do not lift the meter assembly by flex hoses, thermowells, wires, or pulsers. Also, do not lift the meter by putting objects into or through the meter. Removal of the meter assembly from its packaging without adhering to these warnings may cause serious injury or damage to the meter.

The wooden pallets and bases meet the ISPM 15 Guidelines for Regulating Wood Packaging Material in International Trade through the Timber Products Inspection Company (TP #2134).

Every effort has been made to remove the calibration fluid before shipment. All TCS flow meters are plugged and enclosed in a plastic bag. Appropriate precautions should be taken regarding any personal, environmental and material compatibility with the end use system.

Notice

Total Control Systems (TCS) shall not be liable for technical or editorial errors in this manual or omissions from this manual. TCS makes no warranties, express or implied, including the implied warranties of merchantability and fitness for a particular purpose with respect to this manual and, in no event, shall TCS be liable for special or consequential damages including, but not limited to, loss of production, loss of profits, etc.

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TCS does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any TCS product remains solely with the purchaser and end-user.

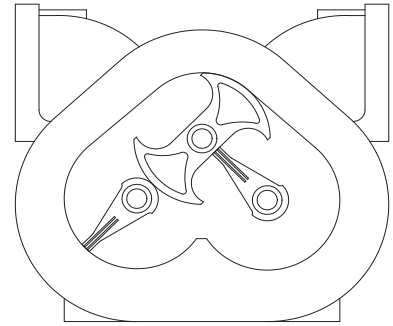
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Flow Meter Identification Plate

The image shows a 'Flow Meter Identification Plate' form. At the top, it features the 'TOTAL CONTROL SYSTEMS' logo and the slogan 'The Standard of Measurement' and 'Made in the USA'. The form includes several fields for recording information: 'MODEL NUMBER', 'PRODUCT', 'SERIAL NUMBER', and 'DATE OF MFG.'. Below these are sections for 'Flow' direction (Gross, Net, Press, Mfg) and 'Velocity'. Technical specifications are listed, including 'ACCURACY CLASS B.5', 'ENVIRONMENTAL CL. C', 'LIQUID TEMP. -100 to 300', and 'PRESS. 0 to 100'. It also contains fields for 'MFG. No.', 'STEP CC.', 'MFG. No.', and 'S/N'. A 'REVISION' section is at the bottom right, with a 'DATE' field and a 'BY' field. The form is designed to be filled out and attached to the flow meter assembly.

Meter Overview

The TCS Model 700-LP series flow meter reflects a simple and efficient design for application on liquefied petroleum gas (LPG). The meter consists of a single fluid chamber that contains a single blocking rotor and two displacement rotors whose rotation is synchronized with mating gears. As the fluid enters the fluid chamber, the blocking rotor is forced to rotate. The displacement rotors, also rotating in conjunction with the blocking rotor help direct the fluid flow through the chamber and to the outlet. The linear flow of the fluid is thus translated into rotary motion in the meter. The output of the meter is picked up from the rotation of the blocking rotor and transmitted to a register or pulse transmitter.



The rotors in the meter are designed to operate at close tolerances to one another and the wall of the fluid chamber. There are slight clearances between the rotors and the chamber wall. Because of this, it is important that the meter be properly applied for the flow rate and operating pressure of the system.

Because the fluid flowing through the meter is redirected only slightly from its natural flow, there is very little pressure drop across the meter, unlike other meters that use multiple measuring chambers.

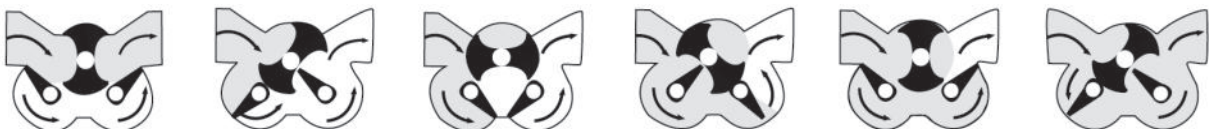
The meter design uses high performance materials for the rotor bearings and journals. Since there is no contact between the rotors and the fluid chamber wall, these critical components have a long life expectancy.

Calibration of the meter involves adjusting the rotation of the output shaft relative to the rotation of the internal rotors of the meter. This is accomplished by changing the settings on an adjuster device. Calibration of the meter is discussed in detail in the section Meter Calibration.

Meter Specifications & Materials of Construction

Flange Connection:	2" NPT Flanges, Standard; 1-1/2" NPT Flanges, Optional. BSPT or Slip Weld flanges available upon request.
Flow Rate:	100 GPM (380 LPM), max flow
Maximum Pressure:	350 PSI (24 BAR)
Working Temperature:	-40 F to 160 F (-40 C to 70 C)
Materials of Construction:	Housing & Rotors: Anodized Aluminum; Bearing Plates: Ni-Resist II; Bearings: Antimony carbon graphite; Gears: Stainless Steel; Seals: UL recognized Buna-N

FLOW ILLUSTRATION



Procedures for LPG Meters

This manual provides warnings intended to inform the owner/operator of the hazards present with this type of equipment. Knowledge of these warnings and avoidance of potential hazards is the sole responsibility of the owner/operator of the equipment. Neglect of that responsibility is not within the control of the manufacturer of this equipment, and the manufacturer bears no responsibility for damages, injuries or deaths resulting from improper or inappropriate use or servicing of the equipment.

WARNING

All internal pressures must be relieved (to zero psi) before inspection, disassembly, or servicing of any part of this meter or metering system. Property damage and serious injury or death from fire or explosion could result from improper use of this equipment, or from maintenance of an improperly depressurized and evacuated meter and metering system. Always follow all federal, state, and local laws, ordinances, and industry codes when installing, operating, or servicing this equipment.

Procedure for Relieving Pressure in LPG Meters

NOTE: All procedures to de-pressurize and purge an LPG tank system must be performed out-of-doors in an open environment free from any ignition sources such as sparks, flames, or heat sources.

1. Close the belly valve of the supply tank.
 2. Close the valve on the vapor return line.
 3. Close the manual valve in the supply line on the inlet side of the meter. If no manual valve exists on the inlet side, consult the system manufacturer for procedures to depressurize the system.
 4. Slowly open the valve/nozzle at the end of the supply line
 5. After product is bled off, close the valve/nozzle at the end of the supply line.
 6. Slowly crack the fitting on top of the differential valve to relieve the product pressure in the system. Product will drain from the meter system.
 7. As product is bleeding from the differential valve, slowly reopen and close the valve/nozzle on the discharge line. Repeat this step until the product stops draining from the differential valve and discharge line valve/nozzle.
 8. Leave the discharge line valve/nozzle open while working on the system.
-

System Recommendations



Meter Selection

The flow meter must be carefully chosen from the Meter Selection factors in the Engineering Manual. The meter must be selected based on the operating system and product characteristics. System variables include flow rate, temperature and pressure. The product characteristics include the material compatibility, lubricity, viscosity, suspensions, pH, and whether the product can congeal, crystallize or leave a dry film. Failure to select the correct flow meter may result in system failure or serious injury.

Air or Vapor Elimination

In any system where the tank may be completely drained or multiple products manifold into one metering system, the possibility of air or vapor being present increases. The solution is an air or vapor eliminator located before the flow meter to vent the air or vapor from the system before it can be measured. Air or vapor elimination is required for all weights and measures regulatory approvals in custody transfer applications.

Control Valves

Safety and isolation valves should be used throughout the metering system. In any pumping system where there is one (1) pump and multiple flow meters, a digital or hydro-mechanical Rate-of-Flow control valve must be used at each flow meter to prevent over speeding of the flow meters.

Best Plumbing Configuration

- 1) Flow meter must have secure mounting to a riser or foundation
- 2) The inlet and outlet piping must be securely supported, in a manner to not allow pipe stress on flow meter.
- 3) System should be designed to keep the flow meter full of liquid at all times.
- 4) System piping should have full 2" pipe diameter throughout the metering system to allow for minimal pressure loss.
- 5) The pipe should be laid out as straight as possible to reduce pressure loss from flow restrictions.
- 6) The meter and piping must be installed in such a way as to avoid accidental draining of the meter. Meter inlet and outlet should be lower than the associated system plumbing (sump position).
- 7) It is not necessary for the vapor eliminator to be installed directly to the meter. It can be installed upstream from the meter. For effective operation of the vapor eliminator, it should be mounted between the meter and any valves, tees or any other potential places where air or vapor may enter the system.
- 8) The metering system should include a means for calibration.

Protection From Debris

On new installations, care must be taken to protect the meter from damage during start-up. It is recommended to put a strainer before the meter. Damage may result from the passage through the meter of dirt, sand, welding slag or spatter, thread cuttings, rust, etc. The insertion of a spool (a flanged length of pipe equal in length to the meter and accessories attached to the meter) in place of the meter until the system is flushed, temporarily bypassing the plumbing around the meter, will also protect the meter from debris. Once the system has run "clean" for a period of time the meter may be reinstalled or protective devices removed.

Thermal Expansion

Most liquids will expand and contract with temperature. This is particularly true for LPG. In any system where there is a chance for liquid to be captured between closed valves without relief, thermal expansion will likely occur and create dangerously high pressures within the system. Care should be taken in designing the system in which thermal shock may occur by implementing Pressure Relief Valves or Thermal Expansion Joints in the system design.

System Recommendations (Continued)



Thermal Shock

The system operating temperature will expand or contract the metals within the flow meter. Systems that have sudden or immediate temperature increases of 68 F (20 C) degrees or more, will require clearance rotors. Clearance rotors will be necessary to eliminate the effect of immediate expansion of the rotors vs. meter body, caused by thermal shock.

Hydraulic Shock (Water Hammer)

Hydraulic shock is a rise in pressure, which happens when an operating system has immediate change in direction of flow such as a fast valve closure at a high operating flow rate. Hydraulic shock can damage any item in the way of the product flow such as internal parts of the meter, valves, and pump. System design and improper operating procedures will amplify this problem. The use of 2-stage preset control valves or surge suppressing bladders or risers will help reduce or eliminate this problem.

To compute the shock pressure when a valve is closed quickly (recommended to be less than 6 PSI):

$$\text{Shock Pressure (PSI)} = 63 \times \text{Velocity (FPS)}$$

In order to eliminate hydraulic shock, you need to slow down the valve closure rate. The time required to close the valve so that the line pressure will not exceed the normal pressure at no flow is:

$$\text{Time (seconds)} = \frac{0.027 \times L \times V}{N - F}$$

- V = Velocity in Feet/Seconds
- L = Length of pipe before the valve in feet
- N = Line pressure at no flow
- F = Line pressure at full flow

Calibration

The meter shall be tested and calibrated with the product it is intended to measure when installed. Total Control Systems shall not be responsible for loss of product or any damages resulting from the end user's failure to test this meter to insure proper calibration. Every 700 Series meter is tested and calibrated at the factory to prove it is calibratable in your system. It is the owner's responsibility to report this device to the local Weights and Measures officials for their inspection before the meter is put to use.

Start up Recommendations



WARNING

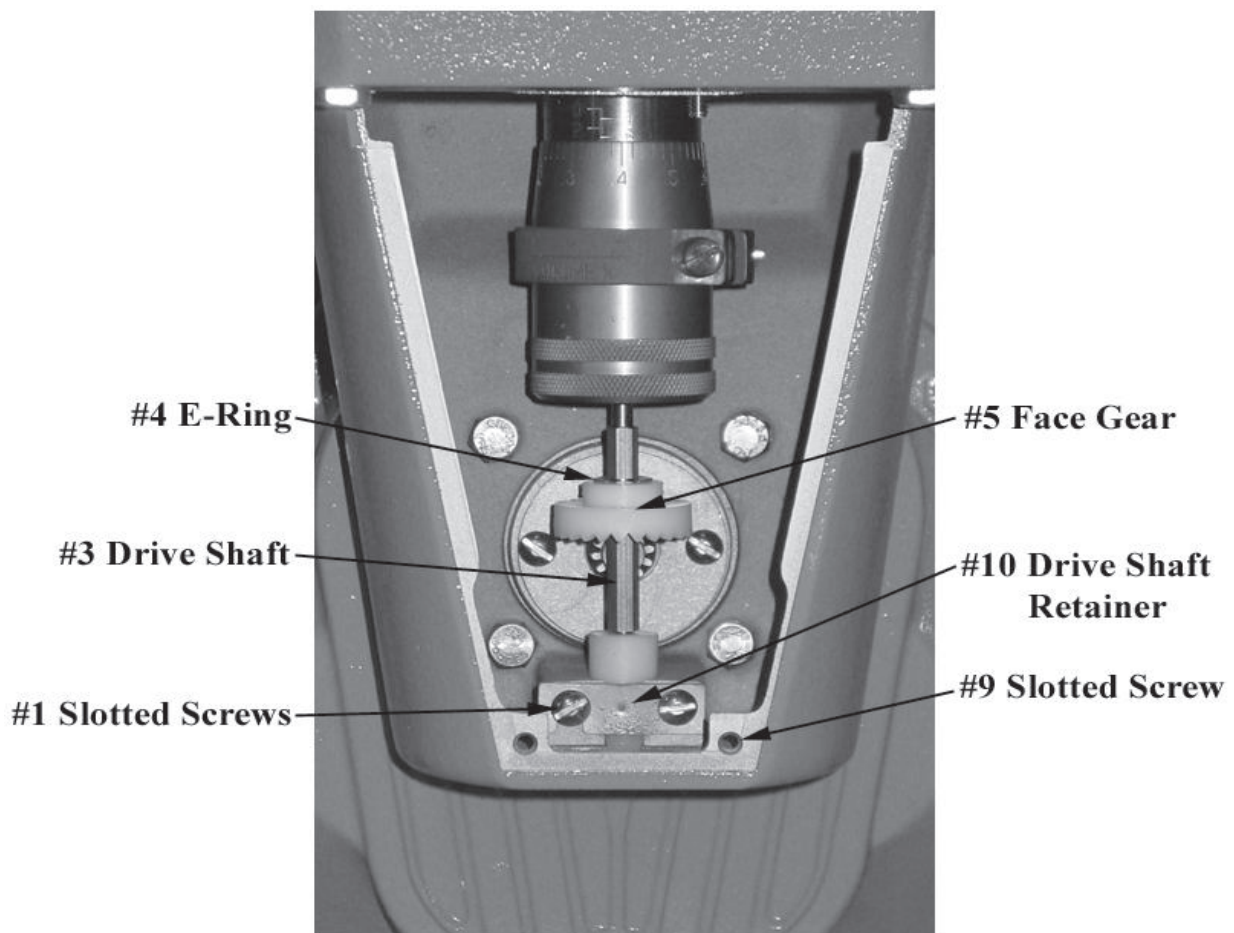
Test equipment should be grounded to prevent a possible spark. Test area should have no ignition source. Operators should wear personal protection and prevent any product exposure and environmental issues.

Start-up instruction for new installations or after maintenance and repairs:

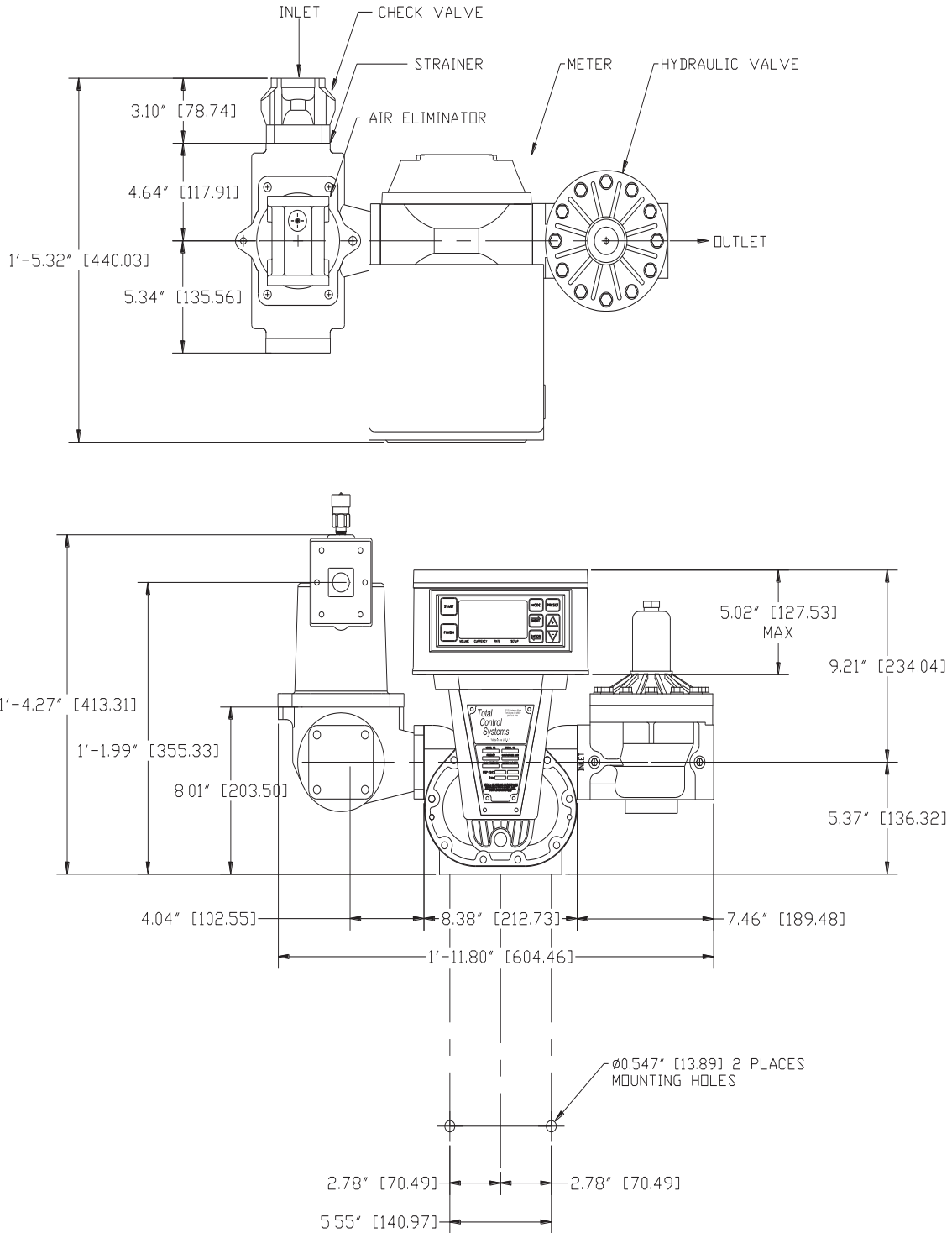
- 1) Only properly trained personal should design, install, or operate metering system.
- 2) Remove plastic threaded plugs placed in meter for shipping protection. They are not to be used in meter system because of the PVC plugs low rated pressure, compatibility, and sealing issues.
- 3) Place the meter in an area with ample workspace, secure from vibration, and pipe line stress. Mount and bolt down on to a fixed stand or platform. This prevents meter stress, which will cause leakage and metal fatigue.
- 4) Apply thread sealing compound and gasket materials that are compatible with product.
- 5) Do not weld to meter or accessories. This will weaken housings and cause o-ring and casting leaks and potentially distort the critical tolerances within the flow meter.
- 6) Always wear safety protection equipment such as goggles, steel toed shoes, gloves and full body clothing.
- 7) Be sure to install a pressure relief valve or expansion joint in the system to protect against thermal expansion.
- 8) Make sure all system components and meter assembly bolts are properly secured and tightened.
- 9) Make sure the vapor eliminator vapor release is properly vented and piped back to the supply tank.
- 10) Make sure electrical connections are properly installed and start/stop switches are off and locked-out.
- 11) Ensure a flooded suction to the pump so that the system will not starve or cavitate the pump.
- 12) Ensure slow flooding of system. Start up system with all shut off valves in the closed position. When a pump is turned on and a valve opened in a new, dry system, tremendous liquid and air pressure can be built up in the piping and forced through the meter. The high pressure and volume of air causes the meter to operate more quickly than normal. When product reaches the meter, there is an abrupt slowing of the meter rotors, which could cause damage to the register, rotor shafts, packing gear and/or blade, timing gears and other components. *The recommended method of starting any system is to flood the piping gradually. This allows product to slowly force the air or vapor from the entire system.*
- 13) When operating the meter with accessories, valves should be opened slowly to avoid a pressure surge that can damage the meter or air eliminator. System pressures should be maintained below 350 PSI (24 BAR).
- 14) Custody transfer metering systems must be calibrated by a regulatory agency before product can be sold off the meter. Contact your local authorities for proper calibration.
- 15) Strainers should be cleaned frequently or have a maintenance schedule. This will ensure a clean system and long service life.

Direction of Flow

The meter is set up at the factory for left to right flow. To change the meter to right to left flow, begin by removing the screws (#9 on the Meter Assembly Breakdown) and the adjuster cover plate (#7) on the front of the meter. Remove both the screws (#1), the drive shaft retainer (#10), the drive shaft (#3), the e-ring (#4) and the face gear (#5). Reinstall the gear on the shaft with the gear teeth facing up. Snap the e-ring back into place to hold the gear in place. Reinstall the shaft, mating the face gear with the drive gear of the packing capsule assembly. Reinstall the screw and cover plate. The meter will now be set up for right to left flow. See Page 14 for a parts breakdown of entire meter assembly.



Meter Dimensions in Inches (Millimeters)



Meter Calibration



The method of proving should be selected, and necessary provisions made, during the design stage of the installation. Use only an accurate, specifically and scientifically designed prover. No other kind should be used. All provers should be checked periodically for accuracy. Weights and Measures officials have been very cooperative in giving assistance in checking provers.

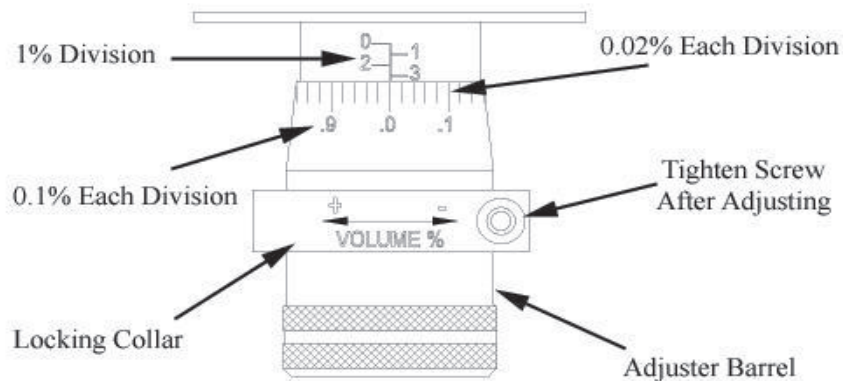
Note: The prover capacity should be equal to at least one minute's flow through the meter at its maximum rate. The prover should be set level, using the levels provided on the prover, or separate ones. This insures consistent results when moving the prover from meter to meter. A detailed description of LP Gas test procedures may be found in the NCWM Course 305 "Liquefied Petroleum Gas Liquid Measuring Devices". Specifications and Accuracy Tolerances are contained in Handbook 44. Tolerances are shown below.

Indication of Device	Tolerance		
	Acceptance Test	Maintenance Test	Special Test
Wholesale or Vehicle	0.6%	1.0%	1.0%

Calibration Adjustment

One complete turn of the adjuster barrel is equal to 1 gallon in 100 gallons or 1% of delivered volume. The adjuster body will show divisions of 1%, while the adjuster barrel has divisions of 0.02%. For volumes other than 100 gallons, the following formula may be used to calculate the Adjuster percent to increase or decrease prover volume.

$$\frac{\text{Volume on Prover minus Volume on Meter Counter}}{\text{Volume on Meter Counter}}$$



Maintenance



WARNING

Test equipment should be grounded to prevent a possible spark. Test area should have no ignition source. Operators should wear personal protection and prevent any product exposure and environmental issues.

- 1). Keeping accurate maintenance and calibration records can be an excellent tool in determining the frequency of inspection or maintenance for a system. As the meter wears, the calibration will be affected and require adjustment. A personality profile can be created for each meter to help guide in a maintenance schedule.
- 2). Great care should be utilized in the maintenance of the metering system. Personal safety protection, environmental hazards, and government regulations need to be the foremost priority. Only fully trained personnel should be involved in maintenance. Failure to use original TCS replacement parts will void any Weights & Measures approvals and risk damage to the meter system.
- 3). ALWAYS RELIEVE INTERNAL SYSTEM PRESSURE TO ZERO BEFORE DISASSEMBLY OR INSPECTION.
- 4). SERIOUS INJURY OR DEATH FROM FIRE OR EXPLOSION COULD RESULT FROM MAINTENANCE OF AN IMPROPERLY DEPRESSURIZED AND EVACUATED SYSTEM.
- 5). Total Control Systems flow meters and accessories are often used with LPG, petroleum, solvents, chemicals, and other liquids that may be explosive, extremely flammable, very toxic, oxidizing, and corrosive. Severe injury or fatalities may result if appropriate safety precautions are not followed.
- 6). Before replacing or cleaning filter/strainer screen, the electrical system must be turned off. Product needs to be drained from system. Collect all product and return to storage or dispose of properly. Replace all drain plugs that were removed. Personal safety protection must be worn at this time. Make sure there is adequate ventilation in the area. The metering system will not completely drain so make sure you collect extra product when you remove the strainer cover. Clean the screen once a week, or more often if there is a lot of sediment in the system. Make sure there is no ignition source and the system is grounded. Replace all plugs that were removed for drainage.
- 7). The metering system is heavy and awkward so take precaution to handle it properly.
- 8). Do not use force to disassemble or use a screwdriver to pry open any part of the metering system. Have the proper tools available before trying to repair the meter system. Be careful of the parts as they can be sharp and heavy. Do not drop housing or rotors as they can cause injury and can destroy the parts. Be careful when inspecting and turning the timing gears and rotors as they can pinch fingers, turn slowly to verify smooth operation.
- 9). When inspecting the spring loaded preset valves do not place anything inside the housing, as the action of the valve will pinch this object when the valve closes.

Maintenance



WARNING

Test equipment should be grounded to prevent a possible spark. Test area should have no ignition source. Operators should wear personal protection and prevent any product exposure and environmental issues.

- 10). When removing gaskets or o-rings, carefully check for damage or corrosion. Any cracked, rough, worn, elongated or swollen o-rings need to be replaced. When replacing the o-rings, place grease along the inside of the o-ring groove or completely around the o-ring to help the o-ring stay in the o-ring groove during assembly. If o-ring is pinched or not in the o-ring groove, the meter system will leak and cause serious problems to the environment and equipment. Collect all replaced parts and dispose of properly. Do not weld any part of the meter system or accessories as this will weaken the part and allow for leaks
- 11). All bolts and screws need to be coated with anti-seize. Then follow the torque specifications for each flow meter.
- 12). Recommended levels of maintenance and inspection will depend upon the system variables, such as the products being measured, their corrosiveness, system pressure requirements, government or company regulations, and age of metering system. If hydrostatic testing is required, the system pressure should not exceed 1.5 times the marked meter pressure. It is not recommended to pneumatically test the meter system at anytime.
- 13). If any component of the meter system is removed from the system, it should be thoroughly flushed with a compatible liquid. After this is done, immediately refill the meter or accessory with a compatible liquid to prevent corrosion and water build up.

Storage Instructions

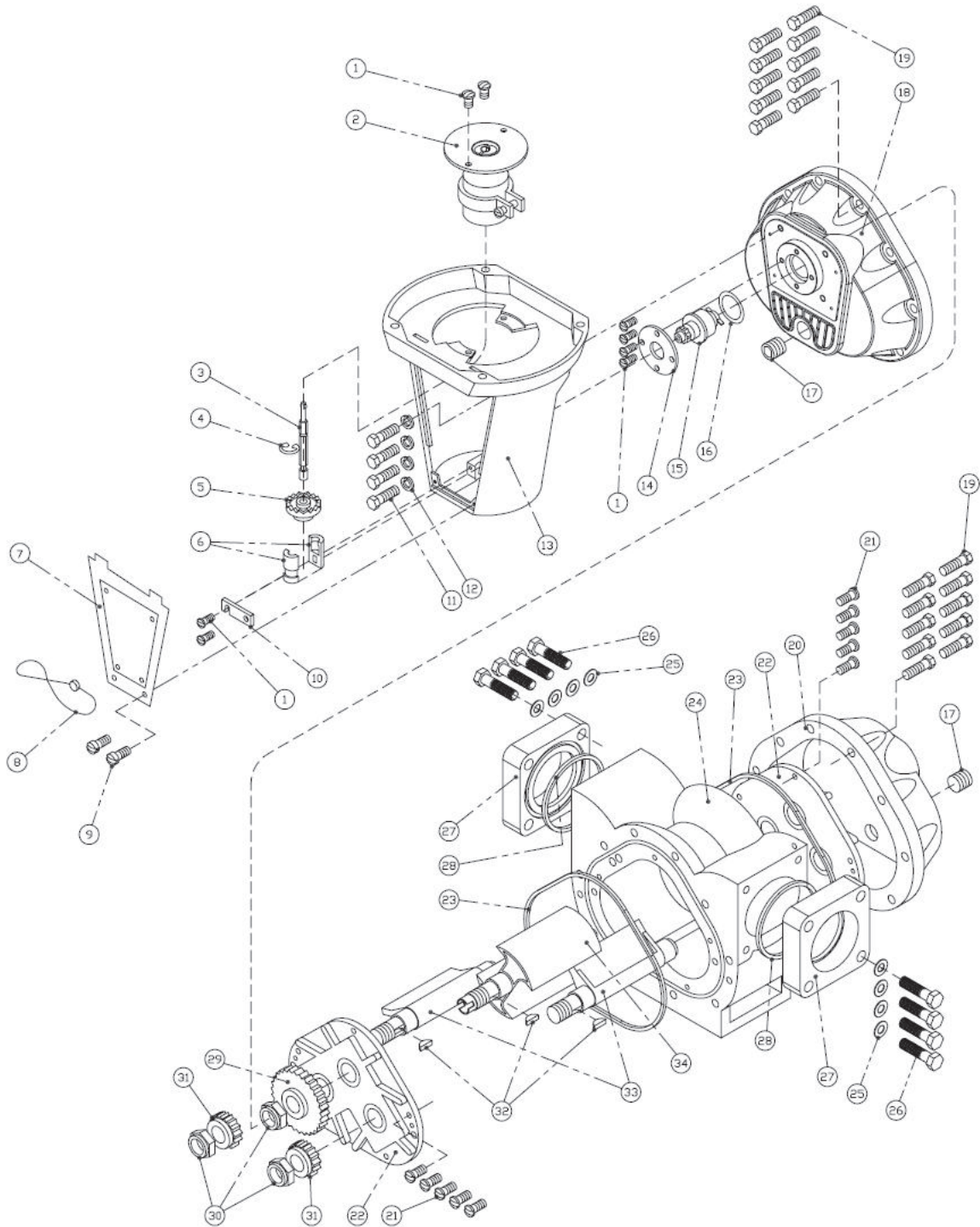


Short periods of non-use of the meter (a week or less) should present no problem, provided that the meter remains full of product. For long periods of non-use, such as winter storage, the following procedure is recommended. Before long-term storage, a good practice is calibration of the meter to determine that it is functioning properly.

- 1). To store the meter when it is left in line, flush the system with clean water until 70-80 gallons of water have gone through the meter.
- 2). Pump a 50% anti-freeze / 50% water solution through the entire system (100% RV antifreeze may be used instead). With the pump running, shut off a valve downstream from the meter, making sure that anti-freeze solution is present at that point. Then close an upstream valve, such that the meter remains full of anti-freeze solution.
- 3). Remove the register from the meter, and lubricate the drive coupling shaft. After lubrication, reassemble the register onto the meter.

When starting the system after a period of storage, check the meter's calibration as detailed earlier in the service manual.

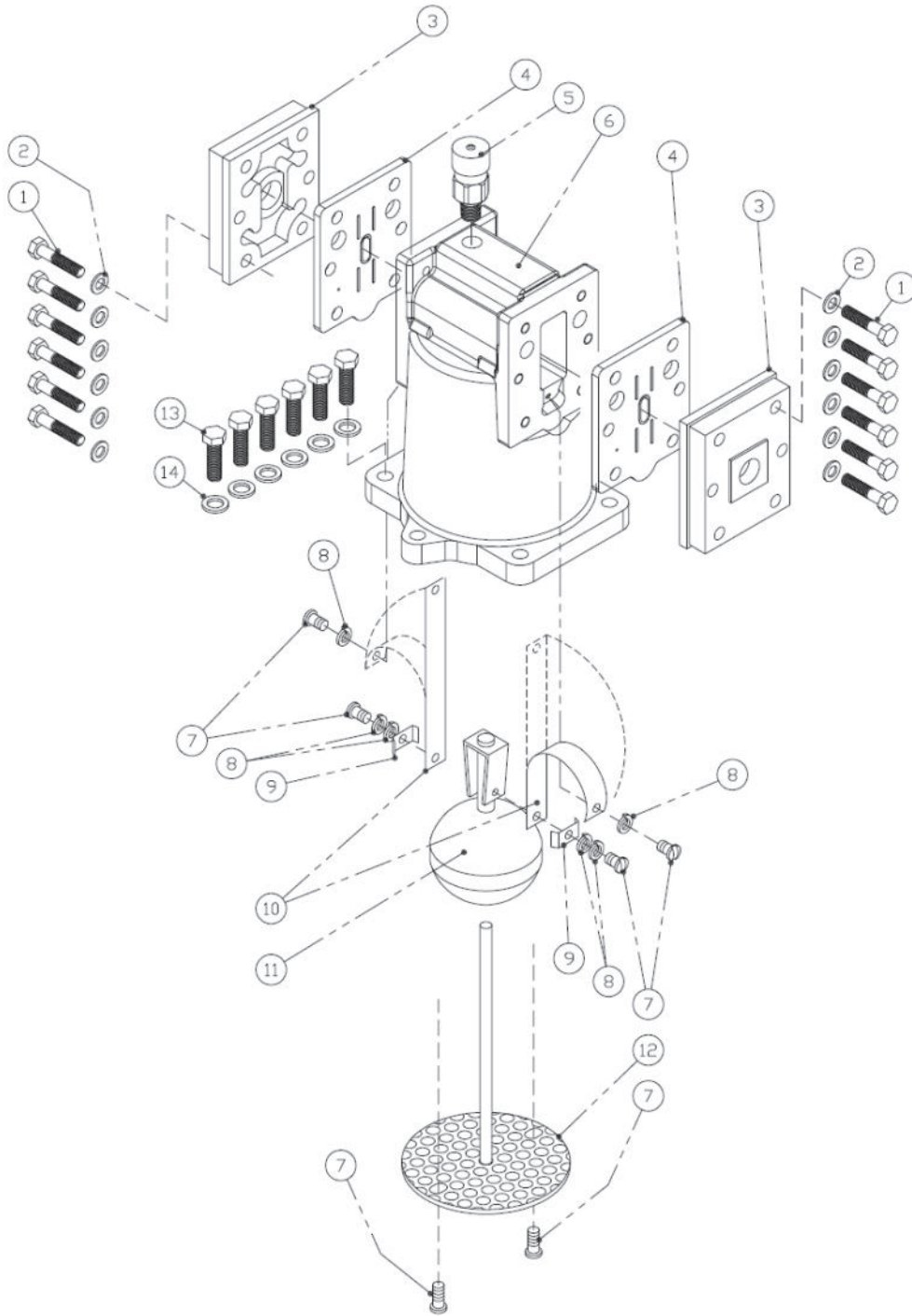
700-20-LP Meter Assembly



700-20-LP Meter Assembly

Item	Description	Qty	700-20-LP
1	10-24 x 1/2 Rd Hd Slotted Machine Screw	8	1-128279
2	Adjuster Assembly	1	700100
3	Drive Shaft	1	700019
4	E-Ring	1	700016
5	Face Gear 24T	1	700018
6	Drive Bushing	2	700020
7	Register Support Cover	1	700029
8	Seal Wire and Seal	1	1-118849
9	10-24 Slotted Drilled Machine Screw	2	700042D
10	Drive Shaft Retainer	1	700022
11	1/4-20 x 3/4 Hex Head Bolt	4	700040
12	1/4" Split Lockwasher	4	700071
13	Register Support	1	700200
14	Packing Retaining Plate	1	700015
15	Packing Capsule	1	700180
16	O-Ring	1	700049
17	3/8" Plug	2	700064
18	Front Cover	1	702505
19	5/16-18 x 1 Grade 8 Bolt	20	702027
20	Rear Cover	1	702555
21	10-24 x 3/4 Rd Hd Slotted	10	702014
22	Bearing Plate w/ AT Carbon Bearings	2	702225
23	Cover Gasket	2	702028
24	LP Meter Housing Assembly	1	702115
25	Special Spacer	8	702018
26	3/8-16 x 1-1/2 Grade 8 Bolt	8	702026
27	2" NPT Steel Flange	2	702613
28	2" Flange Quad Ring	2	702025
29	Blk Rotor Gear Sintered	1	702351
30	Rotor Lock Nut	3	702010
31	Disp Rotor Gear Sintered	2	702451
32	Rotor Key	3	702008
33	Disp Rotor Assembly	2	702405
34	Blk Rotor Assembly	1	702305

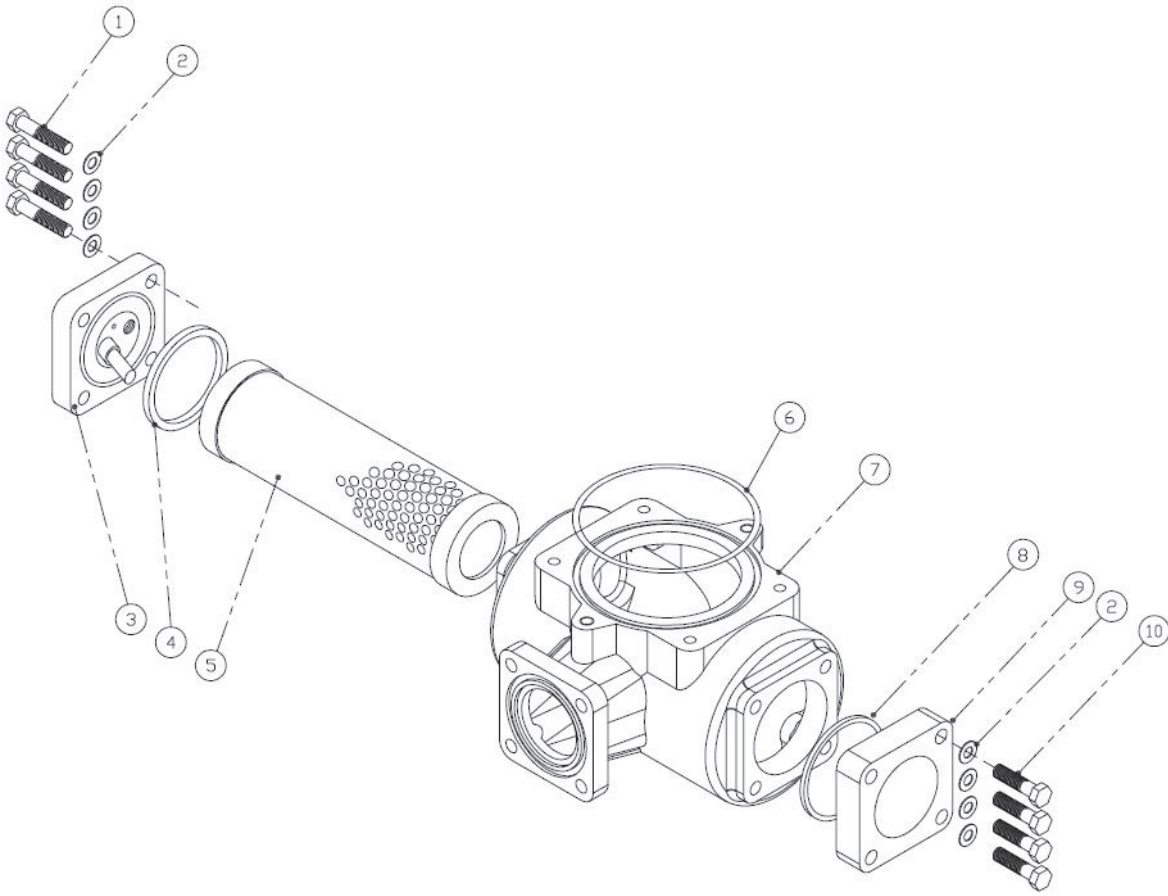
730-20-LP Vapor Eliminator Assembly



730-20-LP Vapor Eliminator Assembly

Item	Description	Qty	730-20-LP
1	5/16-18 x 1-1/2 Grade 8 Bolt	12	740056
2	Ring Washer SM OD	12	740051
3	Outlet Cover, LPG	2	740115
4	Valve Plate, Nitrite	2	740206
5	1/4" Hydro Relief Valve	1	740110
6	LPG Air Eliminator Housing	1	740060
7	8-32 x 1/4 Phillip Pan Head	6	740030
8	# 8 Split Lockwasher	6	740017
9	Retaining Clip	2	740012
10	Reed Air Eliminator	2	740007
11	Float and Stop Assembly	1	740013
12	Diffuser/Shaft Assembly	1	740035
13	3/8-16 x 1-1/4 Grade 8 Bolt	6	700063
14	Special Spacer	6	702018

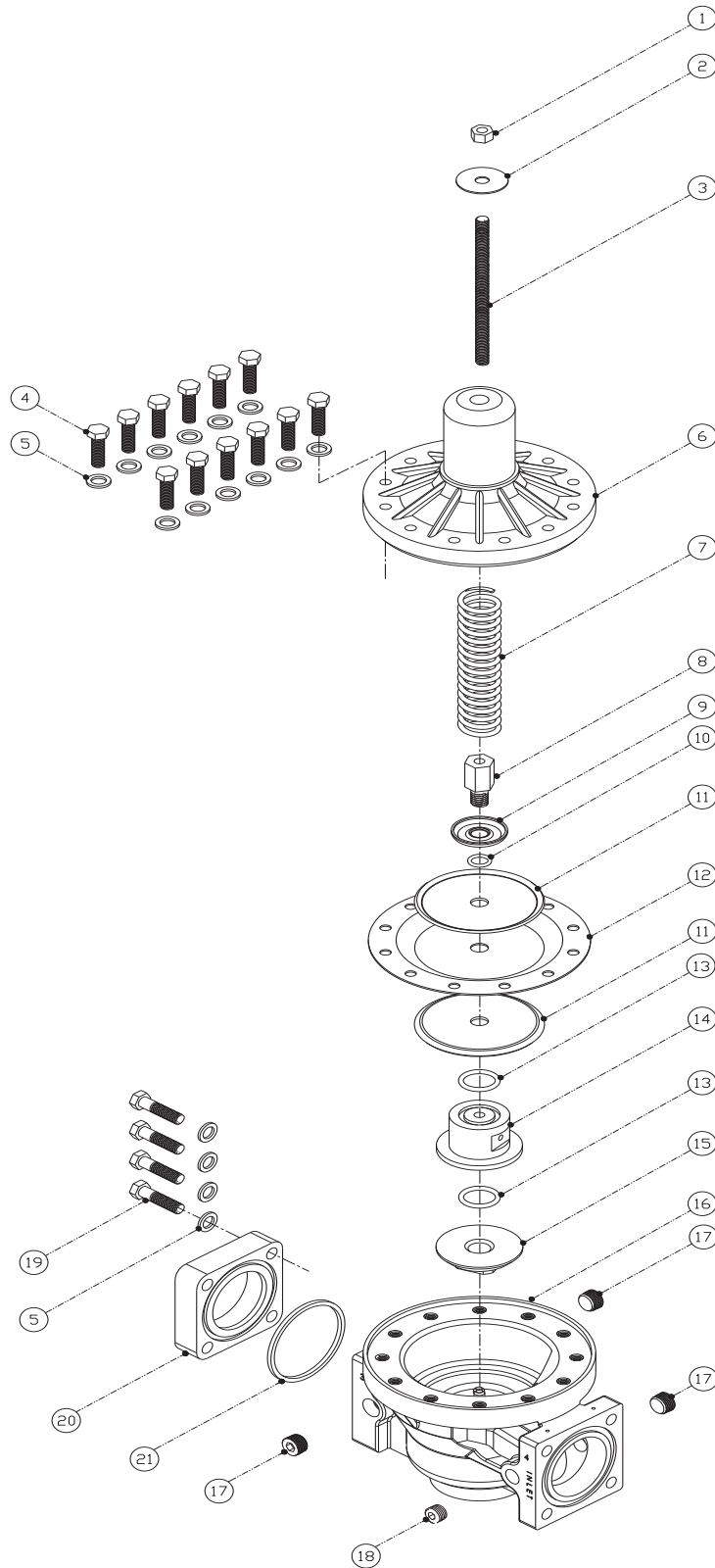
720-20-LP Strainer Assembly



720-20-LP Strainer Assembly

Item	Description	Qty	720-20-LP
1	3/8-16 x 1-3/4 Grade 8 Bolt	4	742026
2	Special Spacer	8	702018
3	3 Port Basket Cover	1	742355
4	Seal Ring	1	742024
5	Strainer Basket 100 Mesh	1	742025
6	Top Seal	1	740053
7	Aluminum Strainer Housing	1	742081
8	Flange Quad Ring	1	702025
9	2" NPT Steel Flange	1	702613
10	3/8-16 x 1-1/2 Grade 8 Bolt	4	702026

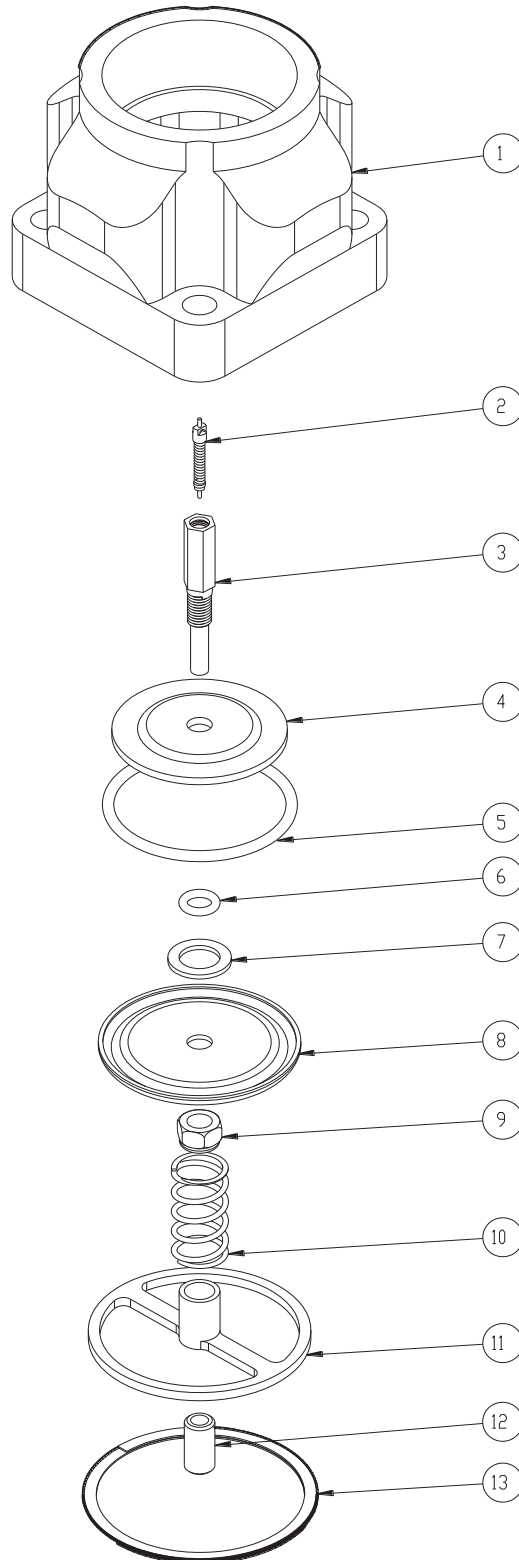
757-20-LP Differential Valve Assembly



757-20-LP Differential Valve Assembly

Item	Description	Qty	757-20-LP
1	3/8-16 Nut	1	757070
2	3/8" Fender Washer	1	757065
3	3/8-16 Threaded Rod	1	757060
4	3/8-16 x 1-1/4 Grade 8 Bolt	12	700063
5	Special Spacer	16	702018
6	Valve Cap	1	757035
7	Valve Spring	1	757055
8	Diaphragm Adapter	1	757010
9	Spring Retainer	1	757005
10	O-Ring	1	757025
11	Diaphragm Backup Plate	2	757001
12	Diaphragm	1	757040
13	O-Ring	2	757020
14	Diaphragm Poppet	1	757030
15	Seat	1	757015
16	Valve Base Assembly	1	757100
17	3/8" Internal Hex Plug	2	700064
18	1/4" Internal Hex Plug	2	757075
19	3/8-16 X 1-1/2 Grade 8 Bolt	4	702026
20	2" NPT Steel Flange	1	702613
21	2" Flange Quad Ring	1	702025

782-20-LP In-Line Check Assembly



782-20-LP In-Line Check Assembly

Item	Description	Qty	782-20-LP
1	Housing	1	782020
2	Pressure Relief Valve	1	782028
3	Valve Housing	1	782025
4	Piston Ring	1	782030
5	O-ring Main Seal	1	782060
6	O-ring	1	782065
7	Special Spacer	1	782080
8	O-ring Retainer	1	782040
9	5/16-18 Nylock Nut	1	782085
10	Spring	1	782050
11	Spring Holder	1	782055
12	Bearing Sleeve	1	782075
13	Retaining Ring	1	782070

Torque Specifications

700-20-LP METER ASSEMBLY

Part Number & Description	Tool	Bolt Size & Material	Foot Lbs. (+/- 10%)		Newton Meter (+/- 10%)	
			Dry	Lubricated	Dry	Lubricated
Cover Screws	1/2" hex wrench/socket	TCS 700026 5/16-18 SAE Grade 8	29	23	39	31
Counter Support Screws	7/16" hex wrench/socket	TCS 700040 1/4-20 18-8 SS	6.3	5.0	8.5	6.8
Bearing Plate Screws	slotted screwdriver	TCS 702014 10-24 316 SS	1.9	1.5	2.6	2.0
Dust Cover Screws	slotted screwdriver	TCS 1-128279 10-24 316 SS	1.9	1.5	2.6	2.0
Rotor Gear Nut	15/16" hex wrench/socket	TCS 702010 5/8-18 316 SS	31	25	42	34

740-20-LP VAPOR ELIMINATOR/STRAINER ASSEMBLY

Part Number & Description	Tool	Bolt Size & Material	Foot Lbs. (+/- 10%)		Newton Meter (+/- 10%)	
			Dry	Lubricated	Dry	Lubricated
Cover Plate Screws	1/2" hex wrench/socket	TCS 740056 5/16-18 SAE Grade 8	20	16	27	22
Cap Screws	9/16" hex wrench/socket	TCS 700063 3/8-16 SAE Grade 8	36	29	49	39
Reed Screws	Phillips screwdriver	TCS 740030 8-32 316 SS	1.8	1.4	2.4	1.9
Diffuser Screws	Phillips screwdriver	TCS 740030 8-32 316 SS	1.8	1.4	2.4	1.9
Basket Cover	9/16" hex wrench/socket	TCS 700063 3/8-16 SAE Grade 8	36	29	49	39

Torque Specifications, continued

757-20-LP DIFFERENTIAL VALVE ASSEMBLY

Part Number & Description	Tool	Bolt Size & Material	Foot Lbs. (+/- 10%)		Newton Meter (+/- 10%)	
			Dry	Lubricated	Dry	Lubricated
Cap Screws	9/16" hex wrench/socket	TCS 700063 3/8-16 SAE Grade 8	36	29	49	39
Diaphragm Adapter	3/4" hex wrench	TCS 757010 1/2-13 Steel	21	17	28	23
Valve Seat	1-1/4" Hex wrench	TCS 757015 3/4-16 Delrin	21	17	28	23
Valve Plug	5/16" Allen wrench	TCS 757075 3/8"-NPT Forged Steel	<ol style="list-style-type: none"> 1. Lubricate with Loctite 567 2. Tighten by hand 3. Tighten 1-1/2 to 2 turns with wrench 			

782-20-LP IN-LINE CHECK VALVE ASSEMBLY

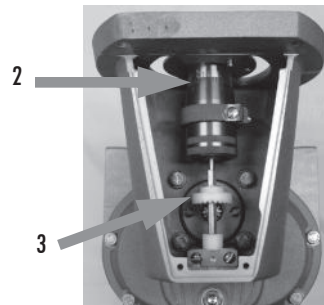
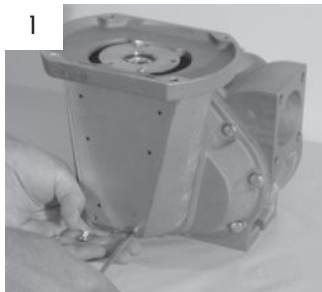
Part Number & Description	Tool	Bolt Size & Material	Foot Lbs. (+/- 10%)		Newton Meter (+/- 10%)	
			Dry	Lubricated	Dry	Lubricated
Cover Plate Screws	1/2" hex wrench/socket	TCS 740056 5/16-18 SAE Grade 8	20	16	27	22

Drive Components



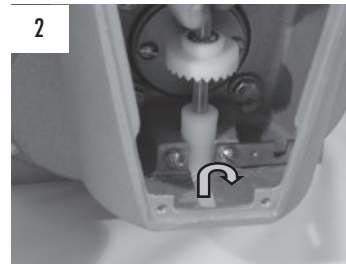
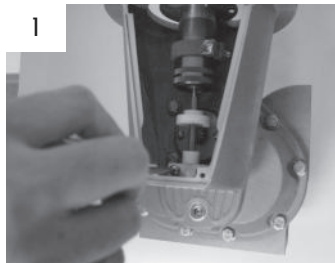
Removing the Dust Cover

- 1) Cut dust cover seal. Remove the dust cover screws with a standard flathead screwdriver.
- 2) Remove the dust cover, and note the setting on the micrometer.
- 3) Note the position of the drive gear (either above or below the packing gland pinion).

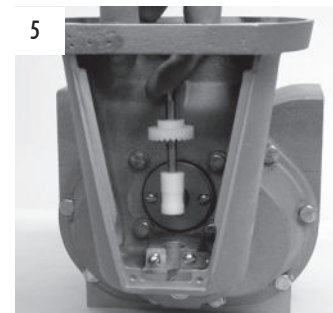
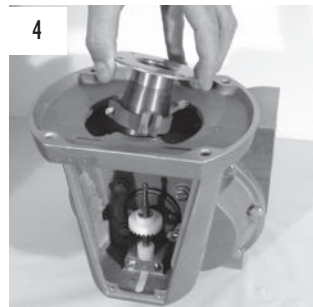
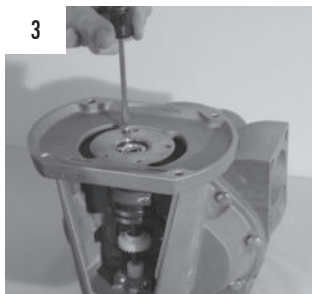


Removing the Adjuster

- 1) Loosen the retaining screws using a standard flathead screwdriver.
- 2) Slide the retaining clip up and over to the left side.



- 3) From the top, remove the screws to the adjuster plate.
- 4) Lift adjuster out of the counter adapter.
- 5) Remove the adjuster drive assembly.



Disassembly of Meter

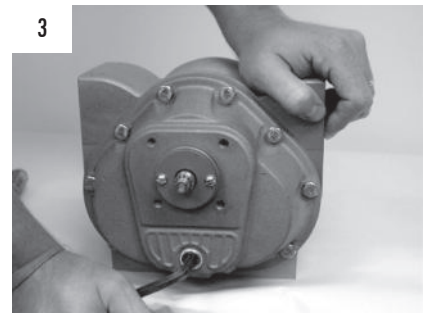
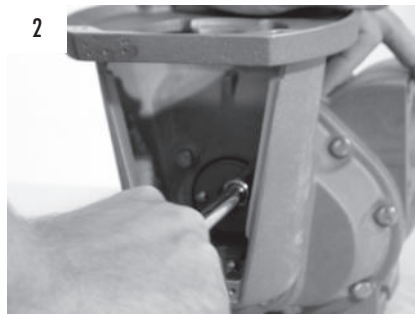
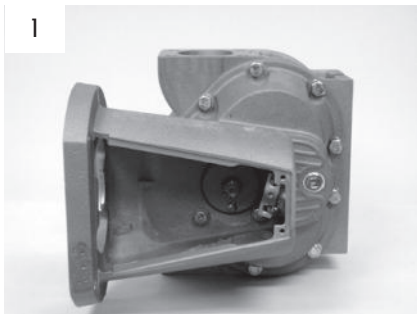


WARNING

All internal pressure must be relieved to ZERO (0) pressure before beginning disassembly of meter or components

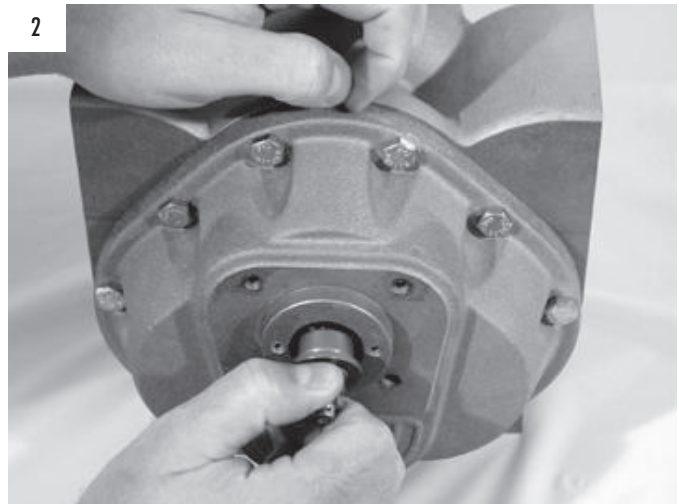
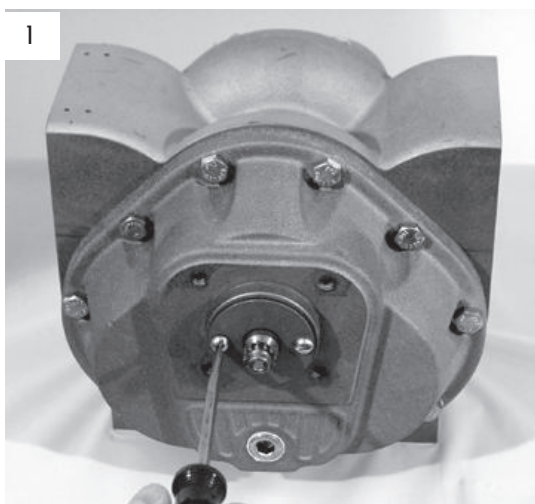
Draining Meter & Removing Counter Support

- 1) Drain the meter by turning it on either the inlet or outlet side.
- 2) Remove the counter bracket screws with a hex wrench or socket driver.
- 3) Remove the drain plugs on the front and rear covers using an allen wrench. Allow more fluid to drain from the meter.



Removing Packing Capsule

- 1) Remove the retaining plate using a standard flathead screwdriver.
- 2) Pull out the packing gland from the meter.

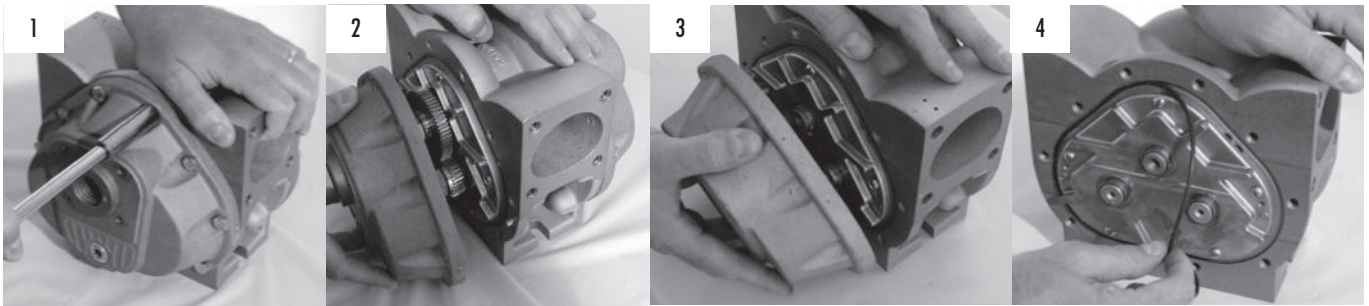


Disassembly of Meter (Continued)



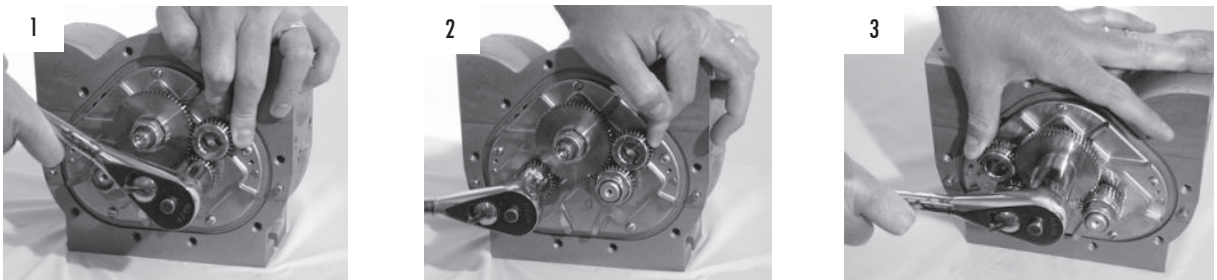
Front & Rear Cover

- 1) Remove the screws on the front cover using a socket or box wrench. Remove screws in a criss-cross fashion.
- 2) Remove front cover.
- 3) Remove the screws on the back and remove rear cover.
- 4) Remove the O-ring from both sides of the housing



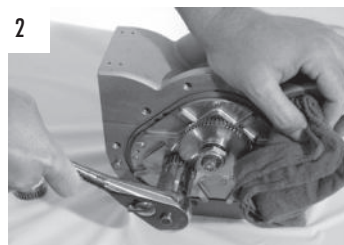
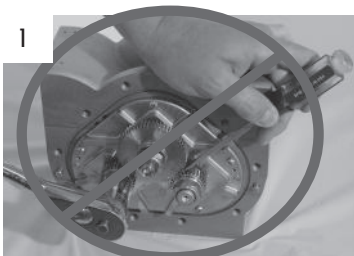
Rotor Gears

- 1) Using a spare displacement rotor gear, place it between the rotor and blocking gear on the meter.
- 2) Use the socket or box wrench to loosen the right rotor gear lock nut. Repeat for the left rotor gear lock nut.
- 3) Move the spare displacement rotor gear to the other side and loosen the blocking rotor lock nut.



Special Notes

- 1) DO NOT remove rotor gears using a screwdriver! This could damage the rotor gear and create potential wear problems within the measuring chamber.
- 2) If a spare rotor gear is not available, then use shop rag between gear teeth.

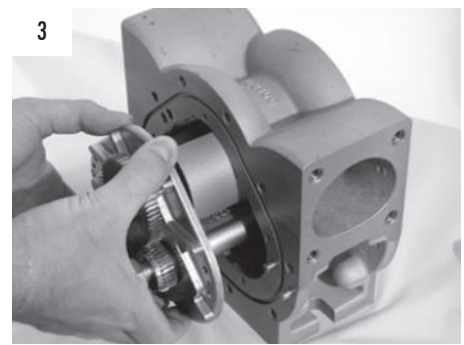
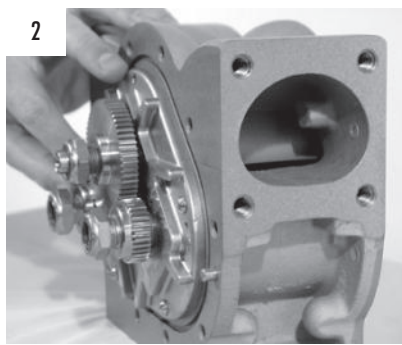
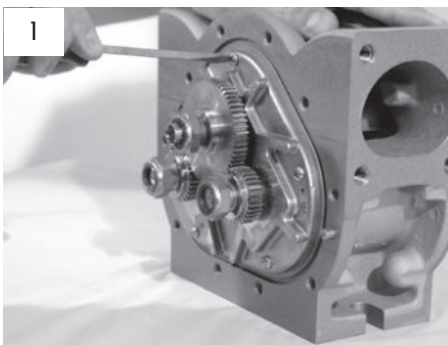


Disassembly of Meter (Continued)



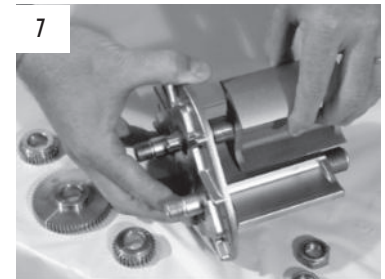
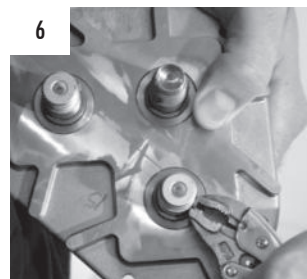
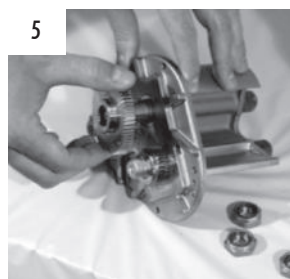
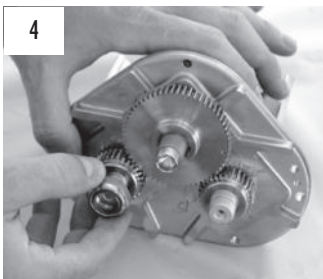
Removing Bearing Plate

- 1) Remove the bearing plate retaining screws with a standard flathead screwdriver.
- 2) To remove bearing plate & rotors, insert a screwdriver into the notches near the dowel pins.
- 3) Gently pry the bearing plate off the dowel pins and slide out the bearing plate and rotors from the housing.



Removing Lock Nuts & Rotors

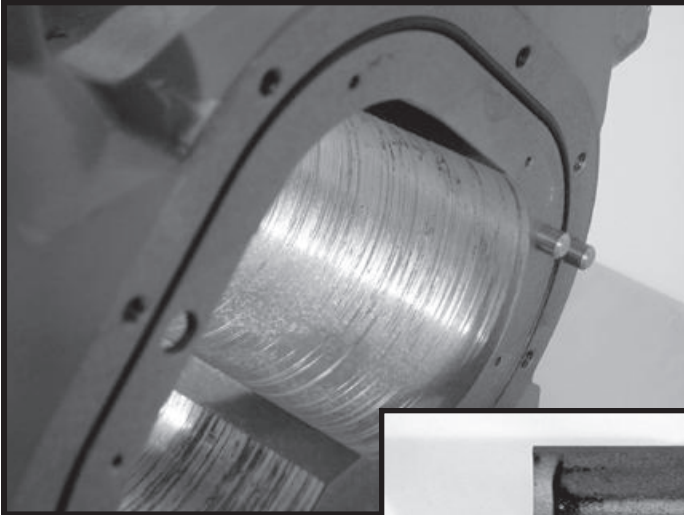
- 4) Remove rotor lock nuts from each gear.
- 5) Pull gears off of rotor shaft.
- 6) Remove rotor key using pliers (this might not be necessary as rotor may slide right out of bearing plate).
- 7) Remove rotors from bearing plate.



Inspection of Parts

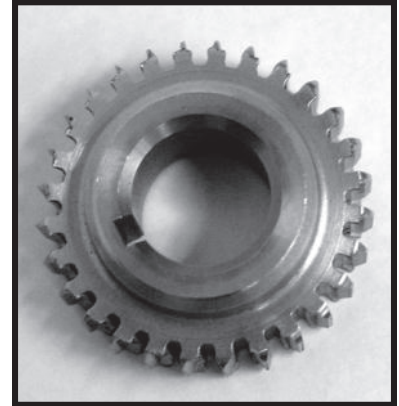
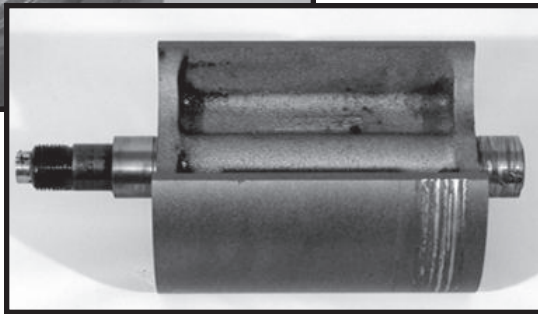


- 1) Inspect the surfaces of rotors, bearing plates, meter housing and gear teeth for any damage or wear.
- 2) Replace parts as needed.



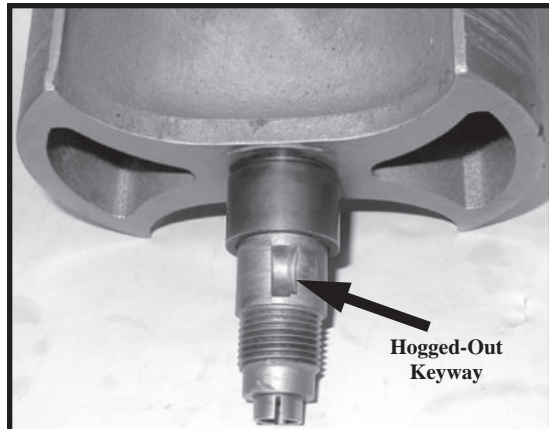
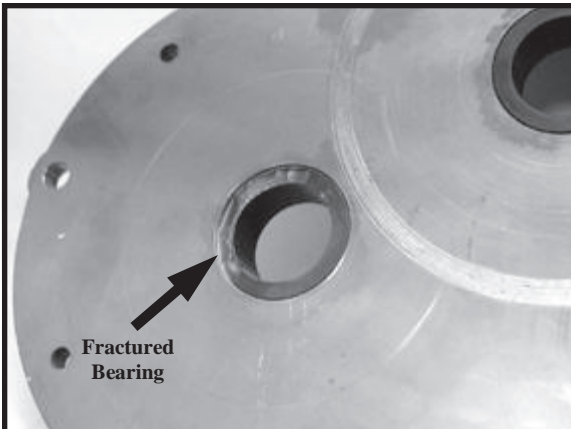
CHAMBER WEAR

- A) Foreign debris, similar to sand or sludge, has run through the meter.
- B) Meter has been operated at a higher capacity and has worn the bearings out, allowing rotors to contact the chamber.



GEAR WEAR

- A) Meter has been run on air (oversped).
- B) Meter has been operated at a higher volume capacity than what is rated.



HYDRAULIC SHOCK

- A) A valve downstream of the flow meter has abruptly shut off, creating hydraulic shock.
- B) Flow meter potentially had large volume of free air flowing within the system, followed by fluid.

Reassembly of Meter



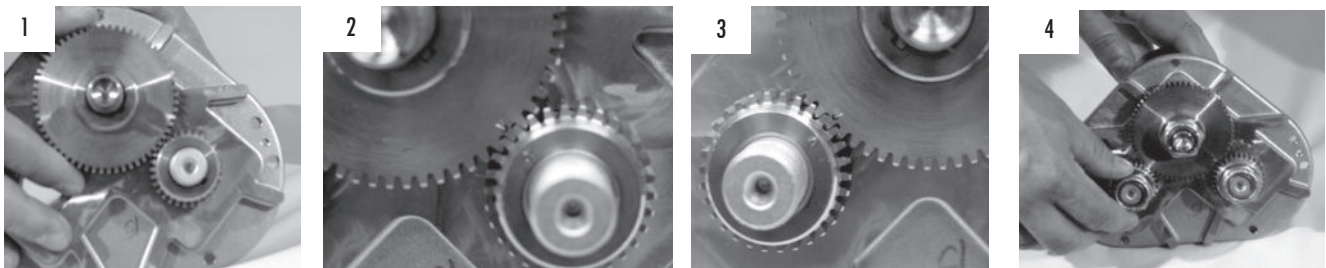
Reinstalling Rotors

- 1) Install rear bearing plate on meter.
- 2) Insert threaded end of blocking rotor and the right displacement rotor into front gear plate (reinsert rotor keys if necessary).
- 3) Align the two rotors (see picture 3) before applying gears.



Rotor Gear Timing

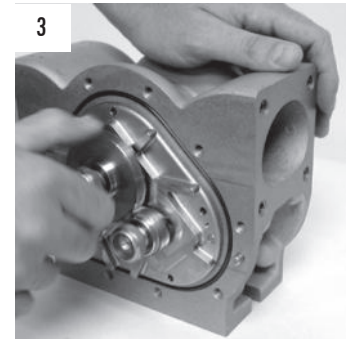
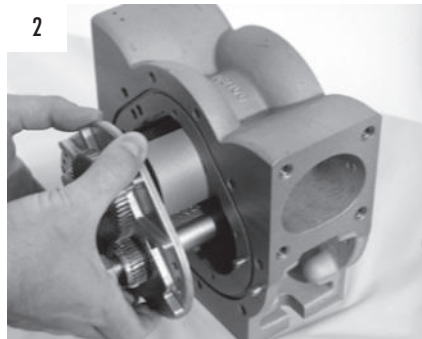
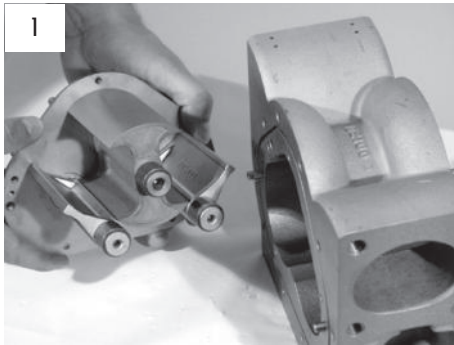
- 1) Slide on blocking rotor gear and position the 'arrow' that it is pointing toward the right displacement gear.
- 2) Align 'arrow' on displacement gear with the 'arrow' on the blocking gear and slide on right displacement gear.
- 3) Rotate the blocking rotor gear toward the left displacement gear and again align 'arrows' and slide on left displacement gear.
- 4) Gears and rotors should rotate freely if gears have been installed properly. If so, proceed with starting on the lock nuts until finger tight.



Reassembly of Meter

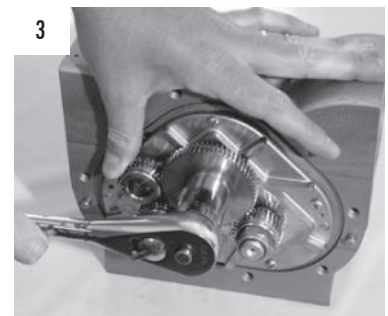
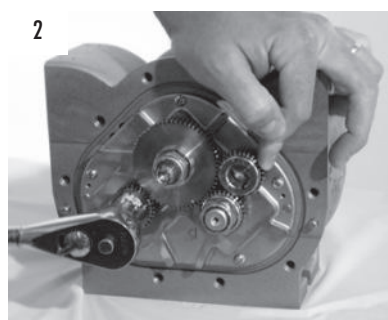
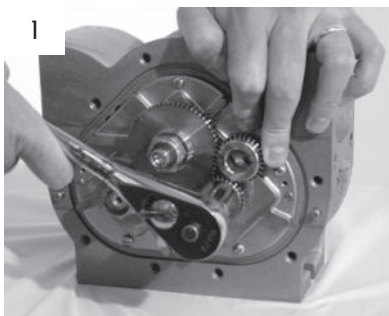
Reinstalling Bearing Plate

- 1) Align rotors on bearing plate (see picture) before inserting into meter.
- 2) Slide front bearing plate with rotors into meter housing and rear bearing plate.
- 3) Again, rotate gears to make sure they turn freely within the housing before proceeding.



Reinstalling Rotor Gears & Lock Nuts

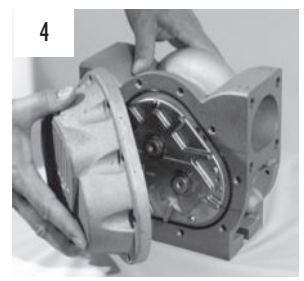
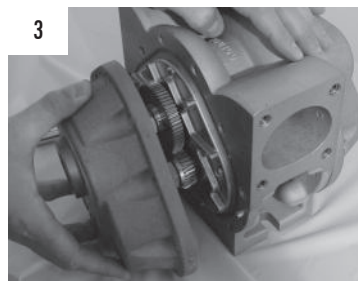
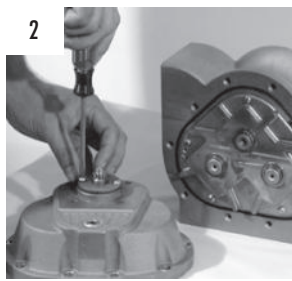
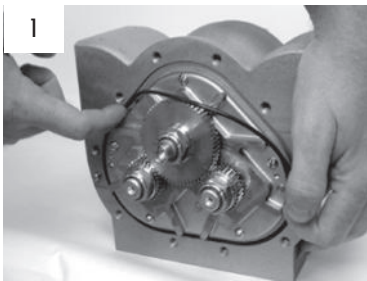
- 1) Using the spare displacement gear (or shop rag), position between right displacement gear and blocking rotor gear.
- 2) Using the torque specifications, apply and tighten the lock nut on the right and left displacement gears.
- 3) Move the spare gear between the left displacement and blocking rotor gears and then tighten the lock nut on the blocking rotor gear.



Reassembly of Meter

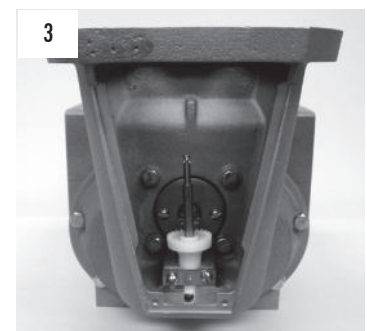
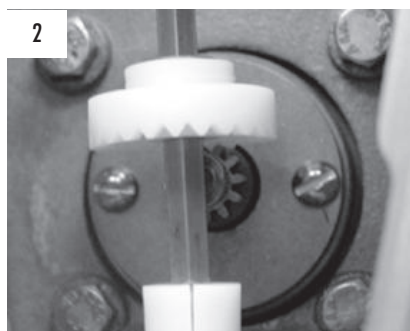
Reinstalling Packing Capsule & Front/Rear Covers

- 1) Reinstall cover O-rings on the front and rear of meter housing.
- 2) Reinsert packing capsule into front cover of meter with retaining plate and tighten screws.
- 3) When attaching front cover, align packing capsule blade with the slot on the blocking rotor sleeve. Tighten all front cover screws.
- 4) Attach rear cover and tighten all screws.



Reinstalling Counter Support & Adjustor Drive Shaft

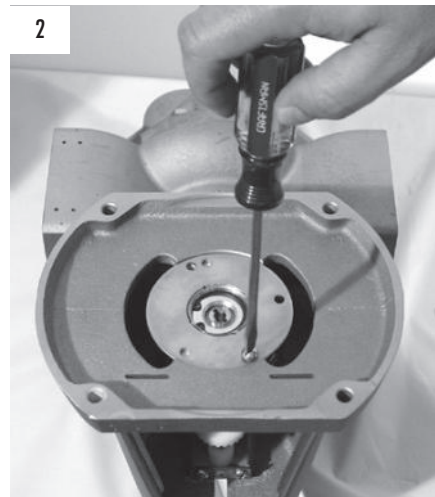
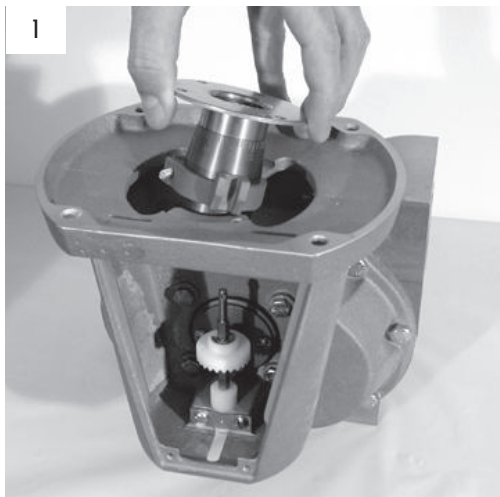
- 1) Position the counter support on the front side of meter and tighten all screws.
- 2) Reinsert adjustor drive shaft into the support housing and assure that adjustor face gear teeth mesh with the packing capsule gear. Do not fit the face gear and packing gear too tight!
- 3) Slide down the adjustor mounting bracket and tighten the screws.



Reassembly of Meter (Continued)

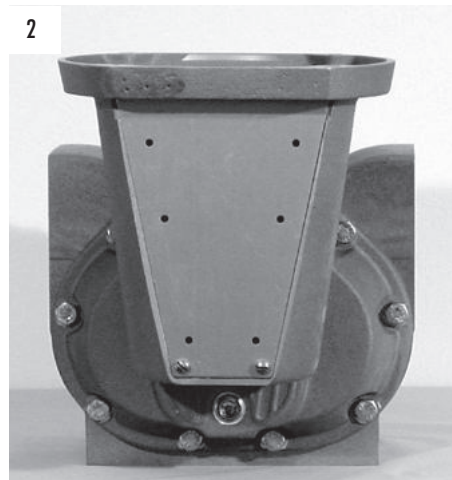
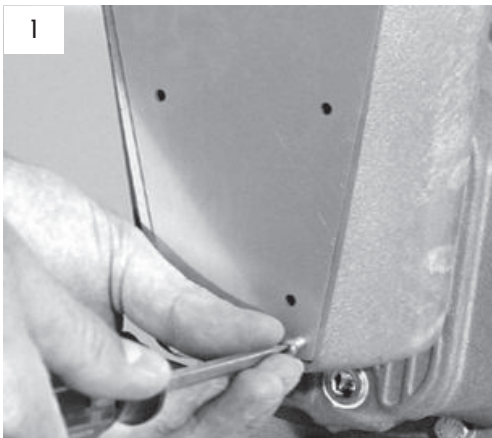
Reinstalling Adjustor

- 1) Reinsert the adjustor into the top of the counter support, ensuring that it mates with the drive shaft.
- 2) Tighten the screws that secure the adjustor plate to the counter support.



Reinstalling Dust Cover

- 1) Reattach dust cover and tighten the screws.



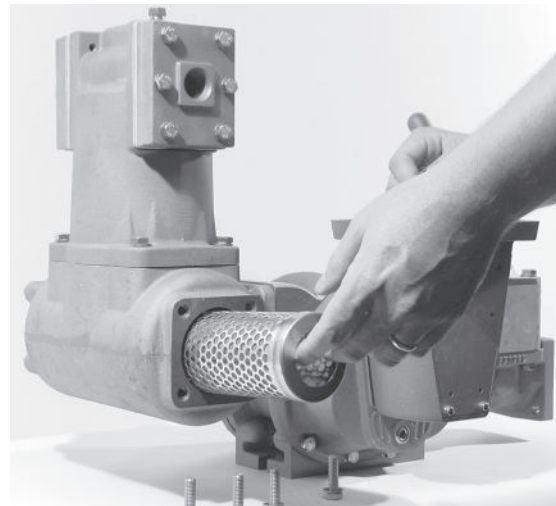
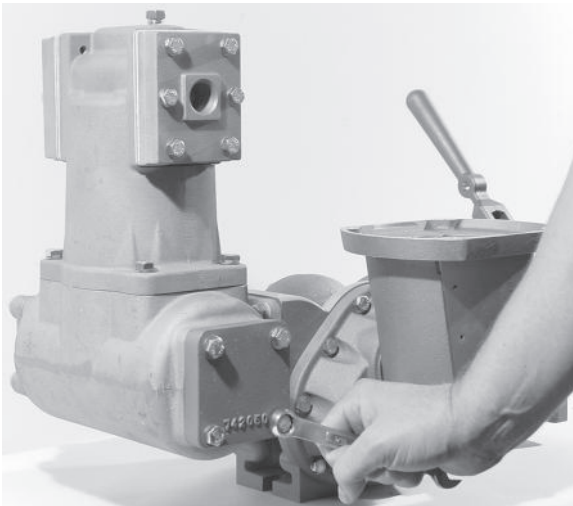
Disassembly of Strainer Assembly



WARNING

All internal pressure must be relieved to ZERO (0) pressure before beginning disassembly of meter or components

- 1) Using a hex or socket wrench, remove the four screws and washers from the cover plate.
- 2) Remove the cover plate and o-ring from the housing.
- 3) Remove the strainer screen.
- 4) Check inside housing for any debris and remove using a clean cloth.
- 5) Clean strainer screen by rinsing with a liquid cleaning agent compatible to your product application. A brush may be used to remove imbedded particles. If screen is too dirty to clean, then replace the screen.
- 6) Wipe clean the face of the cover plate and seal ring. Check o-rings for damage and replace as needed.



Reassembly of 720 Strainer Assembly

- 1) Replace the strainer screen into the housing.
- 2) Place the end cover o-ring in the groove of the end cover.
- 3) Put the end cover with o-ring installed on the strainer housing. Replace and fasten end cover with the 4 screws and washers. Tighten the screws according to the torque chart.

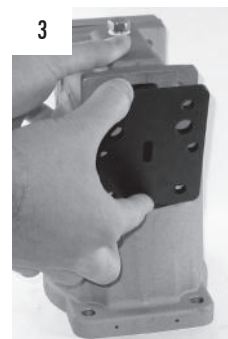
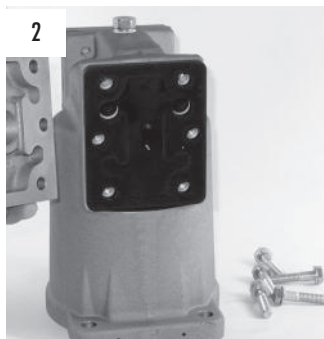
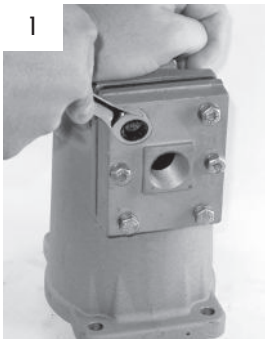
Assembly of Vapor Eliminator



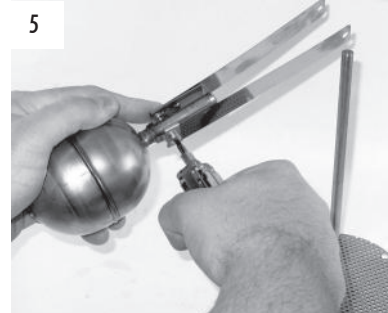
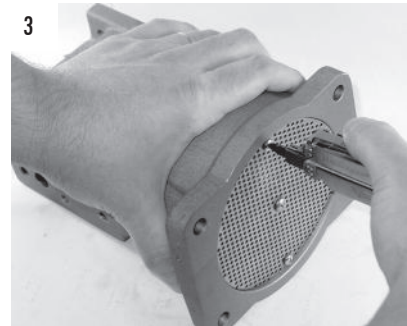
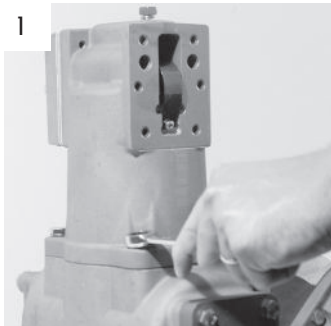
WARNING

All internal pressure must be relieved to ZERO (0) pressure before beginning disassembly of meter or components

- 1) Using a 1/2" wrench or socket, remove the cover screws from vapor eliminator cover plate.
- 2) Remove cover plate.
- 3) Remove valve plate, inspect and replace as needed.



- 1) To remove the vapor eliminator assembly, remove the four screws and washers attaching it to the strainer.
- 2) Using a flathead screwdriver, remove the screws attaching reed valves to air eliminator housing.
- 3) Remove the two screws on the diffuser screen.
- 4) Slide out diffuser shaft assembly.
- 5) Remove the two screws attaching reed valve to the float assembly. Inspect and replace reed valves as needed.



Assembly of Differential Valve

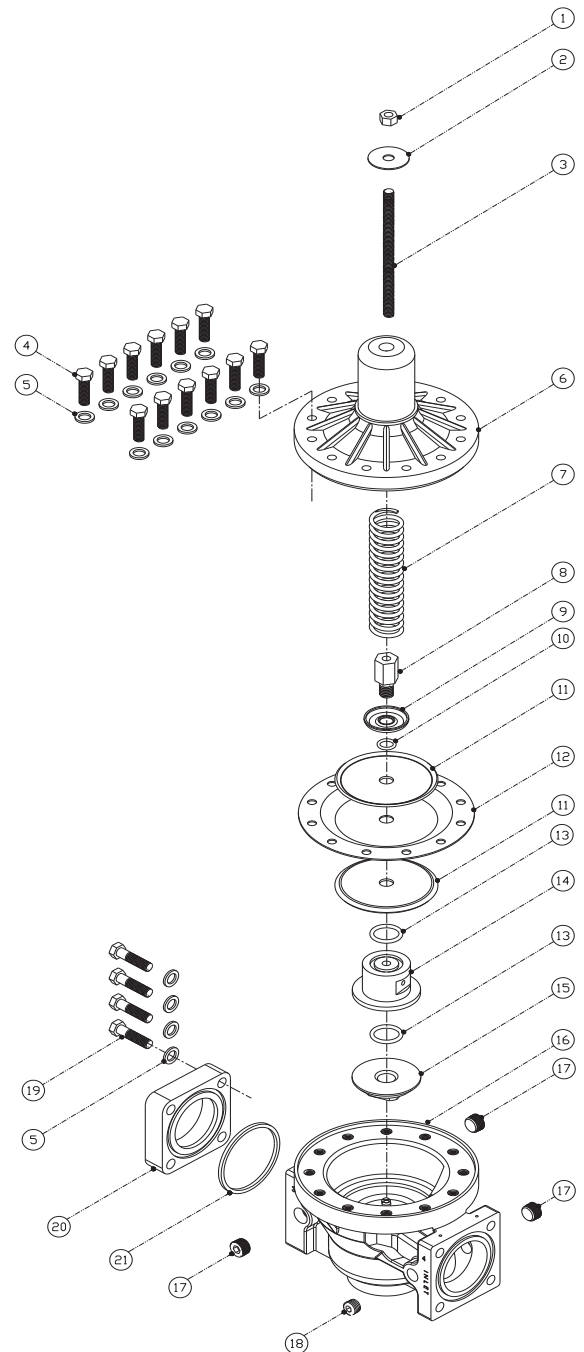


WARNING

All internal pressure must be relieved to ZERO (0) pressure before beginning disassembly of meter or components

DIAPHRAGM ASSEMBLY

- 1) Insert o-rings (#13) on top and bottom of diaphragm poppet (#14).
- 2) Thread seat (#15) onto diaphragm poppet (#14) with cylindrical side closest to poppet.
- 3) Install spring retainer (#9) onto diaphragm adaptor (#8).
- 4) Place o-ring (#10) over shaft of diaphragm adaptor (#8) and up to spring retainer (#9) surface.
- 5) Insert diaphragm back-up plate (#11) with bevel up over shaft of diaphragm adaptor (#8).
- 6) Place diaphragm (#12) with bevel down, onto diaphragm adaptor (#8).
- 7) Insert diaphragm back-up plate (#11) with bevel Down, over shaft of diaphragm adaptor (#8).



FINAL ASSEMBLY

- 1) Insert diaphragm assembly into valve base assembly (#16) with diaphragm adaptor (#8) up.
- 2) Place spring (#7) over diaphragm adaptor (#8).
- 3) Install valve cap (#6) on top of spring (#7).
- 4) Insert threaded rod (#3) into top of valve cap (#6) and thread rod down into diaphragm adaptor (#8) so 4-10 threads are engaged.
- 5) Place fender washer (#2) onto threaded rod (#3).
- 6) Thread nut (#1) onto thread rod (#3).
- 7) Tighten nut (#1) down until the spring (#7) becomes depressed enough to get the bolts (#4) started.
- 8) Place 1 washer (#5) on each of 4 bolts (#4) and put them into valve cap (#6) at an equal distance from one another.
- 9) Using the torque specifications on page 25, tighten the 4 bolts (#4) down.
- 10) Remove threaded rod (#3), fender washer (#2), and nut (#1) from unit.
- 11) Insert the remaining washers (#5) and bolts (#4) into the valve cap (#6).
- 12) Using the torque specifications on page 25, tighten the remaining bolts (#4) down.
- 13) Check to make sure all bolts (#4) are tightened to torque specs when finished.

Assembly of Check Valve

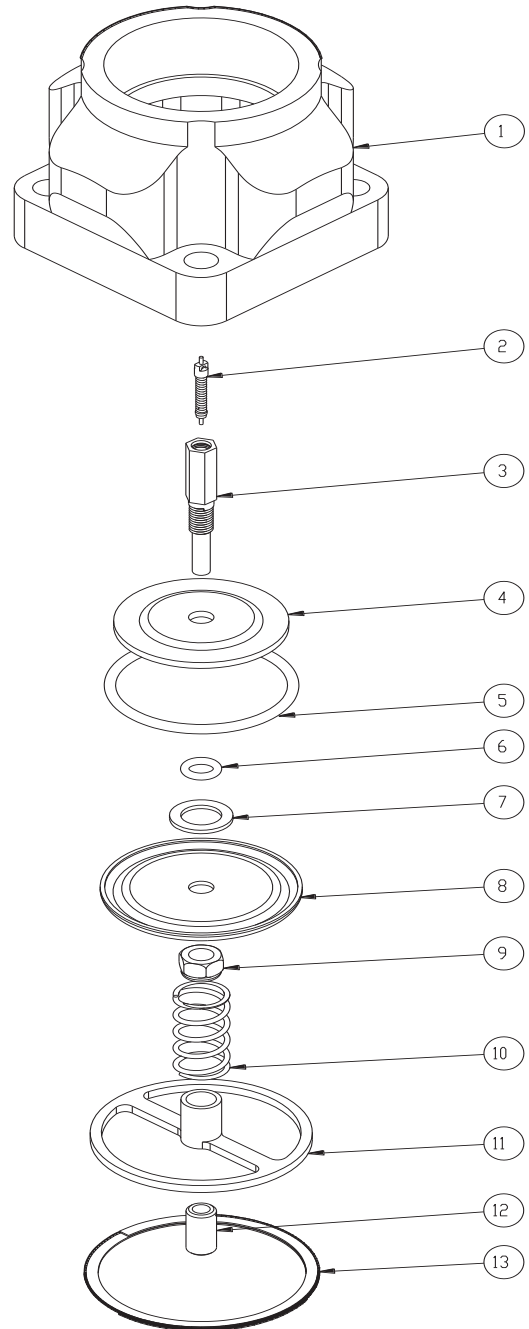


WARNING

All internal pressure must be relieved to ZERO (0) pressure before beginning disassembly of meter or components

CHECK VALVE ASSEMBLY

- 1) Insert pressure relief valve (#2) into valve housing (#1).
- 2) Slide piston ring (#4) onto valve housing (#3).
- 3) Place o-ring (#6) over shaft of valve housing (#3) and up to piston ring (#4) surface.
- 4) Install spacer (#7) over shaft of valve housing (#3) and over o-ring(#6).
- 5) Insert o-ring (#5) into groove of o-ring retainer (#8).
- 6) Slide o-ring retainer (#8) over shaft of valve housing (#3).
- 7) Using the torque specifications, apply and tighten the nut (#9) on the valve housing (#3).
- 8) Install assembly into housing (#1) with o-ring facing pipe threads of housing (#1).
- 9) Press bearing sleeve (#12) into spring holder (#11).
- 10) Insert spring holder (#11) into housing (#1) with cylinder facing pipe threads.
- 11) Install retaining ring (#13) into groove of housing (#1).



Meter Trouble Shooting



PROBLEM: Leaking packing gland and/or housing

Two common causes of packing gland leakage are thermal expansion and hydraulic shock. If two valves in a piping system (on either side of the meter) are closed at one time, and if the temperature rises as little as 1°F in the system, it could result in a rise in pressure within the system that would exceed the working pressure rating of the meter. To avoid this hazard caused by thermal expansion, a pressure-relief valve of some kind must be installed in the system.

Hydraulic shock occurs when a large volume (mass) of liquid is moving through a pipe line at a high velocity and a valve is suddenly closed. When the flow is stopped, the entire mass of the liquid in the piping system acts as a battering ram, causing a shock effect within the meter. Since the valve is usually located at the meter outlet, the meter housing, packing gland and the meter internal members receive the full impact of such hydraulic shock. To prevent this hazard a slow closing two-stage valve should be used with the meter. On those systems where a two-stage slow closing valve cannot be used, an impact-absorbing air cushioning device should be used.

PROBLEM: Product flows through meter but register does not operate.

- A) Gear train motion interrupted by non-functioning gear due to broken pin or key. Replace pin or key.
- B) If all meter parts are moving then problem is in register.
- C) Remove register from meter. If all meter parts are moving but output shaft of adjuster assembly is not, adjuster is worn and must be replaced.
- D) If totalizer numerals (small numbers) on register are recording, but the big numerals are not moving, register needs repair.

PROBLEM: Product flows through meter but register does not record correctly.

- A) Adjuster assembly not properly calibrated, See **METER CALIBRATION** on page 11 for more instructions.
- B) The factory installed gear train may have incorrect gearing ratio.
- C) Check register for defects.

PROBLEM: No flow through meter.

- A) Faulty non-functioning pump.
- B) Foreign matter within the system, meter or components.
- C) Meter has a broken rotor or rotor shaft.
- D) Excessive wear on timing gears or bearings.
- E) Meter “frozen” due to build-up of chemical “salts” inside metering chamber.
- F) Valve not open or not functioning.

PROBLEM: Meter runs too slow.

- A) There is a flow restriction within the system. (i.e.: tees, elbows, valves, strainer, etc.)
 - B) Foreign matter in system, meter or components.
 - C) Meter gears or rotors partially “salted” enough to slow up rotation of parts.
 - E) Valve internal mechanism faulty. Valve does not open fully.
-

Vapor Eliminator Trouble Shooting



PROBLEM: Product is flowing from the Vapor Eliminator vents

- A) Foreign matter located in between seal plate o-rings and metal reeds.
- B) The valve plate may be worn, requiring replacement.
- C) The float may have been punctured not allowing the float to rise and seal the air vents.
- D) The float may have been ruptured from a surge of pressure within the system.
- E) The metal reeds may be fatigued and require replacement.
- F) The metal reeds may be out of alignment with the seal plate.

PROBLEM: The meter is still registering vapor within the system

- A) The vapor return line is not the required minimum of 1/2" ID.
- B) Cavitating pump or leaking pump/valve seals.

Differential Valve Trouble Shooting



PROBLEM: Valve fails to open

- A) Damaged vapor return line with no pressure relief from Valve Cap (Bonnet)
- B) Puncture or Tear in Valve Diaphragm

PROBLEM: Product continues to flow through valve

- A) Valve Seat has excessive wear or is damaged.
- B) Valve Poppet is not secure and requires tightening.
- C) Faulty Solenoid Valve (foreign material or ice).

Material Safety Data Sheet

24 HOUR EMERGENCY ASSISTANCE
(260) 833-3173

GENERAL MSDS ASSISTANCE
(260) 484-0301

CODE: RPS

HAZARD RATING> LEAST-0 SLIGHT-1 MODERATE-2 HIGH-3 EXTREME-4

DR LUBRICANTS, INC.
4611 NEWAYGO ROAD, SUITE D
FORT WAYNE, IN 46808

DATE: 01/21/06
TELEPHONE NUMBER: (260) 484-0301

SECTION I - PRODUCT IDENTIFICATION

PRODUCT: **RP 1039**

SECTION II - COMPOSITION AND HAZARDOUS INFORMATION*

CHEMICAL NAME	CAS NUMBER	WT. PERCENT IS LESS THAN	OCCUPATIONAL EXPOSURE LIMITS (TLV-TWA) (TLV-STEL)
PETROLEUM HYDROCARBON	64741-65-7	90.0	100MG/M3
PETROLEUM HYDROCARBON	64742-53-6	10.0	5MG/M3

*ITEMS NOT SHOWN ARE NOT LISTED IN THE OSHA - T.S.C.A. HAZARDOUS CHEMICALS LISTING.

SECTION III - PHYSICAL DATA

BOILING RANGE:	NA	VAPOR DENSITY:	NA
ODOR:	PETROLEUM ODOR	EVAPORATION RATE:	NA
APPEARANCE	AMBER LIQUID	SOLUBILITY:	INSOLUBLE
VOLATILE BY WEIGHT:	NA	PRODUCT DENSITY:	0.790
VOLATILE BY VOLUME:	NA		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION: COMBUSTIBLE FLASH POINT: 150 F LEL: NA
(CLEVELAND OPEN CUP) UEL: NA

DOT: COMBUSTIBLE LIQUID

EXTINGUISHING MEDIA: CARBON DIOXIDE, DRY CHEMICAL, FOAM

Material Safety Data Sheet (Continued)

PRODUCT: RP 1039

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

UNUSUAL FIRE AND EXPLOSION HAZARDS : DO NOT DIRECT A SOLID STREAM OF WATER ONTO BURNING PRODUCT. THIS MAY CAUSE SPREADING AND INCREASE THE FIRES INTENSITY. COMBUSTION MAY PRODUCE: OXIDES OF CARBON, AND INCOMPLETELY BURNED HYDROCARBONS IN THE FORM OF FUMES AND SMOKE.

SPECIAL FIREFIGHTING PROCEDURES: WEAR A SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE.

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVER EXPOSURE: MAY CAUSE MILD EYE IRRITATION AND REDNESS. PROLONGED OR REPEATED EXPOSURE TO THE SKIN MAY RESULT IN LOSS OF NATURAL OILS ACCOMPANIED BY DRYNESS, CRACKING AND DERMATITIS. INGESTION MAY RESULT IN NAUSEA, DIARRHEA AND GASTRO INTESTINAL IRRITATION. OVEREXPOSURE TO MIST MAY CAUSE UPPER RESPIRATORY TRACT IRRITATION AND DIFFICULTY BREATHING.

MEDICAL CONDITIONS PRONE TO AGGRAVATION BY EXPOSURE: NONE KNOWN.

PRIMARY ROUTE(S) OF ENTRY: DERMAL INHALATION INGESTION.

EMERGENCY AND FIRST AID PROCEDURES: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH EYES WITH CLEAN WATER FOR AT LEAST 15 MINUTES. IF EYE IRRITATION PERSISTS, CONTACT A PHYSICIAN. IN CASE OF SKIN CONTACT, REMOVE ANY CONTAMINATED CLOTHING AND RINSE SKIN THOROUGHLY WITH WATER FOR AT LEAST 15 MINUTES. IF SKIN IRRITATION PERSISTS, CONTACT A PHYSICIAN. IN CASE OF OVEREXPOSURE TO MIST, REMOVE VICTIM TO FRESH AIR: IF BREATHING IS DIFFICULT ADMINISTER OXYGEN: AND CONTACT A PHYSICIAN IMMEDIATELY. IF PRODUCT IS INGESTED DO NOT INDUCE VOMITING: CONTACT A PHYSICIAN.

SECTION VI - REACTIVITY DATA

STABILITY: THIS PRODUCT IS STABLE UNDER NORMAL STORAGE CONDITIONS.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR UNDER NORMAL CONDITIONS.

HAZARDOUS DECOMPOSITION PRODUCTS: THERMAL DECOMPOSITION MAY RESULT IN THE FORMATION OF: OXIDES OF CARBON, AND INCOMPLETELY BURNED HYDROCARBONS IN THE FORM OF FUMES AND SMOKE.

CONDITIONS TO AVOID: AVOID CONTACT WITH OPEN FLAME, STORE IN ROOM TEMPERATURE AREA.

Material Safety Data Sheet (Continued)

PRODUCT: RP 1039
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INCOMPATIBILITY: AVOID CONTACT WITH STRONG OXIDIZING AND REDUCING AGENTS AND STRONG ALKLI.

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SECTION VII - SPILL OR LEAK PROCEDURES

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STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: FOR SMALL SPILLS: SOAK UP SPILL WITH ABSORBENT MATERIAL. FOR LARGE SPILLS: DIKE SPILL AND PUMP INTO DRUMS FOR PROPER DISPOSAL.

WASTE DISPOSAL METHOD: DISPOSE OF IN ACCORDANCE WITH ALL LOCAL STATE AND FEDERAL REGULATIONS.

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SECTION VIII - SAFE HANDLING AND USE INFORMATION

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RESPIRATORY PROTECTION: NORMALLY NOT REQUIRED, HOWEVER, WHEN THE TLV IS EXCEEDED WEAR THE APPROPRIATE MSHA/NIOSH APPROVED RESPIRATOR.

VENTILATION: PROVIDE ADEQUATE VENTILATION (SUCH AS MECHANICAL OR LOCAL) TO ASSURE TLV IS NOT EXCEEDED.

PROTECTIVE GLOVES: NORMALLY NOT REQUIRED, HOWEVER, IF HANDS ARE FREQUENTLY IN FLUID WEAR OIL AND CHEMICAL IMPERVIOUS GLOVES.

EYE PROTECTION: SAFETY GLASSES REQUIRED FOR NORMAL USAGE, WEAR CHEMICAL GOGGLES WHEN EXCESSIVE SPLASHING MAY OCCUR.

OTHER PROTECTIVE EQUIPMENT: NORMALLY NOT REQUIRED, HOWEVER, WHERE REPEATED CONTACT OCCURS, WEAR IMPERVIOUS CLOTHING AND BOOTS.

HYGIENIC PRACTICES: FOLLOW STANDARD INDUSTRIAL HYGIENE PRACTICES. LAUNDER ANY CONTAMINATED CLOTHING BEFORE RE-USE.

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SECTION IX - SPECIAL PRECAUTIONS

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PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: DO NOT STORE IN THE PRESENCE OF HEAT, SPARKS, FLAME OR ANY OTHER SOURCES OF IGNITION. STORE AWAY FROM STRONG OXIDIZING AGENTS. EMPTY DRUMS MAY CONTAIN PRODUCT RESIDUES. ALL SAFETY PRECAUTIONS TAKEN WHEN HANDLING THIS PRODUCT SHOULD ALSO BE TAKEN WHEN HANDLING EMPTY DRUMS AND CONTAINERS.

OTHER PRECAUTIONS: NONE

Material Safety Data Sheet (Continued)

PRODUCT: RP 1039
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SECTION X - HMIS/NFPA RATINGS
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HMIS:HEALTH:1 FLAMMABILITY:2 REACTIVITY:0 PERSONAL PROTECTION:C
NFPA:HEALTH:1 FLAMMABILITY:2 REACTIVITY:0 SPECIFIC HAZARD:

=====
SECTION XI - OTHER REGULATORY INFORMATION
=====

DOT HAZARDOUS: NATURAL DESCRIPTION:

=====
THE INFORMATION CONTAINED HEREIN IS, TO THE BEST OF OUR KNOWLEDGE AND BELIEF, ACCURATE. HOWEVER, SINCE THE CONDITIONS OF HANDLING AND USE ARE BEYOND OUR CONTROL, WE MAKE NO GUARANTEE OF RESULTS, AND ASSUME NO LIABILITY FOR DAMAGES INCURRED BY USE OF THIS MATERIAL. IT IS THE RESPONSIBILITY OF THE USER TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS.
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NOTES

NOTES

Warranty Information

Warranty

New 700 series rotary meters, equipment or components manufactured by Total Control Systems, a division of Murray Equipment, Inc. (TCS) with which this warranty is enclosed, are warranted by TCS to the original purchaser only for a period of TWELVE (12) months from installation or EIGHTEEN (18) months from the date of shipment, to be free, under normal use and service, from defects in material and workmanship. Defects occurring within the stated warranty period, TCS will repair or replace, at TCS's option; provided that part or parts are returned to TCS transportation charges prepaid, and TCS's examination discloses the parts or workmanship to have been defective upon delivery to the purchaser.

Exclusions

This warranty does not cover any parts or equipment not manufactured by TCS or related companies. This warranty does not extend to any equipment that has been altered in any way, subjected to misuse, negligence, accident, or if operated in any manner other than in accordance with TCS's operating instructions or have been operated under conditions more severe than, or otherwise exceeding those set forth in the specifications. General maintenance, calibration, clean up and normal wear is excluded from this limited warranty.

Claim Procedures

In order to obtain performance by TCS of its obligations under this warranty, the original purchaser must obtain a Return Goods Authorization (RGA) number from TCS's customer service department within 30 days of discovery of a purported breach of warranty, but not later than the expiration of the warranty period. Once authorization is received, return the defective meter, piece of equipment, or component covered by this warranty, with transportation charges prepaid, to TCS at the address shown below together with a written statement setting forth the nature of the defect and RGA number.

Repair Warranty

All repair work is warranted for ninety (90) days from the date of shipment to customer. Some parts may be warranted for longer periods by the Original Equipment Manufacturer.

Design and Equipment Changes

Any changes in design or improvements added shall not create any obligation to install same on equipment previously sold or ordered.

Limitations

THERE ARE NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED. TCS SPECIFICALLY DISCLAIMS ANY WARRANTY OR MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. TCS's sole obligation, which shall represent the buyer's sole and exclusive remedy, shall be to repair or at TCS's option, to replace any product or part determined to be defective. In no event shall TCS be liable for any special, direct, indirect, incidental, consequential or other damages of similar nature incurred by the buyer or any third party. TCS has not authorized on its behalf any representations or warranties to be made, nor any liability to be assumed except as expressly provided herein; there is no other express or implied warranty.

Total Control Systems is a leading manufacturer of precision measurement systems. Our world-class positive displacement flow meters are among the most accurate available in any industry and are backed by excellent customer service, support, and prompt deliveries.

TCS meters are designed and manufactured to meet or exceed your needs. Our meters are used world-wide in a multitude of applications including Agriculture, Aviation, Marine, LPG, Refined Fuels, Industrial Chemicals, and Alternative Fuels.

***Discover why Total Control Systems
should be the future of your metering solutions!***



**TOTAL
CONTROL
TCS SYSTEMS**

"The Standard of Measurement"

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