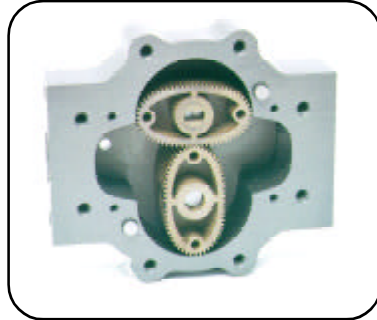


**Stealth Mechanical Manual ZTM1019  
Installation & Maintenance**

**For Oval Gear Meter Models:**     **TS10**  
   **TS15**  
   **TS20**  
   **TS30**

**including:**

- |   |  |
|---|--|
| <input type="checkbox"/> <b>Register</b>                              | <input type="checkbox"/> <b>Strainer</b>                 |
| <input type="checkbox"/> <b>Register &amp; Printer</b>                | <input type="checkbox"/> <b>Strainer, Air Eliminator</b> |
| <input type="checkbox"/> <b>Register, Preset &amp; Valve</b>          | <input type="checkbox"/> <b>Check Valve</b>              |
| <input type="checkbox"/> <b>Register, Printer, Preset &amp; Valve</b> |  |

**Meter Model No.:** TS \_\_\_\_\_



**TUTHILL**  
**Transfer Systems**

www.tuthill.com

48513 Highway 51 P.O. Box 400  
Tickfaw, Louisiana USA 70466  
Tel 504 542-5200 Fax 504 542-7394

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## Installation & Operation



### SAFETY INSTRUCTIONS

Make sure that all necessary safety precautions have been taken including proper clothing, personal safety equipment and fire safety equipment if required.

#### Before Start-up of Meter Make Certain:

1. The meter is properly mounted, secured and piped.
2. All connections are tight.
3. All bleed and drain valves are closed.
4. Do NOT smoke near meter or use meter near an open flame when metering flammable fluids. Fire could result.
5. This meter is not intended for use with fluids for human consumption.

**Install the Meter and Accessories in Compliance with All Applicable Local, State and Federal Construction, Electrical and Safety Codes.**

### Installation

Positive displacement meters are designed to operate full of liquid. The meter should be installed in a manner such that it remains full of liquid at all times.

Protective caps installed in each meter at the time of shipment should remain in the openings until you are ready to install in the piping system.

Prior to meter installation, the piping system should be flushed to remove all debris. Apply pipe compound to the male threads, to install the companion flanges.

**Install the companion flanges. Tighten to a position that allows the meter to bolt to the companion flanges, free of pipe stress. The meter should always be supported by bolting to a platform. Never use the connecting pipe as the means of support.**

When installing the meter consider future maintenance, and install in the best location available to facilitate future meter maintenance. The meter can be disassembled and serviced in place, and provisions for service should be considered during installation.

For the best accuracy, install the meter so that the gear shafts are positioned in a horizontal plane, rotating without the weight of the gear resting on the body or cover of the meter as shown on page 1. In critical installations block valves and by-pass lines are recommended. This allows the meter to be serviced without interruption of flow in critical process application.

Thermal relief valves are recommended and should be installed whenever it is possible to block the meter between two valves. Thermal pressures many times the operating pressure are possible with only a small rise in temperature.

It is recommended that a strainer be installed upstream of each meter to prevent damage from foreign matter, such as weld slag, pipe scale, etc.

Calibration means should be provided during installation. An easy means for diverting flow into a calibration vessel should be considered.

Hydraulic shock like thermal expansion can be harmful to meter components. Consideration should be given to designing pumping piping systems to eliminate hydraulic shock.

### Operation

Fill the system slowly to avoid operation on air or vapor. This can be accomplished in the following manner:

1. Throttle the meter inlet valve, and allow to fill slowly by gravity.
2. Crack open the outlet valve, start the pump, then slowly crack open the inlet valve and fill the meter slowly before fully opening the inlet and outlet valves.

The meter is not designed to operate on air, but the design and materials of construction allow for operation on vapor for short periods of time without damage to the elliptical gears or meter internals.

**Note: Over-speed and hammer caused by the presence of vapor in the system can cause internal damage to the meter.**



### SAFETY INSTRUCTIONS

**The meter's non-shock Maximum Operating Pressure is indicated on the meter name plate. The meter should never be operated in excess of this pressure. Care should be taken to eliminate thermal and hydraulic shock pressures so that they do not exceed the meter's Maximum Working Pressure design.**

Operating the meter in excess of its maximum design flow can cause excessive wear or premature failure. However, the meter can be calibrated to operate below the minimum design flow rate as indicated on the meter name plate if the flow remains constant, or the product is viscous.

## Reversing the Meter Registration

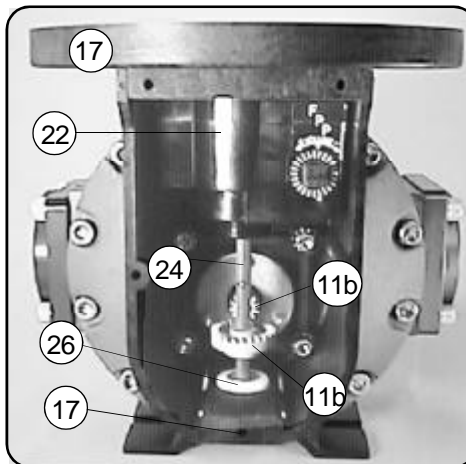
The meter is configured for left to right flow, unless specified differently at the time of order. A label with the word INLET is placed on the inlet flange. Flow direction is determined while facing the front of the meter register.

If the meter is equipped with a strainer, or strainer air eliminator combination, the strainer must be located on the inlet side of the meter. If the meter is equipped with a valve, the valve must be positioned on the outlet side of the meter.

When the meter is first installed, check the register. If the meter and packing gland pinion output shaft is turning, but the register is not turning, or if the register is turning backward, you must reverse the direction of registration by reversing the position of the face gear (11b).

### Reversing the direction of rotation of the calibrator drive shaft (11b) is accomplished by the following method:

◆ Reversing the position of the face gear (top 11b) relative to the packing gland pinion gear (11b).



◆ Remove dust cover (see page 5). Observe the position of the face gear (top 11b and the packing gland pinion gear (11b). See servicing the drive components (page 5).

◆ Remove the retaining clip (25) with a screwdriver or pliers.

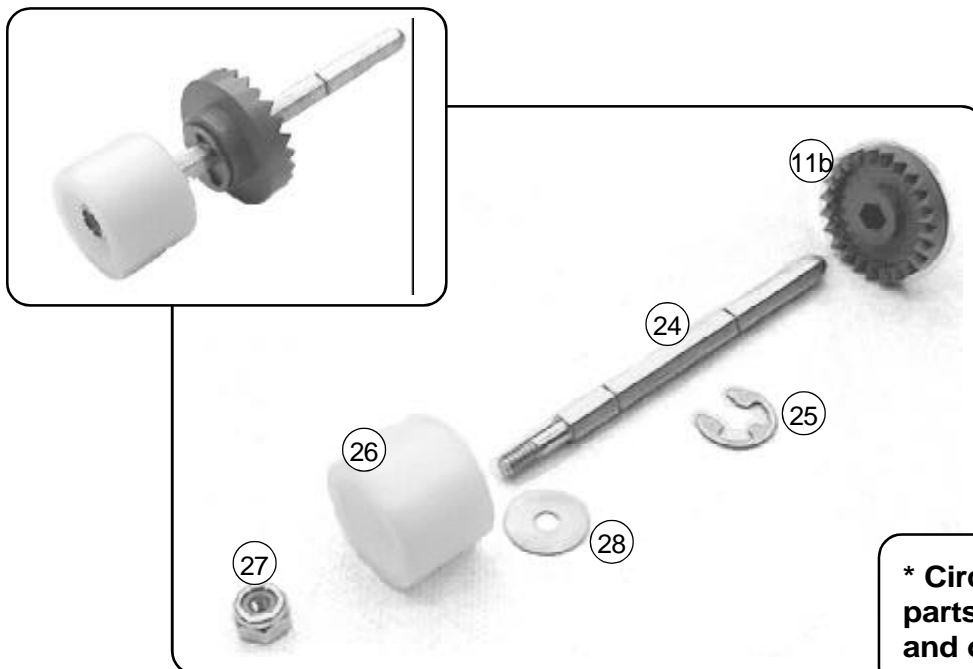
◆ Loosen the set screw (17) (\*see Parts' list and Exploded Parts view) securing the calibrator drive shaft bushing (26).

◆ Slide the calibrator drive shaft bushing (26) out of the right angle drive housing (17).

◆ Remove the adjuster drive shaft assembly, from the right angle drive housing (17).

◆ Remove the face gear (11b) and turn it 180° so that the gear teeth are facing in the direction opposite the original installation.

◆ Reassemble the parts in reverse order. Make sure the calibrator drive shaft bushing flange (26) is tight against right angle drive housing (17). Tighten hex nut (27) and re-install retaining clip (25) in the appropriate groove. Inspect to insure there is



**\* Circled numbers reference parts in manual, on parts list and on exploded parts view.**

## Adjusting the Calibrator

Meters equipped with mechanical registers may have a mechanical calibrator. If so, the calibrator can be used to easily adjust the meter output so that the mechanical registration matches precisely the volume delivered to a meter prover:

- ◆ Remove the dust cover (18), see page 5.
- ◆ Check the meter registration by delivering a known volume of product into an accurate prover. Perform several tests to verify the meter repeatability.
- ◆ Record the meter reading determined in the above step.
- ◆ Note the volume in the prover.

- ◆ When the prover volume is less than the meter register, add the percentage to the original calibrator setting by turning the knob in the direction of the arrow marked “+ volume” on the calibrator. Each click on the calibrator represents a .03% increment.

- ◆ When the prover volume is more than the meter register volume, subtract the percentage from the original calibrator setting by turning the knob in the direction of the arrow marked “- volume” on the calibrator.

- ◆ Make several prover runs to check meter accuracy and repeatability.

Each click of the calibrator represents a .03% increment. There are two clicks per division on the adjustment dial. Run product through the meter to allow the calibrator to adjust to the new setting.

$$\% \text{ CORRECTION} = \frac{(\text{Vol. in the Prover}) - (\text{Vol. on the Meter Register})}{(\text{Vol. in the Prover})} \times 100$$



## Servicing the Meter

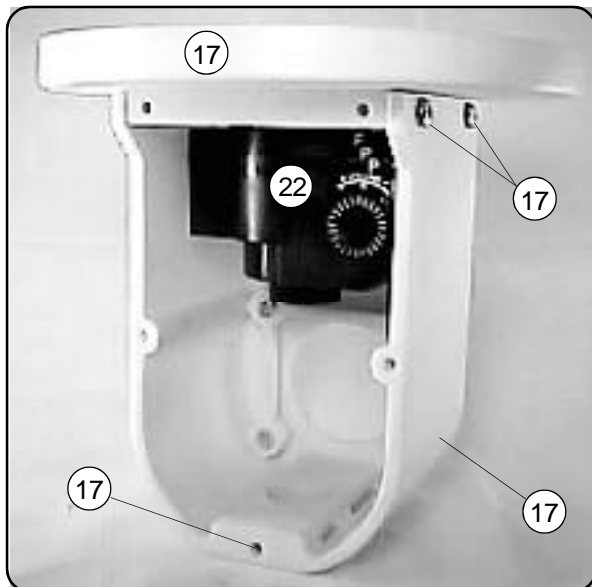
Avoid pipe strain and stress when making meter repairs. The weight of the piping and the meter should be supported independently. This means that the meter can be serviced without affecting the piping alignment.

Avoid prying or exerting heavy pressure on precision parts as this could affect the performance of the meter.

Assure all machined parts are free of burrs and nicks. Stone all machined surfaces if necessary to remove burrs.

Always coat bolt threads with an anti-seize or an appropriate lubricant to prevent thread damage and to assure proper torque values are applied when reassembling.

If meter threads are damaged, repair using inserts.



*Note: The calibrator (22) may be removed from the calibrator housing without removing the adapter flange (17) by first removing the adjuster drive shaft assembly.*

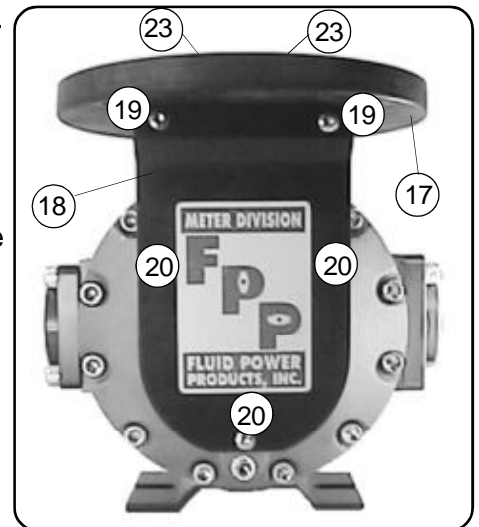
## Servicing the Drive Components

### ◆ Removing the dust cover:

1. Remove hex head screws (19) and (20). These hex head screws require a 5/16 socket.

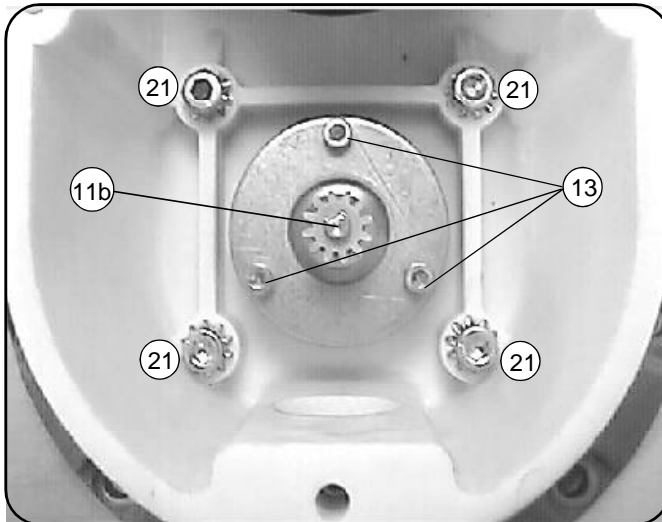
### ◆ Replacing the adjuster:

1. Remove the calibrator drive shaft assembly (see page 5.)
2. Remove the counter from the top of the V/R adapter flange (17).
3. Remove the two screws (23) attaching the calibrator to the counter adapter flange using Phillips screwdriver.
4. Reverse the procedure to reinstall the new calibrator.



### ◆ Removing the adjuster drive shaft assembly: (Refer to the numbered pictures on page 3)

1. Loosen the set screw (17) located in the calibrator housing base, using an Allen wrench (see Torque and Wrench Chart on 12.)
2. Remove the retaining clip (25) using a screwdriver or pliers.
3. Slide the calibrator drive shaft bushing (26) and calibrator drive shaft (24) out of the right angle drive housing (17).
4. Reinstall in the reverse procedure.

**Servicing the Meter...Replacing the Packing Gland**

3. Remove the packing gland assembly (11) from the meter.

4. Reinstall in the reverse procedure, **making sure the metal pin\* is engaged in the slot of the packing gland coupling.**

**SAFETY INSTRUCTIONS**

**Remove All Pressure and Drain & Rinse Meter Before Servicing.**

◆ Replacing the packing gland:

1. Remove the adjuster drive shaft assembly as described on the previous page.
2. Remove the screws (13) using an Allen wrench (see Torque and Wrench Chart on the bottom of page 12.)

The wrenches required for each step, and the torque specification for each screw or bolt is shown in the Torque and Wrench Chart on the bottom of page 12. Anti-seize or an equivalent lubricant should be applied to each bolt or screw before it is installed to assure proper torque application and ease of assembly and disassembly.

**SAFETY INSTRUCTIONS**

**Be Sure to Run a Flushing Fluid Through Meter. Triple Rinse All Meter Components Before Being Taken/Sent in for Repair.**

**Please Refer to Torque and Wrench Chart, page 12**

## Disassembling the Meter

**Important: Relieve Internal Pressure and Drain Before Servicing.**

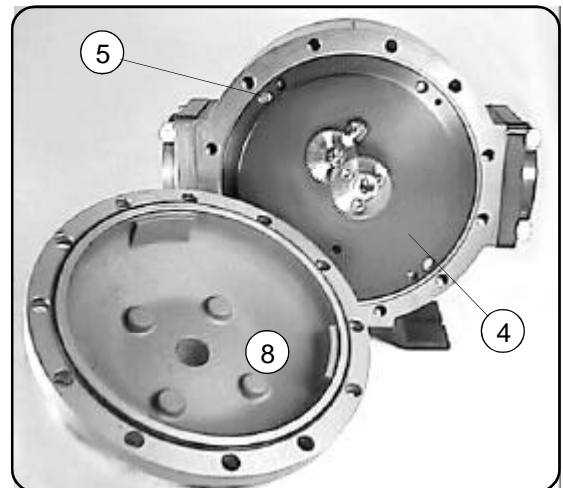
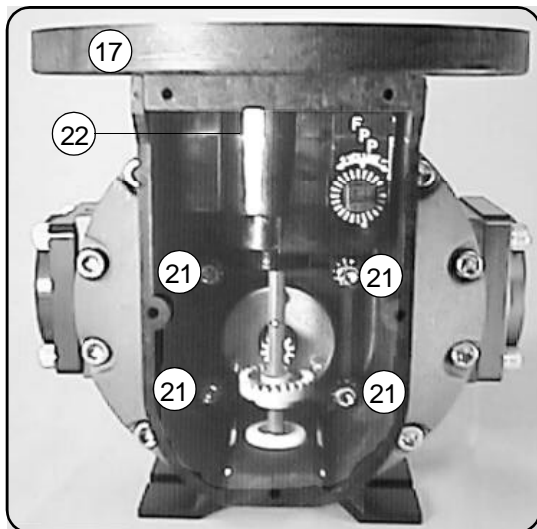
The meter can be serviced through either the front or rear cover. The recommended procedure is to disassemble through the front cover, as this procedure allows for inspection of all components.

◆ Remove the right angle drive assembly by removing the four screws (21) using an Allen wrench.

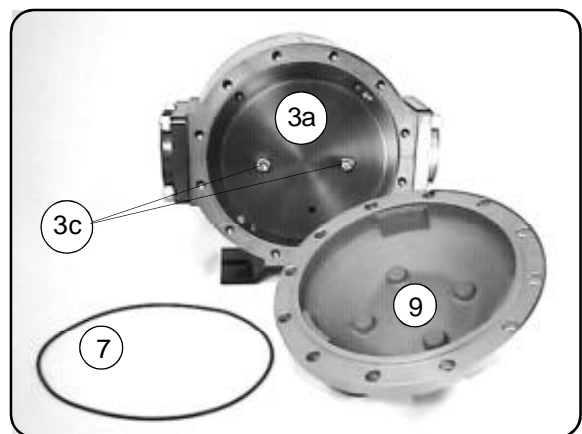
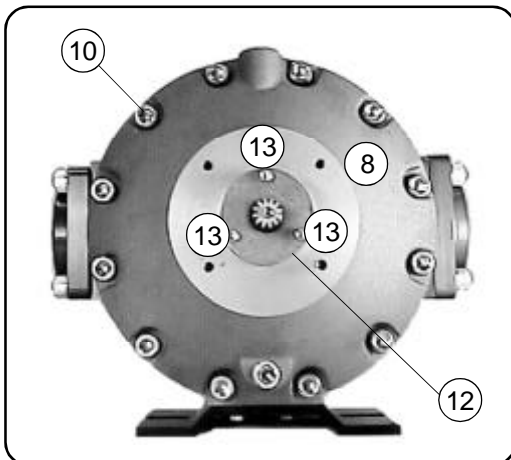
◆ To remove the front cover (8), remove the twelve bolts (10) attaching the front cover to the meter element.

◆ Remove the rear cover (9) by removing the twelve bolts (10) that attach the rear cover to the meter element.

◆ Remove the “O” rings (7) from the front and rear covers. Undamaged Viton™ and Buna seals may be reused. **Always** replace Teflon™ seals.



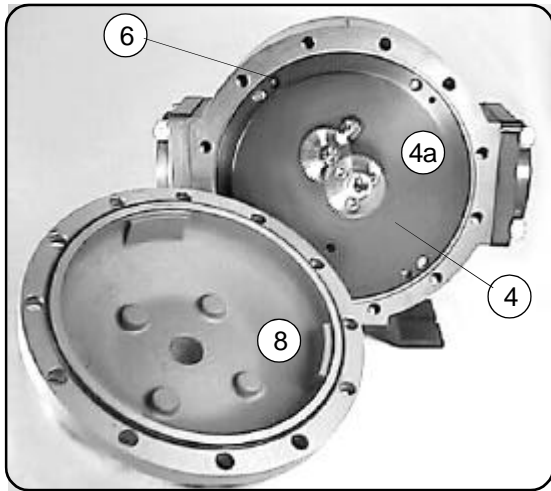
**IT IS NECESSARY TO REMOVE THE REAR COVER ONLY IF THE SHAFTS ARE BEING REPLACED**



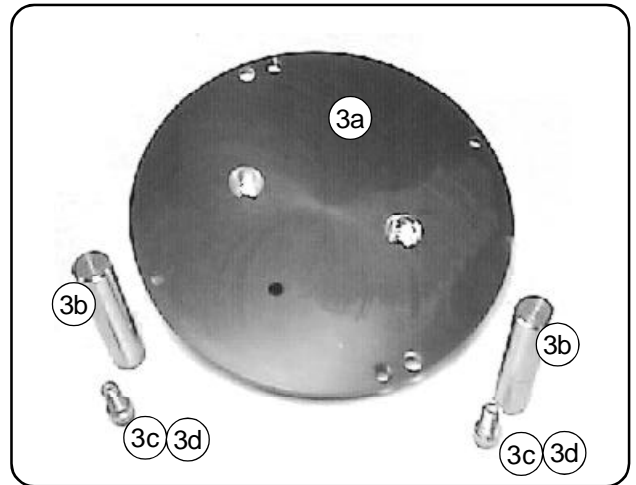
**Appearance will differ with Meter Model numbers but procedures are identical.**



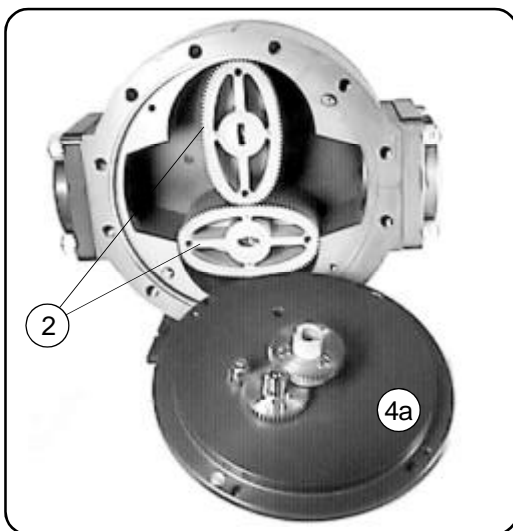
**Disassembling the Meter continued...**



◆ Remove the screws (6) from the gear plate (4a) by using an Allen wrench.

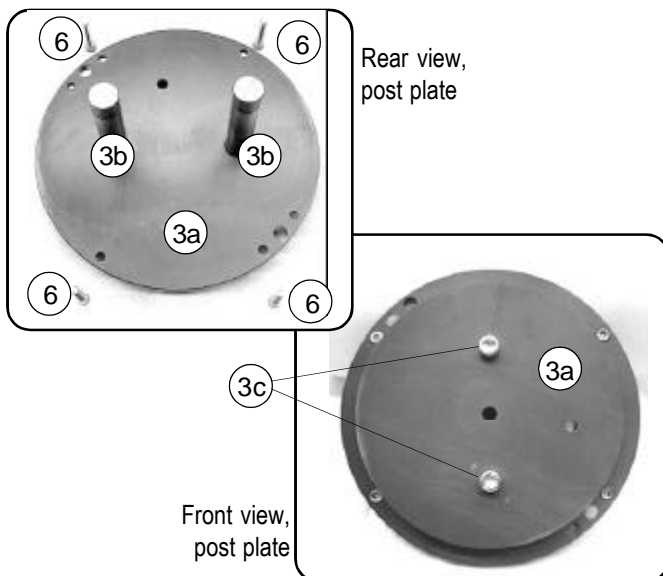


◆ Remove the gear plate (4) assembly from the meter body, using a 5/16 X 18 X 1" jack bolt, if necessary. Once the gear plate is removed, remove the gears (2) and inspect them for wear and damage. If replacement is required, see the next section on servicing the gear and post plates measuring chamber.



◆ Remove the post plate assembly (3) if necessary. Using an Allen wrench, remove the screws attaching the post plate to the meter body. Remove the post plate using jack bolt, if necessary.

◆ To maintain the meters maximum accuracy it is recommended that the post plate with post be replaced as an assembly. It is possible to remove and to replace the old bearing post, which requires a press, and could result in loss of accuracy.



**Inspection and Repair**

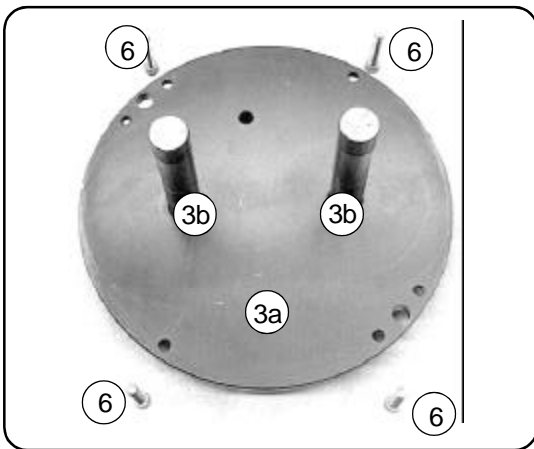
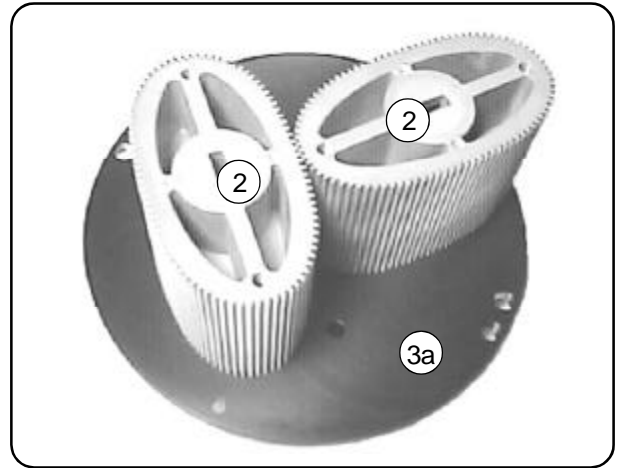
◆ Inspect and repair all critical surfaces like gear teeth, oval gears, gear and post plates and internal housing. Remove any deposits using a fine emery cloth or fine wire brush. Be careful not to score or damage any of the internal parts. Changing the shape, or damaging in any way may interfere with the operation of the meter. Remove all particulate, or grit, as this may also interfere with the proper operation of the meter.

◆ Replace all worn or damaged parts. The proper operation of the meter requires close tolerances to be maintained within the meter chamber. The gears must rotate freely within the measuring chamber without rub or excess clearance.

## Reassembling the Meter

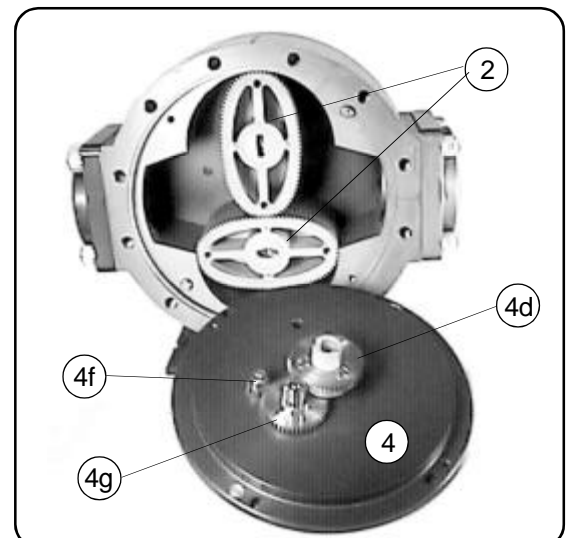
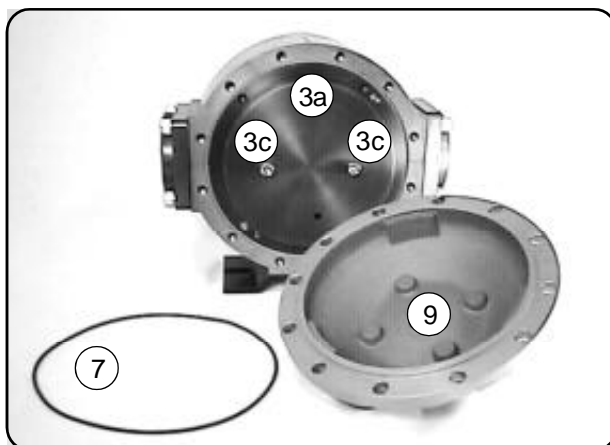
The wrenches required for each step and the torque specification for each screw or bolt is shown in the Torque and Wrench Chart on page 12. Anti-seize or an equivalent lubricant should be applied to each bolt or screw before it is installed to assure proper torque application and ease of assembly.

◆ At this point, place the gears (2) on the gear posts, making sure that they rotate and are properly timed. This is to assure that the oval gears rotate without bind or excessive rub of the post plate. Remove the gears after this is finished.

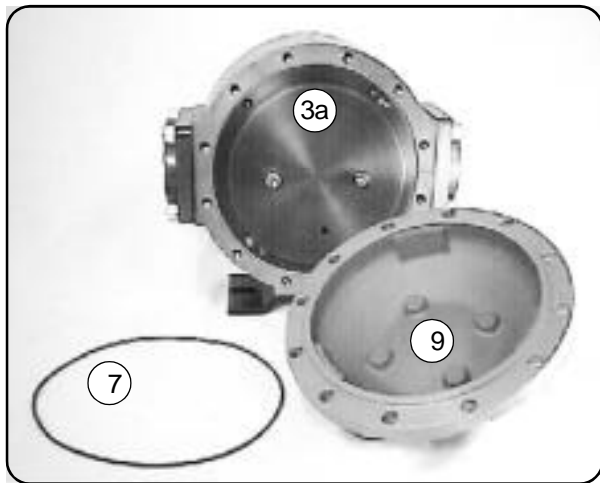


◆ Reinstall the post plate (3a) onto the meter body. The post plate *must* be installed on the proper side of the meter body for proper performance. A dimple on the top of the meter body designates the correct side of the meter body to install the post plate. The gear plate retaining screws (6), attaching the post plate to the meter body, should then be replaced and torqued to the specification shown in the Torque and Wrench Chart on page 12.

◆ Reinstall the oval gears (2). Make sure that the gears are properly timed (gears should be installed at exactly 90° or perpendicular to each other to be properly timed.) Rotate the gears to assure that they are timed properly and that they rotate within the meter housing without interference or excessive clearance.

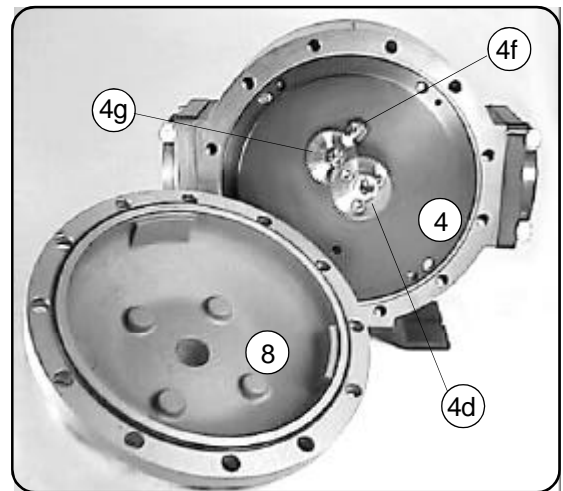


**Reassembling the Meter continued...**



◆ Reinstall the rear cover (9) and “O” ring (7). Be sure the drain plug (31) is toward the bottom of the meter. The twelve bolts should be torqued to specification shown in the Torque & Wrench Chart on page 12.

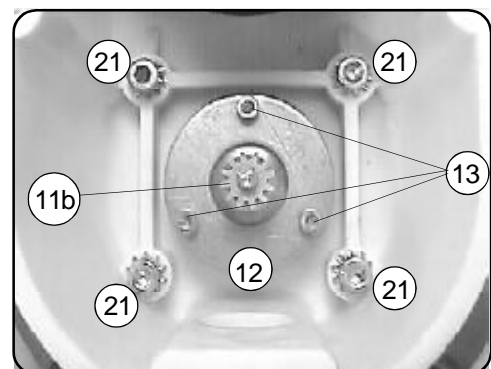
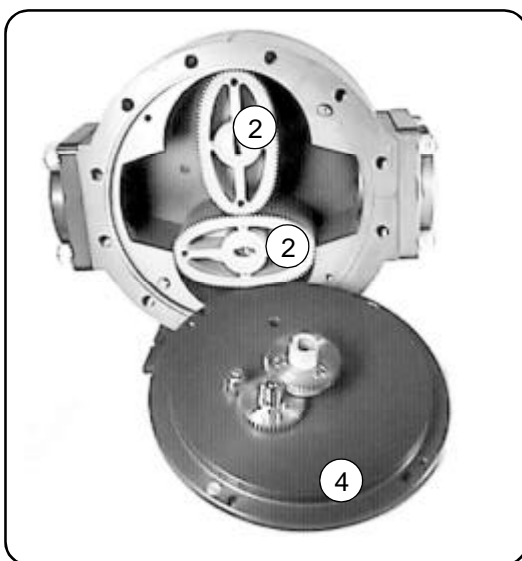
◆ Reinstall the gear plate (4a) onto the meter body. The pressure equalizing hole should be near the outlet flange and the pinion gear (4f) should be located near the top of the meter. Tighten the screws (6), attaching the gear plate to the meter body, torqued to the specification shown in the Torque and Wrench Chart on page 12.



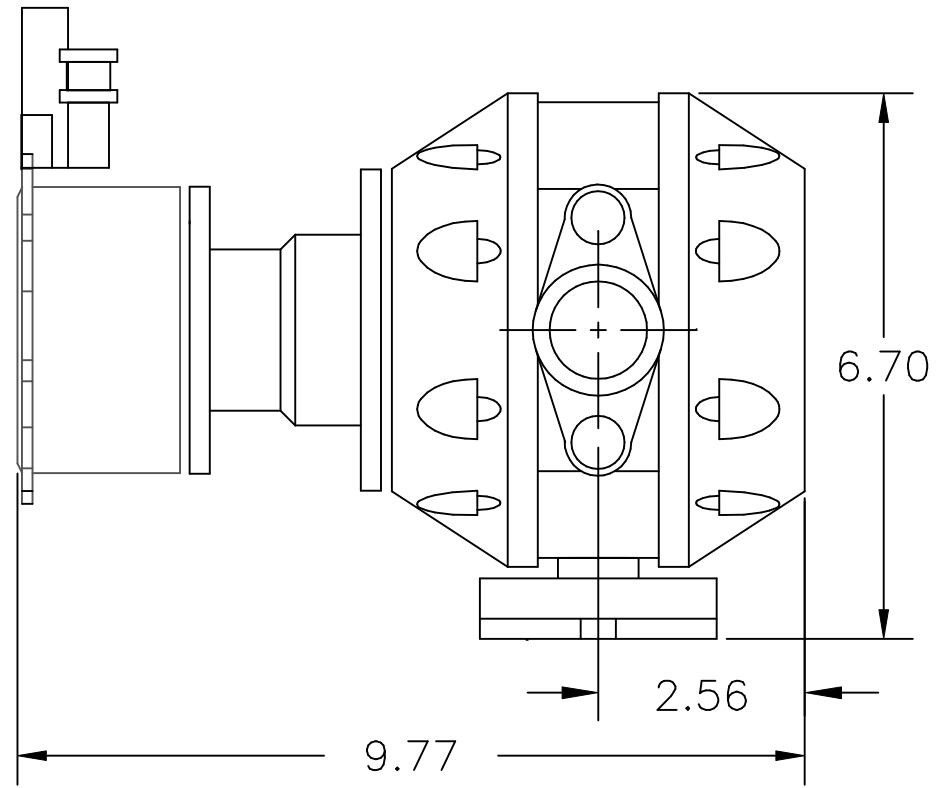
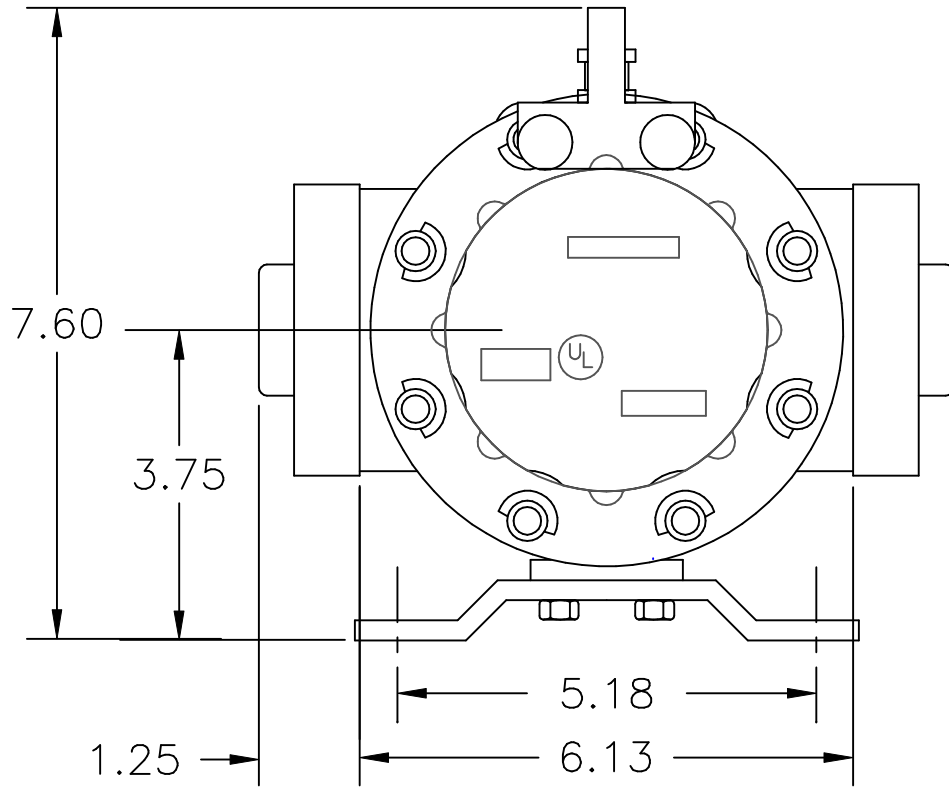
◆ At this point, rotate the drive gear (4d) assuring that all gears turn freely and that the oval gears (2) turn freely in the meter chamber.

◆ Reinstall the "O" (7) ring on the front cover (8) and then place the front cover back onto the meter. Be sure the drain plug is toward the bottom of the cover. This facilitates draining the meter and positions the cover to accept the calibrator adapter. The twelve bolts should be torqued to the specification shown on the Torque and Wrench Chart on page 12.

◆ Reinstall the right angle drive housing (17). The screws (21) should be torqued to the specification shown in the chart on page 12.



**Please Refer to Torque and Wrench Chart (page 12)**



1" ALUM METER W/REED  
SWITCH FLOW SENSOR

DWN. RCD	DRAWING NO.
APPD. KOL	561PULS
PART NO. TS10ASRS	



REVISION	ECN	DATE
A	N/A	8/24/00



# Parts List for Pulsar Meter Model TS10A

Serial No. > B8360



Item	Qty.	Description	Part #	Item	Qty.	Description	Part #
1	1	TS10A Meter Body	MB2560	7*	2	"O" Ring, Viton™, cover assembly	SL1157
2*	1	Gear Set, Ryton™, no bearings	GS560R	8	1	Front cover	CP2550
	1	Gear Set, Ryton™, carbon bearings	GS560RC	9	1	Rear cover	CP2551
	1	Gear Set, Ryton™, high viscosity	GS560R-HV	10	16	5/16-18 X 1" AL SHCS	FS2900
	1	Gear Set, Ryton™, medium viscosity	GS560R-MV	11	1	Packing gland assembly	PG20011
3	1	Post plate assembly	CP25521	12	1	16T Drive gear, brass	GD3216T0128-A
3a**	1	Post plate	CP2552	13	1	"O" Ring, Viton™, packing gland	SL1212
3b**	2	Gear posts	MP90662	14	1	16T Transfer pulser gear, brass	GT3216T0128-A
3c**	2	1/4-20 X 3/4" SS SHCS	FS9830	15	1	Retaining plate	MP9060
3d**	2	Lock washers	FS9302	16	3	8-32 X 3/8" SS SHCS	FS9515
4	1	Gear plate assembly	CP25532	17	2	1" Companion flange, NPT	MP2510
4a***	1	Gear plate w/bushing	CP25531			1" Companion flange, BSPP	MP2513
4b***	1	Pinion drive shaft	MP9043	18	2	"O" Ring, Viton™, companion flanges	SL1233
4c***	2	Cotter pin	FS9210	19	4	3/8-16 X 1" AL SHCS	FS2950
4d***	1	Coupling drive assembly	PL8435	20	1	Meter pedestal	MP2528
4e***	1	Drive coupling sleeve w/bolt	MP9833	21	2	3/8-16 X 1" AL HHCS	FS0920
4f***	1	Pinion gear	PL6502	22	2	1/4" SS drain plug	MS4019
4g***	1	Combination gear assembly	PL6500	23	2	Split lock washers	FS5004
5	4	Dowel pin	MS9021	24	1	Meter pedestal spacer	MP2527
6	8	10-32 X 3/8" SS SHCS	FS9651				

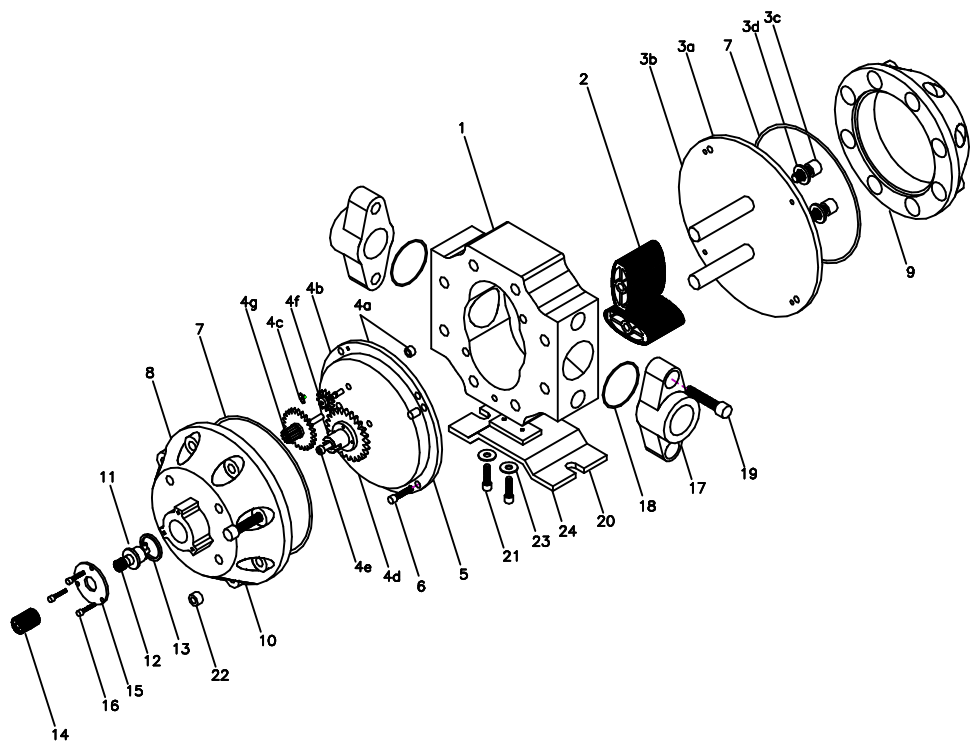
## Torque Specifications

Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9830	1/4-20 X 3/4" SS SHCS	78 in.lbs.	3/16 Allen	FS2950	3/8-16 X 1" AL SHCS	30 ft.lbs.	9/16 Socket
FS9651	10-32 X 3/8" SS SHCS	24 in.lbs.	5/32 Allen	FS0920	3/8-16 X 1" AL HHCS	30 ft.lbs.	9/16 Socket
FS2900	5/16-18 X 1" AL SHCS	24 ft.lbs.	1/4 Allen	MS4019	1/4" SS Drain plug	Snug tite	1/4 Allen
FS9515	8-32 X 3/8" SS SHCS	Snug tite	9/64 Allen				

\* Recommended Spare Parts

\*\* Part of Post Plate assembly, Part No.: CP25521

\*\*\* Part of Gear plate assembly, Part No.: CP25532



**Please have the following information available when you make inquiries, order replacement parts, or schedule service:**

Your meter's serial number: \_\_\_\_\_

Your meter's model number: \_\_\_\_\_

Your full service Distributor: \_\_\_\_\_

Your full service Distributor's phone number: \_\_\_\_\_

**Warranty**

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Tuthill Transfer Systems ("Manufacturer") warrants to each buyer of its FPP Meters products (the "Buyer") for a period of 12 months from date of invoice or sales receipt, but in no event more than 18 months from date of manufacture, that goods of its manufacture ("Goods") will be free from defects of material and workmanship. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturers' option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. If Manufacturer so requests the return of the Goods, the Goods will be redelivered to Manufacturer in accordance with Manufacturer's instructions F.O.B. Factory. The remedies contained herein shall constitute the sole recourse of the Buyer against Manufacturer for breach of warranty. IN NO EVENT SHALL MANUFACTURER'S LIABILITY ON ANY

CLAIM FOR DAMAGES ARISING OUT OF THE MANUFACTURE SALE, DELIVERY OR USE OF THE GOODS EXCEED THE PURCHASE PRICE OF THE GOODS. The foregoing warranties will not extend to Goods subjected to misuse, neglect, accident or improper installation or maintenance, or which have been altered or repaired by anyone other than Manufacturer or its authorized representative. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. No person may vary the foregoing warranties and remedies except in writing signed by a duly authorized officer of Manufacturer. Warranties or remedies that differ from the foregoing shall not otherwise be binding on Manufacturer. The Buyer's acceptance of delivery of the Goods constitutes acceptance of the foregoing warranties and remedies, and all conditions and limitations thereof.



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