NEPTUNE TECHNOLOGY GROUP

TRU/FLO® Compound Meter Installation and Maintenance Guide

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Professional Installation

In accordance with section 15.203 of the FCC rules and regulations, the MIU must be professionally installed by trained utility meter installers. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

TRU/FLO Compound Meter Installation and Maintenance Guide
Literature No. IM TRU/FLO 08.15
Part No. 13505-001

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1 Introduction

This chapter provides a general description of the 2-inch, 3-inch, 4-inch, 6-inch, and 6-inch x 8-inch TRU/FLO® Compound Meters (subsequently referred to as the TRU/FLO meter).

Product Description

The TRU/FLO meter is designed to register wide flow ranges where varying flow rates are typical. It combines the low flow sensitivity of a disc-type meter with the high flow capacity of a turbine-type meter. Its key features include:

- Spring-loaded valve.
- Combined turbine and disc measuring assemblies.
- Compact lead free, high-copper alloy maincase.

The key features produce a rugged and highly accurate meter.

Figure 1 TRU/FLO Compound 3-inch Meter

TRU/FLO General Information

The following sections provide general information about the TRU/FLO meter.

Operation

The hydraulic valve transfers flow smoothly between the disc section and turbine section of the meter, minimizing the loss of accuracy in the crossover range. The turbine measuring assembly registers medium and high flows while the T-10® chamber registers low flows, ensuring accurate measurement at all flow rates.

Construction

The TRU/FLO meter consists of a durable lead free, high-copper alloy maincase, Neptune turbine measuring assembly, Neptune T-10 chamber, and two magnetic-driven, roll-sealed registers.

The lead free, high-copper maincase is corrosion-resistant and easy to handle.

A calibration vane allows field calibration of the meter to lengthen service life and to ensure accurate registration.

The two magnetic-driven, roll-sealed registers simplify the meter's design and reduce long-term maintenance.

Warranty

Neptune T-10 meters and Neptune T-10 nutating disc chambers in TRU/FLO compound meters are warranted to meet or exceed new meter accuracy standards of the *AWWA standard C700-95* for a period of:

- Five years from date of shipment for 5/8-inch, ¾-inch, and 1-inch meters.
- Two years from the date of shipment for 1½-inch, and 2-inch meters.
- Or the applicable registration shown, in Table 1 on page 3, whichever occurs first.

Neptune further guarantees that the Neptune T-10 and Neptune T-10 nutating disc chambers in the TRU/FLO compound meter performs to at least repaired meter accuracy standards according to AWWA manual M-6 chapter 5 for an additional 10 years or the registration shown in Table 1 on page 3, whichever occurs first.

Table 1 TRU/FLO Warranty Chart

Size	Extended Low Flow Accuracy	New Meter Accuracy	Repaired Meter Accuracy
5/8-inch and 5/8-inch x ¾-inch	1/8 US gpm @ 95% 5 years or 500,000	500,000 gallons	1,500,000 gallons
¾-inch	¼ US gpm @ 95% 5 years or 750,000 gallons	750,000 gallons	2,250,000 gallons
1-inch	3/8 US gpm @95% 5 years or 1,000,000 gallons	1,000,000 gallons	3,000,000 gallons
1½-inch	¾ US gpm @ 95% 2 years or 1,600,000 gallons	1,600,000 gallons	5,000,000 gallons
2-inch	1 US gpm @ 95% 2 years or 2,700,000 gallons	2,700,000 gallons	8,000,000

The HP Turbine and turbine side of the TRU/FLO compound water meters performs, for a period of one year from the date of shipment, to AWWA accuracy standards for new water meters.

The TRU/FLO maincase performs from the date of shipment and is free from manufacturing defects in workmanship and material for the life of the meter.

When desired, owner maintenance is easily accomplished by in-line replacement of major components, or a factory-calibrated UME.

2 Specifications

This chapter describes the specifications, operating characteristics, and dimensions for the TRU/FLO meter.

Environmental Specifications

This section contains environmental specifications for the TRU/FLO meter.

Table 2 Environmental Specifications

Application	Cold water measurement of flow in one direction.
Maximum Operating Pressure	150 PSI (1034 KPA)
Maximum Operating Temperature of Water	80º F

TRU/FLO Operating Characteristics

This section provides a table of the operating characteristics of the TRU/FLO meter.

Table 3 Operating Characteristics

TRU/FLO Meter Size	Normal Operating Range @100% Accuracy (±1.5%)	AWWA Standard	Low Flow @95% Accuracy
2-inch HP	½ to 200 US gpm 0.11 to 45.4 m^3/h	1 to 160 US gpm .227 to 36.34m^3/h	⅛ US gpm 0.03 m^3/h
3-inch	½ to 450 US gpm 0.11 to 102.2 m^3/h	2 to 350 US gpm .454 to 79.5 m^3/h	⅛ US gpm 0.03 m^3/h
4-inch	1 to 1000 US gpm 0.23 to 227.1 m^3/h	3 to 600 US gpm .68 to 136.3 m^3/h	½ US gpm 0.11 m^3/h
6-inch	1½ to 2000 US gpm 0.34 to 454.2 m^3/h	5 to 1350 US gpm 1.14 to 306.6 m^3/h	¾ US gpm 0.17 m^3/h
6-inch x 8-inch	1½ to 2000 US gpm 0.34 to 454.2 m^3/h	16 to 1600 US gpm 3.63 to 363.4 m^3/h	¾ US gpm 0.17 m^3/h

TRU/FLO Dimensions

This section provides the dimensions, diagrams, and registration of the TRU/FLO meter.

Table 4 Dimensions

TRU/FLO Meter Size	A	B			C	D	E	F	G	Flange Type	Weight lbs/kg
	in/mm	Std in/mm	PRO in/mm	E-Coder)R900i in/mm	in/mm	in/mm	in/mm	in/mm	in/mm		
2-inch HP	15¼ 387	8⅝ 219	9 229	12⅛ 308	2½ 64	13/16 21	5⅞ 149	6 152	1½ NPT 38	2-inch Oval 150 lb	32 14.5
3-inch	17 432	10½ 267	11 279	14 ¼ 362	3¾ 95	⅝ 16	7½ 191	8½ 216	1½ NPT 38	3-inch ANSI 150 lb	72 32.7
4-inch	20 508	12½ 318	13 330	16¼	4½ 114	11/16 17	9 229	9⅛ 232	2 NPT 51	4-inch ANSI 150 lb	100 45.4
6-inch	24 610	15¾ 400	16¼ 413	19½ 495	5½ 140	1 25	11 279	12¾ 324	2 NPT 51	6-inch ANSI 150 lb	208 94.3
6-inch x 8-inch	55⅜ 1407	15¾ 400	16¼ 413	19½ 495	5½ 140	1 25	11 279	12¾ 232	2 NPT 51	6-inch ANSI 150 lb	460 208.50

The following diagrams show the dimensions for the 2-inch TRU/FLO meter.

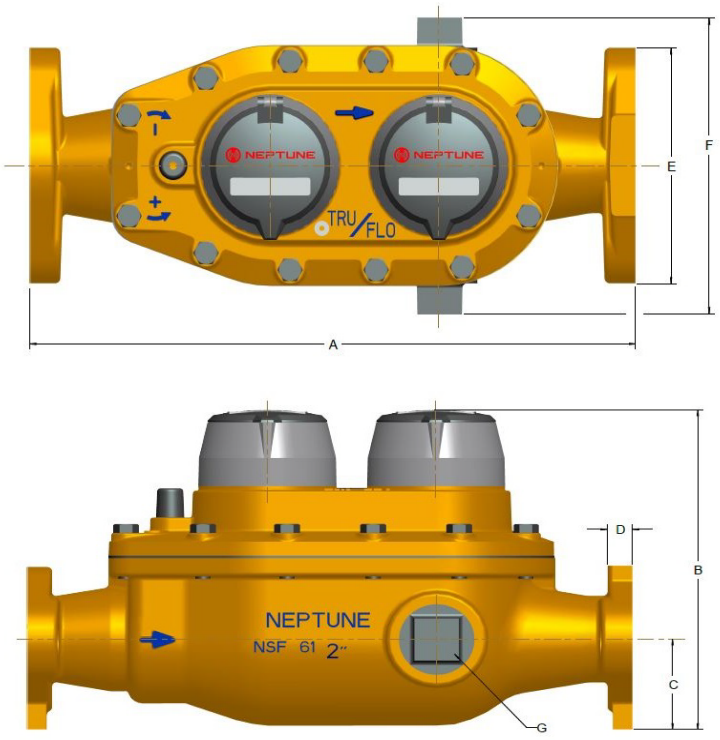


Figure 2 TRU/FLO Top and Side Views

Table 5 Meter Registration (Per One Revolution of the Sweep Hand)

	US Gallon	Imperial Gallon	Cubic Feet	Cubic Meters
Turbine Side				
2”	100	100	10	1
3”	100	100	10	1
4”	100	100	10	1
6”	1,000	1,000	100	10
6” x 8”	1,000	1,000	100	10
Disc Side				
2”	10	10	1	0.1
3”	10	10	1	0.1
4”	10	10	1	0.1
6”	10	10	1	0.1
6” x 8”	10	10	1	0.1

Table 6 Maximum Dial Face Capacity (6-Wheel Odometer)

	US Gallon	Imperial Gallon	Cubic Feet	Cubic Meters
Turbine Side				
2”	100,000,000	100,000,000	10,000,000	1,000,000
3”	100,000,000	100,000,000	10,000,000	1,000,000
4”	100,000,000	100,000,000	10,000,000	1,000,000
6”	1,000,000,000	1,000,000,000	100,000,000	10,000,000
6” x 8”	1,000,000,000	1,000,000,000	100,000,000	10,000,000
Disc Side				
2”	10,000,000	10,000,000	1,000,000	100,000
3”	10,000,000	10,000,000	1,000,000	100,000
4”	10,000,000	10,000,000	1,000,000	100,000
6”	10,000,000	10,000,000	1,000,000	100,000
6” x 8”	10,000,000	10,000,000	1,000,000	100,000

3 General Installation Guidelines

This chapter describes tools, materials, and general installation information for the 3-inch, 4-inch, and 6-inch TRU/FLO meters.

Tools and Materials

Table 7 shows the recommended tools you need to successfully install or perform maintenance on the TRU/FLO meter.

Table 7 is not a complete list of tools.

Table 7 Recommended Tools

Part Number	Description
N/A	Contains standard tools including: • Flathead Screwdrivers • Hammer • Pliers • 7/16-inch Wrench • Tool to Remove Snap Ring
9685-002, 003, 004, 005	Gasket Kit (size dependent).
11097-610, 600, 700, 800	Calibration Vane Assembly (size dependent).
9571-100, 110, 200, 300	Throttle Tube Assembly (size dependent).
9485-011, 006, 003, 008	Magnet Drive Assembly (size dependent).
9681-004, 001, 002, 003	Valve Assembly Kit (size dependent).
N/A	Flashlight.

Safety and Preliminary Checks

Complete the following safety and preliminary checks before and during each installation:

- Verify that you are at the location specified on the Site Work Order.
- Verify that the site is safe for you and your equipment.

4 Installing the TRU/FLO

This chapter describes storage, unpacking, and installation instructions for the TRU/FLO meter.

Prior to Installation

Storage

Upon receipt, inspect shipping containers for damage and inspect the contents of any damaged cartons prior to storage.

Once the inspection is complete, store the cartons in a clean, dry environment.

Unpacking

The TRU/FLO meter is heavy and needs to be handled carefully. Lift the assembly out of the box by the meter maincase, and not by the register. Inspect the meter for damage but use caution; the meter is very heavy.

After unpacking the TRU/FLO meter, inspect it for damage. If the meter appears to be damaged, notify your Neptune Territory Manager or Distributor. If one or more items requires reshipment, use the original cardboard box and packing material.

Tools Needed

Table 7 on page 7 shows the recommended tools you need to successfully install the TRU/FLO meter.

Table 7 is not a complete list of tools.

Installing the TRU/FLO

All TRU/FLO meters operate more accurately and reliably if installed properly. Install the TRU/FLO meter in a horizontal position with the registers facing upwards, and the flow running in a horizontal direction. The TRU/FLO meter's performance is directly related to the flow conditions of the water stream entering the meter. If the flow conditions are distorted as a result of improperly installed upstream fittings or piping changes, the TRU/FLO meter's performance can be adversely affected.

Installing Strainer

Neptune recommends that all TRU/FLO meters be installed with a plate strainer at the meter inlet for 3-inch meters and above. The strainer, in addition to protecting the meter from debris in the line, also corrects the velocity profile of the flow to the meter.

The strainers for the 3-inch, 4-inch, and 6-inch TRU/FLO meters are NSF/ANSI 61 compliant. They are made of a lead free, high-copper alloy.

When installing Neptune meters with a strainer, a minimum of 4-pipe-diameters of straight run pipe is required upstream of the meter and strainer assembly. A minimum of 2-pipe-diameters of straight run pipe is required downstream of the meter and strainer assembly.This can include components that are fully open in their normal operating position.

If a Neptune meter is installed without a strainer, a minimum of 8-pipe-diameters of straight run pipe is required upstream of the meter and strainer assembly. A minimum of 2-pipe-diameters of straight run pipe are required downstream of the meter and strainer assembly. This can include components that are fully open in their normal operating position.

New Meter Installation

Figure 3 and Figure 4 show the recommended installation of a TRU/FLO meter. This installation incorporates a plate-type strainer attached to the inlet of the meter. Figure 5 also shows a bypass which provides uninterrupted service capability during periods of meter service.

The upstream plate-type strainer provides protection against meter damage from debris in the lines and minimizes the effects of variation in upstream piping. Use of a Neptune strainer of the same line size as the meter is specifically recommended. This strainer design provides optimum velocity profile correction at minimum additional head loss.

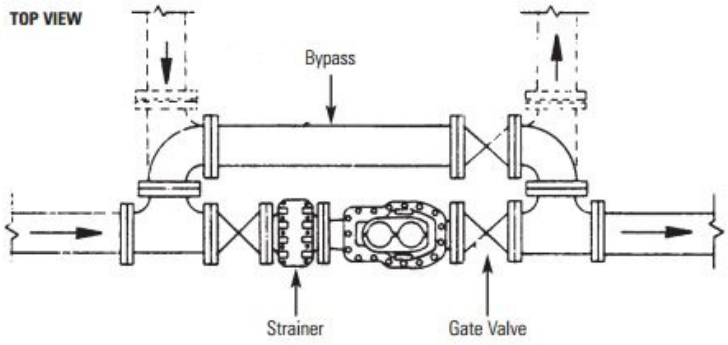


Figure 3 Installed TRU/FLO Compound Meter Top View

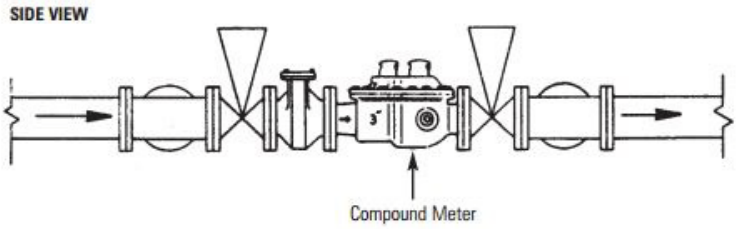


Figure 4 Installed TRU/FLO Compound Meter Side View

When installing a TRU/FLO meter, always follow normal good-piping practices. In particular, all gaskets need to be centrally located on their flanges with no overlap or interference with the pipe diameter. This is particularly important at the inlet connection to the meter where a gasket protruding into the flow stream causes unpredictable velocity conditions.

TRU/FLO meters must operate in a completely filled line at all times. The downstream piping must always provide sufficient back pressure to maintain a full line at the meter.

Ensuring Proper Installation

After the TRU/FLO meter is installed, you must carefully fill the meter with water. Complete the following steps:

1 Make sure the service line has been flushed of any debris before installing the meter.

2 Turn the bleed screw (located on the cover) counter-clockwise one to two turns. See Figure 5.

3 With the outlet-side gate valve closed, slowly open the inlet-side valve to pressurize the meter.

4 Turn the air bleed screw (located next to the turbine register) with a flat screwdriver.

Figure 5 Bleed Screw

5 Close the air bleed screw clockwise when the air is completely vented.

6 Slowly open the outlet-side gate valve until downstream is pressurized.

After installation, it is important that the upstream (inlet) valve be put in the “full open” position during service. A partially throttled upstream valve causes flow profile distortion which adversely affects meter accuracy.

5 Maintaining the TRU/FLO Compound Meter

This chapter provides instructions for maintaining the TRU/FLO meter. The 3-inch, 4-inch, and 6-inch meters in the TRU/FLO product line share similar features and functions. TRU/FLO meters are composed of four major components:

- T-10 chamber.
- Turbine measuring assembly.
- Main valve assembly.
- Throttle valve assembly.

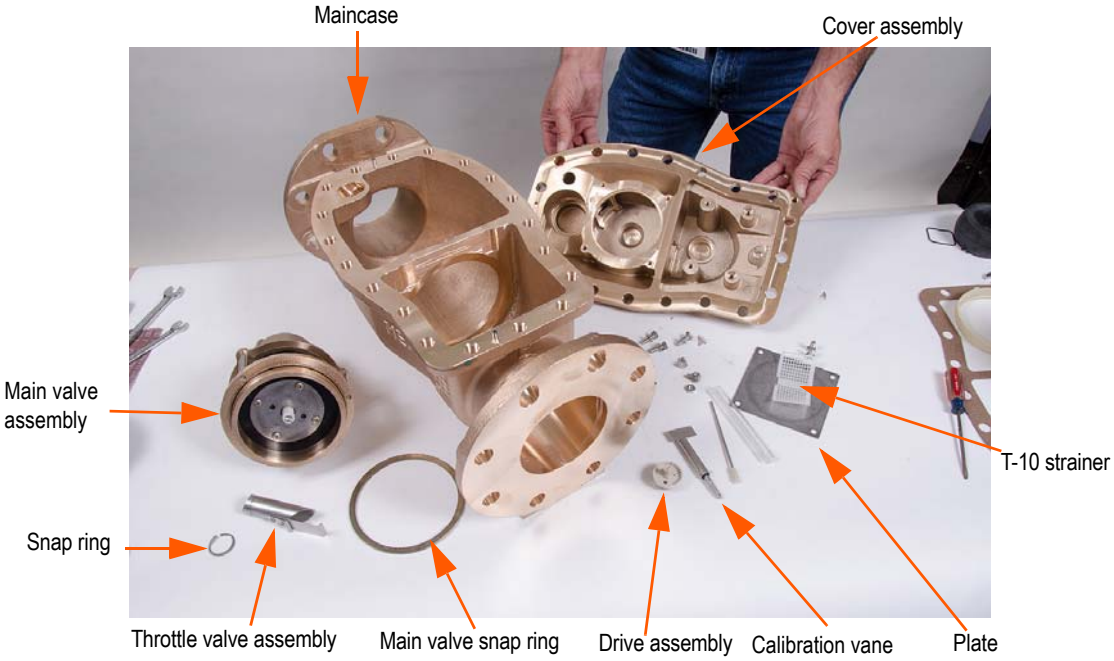


Figure 6 Reusable Parts

Neptune's UME Design

A precalibrated UME can be ordered from Neptune.

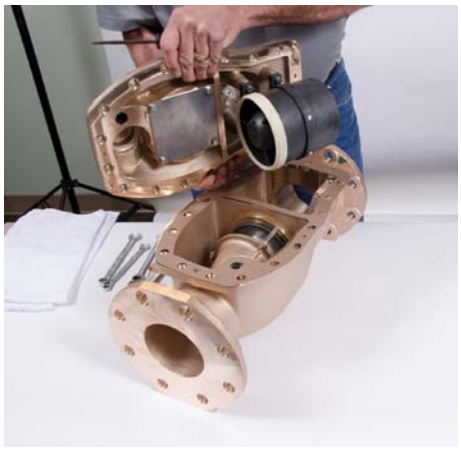


Figure 7 Unitized Measuring Element (UME)

Neptune's UME allows for the quickest, most efficient way to service your large meter. It is available for the TRU/FLO, HP Turbine, HP PROTECTUS III, and Fire Hydrant meters. The UME assembly consists of the meter's cover with all of the measuring components either contained within the cover or attached to it.

- For a TRU/FLO meter, this includes the bronze cover with the two registers, the T-10 chamber, and the turbine measuring assembly.

For the HP Turbine, HP PROTECTUS III, and Fire Hydrant, this includes the register, bronze cover, and the turbine measuring assembly.

When a new UME is ordered from Neptune:

- The UME comes with two new registers attached.
- The UME has completed an accuracy test and receives a new test ticket ensuring its accuracy.

Since the bronze body is warrantied for life, the UME can be easily replaced by removing the bolts, separating the cover from the maincase, removing the old UME, and dropping in the new UME. In fact, after this maintenance is performed, you have the equivalent of a brand new meter.

Performing Maintenance on the Meter

This section provides information on maintaining a meter.

Always wear protective eye wear when working with any product.

This includes removing and reinstalling the cover assembly.

Removing the Cover Assembly

Complete the following steps to remove the cover assembly.

Figure 8 Remove Seal Pin

1 Remove the seal pins from the register. The seal pin can be removed with a screw driver as indicated in Figure 8.

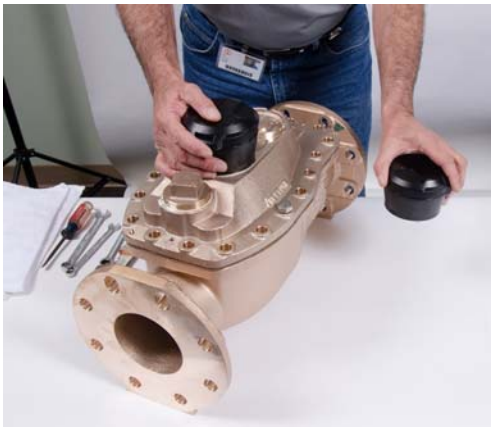


Figure 9 Removing the Registers

2 Remove the registers from the TRU/FLO cover assembly. See Figure 9.

3 Lay the registers aside in an upright position.

Do not place the cover assembly upside down on top of the registers when removing the cover.

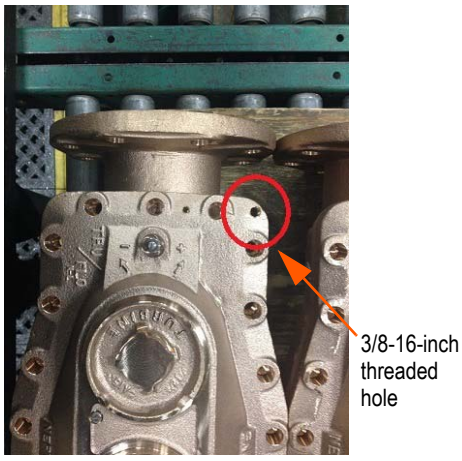


Figure 10 Removing the Cover Assembly

4 Remove the cover bolts attaching the cover assembly to the maincase.

5 The 4-inch and 6-inch TRU/FLOs have two 3/8-16-inch threaded holes that can be used to help remove the cover assembly from the maincase. Screw two 3/8-16-inch bolts into the holes to knock the maincase loose. Then the cover assembly can be pried or lifted from the body. See Figure 10.

6 Remove the cover assembly from the maincase and set it aside on a work bench or on another secure surface.

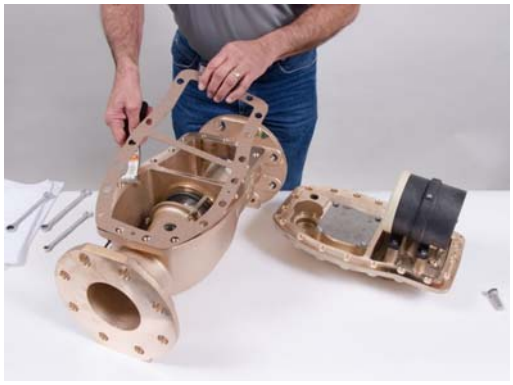


Figure 11 Removing the Gasket

7 Use a flat scraper to remove the old gasket from the maincase and to avoid damaging the maincase. See Figure 11.

Reinstalling the Cover Assembly

Complete the following steps to re-install the cover assembly.

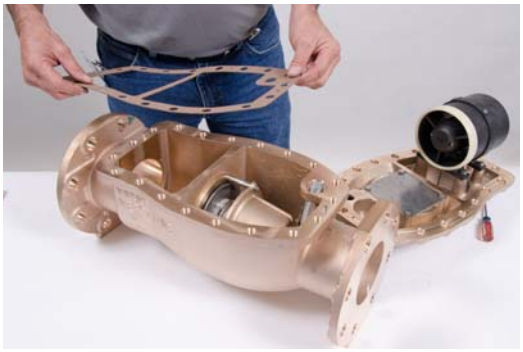


Figure 12 Placing the Maincase Gasket

1 Place the maincase gasket on the maincase. See Figure 12.

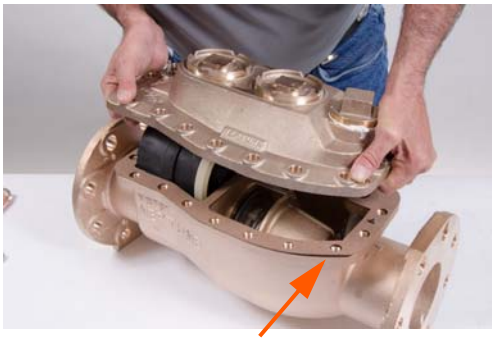


Figure 13 Placing the Cover Assembly

The maincase gasket does not need to be secured with any adhesive.

2 Place the cover assembly on the maincase, making sure that the cover assembly aligns with the guide pins. See Figure 13.

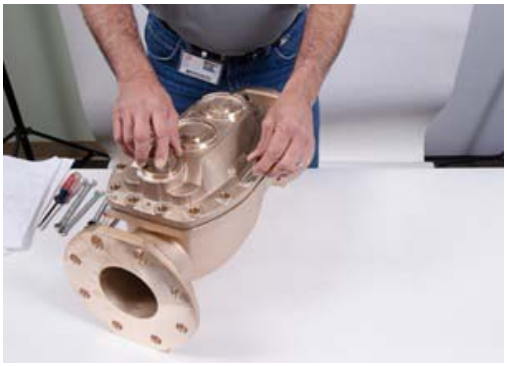


Figure 14 Securing the Cover Assembly

3 Add the bolts to the maincase and tighten them from 500-inch.lbs to 800-inch.lbs in a cross pattern. See Figure 14.

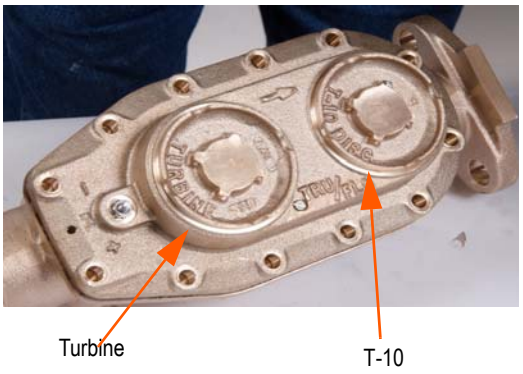


Figure 15 Top of Cover Assembly

4 Place the turbine register in the location marked “TURBINE” on top of the cover assembly. Place the T-10 register in the location marked “T-10 DISC” on top of the cover assembly. See Figure 15. Then secure them with the seal pin.

Performing Maintenance on the T-10 Chamber

Removing the T-10 Chamber

Complete the following steps to remove the T-10 chamber.

Figure 16 T-10 Plate

1 Remove the cover assembly. See “Removing the Cover Assembly” on page 14.

2 Remove the T-10 plate. See Figure 16.

3 Inspect and remove the T-10 plate gasket. See Figure 17.

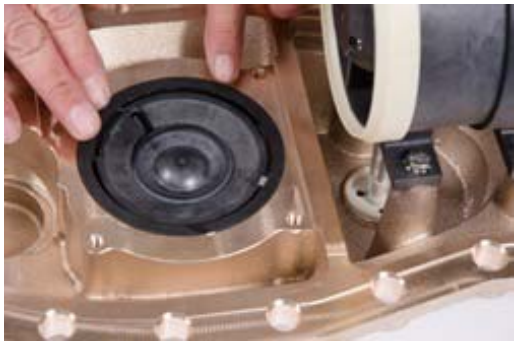


Figure 17 T-10 Plate Gasket

4 Insert the flathead screwdriver under the T-10 strainer, then lift to remove the strainer. See Figure 18.

Figure 18 Removing the T-10 Strainer

The T-10 strainer can be reused if it is not damaged.

5 Insert the flathead screwdriver under the T-10 chamber after the strainer is removed, then lift to remove the chamber. See Figure 19.

6 Inspect the chamber for any damage, and if necessary discard the chamber.

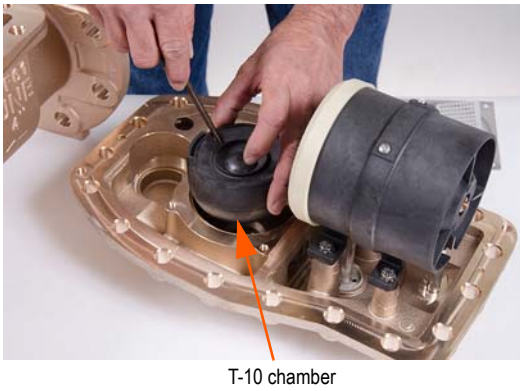


Figure 19 Removing the T-10 Chamber

Breaking down and rebuilding individual components in the chamber is not recommended.

Figure 20 Square O-ring

7 Check the o-ring integrity. See Figure 20.

Figure 21 Cleaning Around the Chamber

8 Clean the magnet and sealing surfaces.

- Use medium grit wet/dry sandpaper to clean the areas where the T-10 chamber was seated in the cover assembly. See Figure 21.
- Lightly rub to remove any collected debris or sediment on the machined surfaces.

Figure 22 Cleaning Under the Registers

- Turn the cover assembly over and clean where the registers were seated on the cover assembly. See Figure 22.

Lightly clean all areas that touch magnetic components. Do not rub too hard or you could permanently damage the machined metal surface.

Replacing the T-10 Chamber

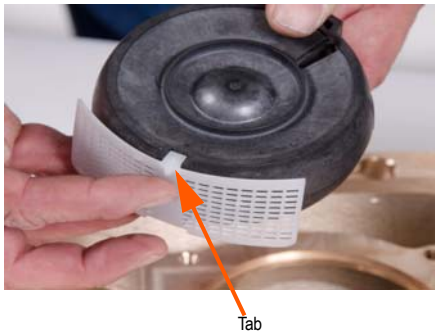


Figure 23 Adding the T-10 Strainer

Complete the following steps to replace the T-10 chamber.

1 Replace the chamber o-ring if necessary.

2 Add the T-10 strainer making sure to align the tab of the strainer with the groove in the T-10 chamber. See Figure 23. Make sure the screen is flush with the T-10 chamber.

Figure 24 Placing the T-10 Chamber

3 Place the T-10 chamber with the T-10 strainer in the cover assembly with the magnet facing down. See Figure 24.

The strainer holds the chamber in place and seals the chamber O-ring against the mating surface in the maincase.

Figure 25 T-10 Chamber Gasket

4 Add the chamber gasket to the T-10 chamber. See Figure 25 and Figure 26.

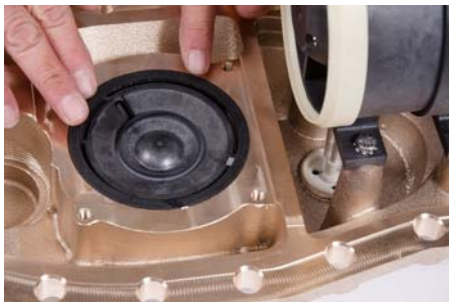
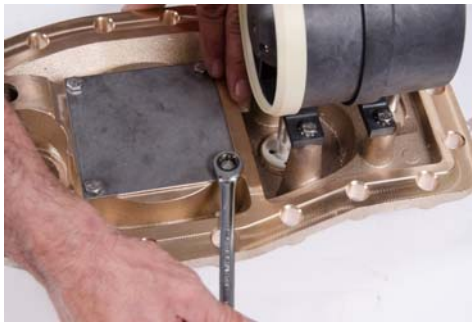


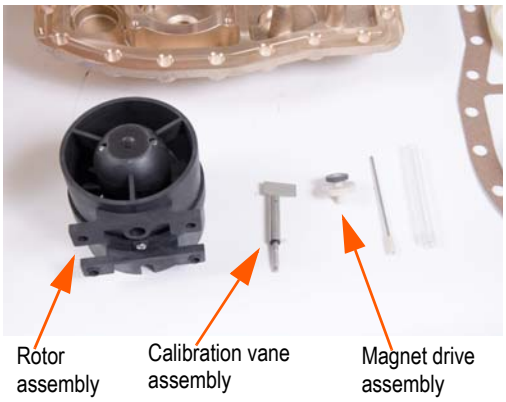
Figure 26 Replacing the Gasket



5 Add the plate and tighten the bolts with the wrench in a cross pattern. Tighten the bolts to 15-inch.lbs or 20-inch.lbs. See Figure 27.

Figure 27 Adding the Plate

Performing Maintenance on the Turbine Measuring Assembly.



There are three primary assemblies on the turbine measuring assembly:

- Rotor Assembly
- Calibration Vane Assembly
- Magnet Drive Assembly

Figure 28 Turbine Measuring Assembly

Removing the Turbine Measuring Assembly

To remove the turbine measuring assembly:

1 Place the cover assembly on its side with the turbine measuring assembly facing you.

2 Use the 7/16-inch wrench to remove the calibration vane lock nut. See Figure 29.

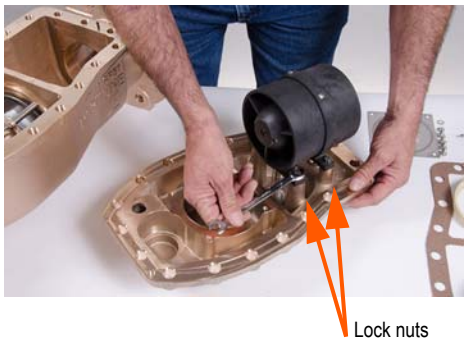
Keep the bolts for later use.

Figure 29 Removing the Lock Nuts

3 Place the cover assembly upside down, then remove the seal ring. See Figure 30.

4 Inspect the seal ring and if it is damaged or compromised throw the seal away.

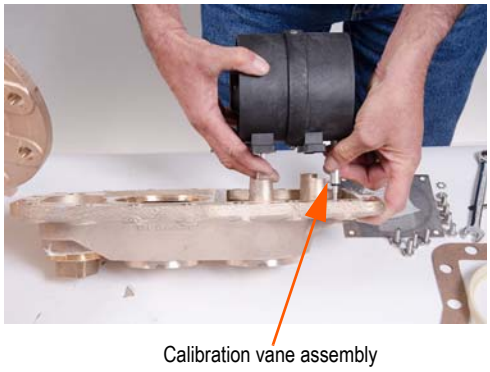
Figure 30 Removing the Seal Ring



5 Use the 7/16-inch wrench to remove the four lock nuts and bolts underneath the turbine measuring assembly. See Figure 31.

With the calibration vane lock nut loosened, you can lift the calibration vane and rotate it out of the way.

Figure 31 Removing the Lock Nuts



6 Remove the turbine measuring assembly by lifting the magnet drive spindle and the calibration vane assembly up. See Figure 32.

Figure 32 Removing the Rotor Assembly

Figure 33 Removing the Magnet Drive Assembly

7 Use pliers to remove the magnet drive assembly. See Figure 33.

The magnet drive assembly can be reused if it is not damaged.

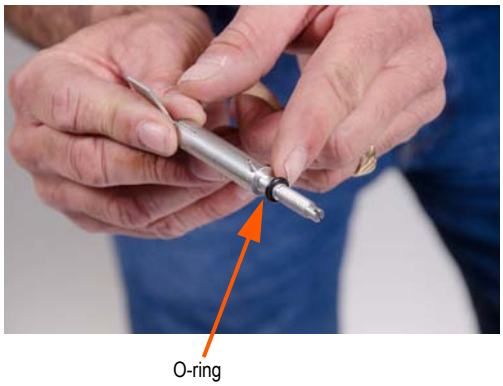


Figure 34 Replacing the O-ring

8 Inspect the o-ring on the calibration vane assembly. If the o-ring on the calibration vane assembly is nicked or damage, it must be replaced.

Replacing the Turbine Measuring Assembly

To replace the turbine measuring assembly, complete the following steps.

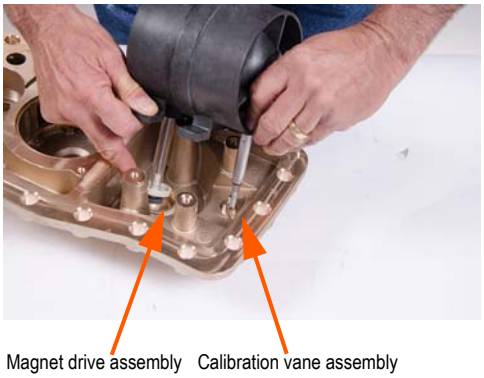
Figure 35 Magnet Drive Assembly

1 Before proceeding, inspect the magnet drive assembly. If it has been cracked or damaged, replace the magnet drive assembly. See Figure 35. A replacement drive assembly is available in the magnet drive assembly kit.

2 Return the calibration vane assembly to the turbine measuring assembly.

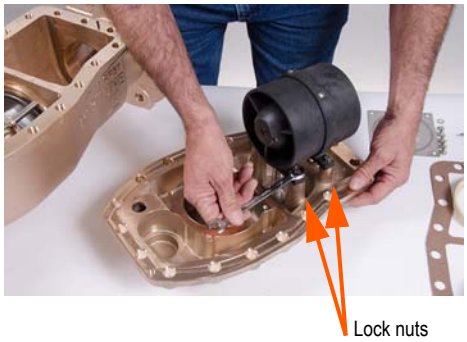
3 Install the calibration vane so that the large portion of the vane is inside of the measuring assembly.

4 Replace or re-install the magnetic drive assembly.



5 Lower the turbine measuring assembly into the cover assembly while holding the calibration vane assembly and magnet drive assembly in place. See Figure 36.

Figure 36 Adding the Measuring Chamber Assembly



6 Replace and tighten the bolts of the turbine measuring assembly with a wrench from 50-inch.lbs to 55-inch.lbs to secure it. See Figure 37.

Figure 37 Tighten Locking Nuts

7 Add the seal ring to the turbine measuring assembly. See Figure 38.

Figure 38 Adding the Seal Ring

Setting the Calibration Vane Assembly

The calibration vane assembly can be modified to change the registration of the meter. You can either turn the calibration vane to the positive side to increase registration or to the negative side to decrease registration.

To properly set the calibration vane assembly, complete the following steps.

1 Turn the cover assembly over, loosen the calibration vane nut.

2 Using a screwdriver turn the calibration vane to the desired setting.

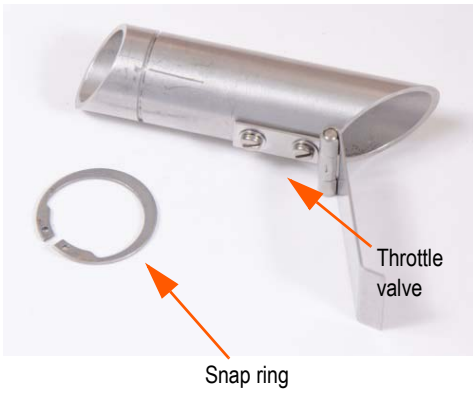
3 After the calibration vane is in the desired location, tighten the nut to fix the location of the calibration vane. See Figure 39.

Figure 39 Setting the Calibration Vane Assembly

4 To increase the registration, turn the calibration vane assembly toward the plus sign.

5 To decrease the registration, turn the calibration vane assembly toward the minus sign.

Performing Maintenance on the Throttle Valve Assembly



The throttle valve assembly consists of two parts:

- The throttle valve.
- The snap ring.

Figure 40 Throttle Valve Assembly

Removing the Throttle Valve Assembly

Complete the following steps to remove the throttle valve assembly.

1 Lift the throttle valve assembly, then insert the snap ring pliers.

2 Use the pliers to remove the snap ring. See Figure 41.

Figure 41 Removing the Snap Ring

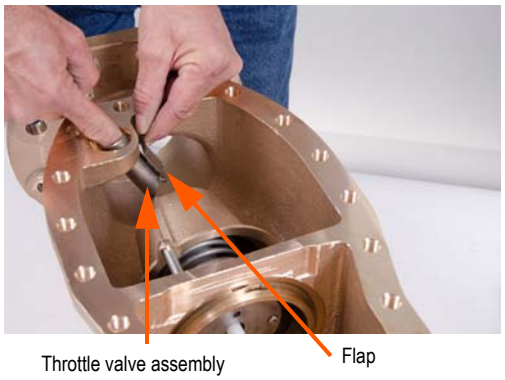


Figure 42 Removing the Throttle Valve Assembly

3 Remove the throttle valve assembly by lifting and holding the flap, then pushing down on the valve. See Figure 42.

Replacing the Throttle Valve Assembly

To replace the throttle valve assembly, complete the following steps.

1 Place the throttle valve assembly in the maincase with the flap toward the main valve assembly. See Figure 43.

The main valve assembly keeps the flap closed.

2 Lift the throttle valve up and place the snap ring in the throttle valve groove.

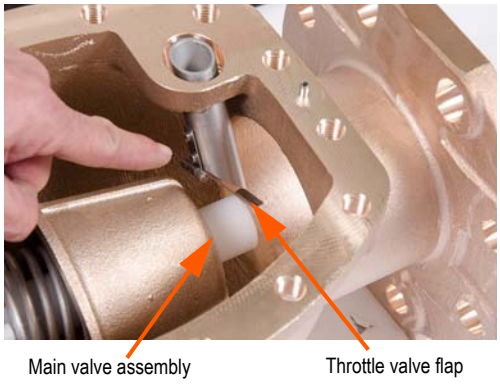


Figure 43 Placing the Throttle Valve Assembly

The snap ring locks the throttle valve assembly in place and can be reused.

Performing Maintenance on the Main Valve Assembly

Removing the Main Valve Assembly

Before you remove the main valve assembly, it is recommended that you remove the throttle valve assembly. See “Performing Maintenance on the Throttle Valve Assembly” on page 24.

1 Place a flathead screwdriver underneath the notch in the snap ring. See Figure 44.

Figure 44 Notch in the Snap Ring

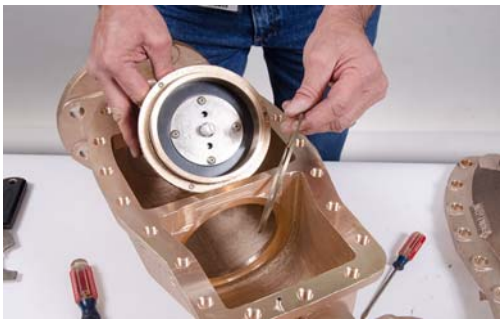
2 Turn the screwdriver 1/4 turn to dislodge the snap ring from the groove in the maincase. See Figure 45.

Figure 45 Dislodge the Snap Ring

3 Use your hand or the screwdriver to walk around the snap and then remove the snap ring from the meter. See Figure 46.

Figure 46 Remove the Snap Ring

Keep the main valve snap ring for later use.



4 Apply pressure to the back top portion of the main valve assembly. The valve falls into the maincase. See Figure 47.

5 With the main valve assembly removed, you can inspect the integrity of the main valve seat and spring.

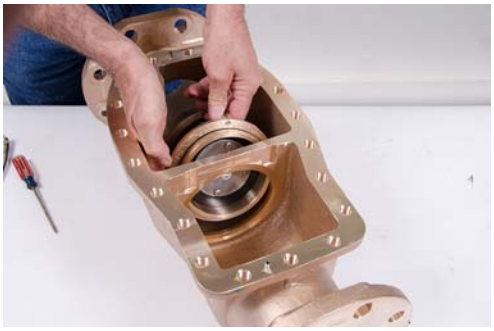
6 Clean off any machined surfaces in the maincase that might have build up.

Figure 47 Removing the Main Valve Assembly

When performing maintenance on the main valve assembly, appropriate safety measures must be taken. The main valve spring is under tension and disassembling the valve assembly can cause bodily harm.

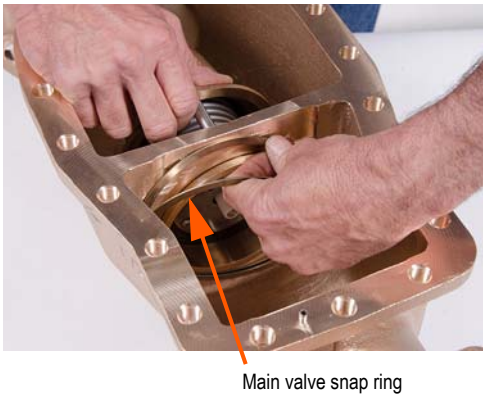
Replacing the Main Valve Assembly

To replace the main valve assembly, complete the following steps.



1 Place the main valve assembly back in the maincase, then push it toward the inlet side of the meter. See Figure 48.

Figure 48 Returning the Main Valve Assembly



2 Attach the main valve snap ring, turning it within the groove inside the maincase. See Figure 49.

The brass is sharp. Handle with care or wear durable gloves to avoid cuts and abrasions.

3 Check and make sure the main valve snap ring is in the groove.

Figure 49 Attaching the Main Valve Snap Ring

6 Why Maintenance is Important

Introduction

The water meter is a cash register for the utility. Like any mechanical device, a meter wears in such a way that its accuracy decreases. This dip in accuracy directly correlates to a dip in revenue since all of the water moving through the meter is not being captured. The impact of revenue loss with accuracy loss is more profound with large meters since they tend to move more water.

This is why creating and maintaining an efficient and reliable meter maintenance program is important for any utility. The end result is meter accuracy effects your bottom line.

Meter performance is driven by three main components:

- Water Quality
- Usage or Throughput
- Routine Maintenance

If a meter is installed in an area where the water has lots of sediment or debris, then maintenance is required more frequently. Similarly, if a meter has a high amount of usage, then routine maintenance can be performed more frequently for two reasons.

- The meter is moving more water which means it is generating move revenue.
- Like any mechanical device, the more the mechanical components of the meter are used the more frequently they need maintenance.

Finally, just like your car or any mechanical device, the more routine maintenance performed the better the overall performance of the meter.

Accuracy Test

The best way to decide if a meter needs maintenance is by an accuracy test. Typically, a meter's maintenance schedule is based on size, but any meter that sees a large amount of usage requires maintenance more frequently. Below are some generic guidelines for performing a meter accuracy test. For more information, consult the *TRU/FLO Field Testing Guide* or *AWWA's M6* manual.

To run an accuracy test, complete the following steps.

1 First, run an accuracy test at low flow. Typically, as a meter deteriorates from use, the low flow accuracy is the first thing to decline.

If a low flow accuracy test shows poor results, it can indicate one of several things:

- The T-10 strainer is clogged and requires cleaning.
- The T-10 chamber needs to be replaced.
- The o-ring in the outlet of the T-10 chamber needs to be replaced.
- The mainline valve is damaged or is wearing out and needs to be replaced.

A poor accuracy test needs to be repeated to make sure that there was not an error in the test setup to cause the poor results.

Acceptable in-field low flow accuracy test results are reported in the *AWWA M6* manual.

2 Second, run a test at medium flow or high flow. This ensures that the turbine measuring assembly is working properly.

A poor accuracy test with high flow can indicate one of the following:

- The calibration vane needs adjustment based upon the high flow results.
- The turbine measuring assembly needs maintenance:
  a. Examine the magnet drive for damage.
  b. Examine the calibration vane assembly for damage.
  c. Examine the rotor assembly for damage.
  d. Clean the bronze strainer.
- The register on the meter can be the wrong size.
- The meter has an up-flow obstruction.
- The meter is not installed with the proper install procedures.

When the meter transitions from low flow to high flow, there is a flow range called crossover. During crossover**,** the water is measured by both the T-10 chamber and the turbine. A brief dip in accuracy is seen when transitioning through crossover.

When performing an accuracy test, be aware of the crossover range. If an accuracy test results in less than the allowable range for low flow and high flow, you might be testing in the crossover range. Accuracy can not dip below 90% in the crossover range. The crossover range can also cover a small flow range. For more details see *AWWA C702*.

For more information, please consult the *TRU/FLO Field Testing Guide* and *AWWA's M6* manual.

Notes:

Appendix A: Strainer Cleaning and Maintenance

This section provides information on how to clean and maintain the TRU/FLO strainer.

Cleaning the Strainer

To clean the strainer, complete the following steps.

1 First remove the cover.

2 Pull the metal strainer out of the body and clean off any build up of debris.

3 If there is any debris in the strainer body, clean out the debris.

4 Replace the gasket between the cover and the body if necessary.

Figure 50 External Strainer

Notes:

Appendix B: TRU/FLO Parts List

This appendix describes the individual parts that makeup the TRU/FLO meter.

2-inch Meter

The following diagram is a representative breakdown of the 2-inch meter. Table 8 on page 34 describes each part of the diagram.

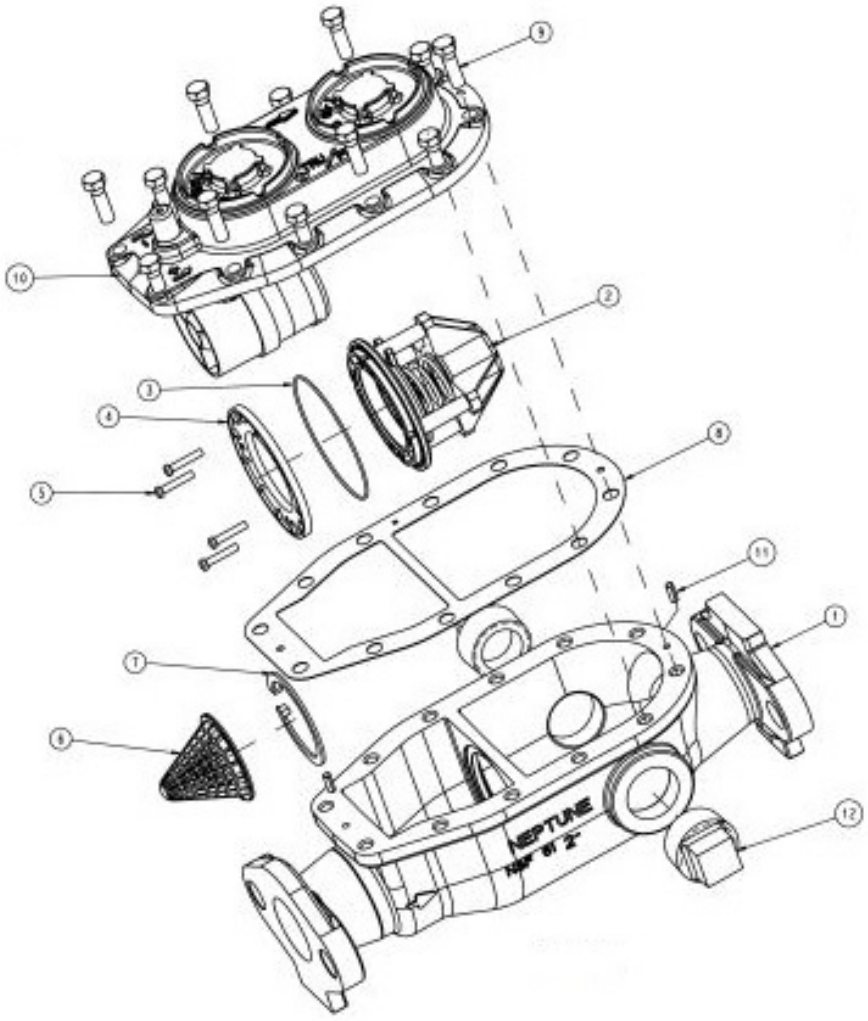


Figure 51 Representative Breakdown of the 2-inch TRU/FLO Meter Components

Table 8 2-inch TRU/FLO Parts List

Item	Description	Item	Description
1	Maincase	7	Lockring
2	Main Valve Assembly	8	Gasket, Maincase
3	O-ring	9	Bolt, 3/8 - 16 UNC - 2A x 1¼-inch LG., SS 316
4	Retainer Ring	10	Cover Assembly
5	Screw, #10 - 24 x 1-inch, Pan Recessed, SS 18-8	11	Roll Pin
6	Strainer	12	Pipe Plug - 1½-inch

3-inch, 4-inch and 6-inch Meters

The following diagram is a representative breakdown of the 3-inch, 4-inch and 6-inch meters. Table 9 on page 36 describes each part of the diagram.

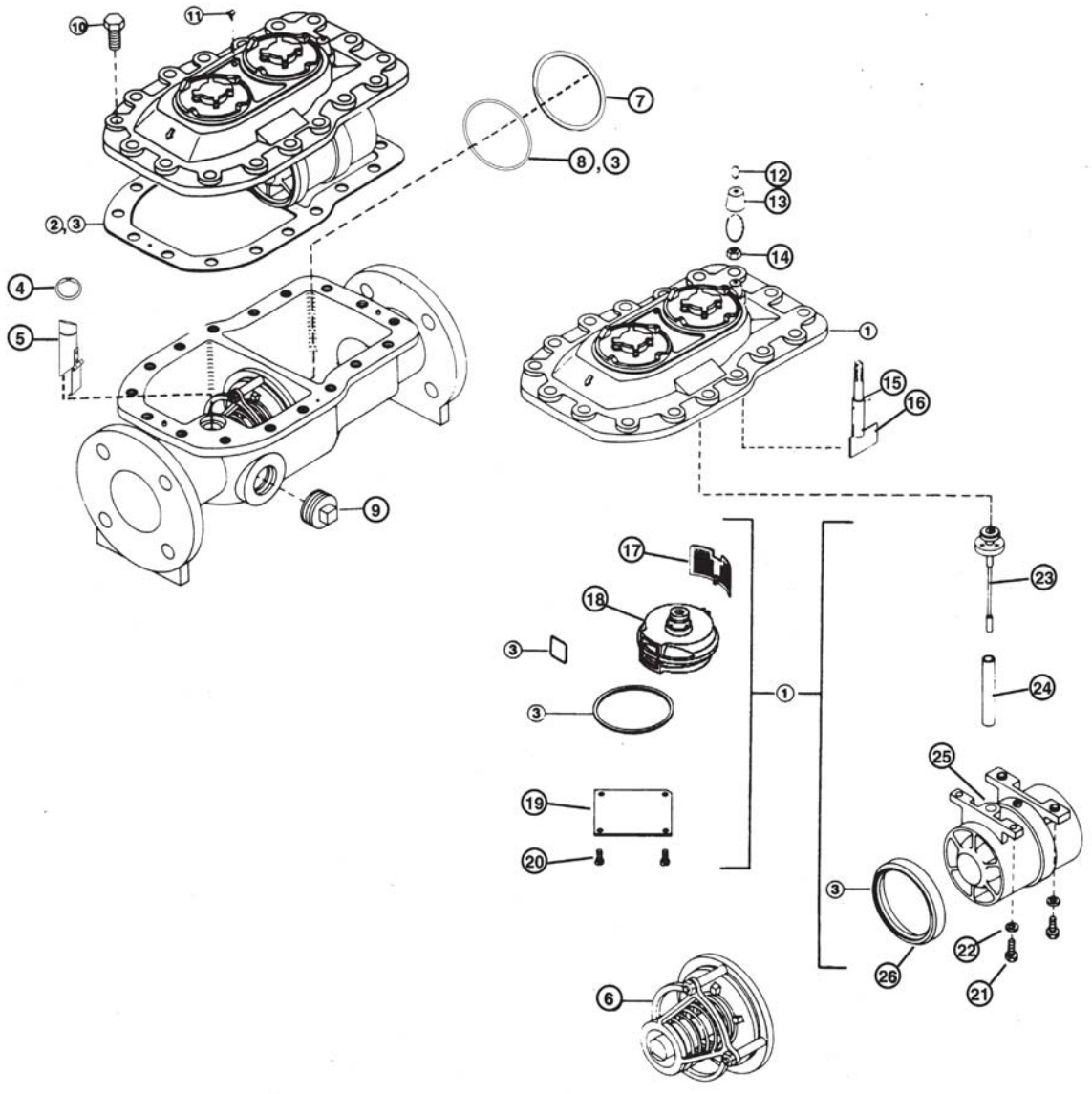


Figure 52 Representative Breakdown of the 3-inch, 4-inch, and 6-inch TRU/FLO Meter Components

Table 9 3-inch, 4-inch and 6-inch TRU/FLO Parts List

Item	Description	Item	Description	Item	Description
1	Cover Assembly	10	Bolt Cover	19	Plate
2	Maincase Gasket	11	Vent Screw	20	Screw
3	Maincase Gasket Kit	12	Seal Wire with Lead Seal	21	Bolt
4	Snap Ring	13	Seal Cap	22	Washer, Lock
5	Throttle Valve Assembly	14	Calibration Nut	23	Drive Assembly
6	Main Valve Assembly	15	O-ring	24	Drive Sleeve
7	Main Valve Snap Ring	16	Calibration Vane Assembly	25	Measuring Chamber Assembly
8	O-ring	17	T-10 Strainer	26	Seal Ring
9	Pipe Plug	18	T-10 Chamber	27	Washer, Lock

Appendix C: 2-inch TRU/FLO Maintenance

This appendix provides information on maintenance for the 2-inch meter.

Removing the UME

Complete the following steps.

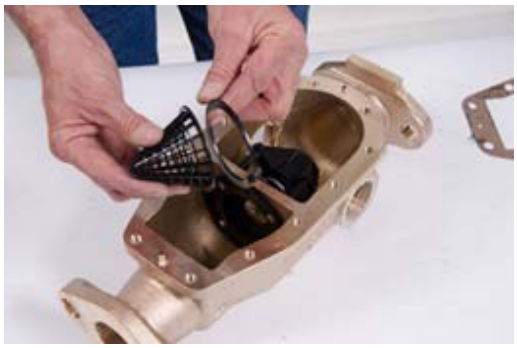
1 Remove the bolts around the perimeter of the cover.

2 Separate the cover assembly from the maincase. See Figure 53.

Figure 53 Remove the UME

Performing Maintenance on the Internal Strainer

Complete the following steps.



1 Before servicing, remove the strainer from the inlet side of the main valve.

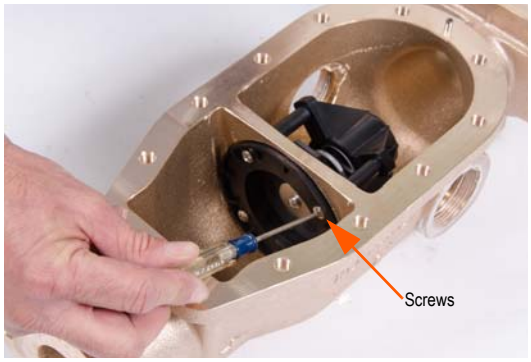
2 Make sure the strainer is not damaged or clogged. See Figure 54.

If the strainer can be cleaned, it can be reused.

Figure 54 Internal Strainer

Performing Maintenance on the Main Valve Assembly

Complete the following steps.



1 Remove the four screws that secure the retainer ring to inlet of the main valve assembly. See Figure 55.

Figure 55 Remove Screws from Retainer Ring

2 Remove the retainer ring from the inlet of the main valve assembly. See Figure 56.

Inside you can see an o-ring that seals the main valve assembly.

Figure 56 Remove Retainer Ring

3 Make sure the o-ring inside the main valve assembly is in good condition and does not have any nicks or cuts. See Figure 57.

If the o-ring is damaged, a failed low flow test could result.

4 Replace the o-ring if needed.

Figure 57 O-ring

5 After checking the retainer ring, the o-ring, and the integrity of the main valve, the parts can be reinstalled. See Figure 58.

Figure 58 Reinstalling the Parts

6 Reinstall the retainer ring on the main valve and tighten the four screws. See Figure 59.

Figure 59 Secure Retainer Ring

Performing Maintenance on the Throttle Valve

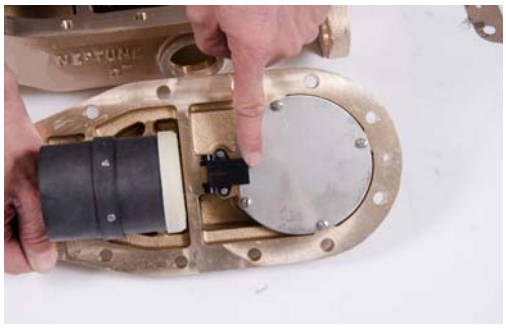


Figure 60 Throttle Valve

Complete the following steps.

The throttle valve is located on the cover of the meter. See Figure 61.

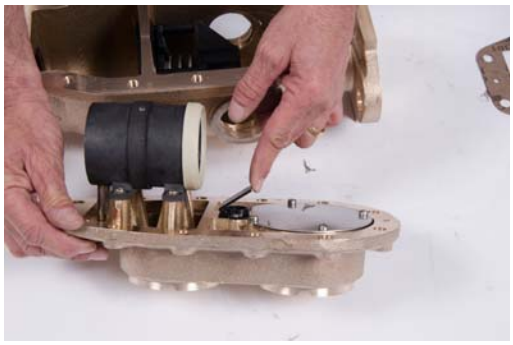


Figure 61 Throttle Valve Angle

1 Perform a visual inspection of the throttle valve.

The valve should open to approximately a 45-degree angle and close freely. See Figure 61.

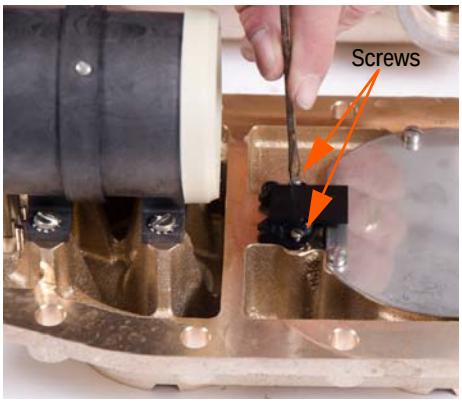


Figure 62 Removing the Throttle Valve.

2 If maintenance is required, the valve can be replaced by removing the two flathead screws on the side of the valve.

3 It is possible that the entire throttle valve needs to be replaced. In that case, the throttle valve door fits into the throttle valve with two snaps.

A failed low flow test can be an indication that the throttle valve needs to be replaced.

Maintenance on the turbine and disc side of the meter is accomplished in the same manner shown previously in this document for the 3-inch, 4-inch and 6-inch meters.

Glossary

AWWA	American Water Works Association.
calibration vane assembly	Allows field calibration of the UME to lengthen service life and to ensure accurate registration.
crossover range	Meter transitions from low flow to high flow.
disc measuring assembly	Registers low flows.
gasket	Shaped piece or ring of rubber or other material sealing the junction between two surfaces.
hydraulic valve assembly	Transfers flow smoothly between the disc section and turbine section of the meter, minimizing the loss of accuracy in the crossover range.
magnet drive assembly	Two magnetic-driven, roll-sealed registers simplify the meter's design and reduce long-term maintenance by eliminating complicated combined drive mechanisms.
main valve assembly	Spring-loaded assembly used to divert low flow rates through the T-10 measuring chamber. Primarily composed of a stainless steel spring and an 85% copper lead free bronze housing. As the flow rate increases, the spring in the main valve assembly is overcome allowing larger flow rates to be captured by the turbine assembly.
maincase	Consists of a durable lead-free, high-copper alloy. It is corrosion-resistant, lightweight, and easy to handle.
nutating disc meters	Meters that have a round disc that is located inside a cylindrical chamber. The disc nutates, or wobbles, as it passes a known volume of liquid through the cylindrical chamber. The rotating motion of the disk is then transmitted to the register that records the volume of water that went through the meter.
nutation	Rocking, swaying, or nodding motion in the axis of rotation of a largely axially symmetric object.

registration	Volume of water that went through the meter. Per sweep hand revolution.
strainer	Protects the meter from debris in the line and corrects the velocity profile of the flow to the meter.
throttle valve assembly	Stainless steel assembly found on the outlet of the T-10 measuring chamber. It is used to regulate the flow that moves through the T-10 chamber as the TRU/FLO's overall flow rate increases. As the flow increases through the TRU/FLO, the main valve assembly seals off the throttle valve. This helps regulate the amount of flow moving through the T-10 measuring chamber.
TRU/FLO meter	Designed to register wide flow ranges where varying flow rates are typical. It combines the low flow sensitivity of a disc-type meter with the high flow capacity of a turbine-type meter.
turbine measuring assembly	Registers high flows.
turbine meters	Meters that have a rotating element that turns with the flow of water. The volume of water is measured by the number of revolutions by the rotor.
UME	Unitized Measuring Element.

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