



# HP PROTECTUS® III Installation and Maintenance Guide



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HP PROTECTUS® III  
Installation and Maintenance Guide

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## FCC Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.



## **RF Exposure Information**

This equipment complies with the FCC RF radiation requirements for uncontrolled environments. To maintain compliance with these requirements, the antenna and any radiating elements should be installed to ensure that a minimum separation distance of 20 cm is maintained from the general population.

## **Professional Installation**

In accordance with section 15.203 of the FCC rules and regulations, the MIU must be professionally installed by trained meter installers.

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

## **Industry Canada (IC) Statements**

Section 8.4 of RSS-GEN

This device complies with Industry Canada License-exempt RSS standard(s). Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme aux normes RSS exonérées de licence d'Industrie Canada. L'opération est soumise aux deux conditions suivantes: 1) cet appareil ne doit pas provoquer d'interférence, et 2) cet appareil doit accepter toute interférence, y compris les interférences pouvant entraîner un fonctionnement indésirable de l'appareil.

Section 8.3 of RSS-GEN

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter IC: 4171B-L900M has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

- Maximum permissible gain of +1 dBi and required impedance of 75 ohm.
- Approved Antenna types:
  - R900<sup>®</sup> Pit Antenna, part number 12527-XXX.
  - High Gain R900<sup>®</sup> Pit Antenna, part number 13586-XXX.
  - R900<sup>®</sup> Wall Antenna, part number 13717-000.
  - Wire monopole, part number 12641-XXX.

En vertu de la réglementation d'Industrie Canada, cet émetteur radio ne peut fonctionner qu'avec une antenne d'un type et un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Pour réduire les interférences radio potentielles avec d'autres utilisateurs, le type d'antenne et son gain devraient être choisis de manière à ce que la puissance rayonnée isotropiquement équivalente (e.i.r.p.) ne soit pas supérieure à celle nécessaire à une communication.

Cet émetteur radio IC: 4171B-L900M a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes énumérés ci-dessous avec le gain maximal admissible et l'impédance d'antenne requise pour chaque type d'antenne indiqué. Les types d'antenne non inclus dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour être utilisés avec ce périphérique.

- Gain maximal admissible de +1 dBi et impédance requise de 75 ohms.
- Type(s) d'antenne approuvé
  - Antenne de puits R900<sup>®</sup>, numéro de pièce 12527-XXX
  - Antenne de puits à gain élevé R900<sup>®</sup>, référence 13586-XXX
  - Antenne murale R900<sup>®</sup>, numéro d'article 13717-00
  - Fil monopôle, numéro d'article 12641-XXX

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## Chapter 1: Product Description

This guide provides installation and maintenance instruction to help achieve maximum performance of the High Performance (HP) PROTECTUS® III Fire Service Meter.

The HP PROTECTUS III meter measures both domestic and fire service water usage through a single water line. The HP PROTECTUS III meter measures extremely wide flow ranges accurately. All Neptune® fire service meters meet or exceed American Water Works Association (AWWA) C703 Standard, are certified to NSF/ANSI 61, and are Underwriters Laboratory (UL) listed and Factory Manual (FM) approved for fire service use.

The HP PROTECTUS III key features include:

- Wide operating range.
- Component repair and maintenance.
- Rolled seated registers.



Figure 1 – HP PROTECTUS® III

## Components

---

The HP PROTECTUS III has five primary measurement components:

- Turbine measuring element.
- T-10<sup>®</sup> bypass meter.
- Throttle valve located inside the T-10 bypass meter.
- Knuckle valve.
- UL / FM strainer.

### Turbine Measuring Element

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"Unitized Measuring Element (UME)" on page 16 shows the turbine measuring assembly removed from the meter. Key components of the turbine measuring element are:

- O-ring assembly that seals the measuring element.
- Turbine / rotor.

The turbine measuring element sits in front of the knuckle valve and handles medium to high flow.

### T-10<sup>®</sup> Bypass

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Figure 1 on page 1 shows the T-10 bypass on the left side of the assembly. The T-10 bypass meter captures the low flow that passes through the HP PROTECTUS III. When the flow rate is low, the water hits the knuckle valve located behind the turbine but it is not strong enough to overcome the spring force of the knuckle valve. Therefore, it is diverted through the T-10 on the bypass.

### Throttle Valve

---

The T-10 bypass meter contains a throttle valve in the meter outlet. See "Throttle Valve Push Button" on page 20. The throttle valve regulates the amount of flow that passes through the T-10 bypass. The valve protects the T-10 from excessive usage and facilitates the meter's transition through crossover.



**Do not replace the T-10 on an HP PROTECTUS III bypass with a T-10 meter that does not have the throttle valve installed in the T-10 outlet. Make sure the throttle valve is present in the outlet of the meter used.**

## Knuckle Valve

---

The knuckle valve sits behind the turbine measuring element. It is a rubber-faced disc that is held closed with linkages. When the flow rate is low, the water does not have enough force to overcome the knuckle valve. The water hits the face of the knuckle valve and is diverted to the T-10 bypass. As the flow rate increases the water pushes the knuckle valve open. When the water increases in flow rate and the knuckle valve transitions from closed to open, the meter is transitioning through a state known as crossover. After transitioning through crossover, the meter is in a medium to high flow range.

The T-10 bypass continues to constantly measure flow. The T-10 bypass should always be registering some flow as long as the flow rate is above the T-10's minimum operating rate. The turbine measuring element can register flow when the rate is medium to high.

## UL / FM Basket Strainer

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The strainer in the HP PROTECTUS III meter is a UL / FM-approved strainer specially designed to handle fire service applications. The round style of the strainer allows debris to fall to the bottom of the strainer housing. This is significant, because the meter must deliver the flow rate required for a fire situation, even if debris has entered the meter. By having the debris fall to the bottom of the strainer housing, it keeps the debris out of the line and does not obstruct a large flow.

You can remove and clean the basket when necessary. There is an o-ring seal between the strainer cover and the body to protect against leaking. "Strainer Case O-Ring" on page 28.

## HP PROTECTUS® III General Information

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The following sections provide general information about the HP PROTECTUS III meter.

### Operation

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At low flow rates, all flow goes through the bypass meter. As flow increases, pressure loss through the bypass meter increases, and the knuckle valve opens. This condition occurs when a fire sprinkler system goes into operation and permits flow through the main turbine meter. As flow decreases, reduced pressure loss closes the knuckle valve, and flow is again directed through the bypass meter.

### Construction

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The HP PROTECTUS III meter includes:

- Stainless steel mainline body.
- Knuckle valve (rubber-faced, stainless steel spring-loaded type).
- Stainless strainer body with stainless steel basket.
- HP Turbine measuring element.
- Bronze bypass assembly.
- Lockable ball valves used on bypass.
- Throttle valve.
- 1-inch T-10 meter (on 4-inch size).
- 1.5-inch T-10 or 1.5-inch HP Turbine meter (on 6-inch sizes).
- 2-inch T-10 or 2-inch HP Turbine meter (on 8-inch and 10-inch sizes).

See Appendix B, HP PROTECTUS III Parts List for additional information.

### Warranty

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Neptune provides a limited warranty for its HP PROTECTUS III meters for performance, materials, and workmanship. The stainless steel body is warranted for 20 years, 10 of which are prorated. Neptune fire service cold water meters perform for a period of one year from date of shipment, to American Water Works Association (AWWA) accuracy standards for new water meters.

You can replace major inline components to maintain the meter, or use a factory-calibrated Unitized Measuring Element (UME).

This chapter describes the specifications, operating characteristics, and dimensions for the HP PROTECTUS® III meter.

### Environmental Specifications

The following table contains environmental specifications for the HP PROTECTUS III meter.

**Table 1 – Environmental Specifications**

| Specification              | Definition   |
|----------------------------|--|
| Application                | Cold water measurement of flow in one direction Maximum Operating Pressure 175 psi (1206 kPa). |
| Maximum Operating Pressure | 175 psi (1206 kPa).  |

### HP PROTECTUS® III Operating Characteristics

The following table contains the operating characteristics of the HP PROTECTUS III meter.

**Table 2 – Operating Characteristics**

| Meter Size | Normal Operating Range @100% Accuracy (±1.5%)  | AWWA Standard   | Low Flow @ 95% Accuracy  | Maximum Intermittent Flow Rate  |
|------------|--|---|--|---|
| 4 inch     | <ul style="list-style-type: none"> <li>• 3/4 to 1200 US gpm.</li> <li>• 0.17 to 272.55 m<sup>3</sup>/h.</li> </ul>   | <ul style="list-style-type: none"> <li>• 4 to 700 US gpm.</li> <li>• 0.91 to 1.59 m<sup>3</sup>/h.</li> </ul> | <ul style="list-style-type: none"> <li>• 3/8 US gpm.</li> <li>• 0.09 m<sup>3</sup>/h.</li> </ul> | <ul style="list-style-type: none"> <li>• 1500 US gpm.</li> <li>• 340.7 m<sup>3</sup>/h.</li> </ul>  |
| 6 inch     | <ul style="list-style-type: none"> <li>• 1 1/2 to 2500 US gpm.</li> <li>• 0.34 to 567.81 m<sup>3</sup>/h.</li> </ul> | <ul style="list-style-type: none"> <li>• 5 to 1600 US gpm.</li> <li>• 1.14 to 363 m<sup>3</sup>/h.</li> </ul> | <ul style="list-style-type: none"> <li>• 3/4 US gpm.</li> <li>• 0.17 m<sup>3</sup>/h.</li> </ul> | <ul style="list-style-type: none"> <li>• 3100 US gpm.</li> <li>• 704.1 m<sup>3</sup>/h.</li> </ul>  |
| 8 inch     | <ul style="list-style-type: none"> <li>• 2 to 4000 US gpm.</li> <li>• 0.45 to 908.5 m<sup>3</sup>/h.</li> </ul>      | <ul style="list-style-type: none"> <li>• 8 to 2800 US gpm.</li> <li>• 1.8 to 636 m<sup>3</sup>/h.</li> </ul>  | <ul style="list-style-type: none"> <li>• 1 US gpm.</li> <li>• 0.23 m<sup>3</sup>/h.</li> </ul>   | <ul style="list-style-type: none"> <li>• 5000 US gpm.</li> <li>• 1135.6 m<sup>3</sup>/h.</li> </ul> |
| 10 inch    | <ul style="list-style-type: none"> <li>• 2 to 6500 US gpm.</li> <li>• 0.45 to 1476.31 m<sup>3</sup>/h.</li> </ul>    | <ul style="list-style-type: none"> <li>• 8 to 4400 US gpm.</li> <li>• 1.8 to 999 m<sup>3</sup>/h.</li> </ul>  | <ul style="list-style-type: none"> <li>• 1 US gpm.</li> <li>• 0.23 m<sup>3</sup>/h.</li> </ul>   | <ul style="list-style-type: none"> <li>• 8000 US gpm.</li> <li>• 1817 m<sup>3</sup>/h.</li> </ul>   |

## HP PROTECTUS® III Dimensions

The following tables provide the dimensions, diagrams, and registration of the HP PROTECTUS III meter.

Table 3 – HP PROTECTUS® III Dimensions - Side View

| Meter Size | A in / mm | B in / mmg     | C in / mmg     | D in / mm     | Weight lbs / kg |
|------------|-----------|----------------|----------------|---------------|-----------------|
| 4 inch     | 33 / 838  | 10 / 254       | 10-3/4 / 273   | 17-1/2 / 445  | 215 / 98        |
| 6 inch     | 45 / 1143 | 11 1/16 / 281  | 11-3/8 / 289   | 21-1/4 / 540  | 570 / 258       |
| 8 inch     | 53 / 1346 | 11 13/16 / 300 | 13-29/64 / 342 | 25-7/8 / 657  | 765 / 347       |
| 10 inch    | 68 / 1727 | 14 13/16 / 376 | 15 / 381       | 30-1/16 / 764 | 900 / 408       |

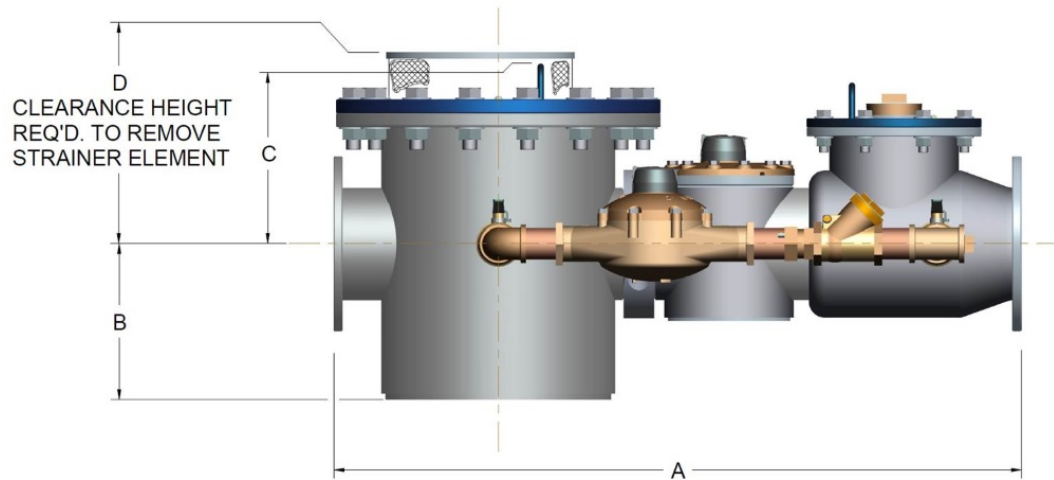


Figure 2 – HP PROTECTUS® III Side View



Table 4 – HP PROTECTUS® III Dimensions - Top and End View

| Meter Size | F in / mm    | G in / mmg   | H in / mmg | I in / mm | J in / mm | Weight lbs / kg |
|------------|--------------|--------------|------------|-----------|-----------|-----------------|
| 4 inch     | 15-1/4 / 387 | 6-63/4 / 171 | 12 / 305   | 2 / 51    | 2 / 51    | 215 / 98        |
| 6 inch     | 19-1/2 / 495 | 96-1/2 / 241 | 16 / 406   | 2 / 51    | 3 / 76    | 570 / 258       |
| 8 inch     | 21-3/4 / 552 | 12-1/2 / 318 | 17 / 432   | 3 / 76    | 3 / 76    | 765 / 347       |
| 10 inch    | 22-1/2 / 572 | 13-3/4 / 349 | 18 / 457   | 3 / 76    | 3 / 76    | 900 / 408       |

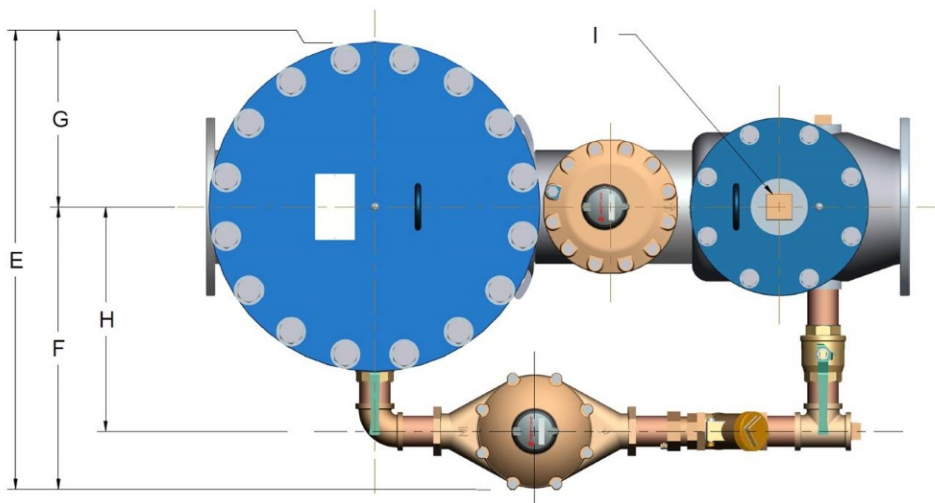


Figure 3 – HP PROTECTUS® III Top View

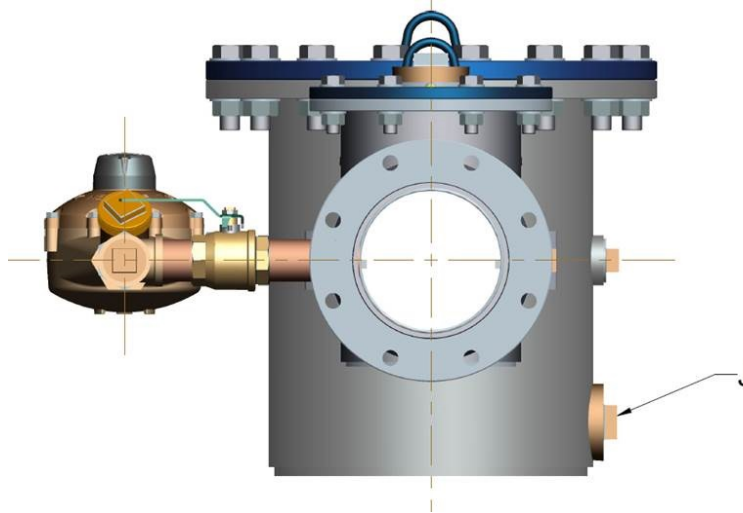


Figure 4 – HP PROTECTUS® III End View

The following table shows the meter registration per one revolution of the sweep hand.

Table 5 – Meter Registration for the Six-Wheel Odometer

| Meter Size          | US Gallon | Imperial Gallon | Cubic Feet | Cubic Meters |
|---------------------|-----------|-----------------|------------|--------------|
| <b>Disc Side</b>    |           |                 |            |              |
| 1 inch              | 10        | 10              | 1          | 0.1          |
| 1-1/2 inch          | 100       | 100             | 10         | 1            |
| 2 inch              | 100       | 100             | 10         | 1            |
| <b>Turbine Side</b> |           |                 |            |              |
| 4 inch              | 100       | 100             | 10         | 1            |
| 6 inch              | 1,000     | 1,000           | 100        | 10           |
| 8 inch              | 1,000     | 1,000           | 100        | 10           |
| 10 inch             | 1,000     | 1,000           | 100        | 10           |

Table 6 – Maximum Dial Face Capacity for the Six-Wheel Odometer

| Meter Size          | US Gallon     | Imperial Gallon | Cubic Feet  | Cubic Meters |
|---------------------|---------------|-----------------|-------------|--------------|
| <b>Disc Side</b>    |               |                 |             |              |
| 1 inch              | 10,000,000    | 10,000,000      | 1,000,000   | 100,000      |
| 1-1/2 inch          | 100,000,000   | 100,000,000     | 10,000,000  | 1,000,000    |
| 2 inch              | 100,000,000   | 100,000,000     | 10,000,000  | 1,000,000    |
| <b>Turbine Side</b> |               |                 |             |              |
| 4 inch              | 100,000,000   | 100,000,000     | 10,000,000  | 1,000,000    |
| 6 inch              | 1,000,000,000 | 1,000,000,000   | 100,000,000 | 10,000,000   |
| 8 inch              | 1,000,000,000 | 1,000,000,000   | 100,000,000 | 10,000,000   |
| 10 inch             | 1,000,000,000 | 1,000,000,000   | 100,000,000 | 10,000,000   |

## Chapter 3: Installing the HP PROTECTUS® III

This chapter steps you through installing the HP PROTECTUS® III meter.

### Prior to Installation

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This section defines how to unpack and store the HP PROTECTUS III before you install it.

#### Storage

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Upon receipt, inspect the shipping containers for damage and inspect the contents of any damaged cartons before storing. After inspecting, store the cartons in a clean, dry environment.

#### Unpacking

---



Do not lift the assembly by a single center strap around the meter body, or by either end alone.

After unpacking the HP PROTECTUS III 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

---

The following table shows the recommended tools you need to successfully install the HP PROTECTUS III meter.



Some items do not apply to your specific installation, or the list may not contain all required tools or materials.

Table 7 – Recommended Tools and Materials

| Item               | Description / Recommendations   | Use                                      |
|--------------------|---|--|
| Tool Kit           | Contains standard tools including: <ul style="list-style-type: none"> <li>• Assorted screwdrivers.</li> <li>• Needle-nose pliers.</li> <li>• Hammer.</li> <li>• 7/16 wrench.</li> </ul> | Perform various installation procedures. |
| 5500-153, 154, 155 | Valve Retainer Tool (size dependent).   | To remove the knuckle valve.             |

### Safety and Preliminary Checks

Observe 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.
- Notify the customer of your presence and tell the customer that you need access to the water meter.

### Installing the HP PROTECTUS® III

The HP PROTECTUS III meter operates more accurately and reliably if installed and maintained properly. HP PROTECTUS III meter performance is directly related to the flow conditions of the water entering the turbine section of the meter. Four pipe diameters of straight pipe are needed in front of and behind the meter.

### Installing the Strainer

The HP PROTECTUS III meter assembly includes the required UL-listed and FM-approved basket-type strainer in front of the fire service turbine and bypass. The strainer, in addition to protecting the meter from debris in the line, also corrects the velocity profile of the flow to the turbine meter and minimizes the effects of upstream piping variations. Properly servicing and cleaning the strainer is important for long term reliability and performance of the turbine measuring element.

When installing the Neptune HP PROTECTUS III, a minimum of four pipe diameters of straight run pipe can include components that are fully open in their normal operating position. This is required upstream and downstream of the meter / strainer assembly.

## Recommended Installation

You can lower the HP PROTECTUS III meter assembly into the meter vault and put it in place using chains or straps. Attach the chains or straps to the lifting hooks on the top of both the strainer and knuckle valve.



Do not lift the assembly by a single center strap around the meter body or by either end alone.

The recommended installation of the HP PROTECTUS III is in a horizontal position with its arrow pointing in the direction of the water flow. You can install the HP PROTECTUS III bypass meter on either side of the mainline meter. Before installing, inspect the knuckle valve to make sure the valve is fully seated and the face is undamaged.

A full-size bypass around the assembly is recommended, because it provides uninterrupted service capability during meter servicing periods. As indicated previously, the required UL-listed and FM-approved strainer provides protection against meter damage from rocks and debris in the lines and virtually eliminates the effects of variation in upstream piping.

A test port on the top of the knuckle valve section enables field testing the meter without removing it from the line.



When installing an HP PROTECTUS III meter assembly, follow normal good piping practices. In particular, centrally locate all gaskets on their flanges with no overlap or interference with the pipe diameter.

The HP PROTECTUS III meter assembly 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.



You can separate the strainer basket from the T-10 and HP Turbine for easier installation in a pit or basement. See Appendix A on page 33.

## Adjusting the Calibration Vane

---

Neptune equips all new turbine meters and UMEs with a calibration vane. If field calibration of the turbine element is required, complete the following steps.

1. Remove the seal pin from the register and twist off the register.
2. Turn the lock nut on the adjusting stem counter-clockwise to loosen it.
3. Insert the slotted screwdriver into the slot in top of adjusting stem and turn it toward the :
  - Plus sign (+) to increase the registration.
  - Minus sign (-) to decrease the registration.

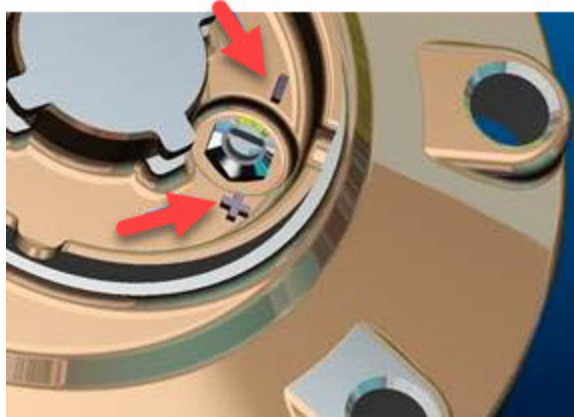


Figure 5 – Calibration Vane



Turning the adjustment stem 15 degrees in either direction results in approximately one percent change in registration. The full range of the calibration vane is 180 degrees.

## Before Operation

Before putting the HP PROTECTUS III meter assembly into service, complete the following steps.

1. Close all valves.
2. Turn the air bleed screw on the knuckle valve and strainer cover counter-clockwise one to two turns.
3. Slowly open the mainline inlet side gate valve to pressurize the meter.  
With the bleed screw open, you hear air vent from the open bleed screw.



Figure 6 – Bleed Screws

4. Wait until the water begins to run from the bleed screw and does not sputter out. This helps to vent some of the air before opening the downstream valve.



There is still a high chance of entrapped air, so open the downstream valve slowly.

5. Close the bleed screw (clockwise) on top of the meter.
6. Slowly open the outlet side gate valve until the downstream line is pressurized.
7. Slowly open the upstream ball valve on the bypass to pressurize the bypass meter.
8. Slowly open the downstream ball valve on the bypass.



After installation, put the upstream (inlet) valve in the full-open position during service.

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## Chapter 4: Maintenance and Troubleshooting

This chapter provides instructions for maintaining the HP PROTECTUS® III meter. The 4-inch, 6-inch, 8-inch, and 10-inch meters in the HP PROTECTUS III product line share similar features and functions. HP PROTECTUS III meters are composed of five major components:

- HP PROTECTUS III turbine measuring element.
- T-10® bypass meter.
- Knuckle valve.
- UL / FM strainer.
- Throttle valve located inside the T-10 bypass meter.



Figure 7 – Main Components of the HP PROTECTUS® III

### Neptune's UME Design

This chapter provides information on the Unitized Measuring Element (UME). You can order a precalibrated UME from Neptune®.

When maintenance is necessary, the complete UME can be quickly and easily interchanged with a factory-calibrated unit. Complete the following steps:

1. Close all valves (mainline and bypass).
2. Vent the pressure from the meter.
3. Remove the cover bolts.
4. Remove the UME.

5. Inspect the o-ring on the new UME for damage.
6. Install the factory-calibrated UME into the maincase.

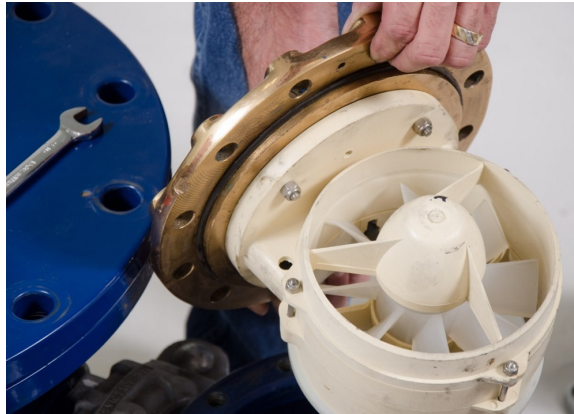


Figure 8 – Unitized Measuring Element (UME)

7. Replace and tighten the cover bolts.

Before putting the HP PROTECTUS III back into service, complete the following steps.

1. Turn the air bleed screw on the detector knuckle valve and strainer cover counter-clockwise one to two turns.
2. Slowly open the mainline inlet side gate valve to pressurize the meter.
3. Close the air bleed screws (clockwise), when air is completely vented and water begins to run smoothly from the bleed screw.
4. Slowly open the outlet side gate valve, until the downstream line is pressurized.
5. Slowly open the upstream ball valve on the bypass to pressurize the bypass meter.
6. Slowly open the downstream ball valve on the bypass.

All UMEs have been factory tested and do not require field calibration. You can purchase a factory-tested UME directly from Neptune or one of its authorized distributors. Neptune encourages all customers to purchase a spare UME to avoid service interruptions.

## Performing Meter Maintenance

This section provides information on maintaining the HP PROTECTUS III meter.



Always wear protective eye wear when working with any product.

There are two sides to the HP PROTECTUS III meter:

- Low side, T-10.
- High side, HP Turbine.

Each side has its own register. The T-10 receives a T-10 register and the HP Turbine receives an HP PROTECTUS III register.

### Low Side T-10<sup>®</sup>

The low side is also referred to as the bypass meter. With the meter de-pressurized, complete the following steps to perform maintenance on the T-10.

1. Remove the bolts from the top plate of the T-10.



Figure 9 – Removing the T-10<sup>®</sup> Bolts

2. Break the register seal pin and remove the register from the top plate of the T-10. Take a small screw driver and drive it into the seal pin.



Figure 10 – Removing the Register

3. Remove the top plate of the T-10.

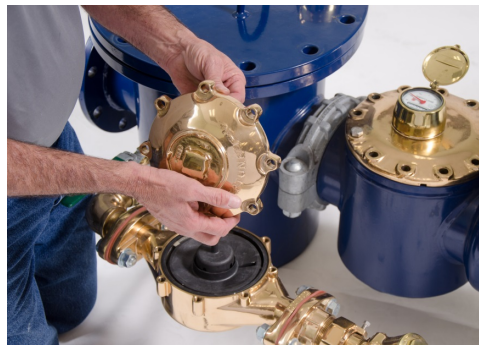


Figure 11 – Removing the T-10<sup>®</sup> Top Plate

4. Remove the gasket from the T-10 and discard, if damaged.



Figure 12 – T-10<sup>®</sup> Gasket

5. Remove the T-10 strainer.
  - Insert the screw driver between the strainer and disc chamber and lift straight up. Tabs are located on top of the strainer for easier removal. Wedge the screwdriver underneath these tabs and lift the strainer straight up.
  - Inspect the strainer and remove any debris.



Figure 13 – Removing the T-10® Strainer



Figure 14 – T-10® Strainer

6. Remove the T-10 disc chamber by lifting it straight up. The throttle valve is exposed.



Figure 15 – T-10® Disc Chamber

7. Inspect the throttle valve for damage (broken spring) and replace, if needed.



Figure 16 – Throttle Valve



A replacement T-10 body does not include the throttle valve. Purchase one of the following:

- New T-10 with the throttle already installed: P/N 12001-000, 12001-100, or 120010200 depending on size.
- Standalone new throttle valve: P/N 11668-000, 11668-100, or 11668-200 depending on size.

### Reassemble the T-10<sup>®</sup>

---

Complete the following steps to reassemble the T-10 meter.

1. Reinstall the throttle valve. The push button on the throttle valve faces the inlet side and slides into the outlet of the meter.



Figure 17 – Throttle Valve Push Button



2. Replace the square o-ring on the disc chamber.



Figure 18 – Square O-Ring

3. Lower the disc chamber into the T-10 meter.



Figure 19 – Inserting the Disc Chamber

4. Insert the disc strainer. Line it up with the notches inside the meter and make sure it is flush.



Figure 20 – Inserting the Strainer

5. Place the new gasket in the main case.

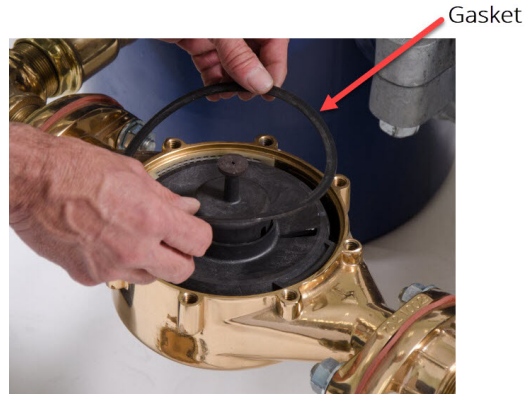


Figure 21 – Inserting the New Gasket

6. Lightly clean the machined surface on the top plate with wet or dry sandpaper.

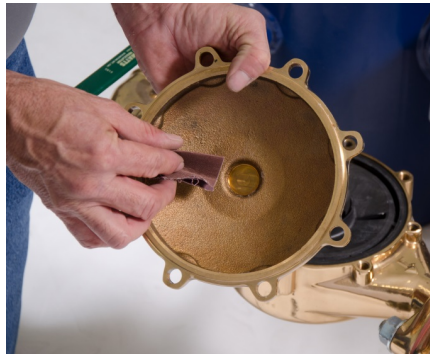


Figure 22 – Cleaning the Top Plate

7. Place the top plate on the T-10 meter.
8. Tighten bolts on the top plate in a crisscross pattern.
9. Replace register on top of the T-10 meter.



Figure 23 – Reinstalling the Top Plate





Do not mix up the low side and the high side registers. Doing so can cause an inaccurate meter reading. The register on the low side says T-10 on the dial face. The register on the high side says either HP PIII or HPT P3”.

## High Side - HP Turbine

To perform maintenance on the HP Turbine, complete the following steps.

1. Remove the bolts from the top plate of the HP Turbine.



Figure 24 – Removing the Bolts from the HP Turbine Top Plate



To prevent the epoxy coat from chipping when installing bolts, place a washer on top of and under the bolt holes.

2. Break the register seal pin and remove the register from the top plate of the turbine. Take a small screwdriver and drive it into the seal pin.



Figure 25 – Removing the Register from the HP Turbine

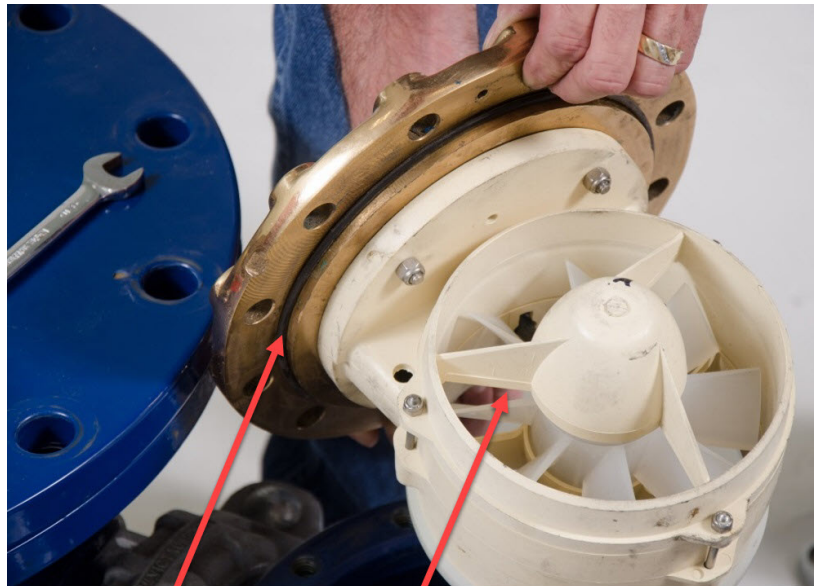
3. Place a screw driver under the HP Turbine cover, in the slots provided to pop the top, and lift up to remove the cover.  
The UME is exposed.



Figure 26 – Removing the HP Turbine Top Plate



Not pictured for the 8 inch meter is the valve seal. The 4-inch and 6-inch meters require a valve seal around the face of the HP Turbine. It is essential that this is present on the HP turbine face before reassembling the unit.



O-ring

Measuring assembly

Figure 27 – UME Attached to the Turbine Top Plate



Neptune recommends the customer purchase a new UME. This ensures that a factory-tested UME is used as the replacement and the turbine performance is guaranteed.

4. Install a new o-ring on the UME, if needed. See the previous figure.
5. Install a new UME using the guide pins provided.
6. Secure the UME with bolts.



Figure 28 – Installing the Register

### Inspect the Basket Strainer

To inspect the basket strainer, complete the following steps.

1. Remove the bolts from the top plate of the strainer.



Figure 29 – Strainer Top Plate

2. Remove the strainer top plate by grasping the hook provided on the top plate.



Top plate hook

Figure 30 – Strainer Top Plate Hook



The top plate is very heavy and could cause serious injury if proper precautions are not taken. Be sure to lift the top plate with the hook provided.

3. Lift the basket out of the strainer case.



Figure 31 – Basket Strainer



4. Inspect the basket for damage (broken welds, dents, or holes) and replace if damaged.



Figure 32 – Inspecting the Basket

### Flush the Strainer Body

A pipe plug is located on the opposite side of the strainer housing. To flush the strainer body, complete the following steps.

1. Remove the pipe plug.
2. Flush the strainer body with water to remove any debris.  
Most debris passes through the open pipe plug.

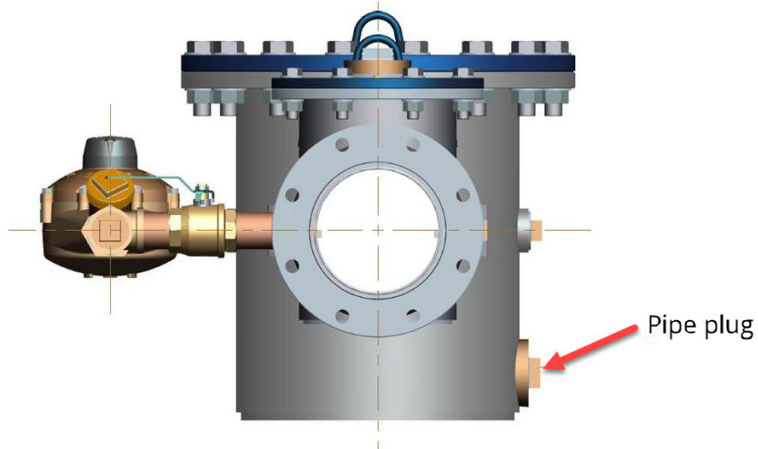


Figure 33 – Pipe Plug

3. Insert the basket into the strainer case.



Figure 34 – Replacing the Basket

4. Make sure the o-ring is in the groove on the flange of the strainer case and is not damaged.



Figure 35 – Strainer Case O-Ring

5. Place the strainer top plate back on the strainer case by using the hook provided.

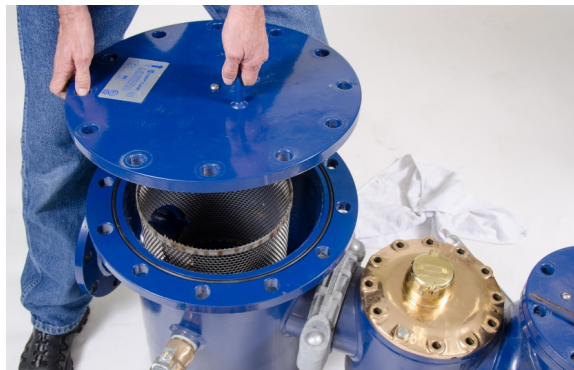


Figure 36 – Strainer Top Plate

- Line up the bolt holes on the top plate to the bolt holes on the strainer body.



To prevent the epoxy coat from chipping when installing bolts, place a washer on top of and under the bolt holes.

- Insert the bolts (with washers) through the top plate into the strainer case in a crisscross pattern and tighten securely.

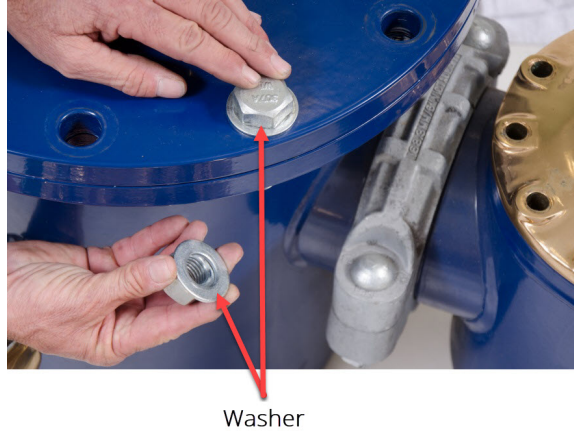


Figure 37 – Securing the Strainer Top Plate

## Knuckle Valve

To perform maintenance on the knuckle valve, complete the following steps.

- Remove the bolts from the cover of the knuckle valve.



Figure 38 – Knuckle Valve Top Plate

2. Use the hook provided to remove the cover off the knuckle valve housing.  
The knuckle valve is revealed.



Figure 39 – Removing the Knuckle Valve Top Plate



The top plate is very heavy and could cause bodily harm. Lift the top plate with the hook provided.

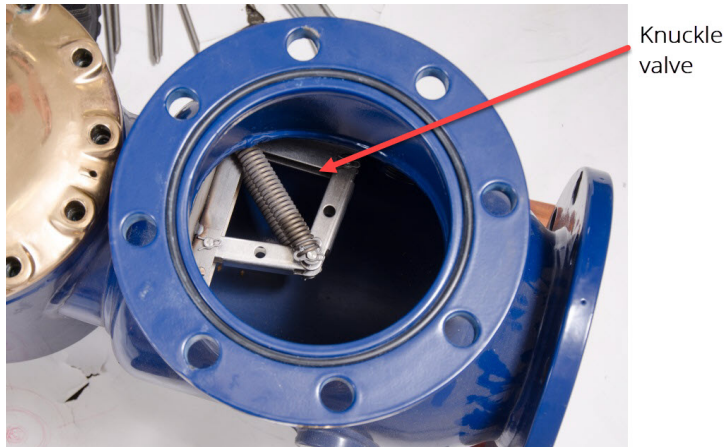


Figure 40 – Knuckle Valve



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



## Removing the Knuckle Valve

To remove the knuckle valve, complete the following steps.

1. Place the knuckle valve top plate back on top of the knuckle valve housing as a safety precaution.
2. Remove the two smaller bolts from the side of the knuckle valve housing until you hear a popping sound.

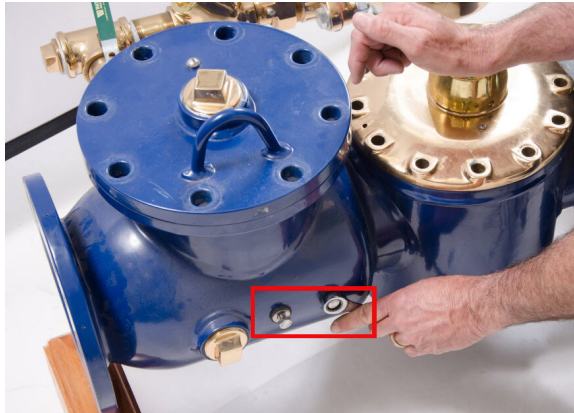


Figure 41 – Knuckle Valve Housing - Small Bolts

3. Remove the cover plate.



Do not place your hand inside the knuckle valve housing. The knuckle valve spring is under tension and can cause bodily harm.

4. Using a long object, such as a large wrench, tap the back of the knuckle valve linkages until the knuckle valve assembly falls into the meter body.



Figure 42 – Inside the Knuckle Valve Housing

5. Tap the knuckle valve linkages until the valve comes off and falls into the knuckle valve housing.
6. Grip the knuckle valve by the rubber disk and remove it from the housing.



Figure 43 – Removing the Knuckle Valve

7. Lightly clean the valve seat inside the knuckle valve housing using wet and dry sandpaper.

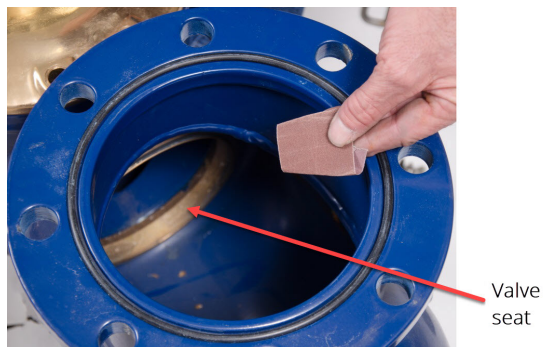


Figure 44 – Cleaning the Knuckle Valve Housing



Clean cautiously. Do not remove paint or cause damage to the meter body.

## Setting the Spring of the Knuckle Valve

To set the knuckle valve, complete the following steps.

1. Insert the bolts you removed from the side of the knuckle valve housing into the same bolt holes, but install the bolts so that their threads are sticking out of the knuckle valve housing.



Figure 45 – Knuckle Valve Bolt Holes

2. Place the new knuckle valve assembly on the bolts.
3. Tighten the nuts onto the bolts so the knuckle valve is secure on the outside of the housing.
4. Compress the knuckle valve by pulling the rubber disc back toward the basket strainer.

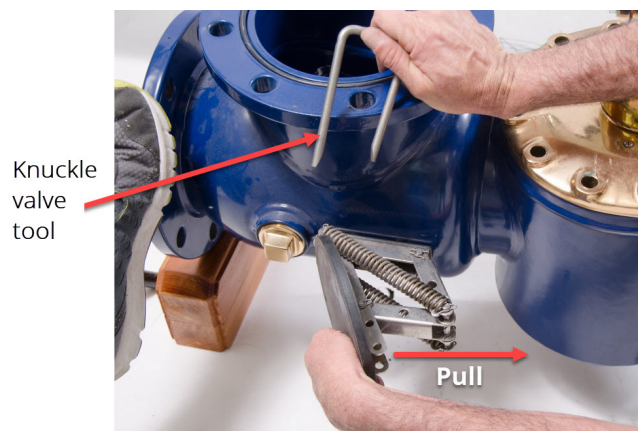


Figure 46 – Compressing the Knuckle Valve



The spring is very strong, take caution not to injure yourself while compressing it. It is advisable to use two people to compress the spring.

5. Insert the knuckle valve tool in the tool holes provided to secure the spring.



Figure 47 – Tool Holes

To purchase the knuckle valve tool, contact Neptune Customer Service and provide one of the following part numbers based on the meter size:



- 4 inch - P/N 5500-153.
- 6 inch - P/N 5500-154.
- 8 inch - P/N 5500-155.
- 10 inch - P/N 5500-155.

6. Release the new knuckle valve from the side of the knuckle valve casing by removing the old bolts and using the knuckle valve tool as a handle.

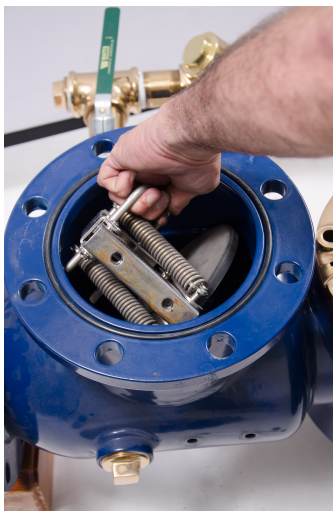


Figure 48 – Handling the Knuckle Valve

## Installing the New Knuckle Valve

To install the new knuckle valve assembly, complete the following steps.

1. Insert the new knuckle valve in the valve casing with the rubber disc facing the HP Turbine.

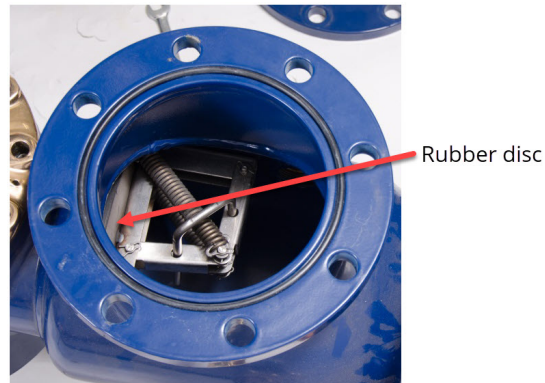


Figure 49 – Rubber Disc Facing HP Turbine

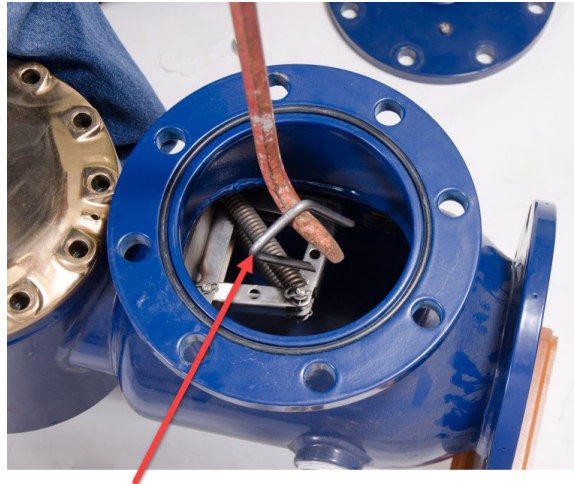
2. Reinstall the bolts holding the knuckle valve so that the threads are now going into the knuckle valve housing. If the old bolts are undamaged, reuse them.
3. Tighten the bolts until the valve is secure.



Figure 50 – Inserting the New Bolts



4. Insert a long object like a crowbar into the knuckle valve casing and hook the knuckle valve tool.
5. Lift the knuckle valve tool up and away from the knuckle valve.



Knuckle valve tool

Figure 51 – Removing the Knuckle Valve Tool

6. Make sure the bolts, washers, and nuts are secure.



Do not place your hand inside the knuckle valve housing. The knuckle valve spring is under tension and can cause bodily harm.

7. Make sure the o-ring is not damaged and is set in the grooves in the flange on top of the knuckle valve casing.



Figure 52 – Knuckle Valve O-Ring

8. Place the top plate on the knuckle valve casing.
9. Tighten all bolts, washers, and nuts until secure.



To prevent the epoxy coat from chipping when removing or attaching bolts, place a washer on top of and under the bolt holes.

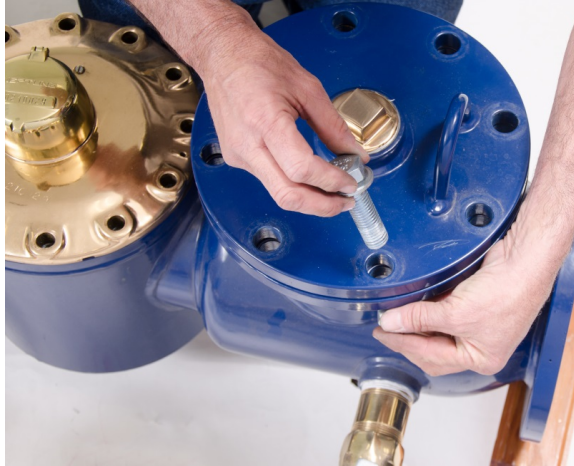


Figure 53 – Securing the Knuckle Valve Top Plate

## Contact Information

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Within North America, Neptune Customer Support is available Monday through Friday, 7:00 A.M. to 5:00 P.M. Central Standard Time, by telephone or email.

### By Phone

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To contact Neptune Customer Support by phone, complete the following steps.

1. Call **(800) 647-4832**.
2. Select one of the following options:
  - **1** if you have a Technical Support Personal Identification Number (PIN).
  - **2** if you do not have a Technical Support PIN.
3. Enter the six-digit PIN and press #.
4. Select one of the following options.
  - **2** for Technical Support.
  - **3** for maintenance contracts or renewals.
  - **4** for Return Material Authorization (RMA) for Canadian Accounts.

You are directed to the appropriate team of Customer Support Specialists. The specialists are dedicated to you until the issue is resolved to your satisfaction. When you call, be prepared to give the following information:

- Your name and utility or company name.
- A description of what occurred and what you were doing at the time.
- A description of any actions taken to correct the issue.

### By Email

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To contact Neptune Support by email, send your message to [support@neptunetg.com](mailto:support@neptunetg.com).



## Appendix A: Detaching the Basket Strainer

This appendix provides information on how to detach the basket strainer from the HP Turbine side of the HP PROTECTUS® III.

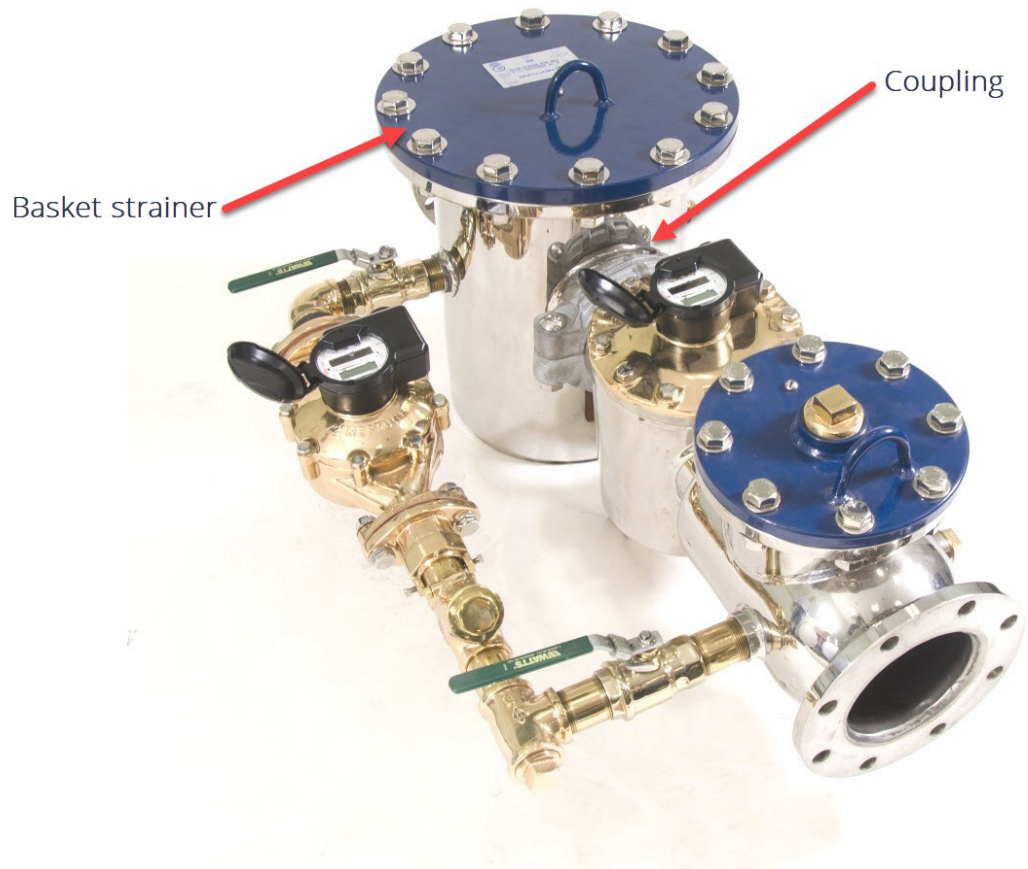


Figure 54 – Victaulic® Coupling

## Detaching the Strainer

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Complete the following steps to detach the basket strainer.

1. Remove the bolts on the top of the coupling.



Figure 55 – Removing the Bolts

2. Place a screwdriver between the two halves of the Victaulic® coupling and work it back and forth until loosened.



Figure 56 – Loosening the Coupling

3. Remove the top half of the coupling.
4. Remove the bottom half of the coupling.

5. Slide the gasket toward the strainer outlet throat.



Figure 57 – Victaulic® Coupling Gasket

6. Separate the strainer from the HP Turbine.



Figure 58 – Separating the Strainer

## Reassembling the Victaulic® Coupling

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To reassemble the Victaulic® coupling, complete these steps.

1. Slide a new gasket onto the outlet throat between the strainer and the HP Turbine.



Figure 59 – New Gasket

2. Align the HP Turbine with the strainer.
3. Place the two pieces of the Victaulic coupling around the gasket on the outlet throat between the strainer and HP Turbine.



Figure 60 – Reattaching the Coupling

4. Place bolts in the holes on the coupling.
5. Tighten the bolts on both sides until secure.



Figure 61 – Tightening the Bolts



# Appendix B: HP PROTECTUS® III Parts

This appendix describes the individual parts that comprise the HP PROTECTUS® III meter.

## HP PROTECTUS® III Diagram

The following diagrams are a representative breakdown of the HP PROTECTUS III. "HP PROTECTUS® III Parts List" on the next page describes each part of the diagram.

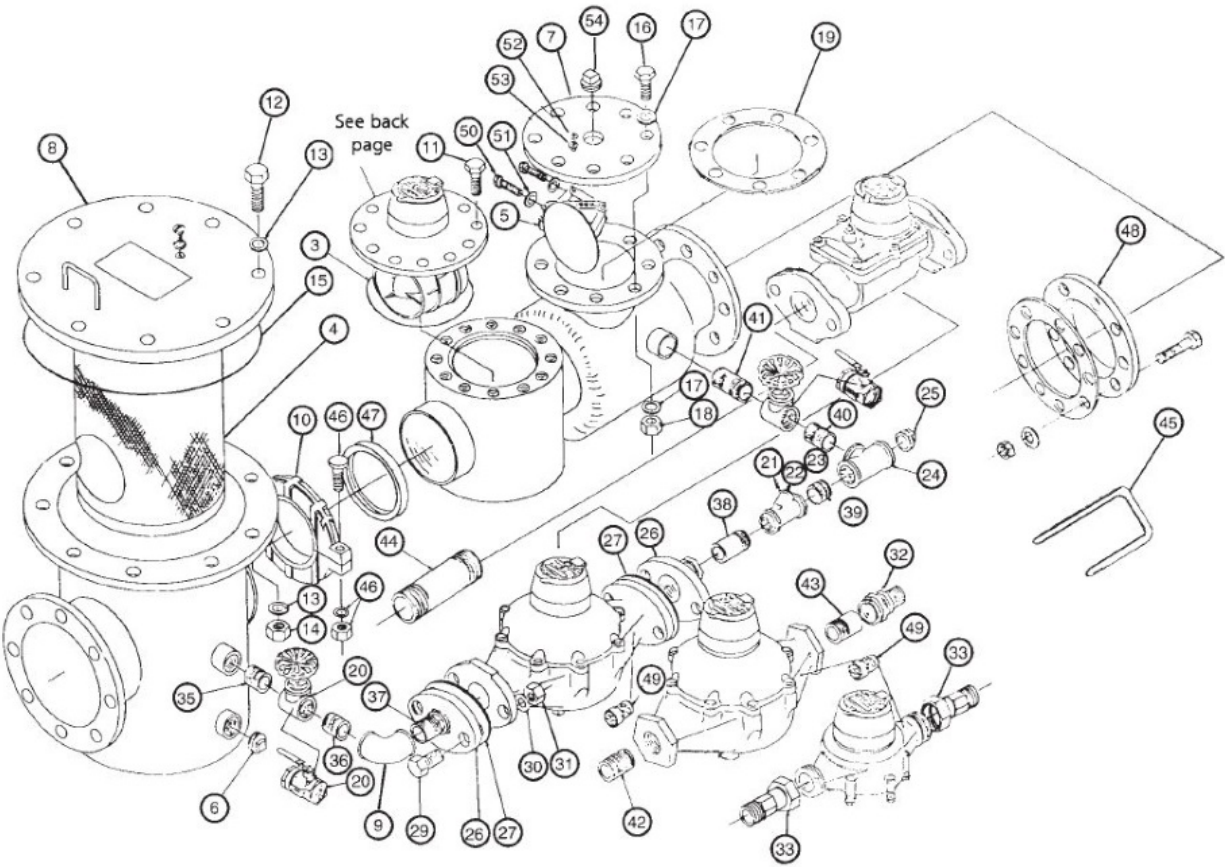


Figure 62 - HP PROTECTUS® III Parts Diagram

HP PROTECTUS® III Parts List

The following table includes the description of each HP PROTECTUS III part in the previous diagram.

Table 8 – HP PROTECTUS® III Parts List

| Item | Description  | Item | Description  |
|------|--|------|--|
| 3    | Meter Cover O-Ring 29.   | 29   | Flange Bolt / Flange Bolt (S/S).                   |
| 4    | Strainer Element.  | 30   | Flange Washer / Flange Washer (S/S).               |
| 5    | Main Line Valve.   | 31   | Flange Nut / Flange Nut (S/S).                     |
| 6    | Flush Port Pipe Plug.  | 32   | Pack Joint.  |
| 7    | Meter Valve Cover.   | 33   | Coupling Assembly.                                 |
| 8    | Strainer Body Cover.   | 34   | Bypass Plug.                                       |
| 9    | 90° Elbow.   | 35   | Threaded Nipple.                                   |
| 10   | Victaulic® Coupling / Victaulic Coupling (S/S Bolts).          | 36   | Threaded Nipple.                                   |
| 11   | Meter Cover Bolts (S/S).                                       | 37   | Threaded Nipple.                                   |
| 12   | Strainer Cover Bolts / Strainer Cover Bolts (S/S).             | 38   | Threaded Nipple.                                   |
| 13   | Strainer Cover Washers (S/S).                                  | 39   | Threaded Nipple.                                   |
| 14   | Strainer Cover Nuts / Strainer Cover Washers (S/S).            | 40   | Threaded Nipple.                                   |
| 15   | Strainer Cover O-Ring.   | 41   | Threaded Nipple.                                   |
| 16   | Valve Cover Bolts / Valve Cover Bolts (S/S).                   | 42   | Threaded Nipple.                                   |
| 17   | Valve Cover Washers / Valve Cover Washers (S/S).               | 43   | Threaded Nipple.                                   |
| 18   | Valve Cover Nuts / Valve Cover Nuts (S/S).                     | 44   | Turbine Bypass.                                    |
| 19   | Valve Cover Gasket / Valve Cover O-Ring.                       | 45   | Valve Retainer Tool.                               |
| 20   | Gate Valve / Ball Valve (Lockable LL) / Ball Valve (Lockable). | 46   | Victaulic Bolt and Nut.                            |
| 21   | Knuckle Valve.   | 47   | Victaulic Gasket.                                  |
| 22   | Knuckle Valve Bolt.  | 48   | Flange Kit / Flange Kit (S/S) / Flange 23 Knuckle. |
| 23   | Knuckle Valve Washer.  | 49   | Throttle Valve.                                    |

Table 8 – HP PROTECTUS® III Parts List (continued)

| Item | Description             | Item | Description           |
|------|-------------------------|------|-----------------------|
| 24   | Test Tee.               | 50   | Bolt-Knuckle Valve.   |
| 25   | Test Tee Pipe Plug.     | 51   | Washer-Knuckle Valve. |
| 26   | Oval Flange.            | 52   | Vent Screw.           |
| 27   | Oval Gasket.            | 53   | Vent Screw Washer.    |
| 28   | Adjustable Oval Flange. | 54   | Test Port Pipe Plug.  |

### Cover Assembly

The following image shows the parts of the HP PROTECTUS III cover.

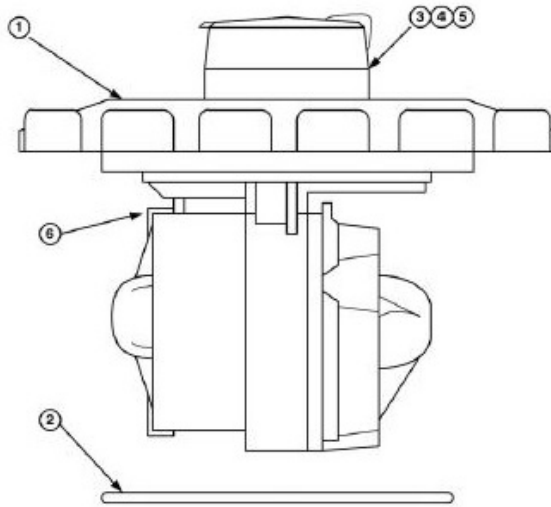


Table 9 – Cover Assembly Parts

| Item | Description     | Item | Description                                       |
|------|-----------------|------|---|
| 1    | Cover Assembly. | 4    | ProRead™ (PIT) (ARB VI) (LP) (2BD) or (3DB).      |
| 2    | O-Ring.         | 5    | E-CODER® (PIT) (ARB VII) or E-CODER®)R900i (PIT). |
| 3    | N/A             | 6    | Seal Ring (only on 4" and 6" units).              |

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### A

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#### **AWWA**

American Water Works Association.

### B

---

#### **bleed screw**

Valve used for allowing accumulations of gas in a liquid to blow off.

#### **bypass meter**

Positive displacement, rotating disc type. It can be piped on the left or right side of the assembly.

#### **bypass valve**

Valve placed to control the flow of liquid through a bypass.

### F

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#### **Factory Manual**

Product manual that come directly from the manufacturer.

#### **FCC**

Federal Communications Commission.

#### **flange**

Ring or collar, usually provided with holes for bolts.

## G

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### **gasket**

Piece of rubber or some other material that is used to make a tight seal between two parts that are joined together.

## H

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### **HP**

High Performance.

## K

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### **knuckle valve**

Rubber faced disc that is held closed with the springs or linkages visible.

## R

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### **Registration**

Volume of water that went through the meter, per sweep hand revolution.

## S

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### **strainer**

Mesh barrier protecting the meter from debris in the line and corrects the velocity profile of the flow to the meter.

## T

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### **throttle valve**

Valve used to regulate the amount of flow that is passing through the T-10®.

## U

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### UL

Underwriters Laboratory.

### UME

Unitized Measuring Element.

## V

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### Victaulic® coupling

A development in which a groove is cut around each end of pipe instead of the usual threads. Two ends of pipe are then lined up and a rubber ring is fitted around the joint. Two semicircular bands, forming a sleeve, are placed around the ring and are drawn together with two bolts, which have a ridge on both edges to fit into the groove of the pipe. As the bolts are tightened, the rubber ring is compressed, making a watertight joint, while the ridges fitting in the grooves make it strong mechanically.

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