

# Lovibond® Water Testing

Tintometer® Group



## Process Turbidimeter



### PTV Series

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### General Information

** DANGER**

A hazard exists that will result in death or severe injury if not avoided.

** WARNING**

A hazard exists that may result in death or severe injury if not avoided.

** CAUTION**

A hazard exists that may result in minor or moderate injury.

**NOTICE**

Important information or specific instructions need to be strictly followed.

**NOTICE**

The manufacturer is not liable for damages from defects or omissions in the descriptions or instructions provided by this document. The right to make changes to the literature and the products described herein can be made without notice or obligation at the discretion of the manufacturer.

### Safety Notifications

Do not begin operation or installation of this equipment before reading and understanding the risks associated with this equipment. Damage to the equipment and/or severe injury or death may occur if the information and hazard statements presented in this document are disregarded










** DANGER**

Disabling, tampering with or impairing the safety devices or labeling of this instrument may result in severe injury or death.

**CHEMICAL AND/OR BIOLOGICAL HAZARDS MAY EXIST WHERE THIS PRODUCT IS USED. ABIDE BY ALL GOVERNING LAWS, REGULATIONS AND PROTOCOLS WHEN OPERATING, MAINTAINING OR TAKING REMEDIATION ACTIONS REGARDING THIS EQUIPMENT.**

## Guide to Symbols

Labels attached to the instrument should be strictly observed to avoid personal injury or damage to the instrument. Refer to this document 'Guide to Symbols' for information regarding the nature of the danger or risk before taking any action where such label is present.

	ATTENTION! - Indicates that important information or specific instructions need to be strictly followed; (Information or instructions that can be found in the manual). 
	<b>For professional users in the European Union:</b> If you wish to discard electrical and electronic equipment (EEE), please contact your dealer or supplier for further information. <b>For disposal in countries outside of the European Union:</b> This symbol is only valid in the European Union (EU). If you wish to discard this product please contact your local authorities or dealer and ask for the correct method of disposal.
	DANGER! - A risk of severe injury or death from ELECTRICAL shock.
	DANGER! - A risk of CHEMICAL injury.
	WARNING! - A risk of severe burn; HOT SURFACE.
	WARNING! - A risk of severe injury; PROTECTIVE EYE WEAR required.
	ATTENTION! - Radio wave emissions.
	DANGER! - LASER RADIATION, avoid direct exposure to the beam. Applicable to the PTV 6000 only.

The PTV series devices are protected by US patents US9914075, US10078051 and US020170248795.

The flow body is protected by US Patents US9914075 and US10078051.

## Certification

Bluetooth® version, Bluetooth® Module: Radio Equipment	ETSI EN 300 328	CE Mark
EMC Conducted and radiated emissions	CISPR 11 (Class A Limits)	CE Mark
EMC Immunity	EN 61326-1 (Industrial limits)	CE Mark
Safety	EN 61010-1	TÜV safety mark
FCC	FCC Class A	FCC mark
Laser	EN 60825-1 / CFR 101010	TÜV safety mark

### FCC Class A Notice

This device complies with Part 15 of the FCC Rules. 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.

**Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

### Shielded Cables

Connections between the system and its peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits.

### Modifications

Any modifications made to this device that are not approved by Tintometer may void the authority granted to the user by the FCC to operate this equipment.

### DOC Class A Notice - Avis DOC, Classe A

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

### Instrument Features

The Lovibond® PTV Series turbidimeters have been designed to meet or exceed requirements associated with low level turbidity monitoring and regulatory monitoring of turbidity in drinking water and low level industrial or ultra-pure waters:

Lovibond® T-CALplus® calibration system <sup>1</sup>
No external controller needed
ISO and USEPA compliant
< 0.0005 NTU <sup>2</sup> limit of detection
< 0.005 NTU <sup>2</sup> limit of quantitation
Drift compensated solid-state light sources
Low 285 ml sample volume
Low water consumption (recommended flow rate of 80 ± 40 mL/min)
Bubble trap built-in (sample deaerator)
Wireless <i>Bluetooth</i> ® communication via Lovibond® AqualXP app - (Regional Availability)
Flow integrity monitoring - optional
Quick-release mounting system
Fluidic manager (enables flow adjust and grab sample waste stream break) - optional
2% accuracy using 1-point calibration
4-20mA output built-in
Dry Verification Device (available in low and high values) - optional
16-bit color touch screen display built-in
Certified to industrial electrical standards
<b>Additional PTV 6000 Features</b>
Drift compensated solid state laser at 685 nm
Limit of detection better than 0.0001 NTU
Range 0.0001 to 20.00 NTU
Laser safety interlock system
High sensitivity to small turbidity events
RSD Parameter for the prediction of breakthrough events.
Excels at membrane filtration processes for drinking water, ultra pure water, and any clean water purity monitoring

<sup>1</sup>Note: Pre-packaged stabilized formazin calibrants and cleaning solutions designed for minimum chemical exposure.

<sup>2</sup>NFU units are used when referring to ISO 7027 compliance standard. NTU units are used when referring to the USEPA compliance standard.

## Product Overview

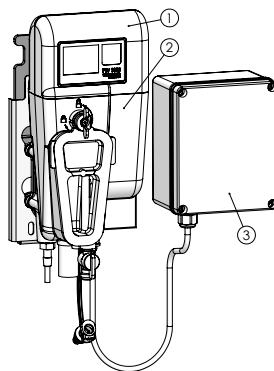
The Lovibond® PTV Series Turbidimeters are continuous-reading process monitoring instruments for filter management and regulatory reporting for turbidity in potable water. This includes regulatory reporting of turbidity for the United States Environmental Protection Agency (USEPA) or ISO 7027 International Standard. The Lovibond® PTV Series Turbidimeters may be applicable for water monitoring application in which the expected turbidity is typically less than 10 NTU or FNU.\* The Lovibond PTV Series Turbidimeters are designed to detect an incremental change in turbidity of less than 0.0005 NTU when measuring below 0.05 NTU. This sensitivity is 100 times lower than the sensitivity as specified by USEPA 180.1 (measurement rounding).

**1. Measurement Module** (synonymous to turbidimeter 'Head') - The Measurement Module of the turbidimeter contains the light source, optics, signal processing, data storage, display and a touch screen user interface. The local touch screen permits operation of the Lovibond® PTV Series Turbidimeters without an external controller. The 'Home' screen displays the current turbidity value and status of the turbidimeter.

**2. Flow Body** - The Flow Body contains the components that come in contact with the sample and is engineered to ensure consistent results over a large range of operating conditions. The flow body incorporates design elements necessary for low-level turbidity detection. Routine maintenance, such as calibration and cleaning, can be performed without the use of tools and with low chemical exposure.

**3. Power & Communications Module (PCM)** - The PCM contains the high voltage power supply, digital and analog communication interfaces. (A complete description of PCM including all electrical installation instructions are included within a separate manual. A qualified electrician trained in the installation of electrical equipment should read and understand prior to working with this component as potential lethal hazards are present).

### PTV 1000 • PTV 2000



\*For the purposes of specification, FNU = NTU when

1) The instruments are calibrated on Formazin based standards and

2) Formazin is used in the derivation of the specifications. It is possible for FNU and NTU to differ on real world samples.

## Product Overview

**PTV 6000 ONLY** The PTV 6000 Process Turbidimeter is a Class 1 Laser product that includes an interlocked, non-serviceable, Class 3B laser. Two interlocks ensure the user is not exposed to laser radiation.

**1. Measurement Module Interlock** - The internal interlock disables the beam when the Measurement Module is removed from the flow body, or when the flow body is removed from the Mounting Cleat.

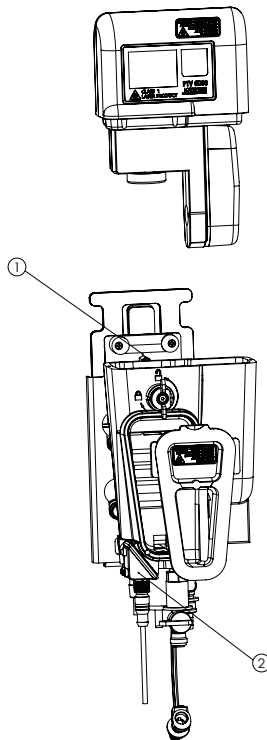
**2. Bubble Trap Cover Interlock** - The external interlock disables the beam when the bubble trap cover is removed.

Note: PTV 1000/2000 bubble trap cover will not enable the laser.  
Use only 19806-048 cover with the PTV 6000.

The PTV 6000 must be returned to the factory for service.



PTV 6000: Class 3B laser radiation when open and interlocks defeated, avoid exposure to the beam.





## RSD Parameter for PTV 6000

Laser turbidimeters such as the PTV 6000 possess highly improved optical qualities to yield a very stable process measurement system. This enhanced stability provides additional information that can be deciphered from the laser turbidity measurement itself and used as a separate parameter to further improve the limit of detection to breakthroughs in filtration systems. This parameter is known as the RSD parameter. The parameter has been shown to also enhance the sensitivity of detection of minor breakthroughs in different filtration systems. Studies in conventional anthracite filtration, micro-filtration, ultra-filtration, Nano-filtration, and reverse-osmosis filtration have proven out this process detection parameter.<sup>1</sup>

Using the RSD parameter as a predictive indicator of a pending filtration breakthrough requires an optical arrangement wherein the measured portion of the sample, (or view volume), is interrogated by a beam of light of high energy density, preferably a laser. An incident beam of high energy density is capable of detecting the presence of particles in very low concentrations. A conventional turbidimeter without the use of a high-density beam is capable of detecting particles of approximately 1.0- $\mu\text{m}$  or larger, whereas a laser turbidimeter is capable detecting particles as small as 0.01- $\mu\text{m}$ . This enables the laser turbidimeter to detect very small breaches in a filter such as a pinhole.

Laser turbidimeters are designed to meet these criteria and, like particle counters, can use the real time derivative of their monitoring baselines as an independent indicator of a membrane breach. One commercially available laser turbidimeter that offers RSD parameter is the PTV 6000. This parameter is automatically viewed on the instrument's touchscreen and has the unit "RSD" and on those mobile devices that are connected to the respective PTV 6000.

Use of this parameter should be based on each water treatment plants design and operational parameters. A general guideline is that RSD values that are less than 1 percent indicate stable filtration operation. Values exceeding 1 percent can indicate particle leakage through a filtration system.

1. Sadar, M and Bill, K., 2001. Using Baseline Monitoring Techniques to Assess Filter Run Performance and Predict Filter Breakthrough. Proceedings from the 2001 Water Quality Technology Conference, Nashville, Tennessee.

**Technical Specifications**

The Lovibond® PTV Series Turbidimeter is available in four versions, one ISO and three US EPA compliant versions. The PTV 1000 IR displays turbidity values in FNU units and is compliant to ISO method 7027. The PTV 1000 WL, PTV 2000 and PTV 6000 are EPA approved methods and display turbidity values in NTU units. Approval information for the PTV 1000 WL, PTV 2000 and PTV 6000 are referenced in Federal Register / Vol. 82, No 143 / Thursday, July 27, 2017 / Rules and Regulations, 34861 – 34868.

Specification	Details
Measurement Method	Nephelometry, scattered light collected at 90° to the incident beam
Operating temperature	0 to 50°C (32 to 122°F)
Measurement Range	PTV 1000 / PTV 2000: 0.0001 to 100 NTU / FNU PTV 6000: 0.0001 to 20.00
Display units	FNU, NTU, mNTU, TE/F, mg/l PSL, mg/l Kaolin, Degree, custom
Accuracy	± 2% of reading from 0 to 10 NTU ± 4% of reading between 10 to 100 NTU
Repeatability	Less than 1% at 1 NTU/FNU, expressed as percent relative standard deviation (%RSD)
Linearity error	Less than 1% for 0 to 5 NTU and 2% for turbidity values greater than 10 NTU (requires 2-point calibration)
Stray Light	PTV 1000 IR: <0.005 / 5 mNTU PTV 1000 WL: <0.015 / 15 mNTU PTV 2000: <0.008 / 8 mNTU PTV 6000: <0.005 / 5 mNTU
Limit of Detection	PTV 1000: <0.0005 NTU PTV 2000: <0.0001 NTU PTV 6000: <0.0001 NTU
Limit of Quantitation	PTV 1000: Better than 0.005 NTU PTV 2000: Better than 0.001 NTU PTV 6000: Better than 0.001 NTU
Resolution	0.0001 NTU or FNU (range dependent 5 digits displayed)
Response time	10% change within 40 seconds @ 200 mL/min
Response 10 to 90%	Less than 240 seconds @ 200 mL/min at 1 NTU
Signal Averaging	User Selectable: 1, 3, 6, 10, 30, 60, and 90 seconds. Default set to 30 seconds
Sample temperature <sup>1</sup>	0 to 50°C (32 to 122°F) <sup>1</sup> For best performance the sample temperature should be at least 5°C less than the ambient temperature.
Sample Flow	30 to 500 <sup>2</sup> mL/min (0.476 to 7.925 gal/hr), 40 to 120 mL/min (0.634 to 1.902 gal/hr) recommended flow; <sup>2</sup> For flow rates above 100 ml/min (1.585 gal/hr) use external flow monitoring (not supplied).
Sample pressure	0.03 to 5.5 bar (0.435 to 80 psi)
Sample Volume	285-ml (Measurement Module installed in Flow Body)

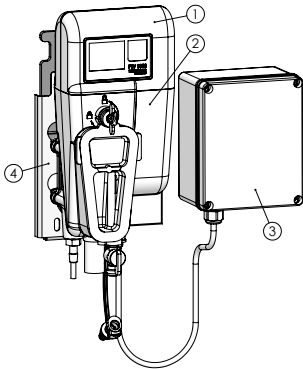
## **GB** Specifications

<b>Specification</b>	<b>Details</b>
Humidity	5 to 95 %RH (Non-condensing)
Regulatory Compliance Methods	ISO 7027: PTV 1000 IR EPA: PTV 1000 WL, PTV 2000 & PTV 6000 The Lovibond White Light LED Method, The Lovibond 660-nm LED Method and Lovibond 6000 Laser Method are cited in 40 CFR 141.74(a)(1) as approved by the USEPA for drinking water turbidity.
Safety Compliance	PTV 6000: Class 1 laser product, contains non-serviceable laser operating at 685 ± 10 nm, 55mW max output.
Alarms	Three set-point alarms, each equipped with an SPDT relay with unpowered contacts rated 5A resistive load at 230 VAC
Pollution degree	2
Enclosure rating	IP 65
Mounting	Indoor using supplied quick-connect mounting cleat affixed to a wall. Optional Panel Mount accessory is available.
Dimensions HxDxW	34.0 x 13.7 x 20.3 cm (13.4 x 5.4 x 5.8 in)
Shipping weight	1 kg (2.2 lbs)
Method of calibration	1-point calibration defaulted to a value of 5.0 NTU with any regulatory approved formazin calibrant.
Sensor cable length	Standard: 0.6 m (~2 ft) Optional: 2, 3 and 10 m (6.6, 9.8 and 32.8 ft)
Storage and shipping temperature	-40° to 60°C (-40 to 140°F)
Power requirements	24 VDC, 1.5A supplied by PCM
Inlet fitting	¼-inch NPT female, ¼-inch quick-connect tubing (Included) (¼ inch = 6 mm)
Outlet fitting	3/8-inch NPT female, 3/8-inch hose barb tubing (Included) (3/8-inch = 9mm)
Sample tubing	HDPE, ¼-inch OD (high-density polyethylene), color = black or blue (¼ inch = 6 mm)
Analog output	Two outputs selectable range of 0-20 mA or 4-20mA; Output programmable over any portion of the measurement range. Connections inside PCM.
Interface protocols	Touch screen USB to Android or Windows device via PCM. Wireless (Regional Availability): Low Energy <i>Bluetooth</i> ® between Measurement Module and Smart Device (iOS or Android)
Verification options	Dry Verification: Device (high or low value) Wet Verification: T-CAL <sup>plus</sup> ®, T-CAL® or Formazin
Calibration options	T-CAL <sup>plus</sup> ®, T-CAL® or Formazin: 1-point calibration (5.0 NTU recommended; or between 4 to 22 NTU)
RSD Parameter	For measurement of baseline fluctuation (PTV 6000 Only)
Warranty	1 year

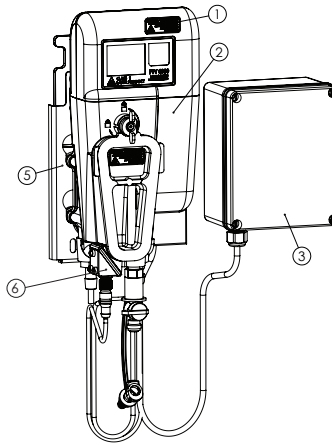
**Product Components**

Main components and optional accessories

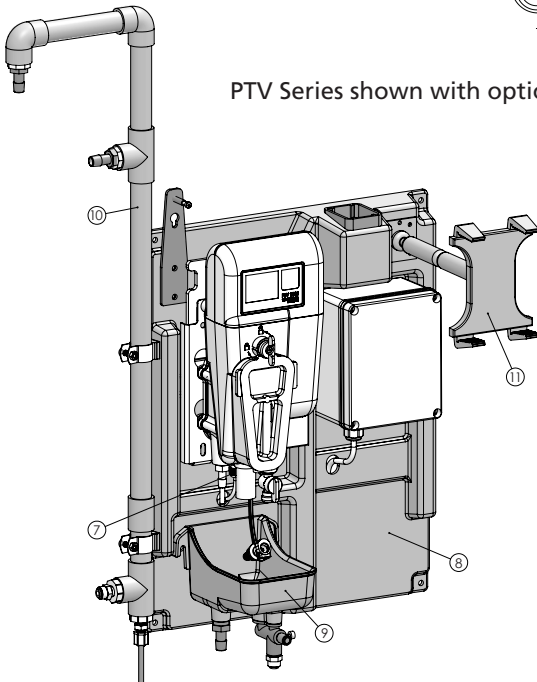
**PTV 1000 • PTV 2000**



**PTV 6000**



**PTV Series shown with optional accessories**



1	Measurement Module
2	Flow Body
3	Power & Communications Module
4	PTV 1000/2000 Mounting Cleat
5	PTV 6000 Mounting Cleat
6	Beam Dump Guard (PTV 6000 Only)
7	Flow Sensor (optional)
8	Mounting Panel (optional)
9	Fluidics Manager (optional)
10	Constant Head Device (optional)
11	Smart Device Mount (optional)

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## **GB** Installation

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### **General Guidelines**

Before beginning the installation, locate an area with a solid wall to mount the instrument that is away from heavy traffic, exposure to direct sunlight or other heat sources, with minimum dust and vibration. The panel mount option is recommended to ensure proper installation, to manage cables and to provide conveniences that help increase work flow efficiency.

 **WARNING**

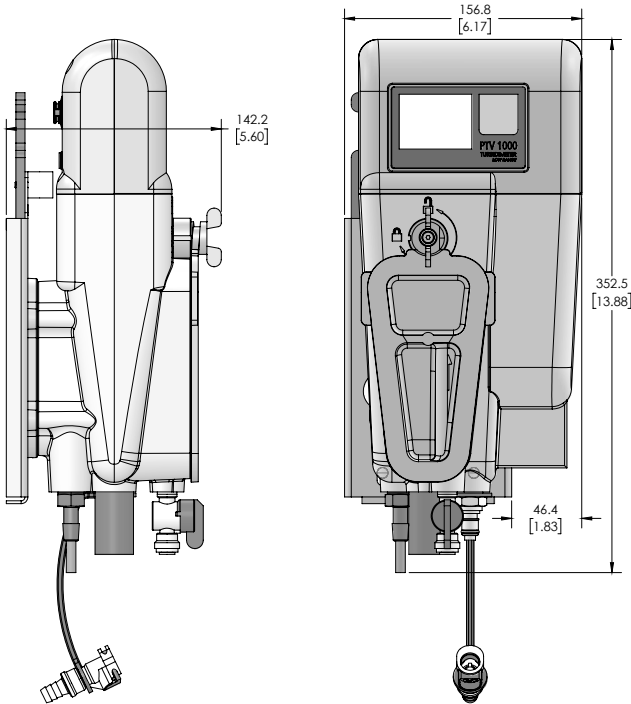
There are multiple hazards associated with the installation of this equipment. Installation of this equipment should only be conducted by qualified personnel.

## Mechanical Installation

- Install this instrument on a wall.

### NOTICE

**ALLOW AN ADDITIONAL 30.5CM (12" INCH) CLEARANCE FROM THE TOP OF THE FLOW BODY FOR REMOVAL OF THE MEASUREMENT MODULE.**



## Installing the Mounting Plate

Allow 25-cm (9.8 inch) above and 6-cm (2.4 inch) clearance to the right of the mounting plate for serviceability and cable routing. The mounting plate attaches to the vertical wall using four M6 or 1/4 inch stainless steel bolts, (of a suitable style and length determined by installer, to assure the mounting plate is securely attached).

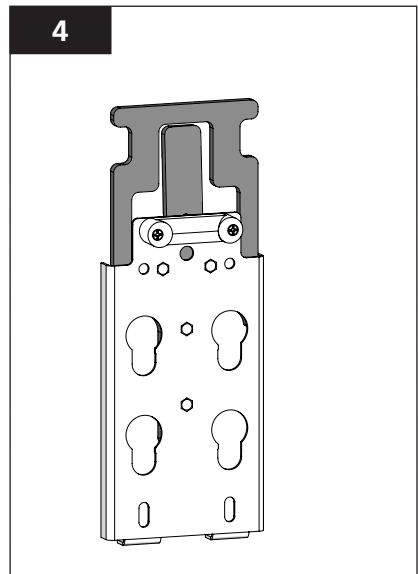
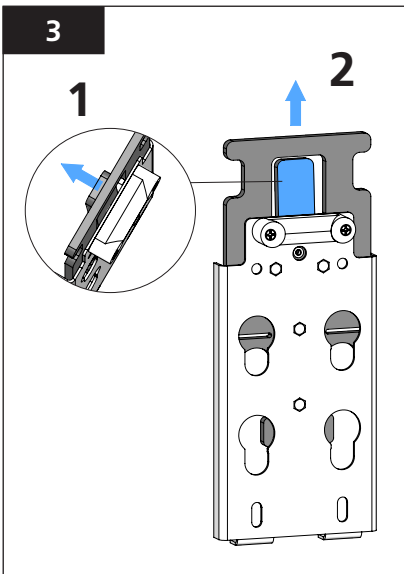
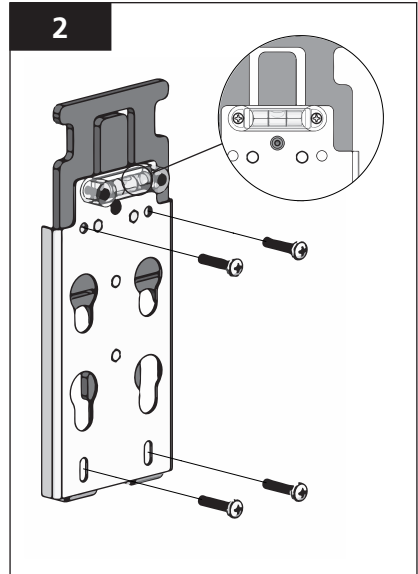
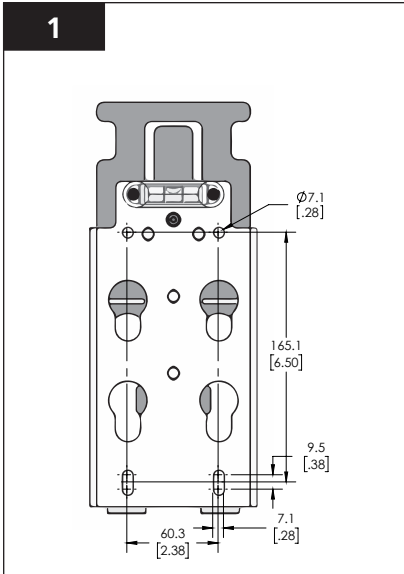
### NOTICE

Do not over-tighten screws and deform the mounting plate during installation.

## GB Installation

### NOTICE

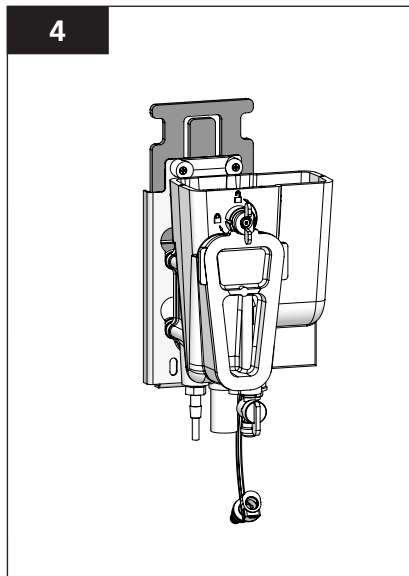
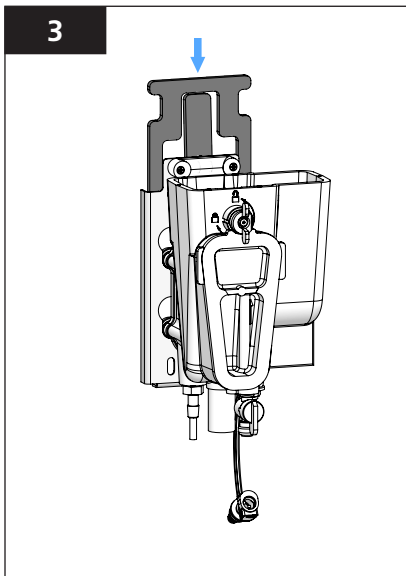
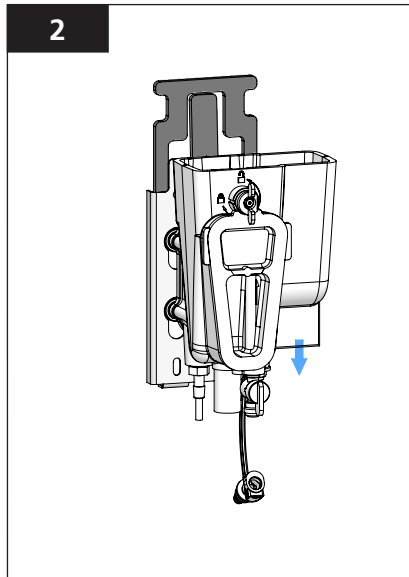
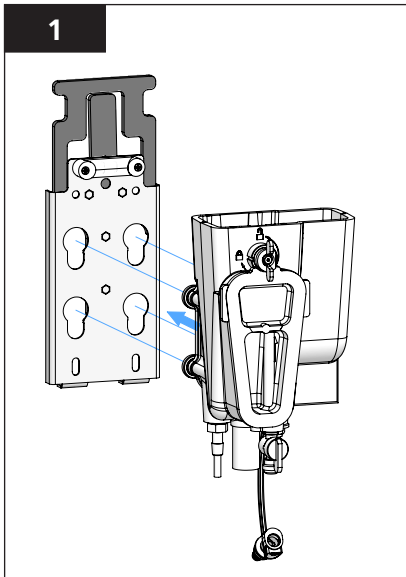
The Sight Level, (included as part of the Mounting Cleat), should be used while marking the hole locations on the wall and during installation. Level mounting of the Flow Body is important for proper transfer of sample through the turbidimeter.



## **GB** Installation

### Attaching the Flow Body to the Mounting Cleat

Note: PTV 1000/2000 Mounting Cleat will not enable the PTV 6000 Laser. Use Only 19806-119 mounting cleat with the PTV 6000



#### **NOTICE**

Check to ensure the instrument is level after installation.



## Fluidic Connections

ASTM D6698 sampling conditions should be followed for this installation.

### Sample tap (from the source)

Sample tap should project into the center of the pipe to minimize interference from air bubbles or sediment. Sample lines should be as short as possible to minimize reading delays due to changes in the sample turbidity. Avoid sample line routings which cause the inlet pressure to drop below the recommended sample line pressure minimum; (this can cause air lock conditions within the sample line).

### Sample Line Installation

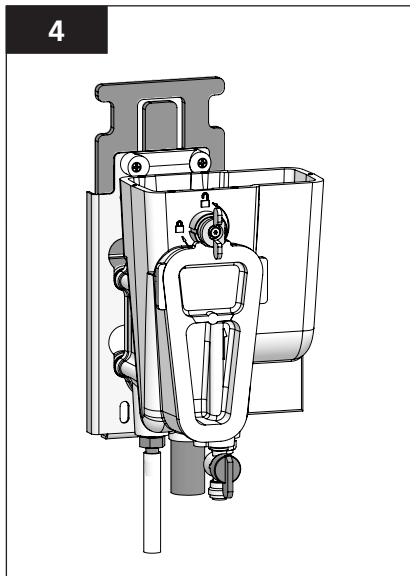
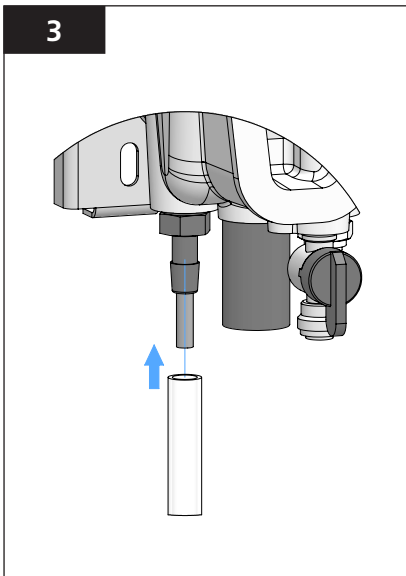
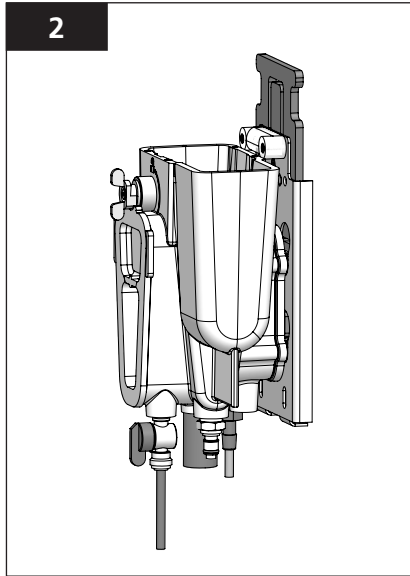
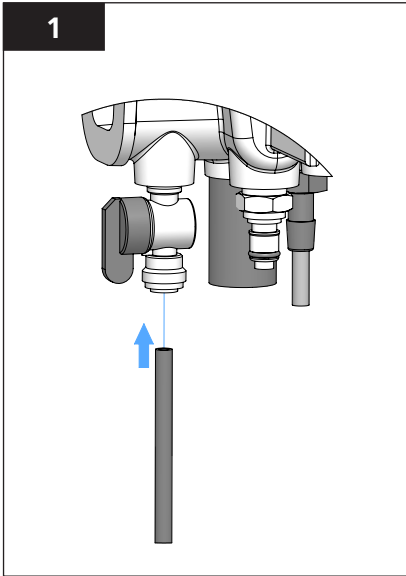
1. Adjust the length of the ¼-inch (6mm) sample tubing to minimize the distance that the sample must travel.
2. Cut the ¼-inch (6mm) sample tubing square to ensure a secure and leak free connection.
3. Insert the sample line into the shutoff valve inlet located on the bottom of the PTV series Flow Body; push firmly to seat the tubing in the shutoff valve

NOTICE
For setup and/or for real time 'at-the-head' observations, a 0 to 100 ml/min rotameter may be installed into the 1/4-inch sample flow line as a visual flow indicator. See <i>Accessories &amp; Replacement Parts</i> section for details.

### Drain Line Installation

1. Connect a 3/8-inch (9mm) ID tube to the 3/8-inch (9mm) barbed fitting located on the bottom of the PTV series Flow Body and route to drain.

NOTICE
Avoid drain line routings which can become kinked or trap water within the drain tubing when no grab sample air break is present at the turbidimeter Outlet Fitting.



**NOTICE**

Flow Bodies equipped with a flow sensor; the 1/4-inch (6mm) siphon tube will fit inside the 3/8-inch (9mm) ID Outlet tube.

**DO NOT SHORTEN OR REMOVE THE SIPHON TUBE.**

For best performance, the flow rate and operating conditions should be kept as constant as possible; *(an optional constant head device may be added to minimize flow variation).*

## **GB** Installation

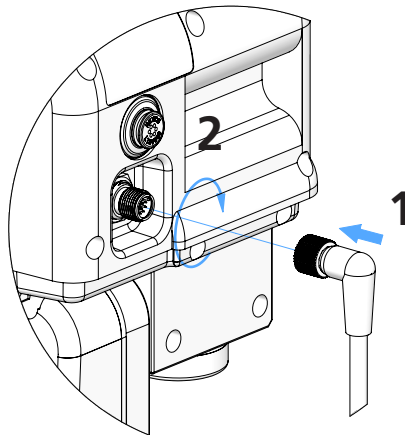
### Electrical Installation - PTV 1000 and PTV 2000 Models

Measurement Module power connection - Connect the 90 degree 12 PIN M12 connector to the Measurement Module.

This is a keyed connector pair; carefully align the connectors during insertion so as not to bend the pins on the male connector.

#### NOTICE

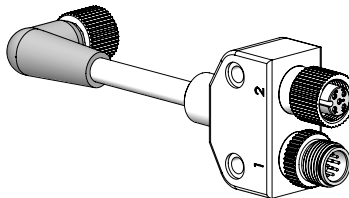
Refer to the Power & Communications Module Installation Manual for all other electrical and communication connections



#### Connecting the power cable to the PTV Measurement Module

#### NOTICE

For Flow Bodies that come equipped with a flow sensor, the 12-PIN M12 connection will be made through a supplied Y-Connector attached to the Measurement Module.



PTV series turbidimeters are shipped with the Flow Sensor configuration set to **DISABLED**. Refer to the Configuring the Instrument Section to enable this feature. With the Flow Sensor configuration set to **ENABLED**, a flow warning will be issued if: 1. the Flow Sensor is not present or 2. has been disconnected or 3. the average flow rate is outside the recommended flow range.

### Electrical Installation - PTV 6000 Interlock Connection

Measurement Module interlock connection - Connect the 90 degree 4 PIN M8 connector to the Measurement Module. This cable ensures the laser is disabled when the bubble trap cover is removed and is required for proper operation.

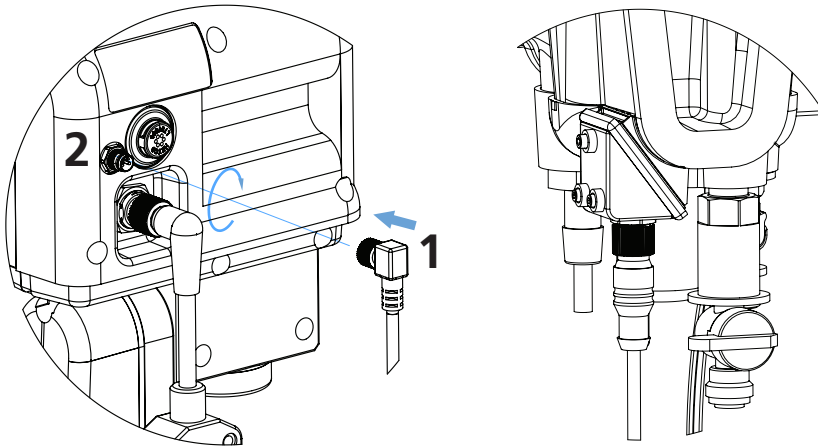
This is a keyed connector pair; carefully align the connectors during insertion so as not to bend the pins on the male connector.

#### NOTICE

Refer to the Power & Communications Module Installation Manual for all other electrical and communication connections

### Interlock Module Connection

Connect the straight end of the 4 pin M8 connector to the interlock module, located next to the body drain.



Connecting the interlock cable to the PTV Measurement Module

**⚠ DANGER**

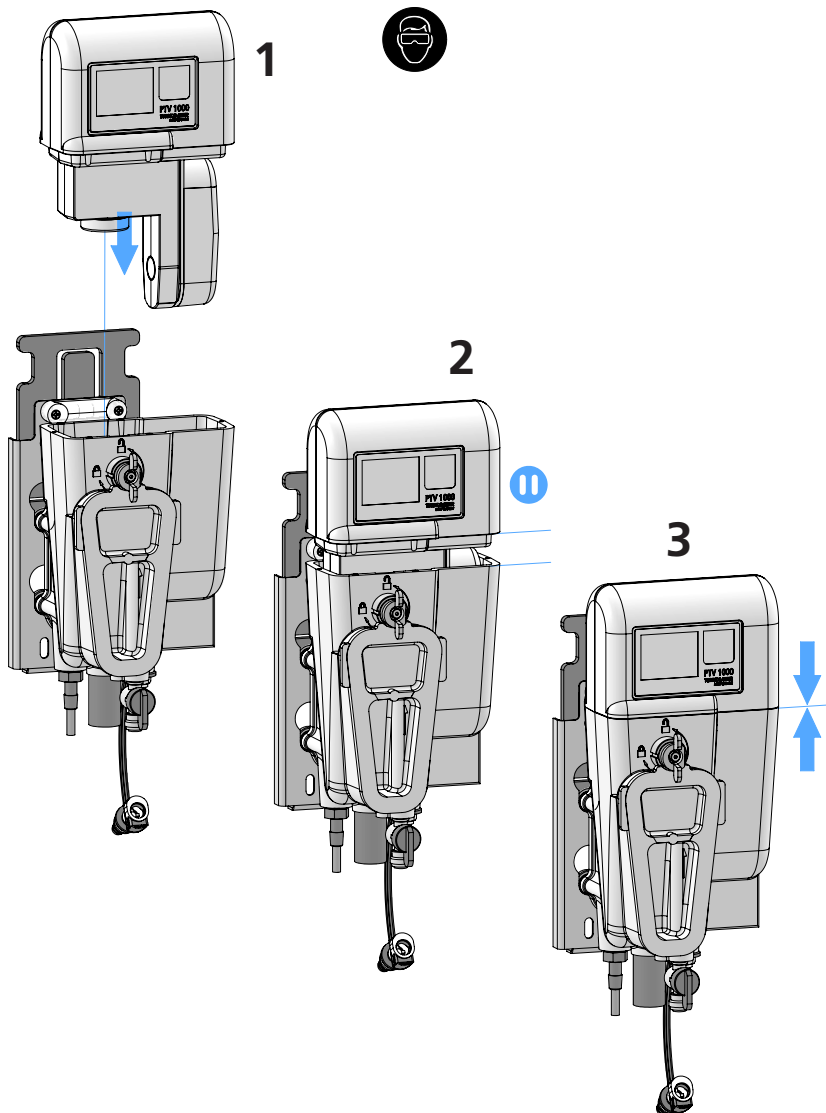
Class 3B laser radiation when open and interlocks defeated, avoid exposure to the beam.

## GB Installation

### Inserting the Measurement Module into the Flow Body

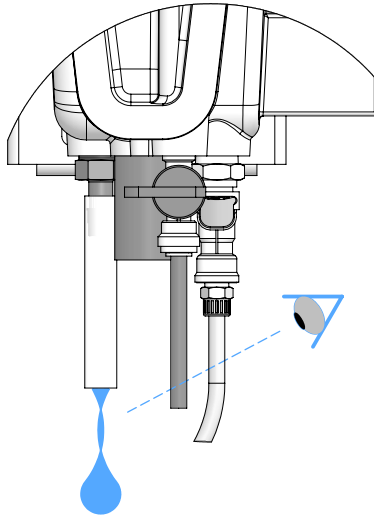
#### NOTICE

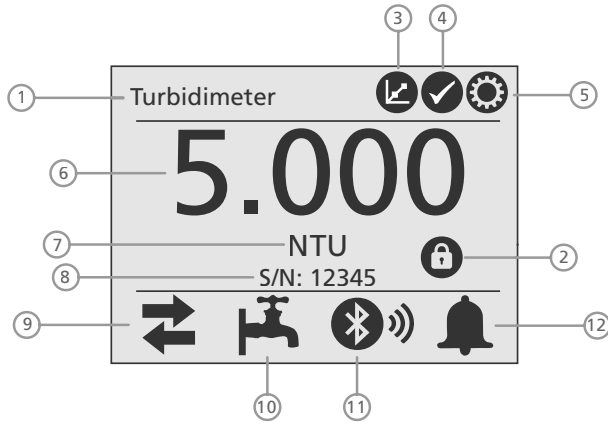
Slowly lower the Measurement Module into the Flow Body.  
Allow water to drain during the end of insertion as needed.



## Instrument Drain / Optional Flow Meter Setup

If your instrument has the flow indicator option, the flow out of the instrument drain will **NOT** be continuous. Flow should occur in pulses 20 to 30 seconds apart. If the pulses are more frequent than this, reduce the flow rate and if they less frequent , increase the flow rate.

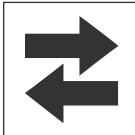




Home screen for the touch screen interface (located on sensor).

1 - Turbidimeter Name	2 - Security Icon (if set)	3 - Calibration Icon
4 - Verification Icon	5 - Settings Icon	6 - Turbidity Value
7 - Units	8 - Serial Number	9 - Outputs Icon
10 - Flow Icon	11 - Bluetooth® Icon	12 - Alarm Icon
13 - Laser Icon (PTV 6000)		

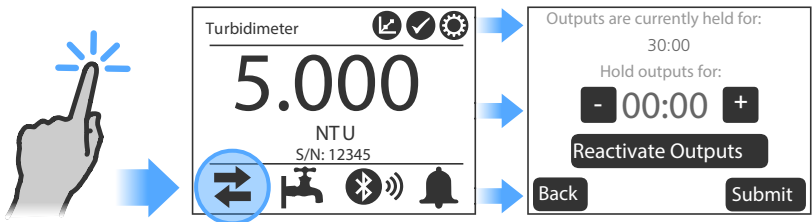
**Outputs Icon:**



Displays whether outputs are active or held.

- A **green** icon = outputs are **active**.
- A **red** icon = outputs are **held**, (not active).

Tap the Icon to access the outputs controls.



## Touchscreen Interface, continued

### Laser Icon:



Displays the status of the Laser.

- A **red** icon indicates laser is engaged.
- Laser icon disappears when laser is disengaged.
- Only appears on PTV 6000

### Bluetooth® Icon:



Displays the *Bluetooth*® connectivity status of the Measurement Module.

- The bars will display when a mobile application is connected.
- The number of bars indicates the signal strength.
- A grey icon = *Bluetooth*® not present or disabled.

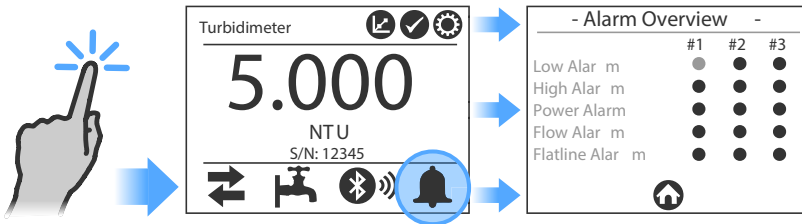
### Alarm Icon:



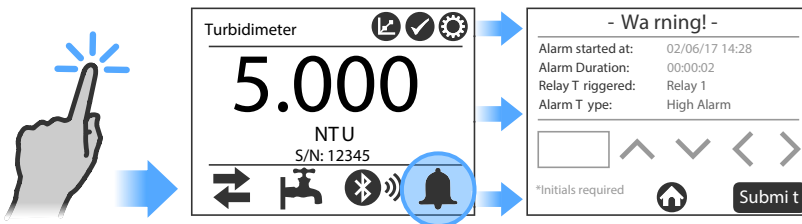
Displays the status of the Alarm Relays.

- A **green** icon = **no alarm** is triggered.
- A **red** icon = **alarm** has been triggered.

Tapping on a **green** alarm icon will show an overview of all of the Alarm Relays.



Tapping on a **red** alarm icon will display the alarm screen with details on the triggered alarm relay. A log is created when initials are added and the form is submitted.





## Touchscreen Interface, continued

### Calibration Icon:



Tap the **calibration** icon to access the two calibration options:

- 1 point
- Grab Sample Cal
- Zero Electronics

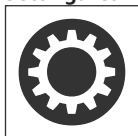
### Verification Icon:



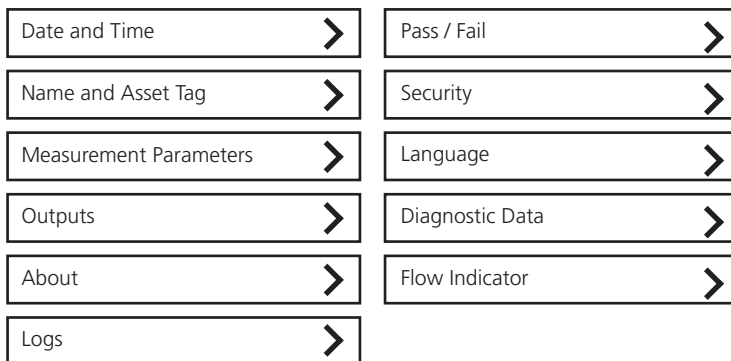
Tap the **verification** icon to access the three verification options:

- Grab Sample Ver
- Wet Standard
- Dry Verification

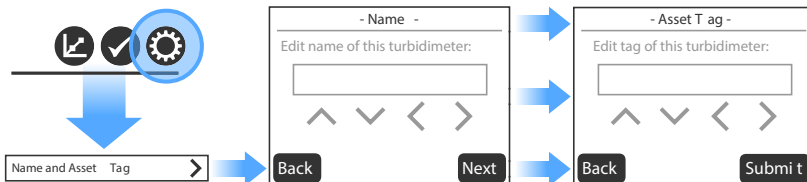
### Settings Icon:



Tap the **settings** icon and select from eleven categories:

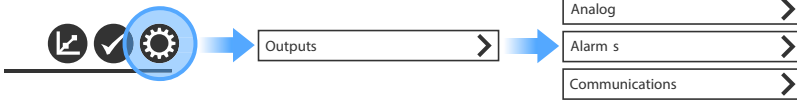


*Enter the Turbidimeter Name and Asset Tag (name and/or number).*

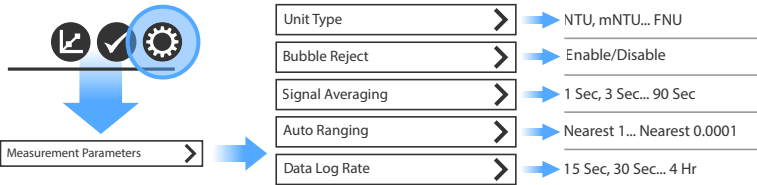


## Touchscreen Interface, continued

Outputs menu:



Measurement Parameters:



Date and Time

### NOTICE

If using the touchscreen to set the date/time, set the timezone before setting the time.

**Time Zone:** Enter the timezone offset from UTC/GMT.

- Sarasota, Florida (EST): -5 during standard daylight time
- Fort Collins, Colorado (MST): -7 during standard daylight time
- Dortmund, Germany (CET): +1 during standard daylight time
- Beijing, China (CST): +8 during standard daylight time

**Date Format:** User selectable between MM/DD/YYYY or DD/MM/YYYY.

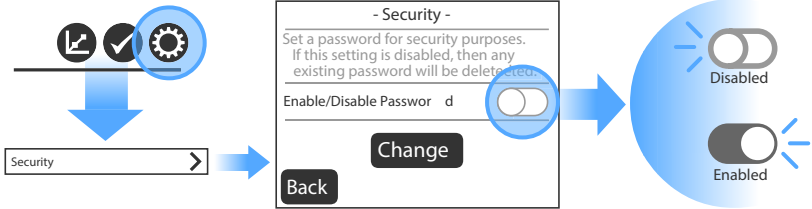
**Date:** Enter date according to selected date format.

**Time:** Shown on 24 hour on Measurement Module. If using AquaLXP App, the time will be displayed in the same format as the device being used.

## GB Operation

### Touchscreen Interface, continued

Security:

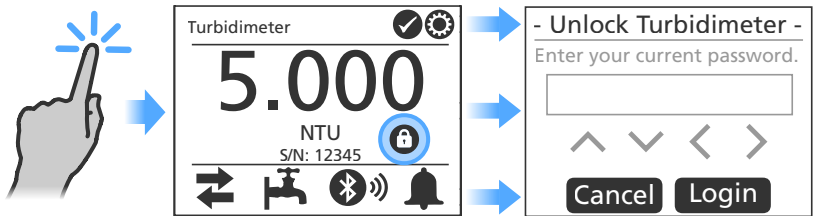


If setting a password, write the password you set here: \_\_\_\_\_

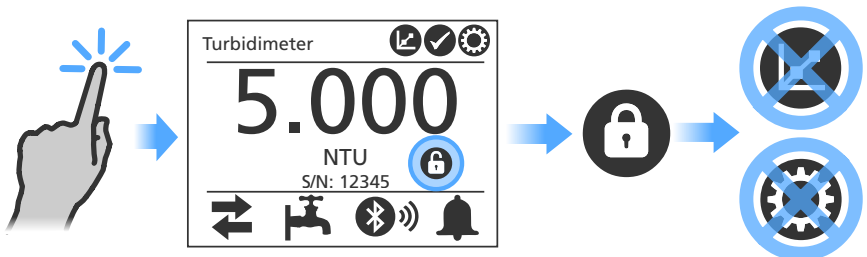
'Locked' Security icon:



Tap on the 'locked' security icon and enter your password.



Tap on the 'unlocked' security icon to lock functionality.

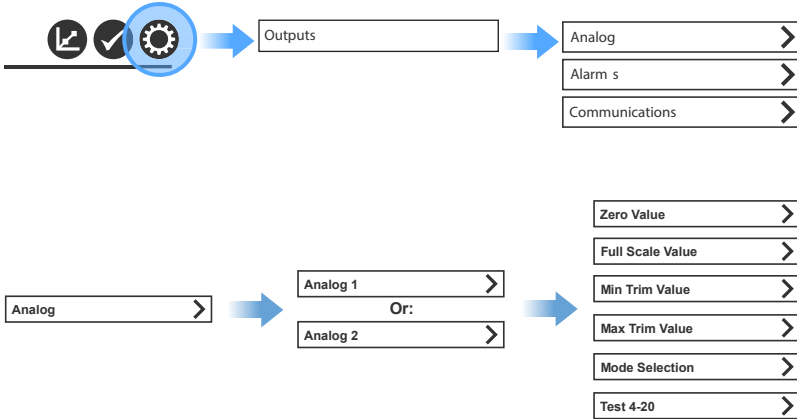


## Initial Configuration

### Configuring Outputs

#### Analog Output Configuration

PTV Series instruments configured with a PCM contain two (2) analog (4-20mA) outputs. A single analog output (Analog 1) is available on 24VDC configurations.



#### NOTICE

Using a voltmeter or a multimeter, it is recommended that users begin in the Test 4-20 mode to determine the actual count value for 4mA and then for 20 mA. A 4mA count value is estimated to be  $790 \pm 20$  counts; a 20 mA count value is estimated to be  $4000 \pm 20$  counts.

Once the count values are determined, they can be easily entered into the Min Trim Value and Max Trim Value fields.

**Zero Value** – The zero value is the lowest turbidity value in NTU that will be scaled by the analog output (value corresponding to 0mA or 4mA). **The default value is set to 0 NTU.**

**Full Scale Value** – The full scale value is the highest turbidity value in NTU that will be scaled by the analog output (value corresponding to 20mA). **The default value is set to 10.0 NTU.**

**Count (Cnts)** - These values are used to adjust the trim value. This is an arbitrary term used to describe the resolution of a digital voltmeter or multimeter.

**Min Trim Value** - The min trim can be adjusted from 0 to 4095 counts to make a PLC or chart recorder read exactly 0mA or 4mA. Each count value is approximately 0.005mA. **The default value is set to 790 counts, which is approximately 4mA.**

**Initial Configuration, continued**

*Analog Output Configuration, continued*

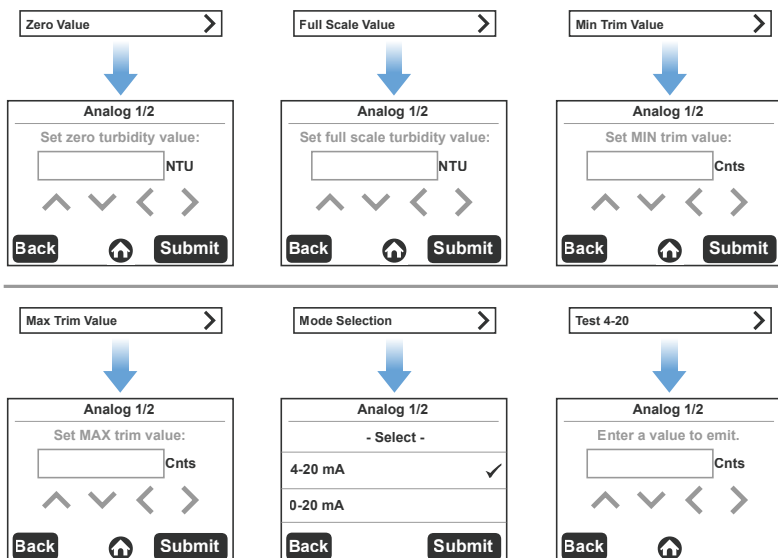
**Max Trim Value** - The max trim can be adjusted from 0 to 4095 counts to make a PLC or chart recorder read exactly 20mA. Each count value is approximately 0.005mA. The max value should be larger than the min value for proper operation. **The default value is set to 4000 counts**, which is approximately 20mA.

**Mode Selection** - The mode selection can be set to 4-20mA or 0-20mA. If 4-20mA is selected, the min trim value is set to 790 counts. If 0-20mA is selected the min trim value is set to 0 counts. Note that the previous min trim value will be overwritten when one of these are selected.

**Test 4-20** – The test 4-20 function immediately forces the analog output to the selected count value. Each count value is approximately 0.005mA, so a value of 4000 yields 20mA. This feature is useful when setting up or testing a PLC or chart recorder. The 4-20 output is restored to normal when this screen is exited. **This function is only available on the touchscreen interface; it is not available in the AquaLXP mobile app.**

Use table to set desired output resolution.

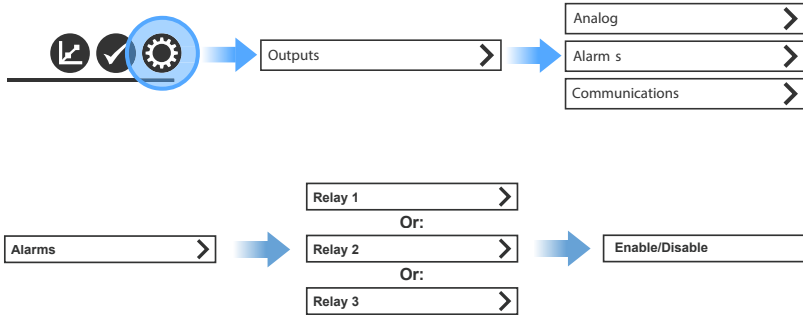
Range (NTU)	Limit of Resolution (NTU)
0-10	0.0024
0-5	0.0012
0-1	0.0002



## Initial Configuration:, continued

### Setting Alarms

PTV Series instruments contain three (3) alarm relay outputs which are located inside the PCM. Alarms can be setup via the “Settings” icon on the touchscreen display. In addition, multiple alarm triggers can be enabled for each relay.



To enable an alarm, select “Enable,” ensuring the checkmark is displayed before continuing. Next, select each appropriate alarm type for that relay. Note that multiple types can be enabled, but only high or low can be selected in a single relay.

For high or low alarm types, enter the alarm value in NTU.

For high and low alarm types, enter the deadband value in percent. For example, a high alarm with value of 1 NTU and 5% deadband will activate when the turbidity reaches  $1 + 0.05 = 1.05$  NTU.

For all alarm types enter the “set off” delay value in seconds. This is the delay time before an alarm deactivates.

For all alarm types enter the “set on” delay value in seconds. This is the delay time before an alarm activates.

**Low Alarm:** Activates below turbidity setpoint. User defined.

**High Alarm:** Activates above turbidity setpoint. User defined.

**Loss of Power:** Activates when power to the Measurement Module is removed.

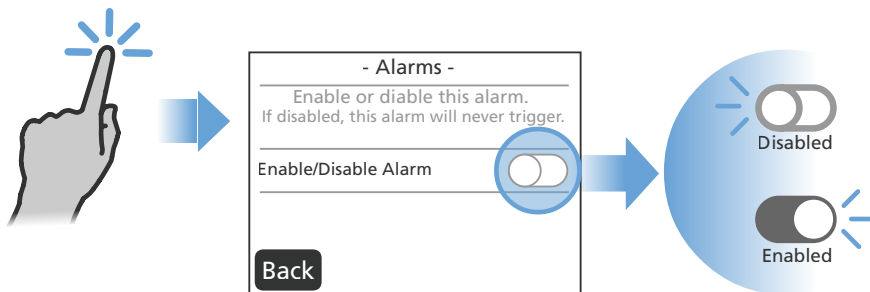
**Loss of Flow:** Activates when Flow drops below 5 ml/min or above 150 ml/min for 5 minutes.

**Flatline Alarm:** Activates if the change in NTU value is less than 0.00001 NTU for 30 seconds.

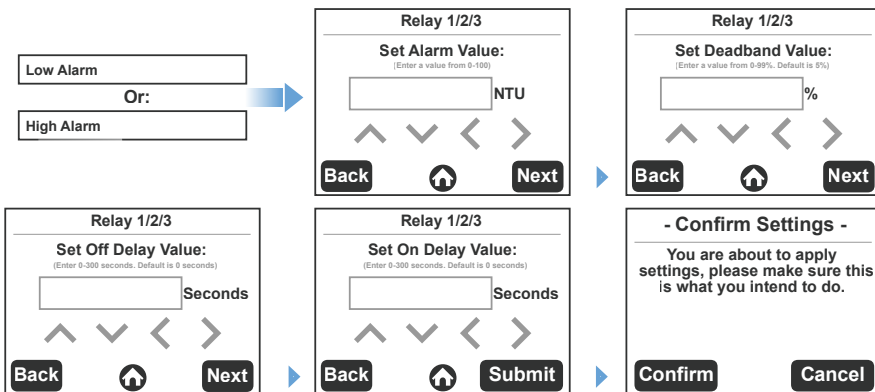
## **GB** Operation

### Initial Configuration:, continued

#### Setting Alarms, continued



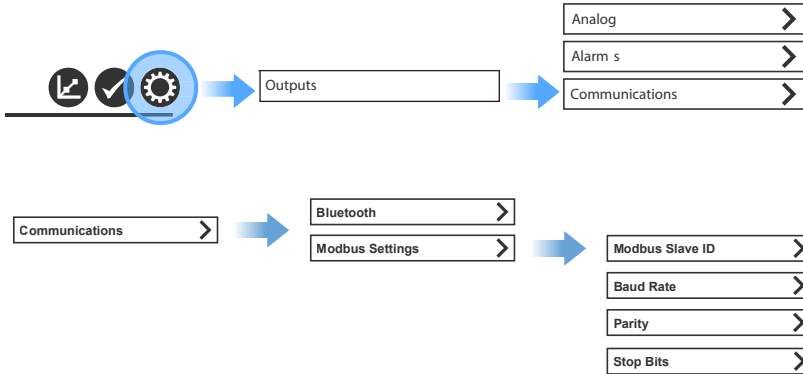
Low Alarm	<input type="checkbox"/>
High Alarm	<input type="checkbox"/>
Loss of Power	<input type="checkbox"/>
Loss of Flow	<input type="checkbox"/>
Flatline Alarm	<input type="checkbox"/>
<b>Back</b>	



## Initial Configuration, continued

### Communications Menu

Depending on the configuration of a PTV Series Turbidimeter, multiple communication outputs are available. No configuration is required for Profibus DP and Modbus TCP.



**Bluetooth®** – For Bluetooth, touch the “enable/disable” button. The button turns green when enabled.

**Modbus** – Several settings are available for Modbus as follows. In addition, a list of available Modbus registers can be found in the Optional Communications section.

**Modbus Slave ID** – The Modbus slave ID is the address of the device on the network. It must be set to a unique number from 1-247.

**Baud Rate** – The Modbus baud rate changes the speed of the communication line. The rate can be set to 9600, 14400, 19200, 38400, 57600, or 115200.

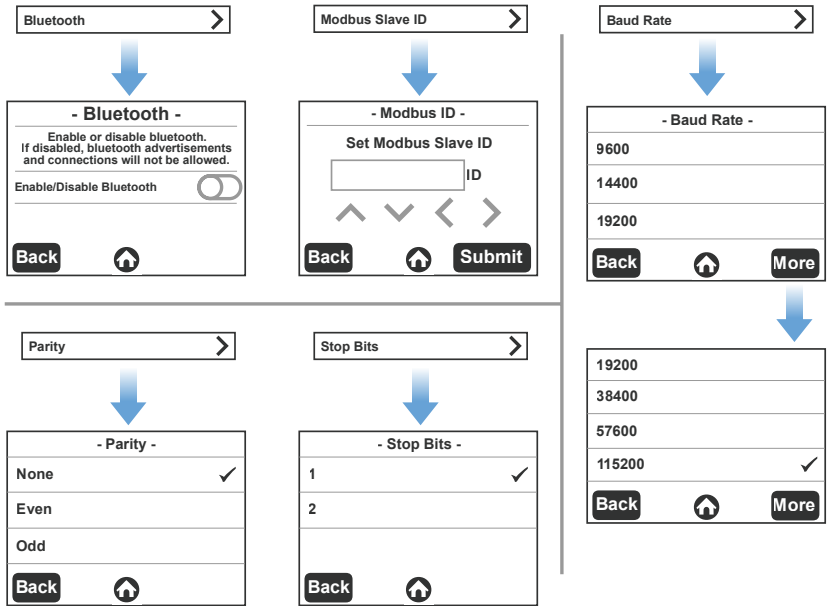
**Parity** – The Modbus parity changes the parity bit of the Modbus packets. The parity can be set to None, Even or Odd.

**Stop Bits** – The Modbus stop bits changes the number of stop bits of the Modbus packets. The stop bits can be set to 1 or 2.



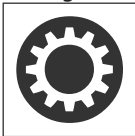
Initial Configuration, continued

Communications Menu, continued

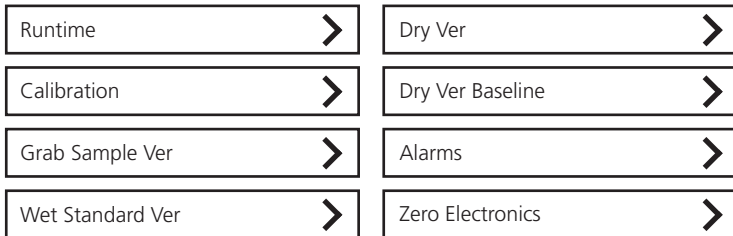


Logs Menu

Settings Icon:



Tap the **Settings** icon and select **Logs** from the categories:



## GB Operation

### Initial Configuration, continued

#### Flow Icon:



Displays the status of the Flow Sensor.

- A **green** icon indicates normal flow.
- A **yellow** icon = warning.  
(sample flow may be too high or too low)
- A **grey** icon = sensor not present or disabled.

#### Setting and Adjusting Flow Rate

##### NOTICE

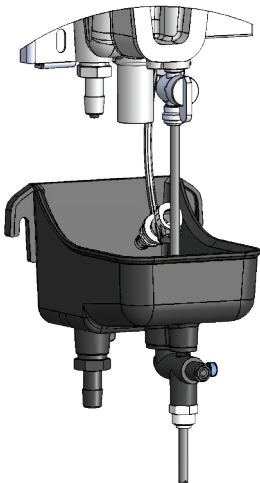
Before proceeding, review the section on Fluidics Connections in the Installation section

The flow rate for this instrument is 30 to 500 mL/min (0.476 to 7.925 gal/hr). A flow rate of 40 to 120 mL/min (0.634 to 1.902 gal/hr) is recommended. For flow rates above 100 mL/min (1.585 gal/hr) use external flow control (not supplied).

If instrument is outfitted with the optional Flow Sensor, at flow rates **GREATER THAN 120 ml/min (1.902 gal/hr)** the Flow Sensor output should be set to **DISABLED** to avoid the instrument issuing a flow warning. To enable or disable the Flow Sensor output, go to; 'Settings' > 'Flow Sensor' > then 'ENABLE' or 'DISABLE' using the slide switch.

##### NOTICE

It is not necessary or recommended to remove the flow sensor cable from the Flow Body when disabling the Flow Indicator as damage to the electronics may occur.



An external flow control valve is required to regulate the rate of flow into the instrument. This can be accomplished with the Fluidics Manager accessory.

- If optional Flow Sensor is installed, flow out of the instrument waste chamber is not constant. If operating within recommended flow rate of 40 to 120 ml/min, sample will dispense approximately every 20 to 30 seconds.
- If optional Flow Sensor is not installed, flow out of the instrument waste chamber will be constant. Flow rate can be estimated by collecting sample in a graduated beaker for 1 minute.

## General Cleaning Guidelines

Clean as experience dictates. Unexpected variability in readings, erratic readings, an increase in the historical baseline, or Verification failure, may indicate the need to clean.

NOTE: The **BLACK** Cleaning Tube is reusable, **DO NOT DISCARD!**

### WARNING

**CHEMICAL EXPOSURE RISK:** Use proper safety equipment including eye protection and abide to all safety protocols when using chemicals.

Lovibond® Cleaning Solutions are high purity, non-abrasive cleaning solutions that have been specifically formulated to remove organic buildup and scale without damage to the Instrument.



Cleaning Option	When to Use
Lovibond® Detergent Solution	Surfactant solution used in conjunction with a micro-fiber cloth for the removal dirt and debris.
Lovibond® Cleaning Solution	Chemical Cleaner can be used in systems where the sample contains higher levels of organics and scale or where biofilms are more likely to form.
Lovibond® Scale Remover	Always used in conjunction with the Cleaning Solution, the Scale Remover removes scale, caused by high levels of iron and/or manganese in the sample.

## Cleaning Instructions

### Basic

1. Add approximately 2 ml of detergent to flow body that is approximately half full.
2. Use a microfiber pad.
3. Rinse.

### Advanced

1. Drain body.
2. Fill turbidimeter with the cleaning solution (in the bag).
3. Prepare the WASR: dissolve contents of one packet into about 30-ml of water.
4. Add dissolved Waste and Scale Remover (WASR) solution to the turbidimeter.
5. Wait 5 minutes.
6. Drain contents of waste back into the bag.



**NOTICE**

**DISPOSE OF USED CLEANING SOLUTIONS IN COMPLIANCE WITH ALL LAWS GOVERNING THE DISPOSAL OF CHEMICAL WASTE.**

**NOTICE**

**ONLY USE MICRO-FIBER CLOTHS** for cleaning optical surfaces or any of the polished surfaces which contact the sample.

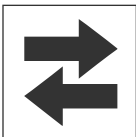
**NOTICE**

**DO NOT SCRUB OR USE ABRASIVE CLEANERS** on the optical surfaces or any of the surfaces which contact the sample.

**Spill Control/Remediation**

1. Identify all chemicals or materials of the spill.
2. Refer to MSDS/SDS data sheets for information regarding precautions, safety wear and protocols for the chemicals or materials of the spill.
3. Control the spill in accordance to all facility safety protocols.
4. *DISPOSE OF SPILL CONTROL/REMEDICATION MATERIALS AND RECOVERED CHEMICALS IN COMPLIANCE WITH ALL LAWS GOVERNING THE DISPOSAL OF CHEMICAL WASTE.*

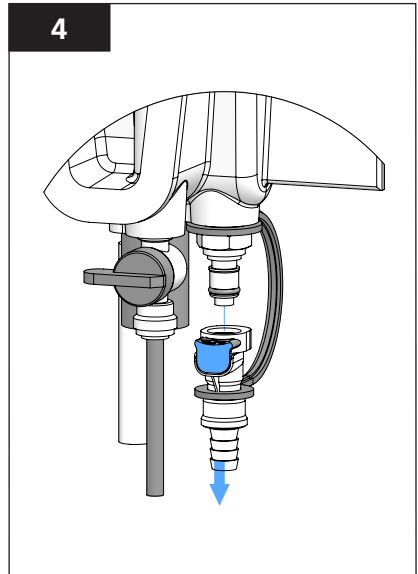
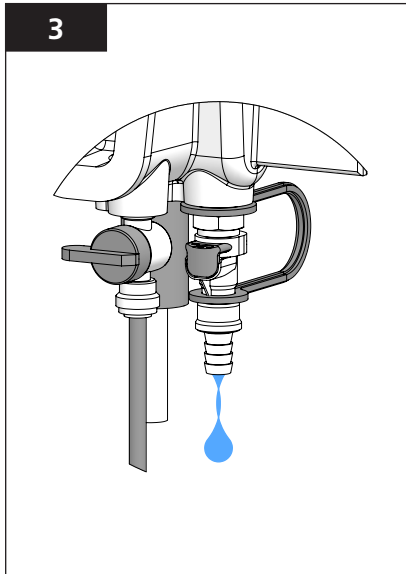
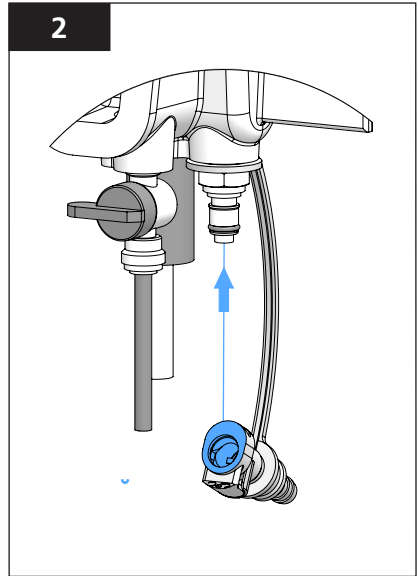
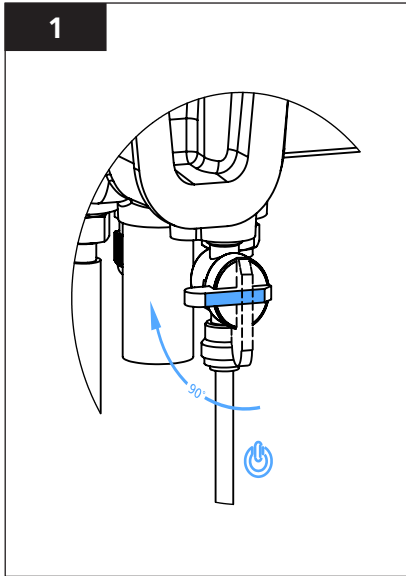
Prior to cleaning, determine if hold outputs are needed.



Displays whether outputs are active or held.

- A **green** icon = outputs are **active**.
- A **red** icon = outputs are **held**, (not active).

Draining the Flow Body

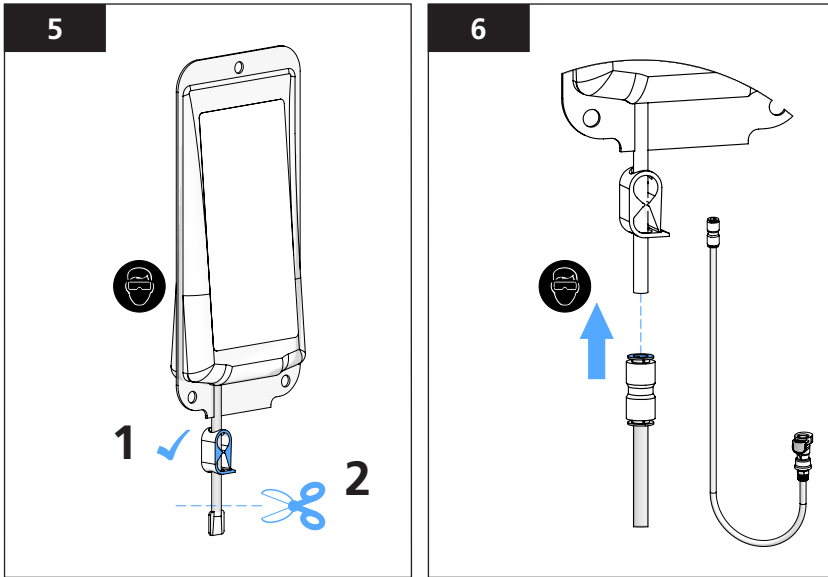


1. Close the Inlet Ball Valve.
2. Connect the Discharge Fitting to the Service Port to empty the Flow Body.
3. Allow the Flow Body to empty before proceeding.
4. Press the release button on the Discharge Fitting to remove it from the Service Port.

When Flow Body has been drained, proceed with cleaning the body with the cleaning solution of choice. See General Cleaning Guidelines and Cleaning Instructions.

## GB Cleaning

### Preparing the Cleaning Solution



Rinse the **BLACK Cleaning Tube** with filtered water before each use.

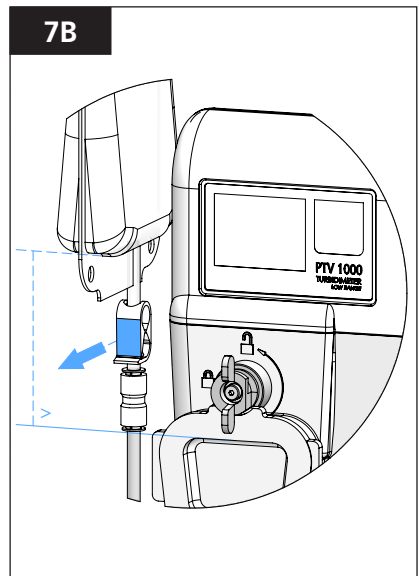
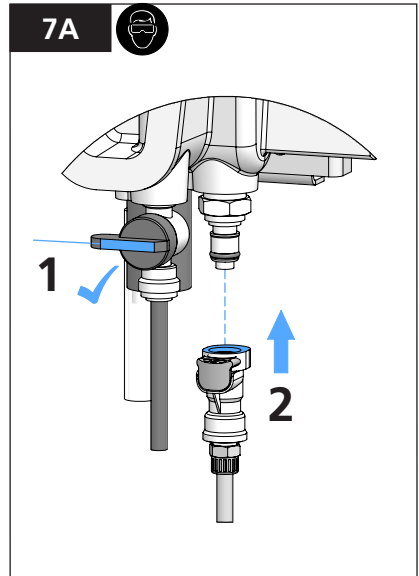
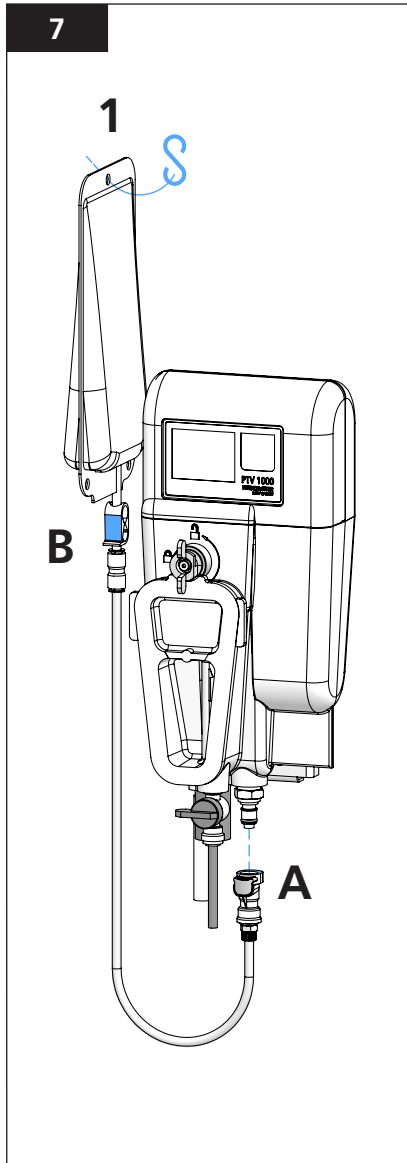
#### NOTICE

**USE ONLY the BLACK Cleaning Tube** with cleaning solution;  
**DO NOT USE the BLUE Calibration Tube** for cleaning

#### ⚠ WARNING

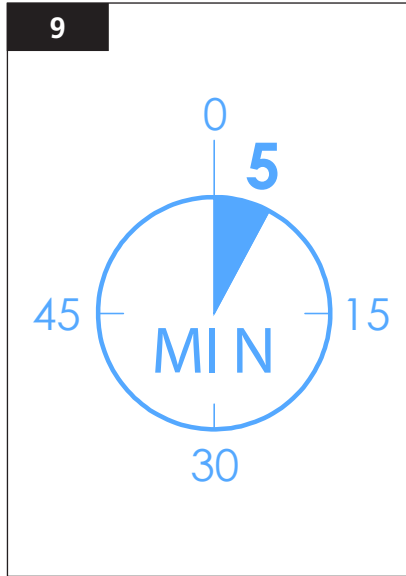
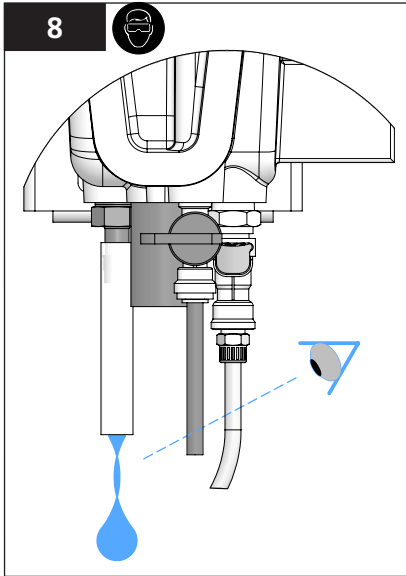
**CHEMICAL EXPOSURE; USE PROPER SAFETY EQUIPMENT AND PROTOCOLS**

Introduce the Cleaning Solution into the Flow Body



## GB Cleaning

### Filling the Flow Body with Cleaning Solution and cleaning

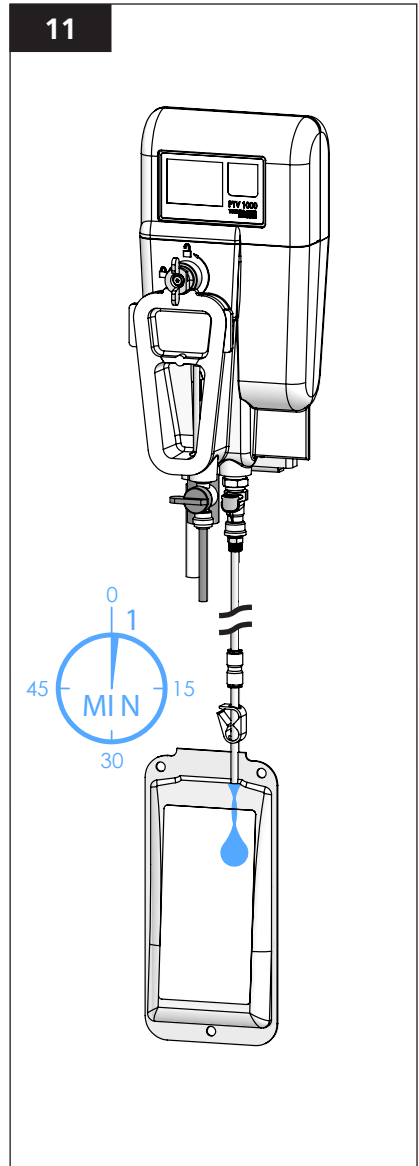
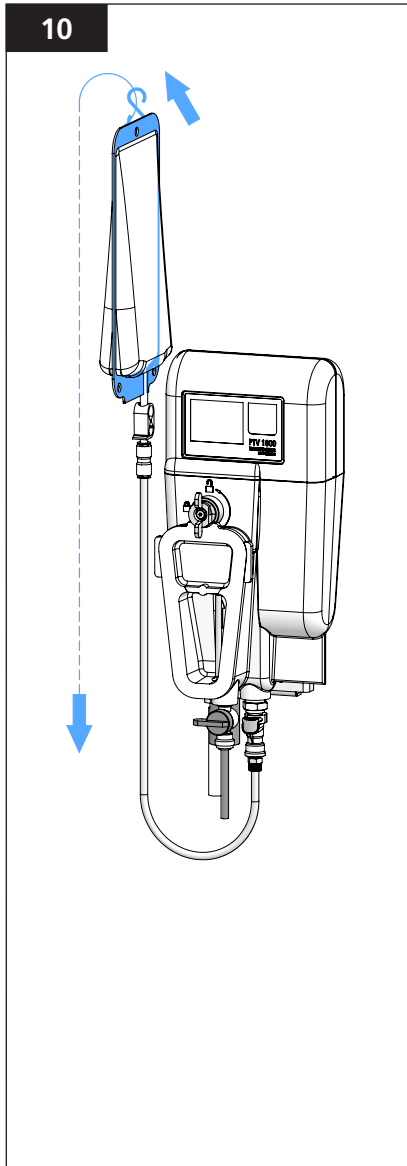


The Flow Body is filled when cleaning solution is observed flowing<sup>1</sup> from the Outlet Fitting. Allow at least 1 discharge cycles to occur for Flow Bodies equipped with a Flow Sensor.

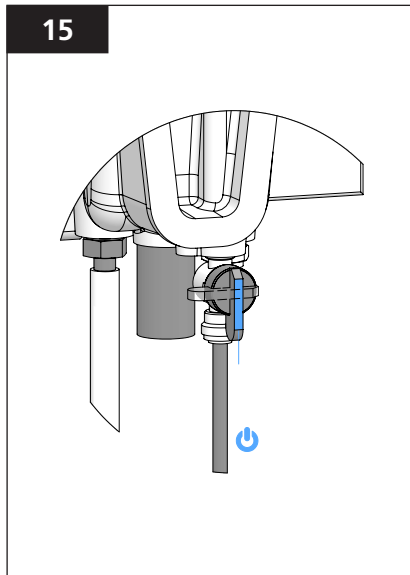
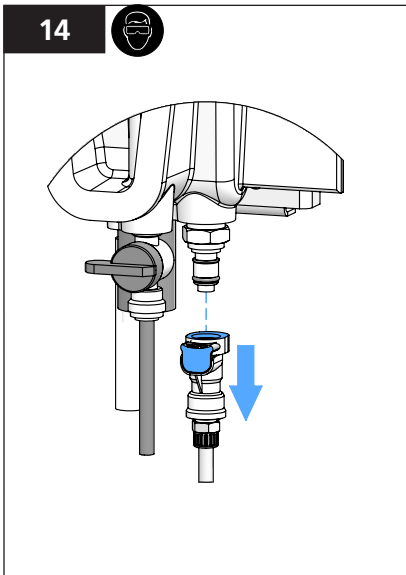
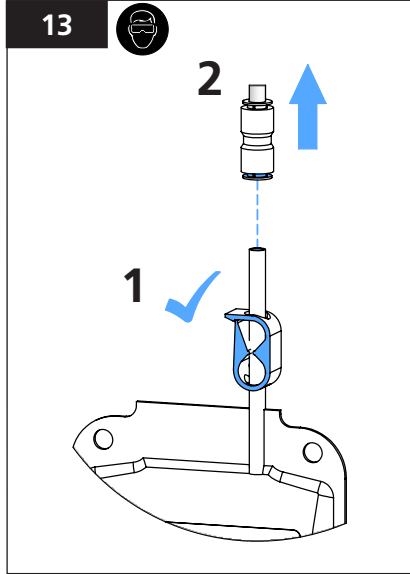
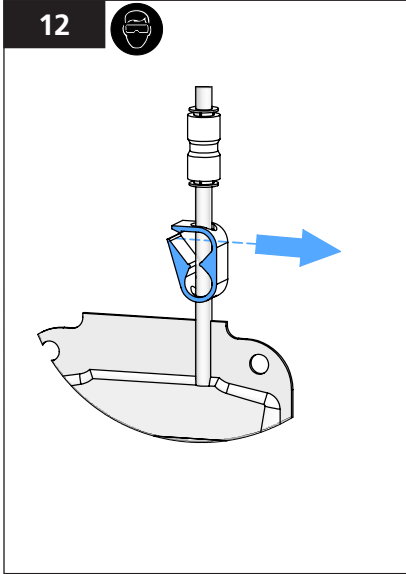


## GB Cleaning

Collecting used Cleaning Solution for disposal



Collecting for disposal and restoring sample flow



Rinse the **BLACK** CLEANING Tube with filtered water after use and store in a clean, dry plastic bag to prevent contamination.

**NOTICE**

The **BLACK** CLEANING Tube is reusable; **DO NOT DISCARD**

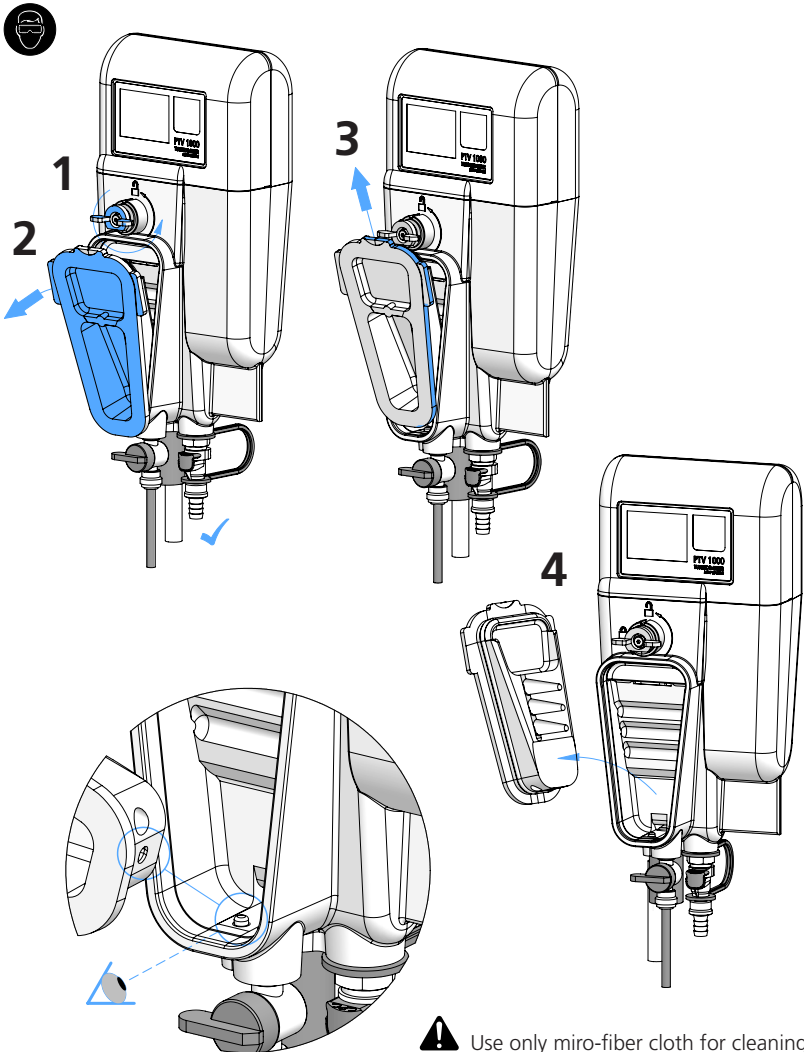
## **GB** Cleaning

### Cleaning the bubble trap

Check that the sample flow is stopped and that the Drain Fitting is connected to the Service Port before opening the Front Cover.

**⚠ DANGER**

PTV 6000: Class 3B laser radiation when open and interlocks defeated, avoid exposure to the beam.



To reinstall Front Cover; 1st seat heel of Front Cover onto pin in Flow Body.

## Calibration

Use care to avoid particle contamination during and after cleaning of the instrument.

NOTICE
Calibration should be performed every 90-days or more frequently as regulatory requirements demand. <b>ABIDE BY ALL GOVERNING REGULATIONS REGARDING THE FREQUENCY OF CALIBRATION.</b>
Perform any maintenance and cleaning prior to calibration.
Low turbidity water can be filter effluent water, distilled water, or filtered tap water that has been passed through a 0.5 micron (or smaller) filter.
A minimum of 300 ml of calibrant is required for calibration; T-CAL® or T-CALplus® stabilized formazin, or other approved calibrant for instruments that report turbidities under USEPA or ISO regulations.
A valid calibration standard must have a value between 4 and 30 FNU/NTU. Calibrant values outside the 4 to 30 FNU/NTU range will not be accepted by the instrument.
<b>After installation, perform the ZERO ELECTRONICS procedure.</b> Follow the instructions provided on the touchscreen or app. Upon completion of the ZERO ELECTRONICS procedure, the instrument calibration can be performed or sample measurements can commence. This procedure determines the electronic offset of the instrument. It is critical when performing measurements below 0.5 NTU. ZERO ELECTRONICS should be performed after any component maintenance or on a yearly basis.

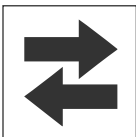
*Note: The performance specifications provided in this manual are based on formazin standards and can only be guaranteed when calibration is performed as described herein (including the smart device interface). The manufacturer cannot guarantee the performance of the instrument if calibrated with styrenedivinylbenzene co-polymer beads or other suspensions.*

### Calibration Icon:



Tap the **calibration** icon to access the two calibration options:

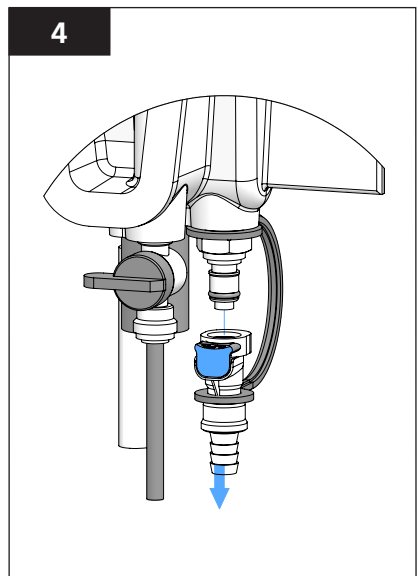
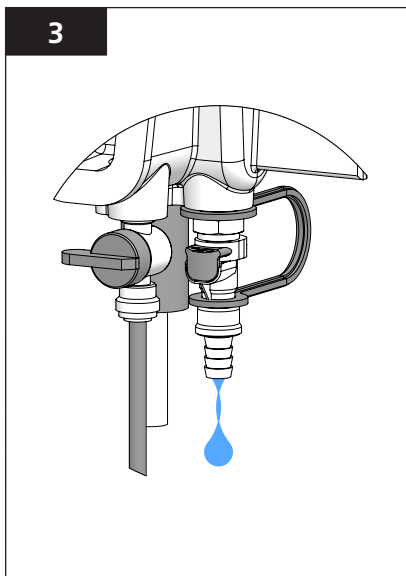
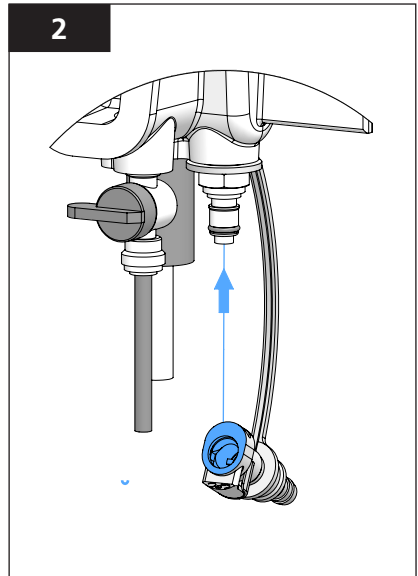
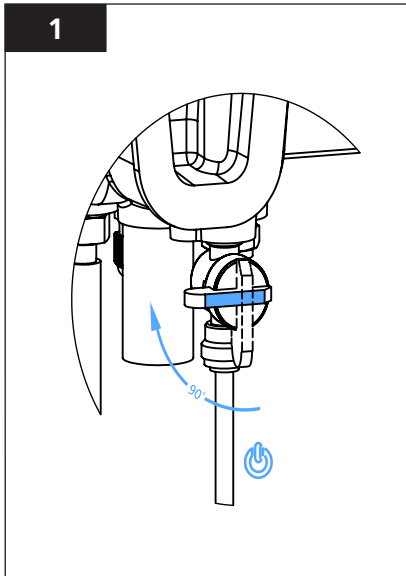
- 1 point
- Grab Sample Cal
- Zero Electronics



Displays whether outputs are active or held.

- A **green** icon = outputs are **active**.
- A **red** icon = outputs are **held**, (not active).

Draining the Flow Body



1. Close the Inlet Ball Valve.
2. Connect the Discharge Fitting to the Service Port to empty the Flow Body.
3. Allow the Flow Body to empty before proceeding.
4. Press the release button on the Discharge Fitting to remove it from the Service Port.

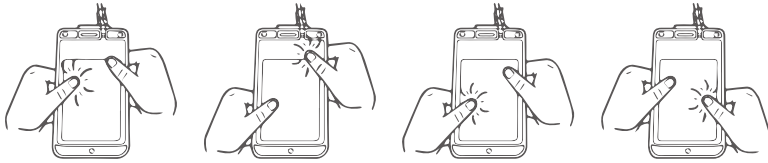
## GB Calibration

Preparing Lovibond® T-CALplus® calibrant for use

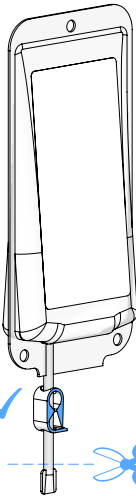
5



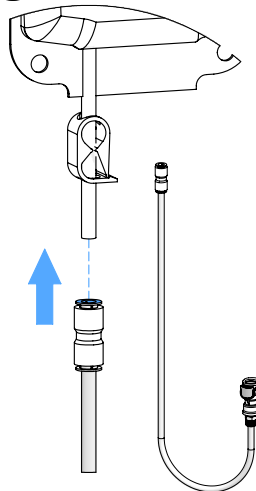
15X



6



7



Rinse the **BLUE** Calibration Tube with filtered water before each use.

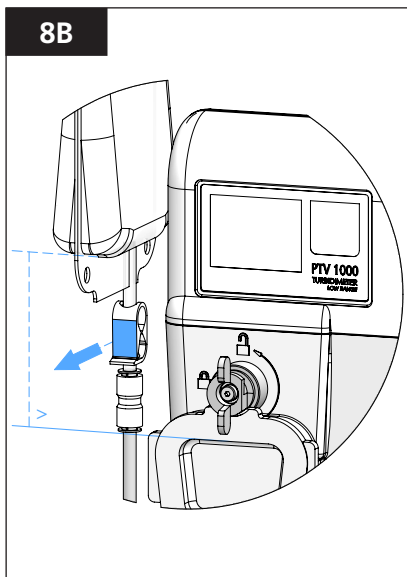
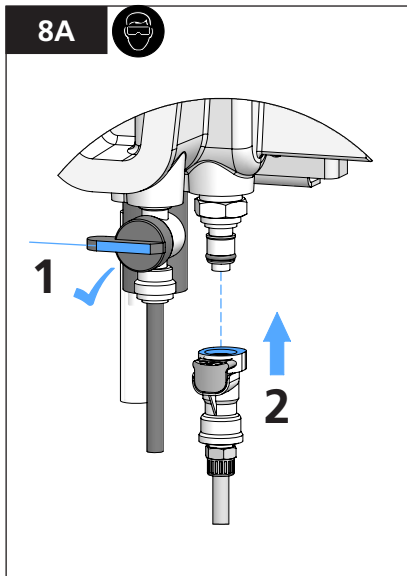
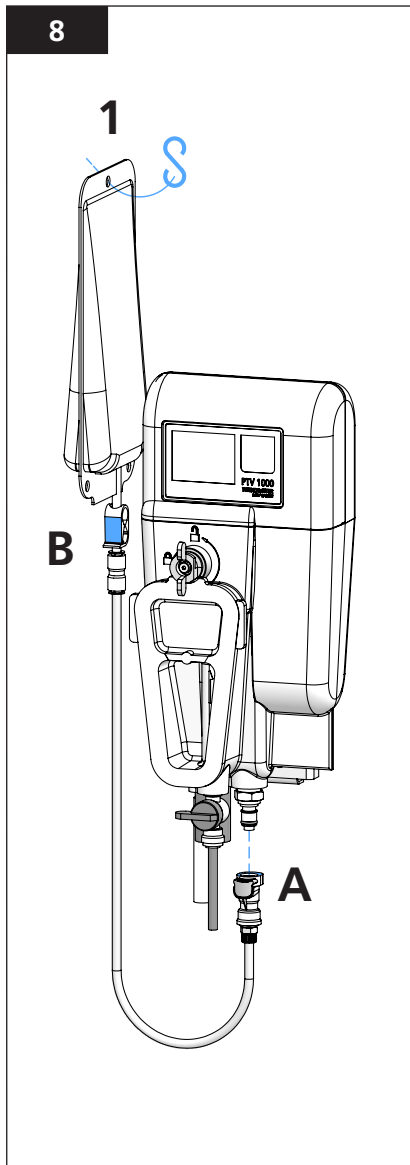
### NOTICE

**USE ONLY** the **BLUE** Calibration Tube with T-CALplus® calibrant; **DO NOT USE** the **BLACK** Cleaning Tube for calibration as degradation to the calibrant may occur.

### WARNING

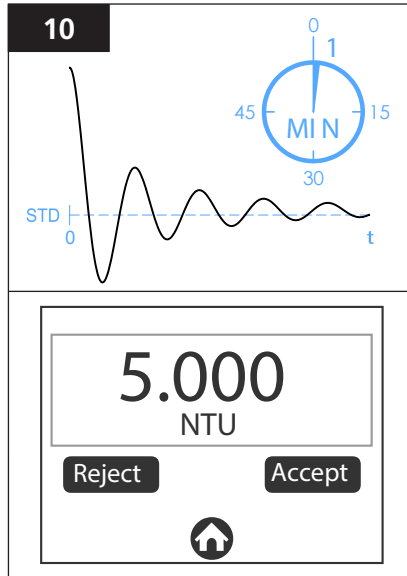
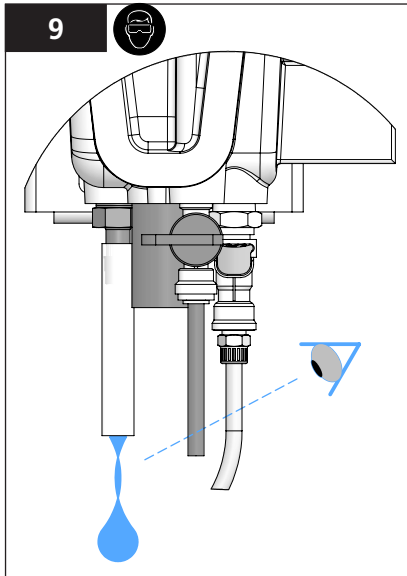
**CHEMICAL EXPOSURE; USE PROPER SAFETY EQUIPMENT AND PROTOCOLS**

Introduce the Lovibond® T-CALplus® calibrant into the Flow Body



1. Connect the Lovibond® T-CALplus® calibrant to the Service Port via the Calibration Tube.
2. Allow standard to completely fill the flow body. The Flow Body is considered filled when excess standard can be observed to flow from the Outlet.
3. Wait approximately 1 minute after the flow body is filled before accepting the calibration. **THE TURBIDITY VALUE SHOULD NOT BE DRIFTING UP OR DOWN BEFORE ACCEPTING THE CALIBRATION VALUE.**

## Filling the Flow Body with Lovibond® T-CAL<sup>plus</sup>® calibrant and calibrating



\*The Flow Body is filled when calibrant is observed flowing<sup>1</sup> from the Outlet Fitting.  
(Allow at least 1 discharge cycles to occur for Flow Bodies equipped with a Flow Sensor).

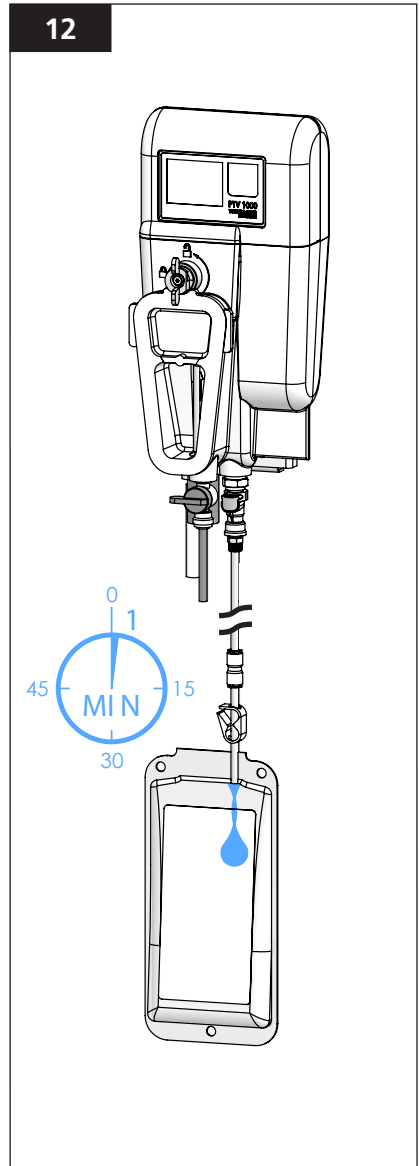
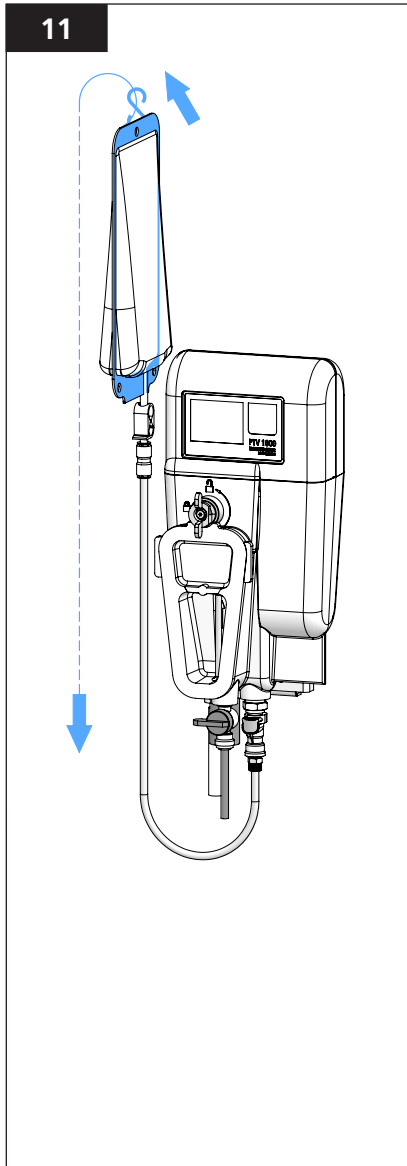
At the completion of calibration, a retrievable record is added to the Calibration Log; (refer to 'Calibration & Verification Logs' in the Calibration Offset Adjustment & Logs section within this manual.

### NOTICE

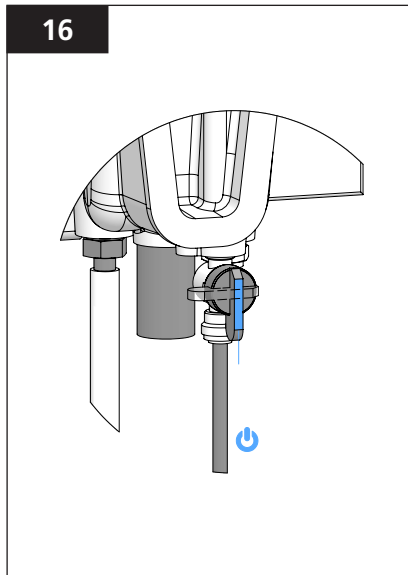
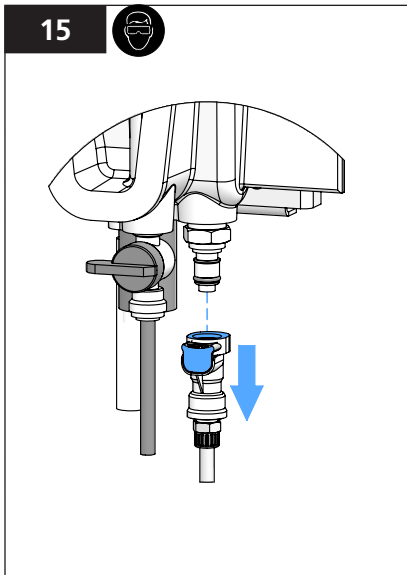
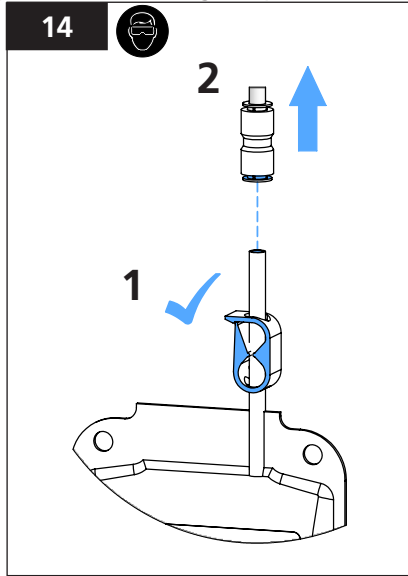
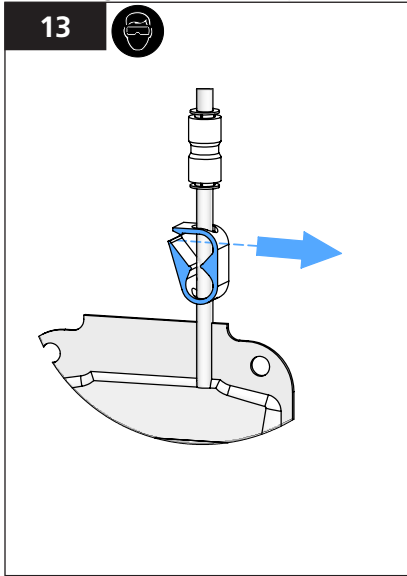
The slope or gain of the calibration is required to be within a factor of 0.5 and 2.0 of the factory stored calibration. A calibration 'FAIL' means that the slope of the calibration is outside the gain limits and the previous calibration will persist.



Collecting used Lovibond® T-CAL<sub>plus</sub>® calibrant for disposal



Collecting the used T-CAL<sup>plus</sup>® for disposal and restoring sample flow



1. Rinse the **BLUE** Calibration Tube with filtered water after use and store in a clean, dry plastic bag to prevent contamination.

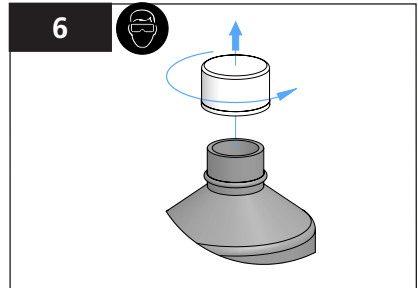
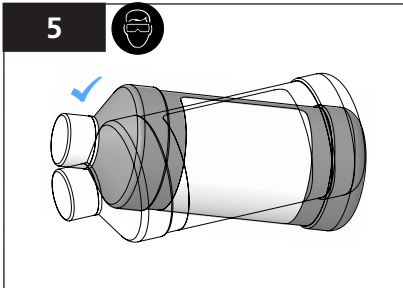
**NOTICE**

The **BLUE** Calibration Tube is reusable; **DO NOT DISCARD**

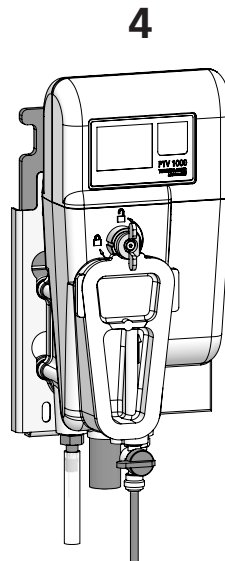
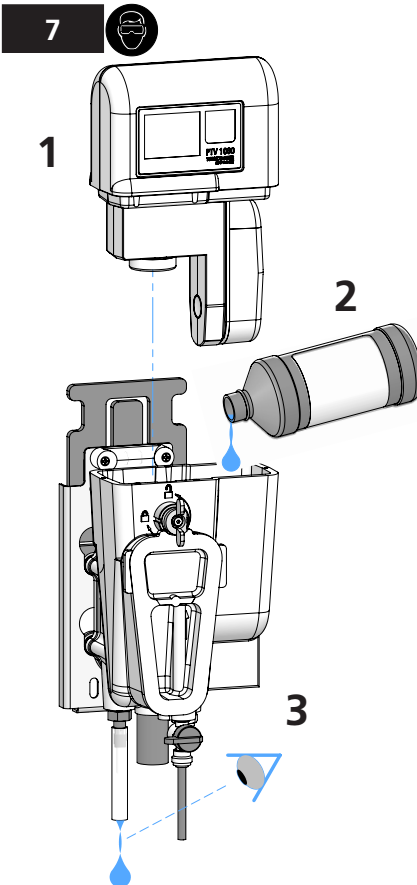
## GB Calibration

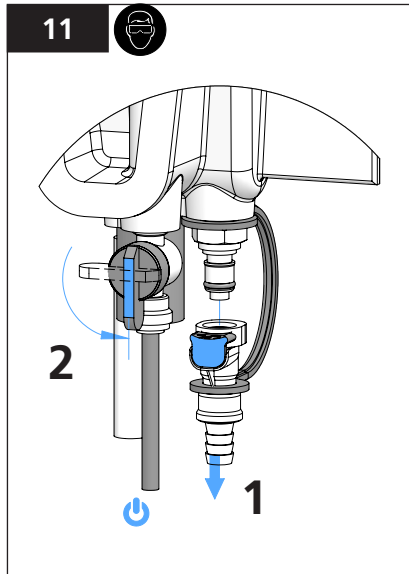
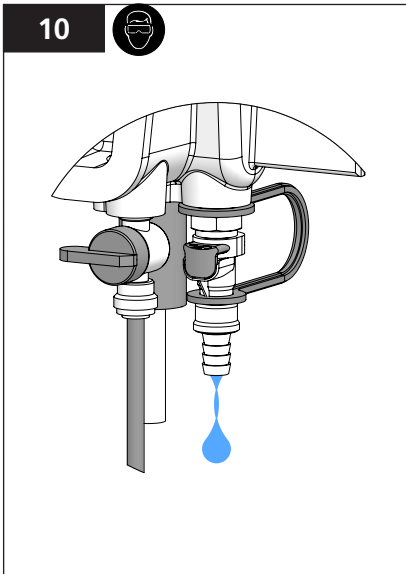
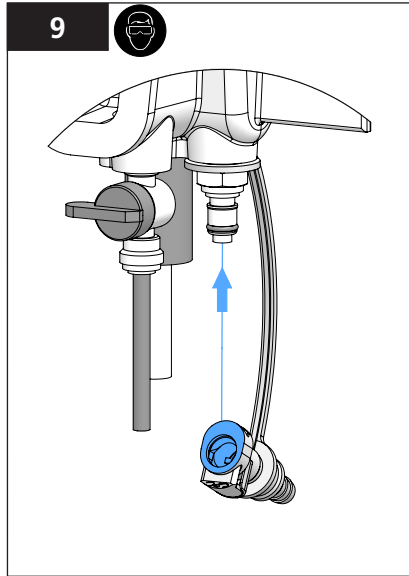
### Calibration using T-CAL® (stabilized formazin, bottled calibrant)

Before beginning, refer to the beginning of the Calibration Section and **follow illustrations 1 THROUGH 4** for 'Draining the Flow Body'.



Mix contents back and forth in bottle to prepare calibrant, **DO NOT SHAKE**





**NOTICE**

**DISPOSE OF USED CALIBRANT IN COMPLIANCE WITH ALL LAWS GOVERNING THE DISPOSAL OF CHEMICAL WASTE.**

### Calibration Offset Adjustment using a Grab Sample

 **WARNING**

**CALIBRATION OFFSET ADJUSTMENT IS NOT PERMITTED BY CERTAIN REGULATORY ENTITIES. CHECK ALL REGULATIONS BEFORE ADDING AN OFFSET TO THE CALIBRATION.**

1. Go to; 'CAL' icon > 'Grab Sample Cal' (*For best results, it is recommended that the reference instrument be in close proximity of the turbidimeter when performing a calibration offset adjustment*). The recommended and default Offset Adj value = 0.
2. Ensure the grab sample vial is clean, (rinse at least 3X with sample) then collect a sample at the output fitting of the turbidimeter; (*allow the sample sufficient time to degas prior to measurement*). Follow the instructions and recommendations provided with the reference instrument for measuring samples.
3. The Calibration Offset Adjustment is limited to 0.05 NTU/FNU.
4. A log file is created when a verification or calibrations is accepted.

**NOTICE**

Upon acceptance of a calibration, verification baselines are cleared.

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## **GB** Verification

---

Verification is a procedure that ensures the instrument is measuring correctly. At the completion of any of the verification methods, a retrievable record is added to the Verification Log.

### NOTICE

Verification does not change the calibration or any of the other operating parameters of the turbidimeter.



### WARNING

**CHEMICAL EXPOSURE; USE PROPER SAFETY EQUIPMENT AND PROTOCOLS**

#### Verification Icon:



Tap the **verification** icon to access the three verification options:

- Grab Sample Ver
- Wet Standard
- Dry Verification



Displays whether outputs are active or held.

- A **green** icon = outputs are **active**.
- A **red** icon = outputs are **held**, (not active).

**Verification using Lovibond® T-CALplus® calibrant, (best practice)**

1. For wet verification using T-CALplus® calibrant, select 'WET STANDARD' in the 'VERIFICATION' menu on the 'HOME' screen.
2. Follow the illustrations provided for calibration; (refer to 'Calibration' in the Calibration Section within this Manual).

**Verification using a grab-sample**

1. Select 'GRAB SAMPLE' in the 'VERIFICATION' menu on the 'HOME' screen. *(For best results, it is recommended that the reference instrument be in close proximity of the turbidimeter when performing a 'grab-sample' verification).*
2. Ensure the grab sample vial is clean, then collect a sample at the Output Fitting of the turbidimeter; *(allow the sample sufficient time to degas prior to measurement).* Follow the instructions and recommendations provided with the reference instrument for measuring samples.

**Verification using a Dry Verification Device**

1. Select 'DRY STANDARD' in the 'VERIFICATION' menu on the 'HOME' screen.
2. Refer to the instruction provided with the Dry Verification Device for performing this type of verification.

NOTICE
The baseline for a dry verification must be (re)established after each calibration.

**Verification FAIL (mitigation / corrective action)**

The default pass/fail criteria for verification 'PASS' is for the instrument reading to be within 10 percent of the standard or baseline value, or a difference in reading of less than 0.05 FNU/NTU of the grab-sample value. This is user-selectable in the Settings Menu ('Settings' > 'More' > 'Pass / Fail Criteria'). If the instrument issues a 'FAIL':

1. If the instrument issues a 'FAIL' verification message, clean the turbidimeter; (refer to the 'Cleaning' in the Maintenance Section within this manual).
2. Perform a calibration; (refer to 'Calibration' in the Calibration Section within this document).

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## Optional Communications

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### Optional Interfaces

The AqualXP App can be used via a USB connection with some Android devices. The device must have "USB Host" functionality in order to be compatible.

To determine compatibility, launch the AqualXP App on the device. The app can be downloaded from the Google Play Store. If the USB icon is present, the device is compatible. If the icon is not present, your device is not supported.

Data transfer is available via the AqualXP App through the Data / Stats button on the home screen.

<b>Interface</b>	<b>Com Protocol</b>	<b>How to Get</b>
AqualXP with iOS device	BLE	iTunes Store
AqualXP with Android Device	BLE	Google Play Store
AqualXP with Android Device	USB	Google Play Store
AqualXP with Windows	USB	<a href="http://www.lovibond.com">www.lovibond.com</a>



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## **GB** Optional Communications

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### Anybus Modules

Refer to PCM Manual for Installation and Digital Communication information.

Data from a sensor connected to the PCM is provided in a standard data structure shown in the following table. This is the standard output structure for all modules.

The standard data structure for all outputs are shown below.

Order	Name	Description	Data Type
1	Alarm Status	Describes the state of all relays on the PCM Module	Unsigned Long Integer (4 bytes)
2	PCM Error	Describes the status of the PCM	Unsigned Long Integer (4 bytes)
3	Turbidity NTU	Most recent measurement	Float (4 bytes)

The description of the alarm status is shown below.

Bit	Set to 1	Description
0	Relay 1 has been triggered	A specific alarm has been triggered on relay 1
1	Relay 2 has been triggered	A specific alarm has been triggered on relay 2
2	Relay 3 has been triggered	A specific alarm has been triggered on relay 3

The description of the error status is shown below.

Bit	Set to 1	Description
0	Measurement Device Offline	The PCM has lost communication with measuring device
1	Communication Error	Communication problem between Measurement Module and PCM.

---

## **GB** Optional Communications

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### Profibus Network Setup:

- Import the provided GSD file into your Profibus configuration tool. The GSD file can be downloaded from [www.lovibond.com](http://www.lovibond.com)
- The following information is a reference to describe the data output for the user when using a Profibus configuration tool during setup of the network.
- The following table describes the Input Data format. (From Slave to Master)
- Byte order is 4 3 2 1

### Profibus Data Telegram Structure

Slot	Data Type	Description
1	2 Words from Slave	Alarm Status
2	2 Words from Slave	PCM Error
3	2 Words from Slave	Turbidity NTU

---

## **GB** Optional Communications

---

### Modbus TCP Ethernet Network Setup:

- By default the IP address is assigned by the DHCP server of the network.
- Server port should be set to 502.
- Word wise swapping is used.
- The third and fourth bytes are interchanged.  
The byte order of packet is 3 4 1 2.
- The following table describes the address of the Holding Registers where the data is stored.

### Modbus TCP Holding Registers Map

<b>Modbus Register</b>	<b>Signal</b>	<b>Data Type</b>
2048	Alarm Status	Unsigned Long Integer (4 bytes)
2050	PCM Error	Unsigned Long Integer (4 bytes)
2052	Turbidity NTU	Float (4 bytes)

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## **GB** Optional Communications

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### Modbus RS485/RS232 Network Setup:

- Baudrate is 19200.
- Use the switch on the Modbus Adapter board to select RS232 or RS485.
- Word wise swapping is used.
- The third and fourth bytes are interchanged. The byte order is 3 4 1 2.
- The Modbus Wiring Adapter contains 2 slide switches SW1 and SW2.

SW1 enables the integrated resistor combination. Setting SW1 to "T" side, connects the terminating resistor across the network. Setting SW1 to "O" side disconnects the terminating resistor, which can be used to change from RS485 to RS232.

SW2 is used to select RS485 or RS232 for communication. Setting SW2 to "RS232" enables R232. Setting SW2 to "RS485" enables RS485.

### Modbus RS485/RS232 Holding Registers Map

<b>Mobus Register</b>	<b>Signal</b>	<b>Data Type</b>
528	Alarm Status	Unsigned Long Integer (4 bytes)
530	PCM Error	Unsigned Long Integer (4 bytes)
532	Turbidity NTU	Float (4 bytes)

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## **GB** Maintenance

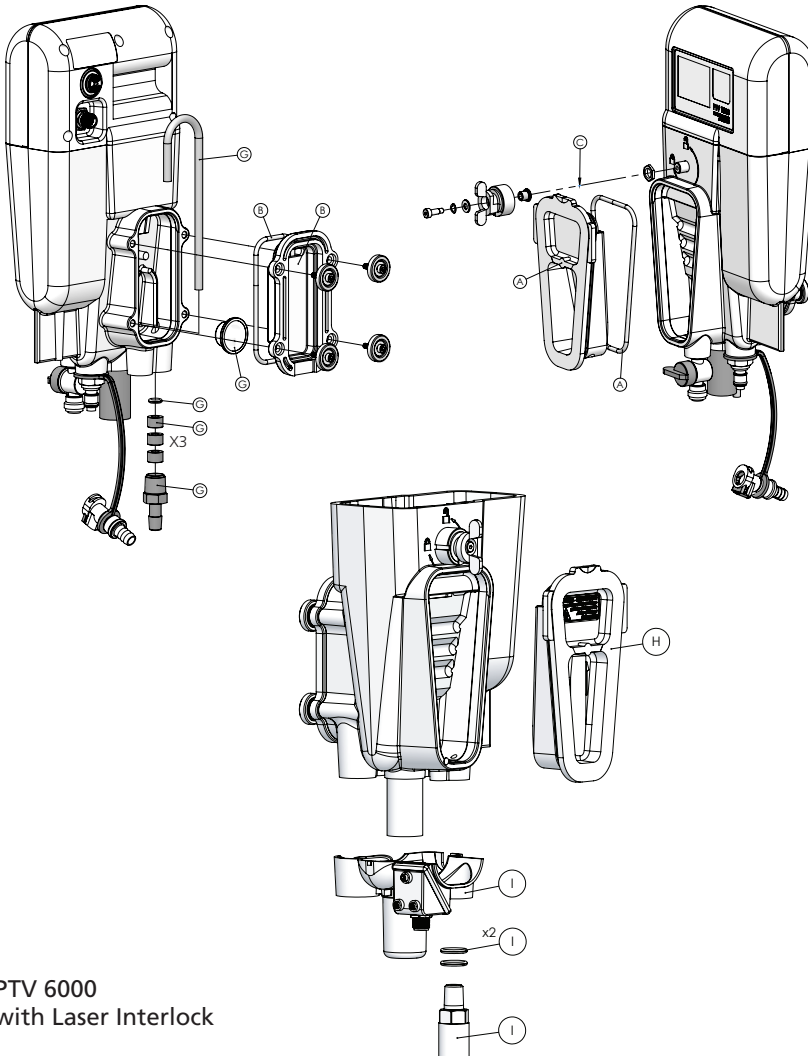
Parts Kits are letter coded; refer to 'Accessories & Replacement Parts' section for details.

### NOTICE

**DO NOT USE OILS OR GREASE ANYWHERE ON THE TURBIDIMETER.**

### NOTICE

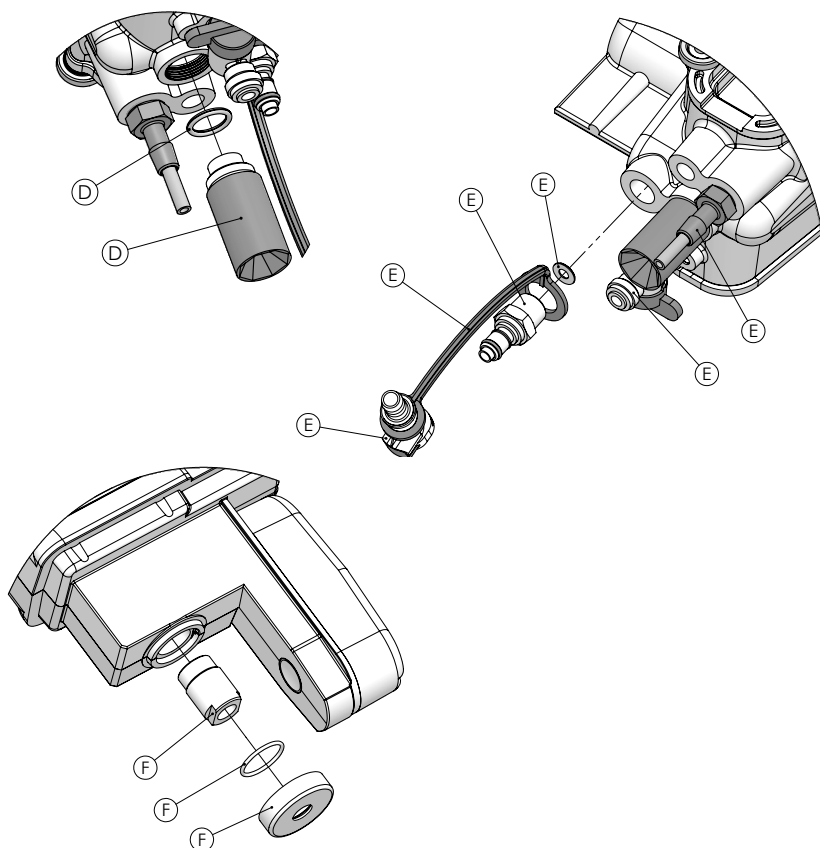
Before installing covers; apply a wetting solution of 1ml (Dawn® Original) Dishwashing Liquid to 250ml water, to lubricate the radial O-ring seals and housing seats.



**PTV 6000  
with Laser Interlock**

## GB Maintenance

Seat O-ring in Flow Body before screwing in Beam Dump (Kit 'D').



Repair Part Kits		Part Number
A	PTV 1000/2000 - Kit, Bubble Trap Cover and O-Ring	19806-077
B	Kit, Waste Chamber Cover and O-Ring	19806-081
C	Kit, Bubble Trap Latch & Hardware	19806-079
D	Kit, Beam Dump & O-ring	19806-078
E	Kit, Flow Body Fittings, Tubing & Lanyard	19806-059
F	Kit, Collimating Lens Assembly, O-Ring & Guard	19806-085
G	Kit, Siphon Tube, Float, Outlet Fitting, O-ring & Spacers	19806-080
H	PTV 6000 - Kit, Bubble Trap Cover and O-ring	19806-048
I	PTV 6000 - Kit, Beam Dump Guard / Interlock, Fitting & O-rings	19806-716

## **GB** Troubleshooting

Symptom	Possible Cause	Solution
Calibration failure	Calibrant not properly Prepared.	Re-make the standard.
Low sample flow	Inadequate inlet pressure.	Confirm head pressure is within specifications.
Inadequate sample flow	Flow control valve plugged.	Clean out valve (reverse flow through valve).
Calibration failure	Flow Body not cleaned properly.	Clean instrument.
	Water on illuminator optics (Figure F in Maintenance section).	Dry Collimating Lens with micro-fiber cloth.
	Incorrect calibrant.	Use correct calibrant.
Enter proper calibrant value during calibration.		
Flow out of Flow Body is not constant	See "Setting and Adjusting Flow Rate" section.	
Display not powered	Power connector is not secure.	Remove and inspect pins are not damaged. Re-connect power cord to measurement module.
Unexpected low turbidity readings	Dirt or Scale on the 90 degree detector window.	Clean in accordance with the instructions provided within this manual.
	Beam strength is low.	Clear any obstruction in illuminator ray path.
Elevated readings after maintenance	High zero electronics reading.	Flush instrument with low turbidity water.
		Perform new zero electronics.
High measurement variability	Sample flow too high.	Reduce sample flow.
	Signal averaging is set too low.	Increase signal averaging (recommend 60 to 90 seconds).
	Bubble reject not turned on.	Turn bubble reject 'on'.
	High pressure drop close to inlet of turbidimeter.	Reduce pressure in more than one stage away from the turbidimeter. Use optional Constant Head Device.
	Condensate present on collimation lens.	Reduce sample temperature to 5°C below ambient temperature.
Clean collimating lens in accordance with the instructions provided within this document. Carefully place measurement module slowly onto body to prevent splash back onto illuminator pathway.		



## **GB** Troubleshooting

Symptom	Possible Cause	Solution
High measurement variability (continued)	Large particles within sample.	Grab sample to confirm; no action required.
	Illuminator pathway is wet.	Dry illuminator pathway with soft cloth. Carefully place measurement module slowly onto body to prevent splash back onto illuminator pathway.
Flow icon yellow.	Sample flow rate is high or too low.	Adjust sample flow to between 40 and 80 ml/minute.
	Float is not moving.	Open rear cover and inspect Float for damaged or obstruction.
		Replace siphon tube.
	Water inside float.	Remove waste chamber cover and replace float.
Flow monitor cable disconnected or damaged.	Check flow monitor cable connection.	
Flow icon grey	No Communication with Flow sensor.	Flow Sensor not present or disabled.
Alarm bell red	Alarm condition triggered.	Press Alarm Bell to view alarm status.
<i>Bluetooth</i> <sup>®</sup> fails to connect	Signal strength is weak.	Move the Smart Device closer to instrument to increase signal strength.
		Confirm instrument is powered on.
<i>Bluetooth</i> <sup>®</sup> icon grey	No <i>Bluetooth</i> <sup>®</sup> detected.	Enable <i>Bluetooth</i> <sup>®</sup> .
No bars on <i>Bluetooth</i> <sup>®</sup> icon	Signal strength is weak.	Move the Smart Device closer to instrument to increase signal strength.
<b>PTV 6000 ONLY</b>		
Symptom	Possible Cause	Solution
Laser active icon grey	Interlocks not engaged. PTV 6000 installed on PTV 1000/2000 mounting cleat.	Re-seat measurement module into flow body.
		Ensure interlock cable is connected to measurement module.
		PTV 6000 mounting cleat.

## **GB** Accessories & Replacement Parts

<b>Item Description</b>	<b>Part Number</b>
<b>Calibration and Verification Supplies</b>	
T-CAL <sup>plus</sup> ®, 0.30 NTU Standard for Verification	48010035
T-CAL <sup>plus</sup> ®, 1.00 NTU Standard for Verification	48010135
T-CAL <sup>plus</sup> ®, 5.00 NTU Standard for Calibration	48010235
T-CAL <sup>plus</sup> ®, 20.0 NTU Standard for Calibration	48010335
T-CAL® Standard, 0.30 NTU, 500 ml	48011050
T-CAL® Standard, 1.00 NTU, 500 ml	48011150
T-CAL® Standard, 5.00 NTU, 500 ml	48012250
T-CAL® Standard, 20.0 NTU, 500 ml	48012350
Formazin Stock Solution, 4000 NTU, 100 ml	194141
Formazin Stock Solution, 4000 NTU, 250 ml	194142
Formazin Stock Solution, 4000 NTU, 500 ml	192130
T-CAL <sup>plus</sup> ® Calibration Tube Assembly, (blue)	19806-062
Dry Verification Device, (less than 1 NTU)	19806-111
Dry Verification Device, (greater than 10 NTU)	19806-110
<b>Cleaning Supplies</b>	
Detergent Solution	54011010
Cleaning Solution	54010435
Scale Remover	54013003
Complete Cleaning Kit <i>Includes: Detergent Solution, Cleaning Solution and Scale Remover with a Rinse Bottle and microfiber pad.</i>	19806-63
Cleaning Accessory Kit <i>Includes: Rinse Bottle (500 ml) and Cleaning Pad</i>	19806-112
Cleaning Tube Assembly (black)	19806-072
Cleaning Pad, 10 Pack	19806-803
Microfiber Cloth	197635
Rinse Bottle, 500 ml	420056

T-CAL<sup>plus</sup>® Standard for Verification is protected by patent EP3190155 and US10274418.

T-CAL® Standard is protected by patent EP3190155.

## **GB** Accessories & Replacement Parts

<b>Item Description</b>	<b>Part Number</b>
<b>Installation Supplies</b>	
Installation Kit, Tools	19806-075
Installation Kit, Connectors	19806-086
Mounting Disc Assembly, single disc	19806-106
Kit, Mounting Cleat Assembly	19806-082
PTV 6000 - Kit, Mounting Cleat Assembly	19806-119
<b>Cables, Connects Measurement Module to PCM</b>	
For Flow Body without Flow Sensor Measurement Module Cable (no Flow Sensor)	19806-574
For Flow Body with Flow Sensor Splitter Cable, Measurement Module	19806-212
12 Conductor Straight Cable	19806-572
PTV 6000 4 Conductor Right Angle to Straight Cable, M8, Interlock	19806-632
<b>Additional Accessories</b>	
Panel Mount Assembly	19806-088
Fluidics Manager	19806-056
Tablet Holder, Wall Mount	19806-521
Constant Head Device	19806-058
Hook, Reagent Bag	19806-569
Float, Flow Sensor	19806-054
Rotometer Kit	19806-087

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