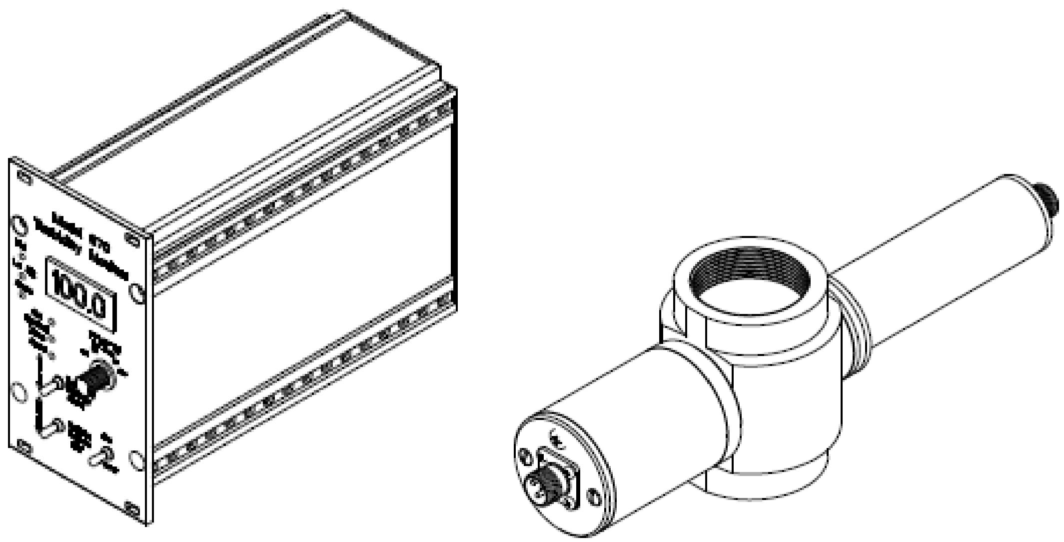
Operating Instructions

Model OUM670 Turbidity Monitor
Model OUSTF10 Inline Sensor

Monitor/Sensor to measure low levels of non-dissolved solids



P/N 71002830 Rev 7
BA927C/07/en/0609

Endress+Hauser
People for Process Automation

Table of Contents

1. General Information

Turbidity is the visual appearance of a liquid containing suspended solids. The presence of these solids causes light to be scattered and absorbed, making the liquid appear 'turbid'. The amount of light that is scattered or absorbed in a liquid can be used in a measurement system to determine the actual level of turbidity.

The Model OUM670 turbidimeter measures turbidity by measuring the amount of light that is scattered by solids suspended within a liquid.

The simplified optical diagram below illustrates the basic principles of scattering measurements. A focused parallel beam of light is projected through the liquid. This beam is called the Direct Beam and is measured by the Direct Beam detector. Ahead of the Direct Beam Detector is a anti-reflection coated broad band neutral density filter. This filter attenuates the beam and more importantly attenuates any reflected light from the detector window (reflected light from the Direct Beam detector window can be further reflected from the flow cell windows and cause an optical error).

If the fluid in the sample cell is free of particles then all light projected from the lamp is seen by the Direct Beam detector. If particles are present in the fluid then light is scattered in all directions, most of the scattering taking place in a forward direction. The optical system was designed to measure scattered light centered around 11 degrees in the forward direction. This viewing angle of the Scatter Beam detector assures that the maximum available scatter signal is detected. Further, this low view angle assures that the pathlengths for the direct and scattered beam are, for practical purposes, equal resulting in excellent color compensation.

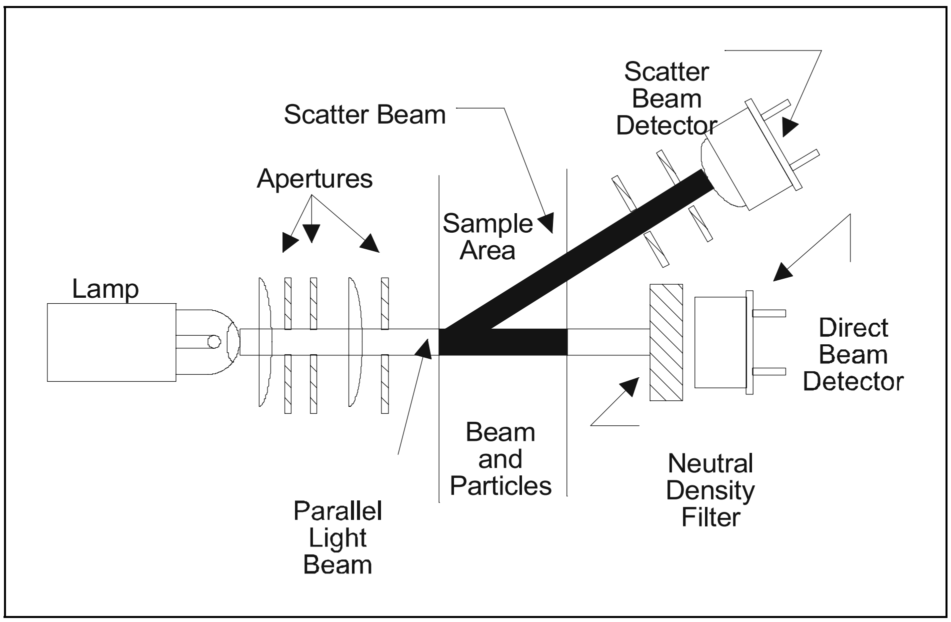


Fig. 1 - Simplified Forward Scatter Optical Diagram

The particle concentrations that the OUSTF10 series sensors typically measure is 0 to 0.2 ppm in its lowest range and 0 to 200 ppm in its highest range with particle sizes from 0.1 to 100 microns. The ppm measurement is based on the measurement of Diatomaceous Earth in water. The sensors can be calibrated using other materials.

The use of the dual beam method of turbidity measurement eliminates sources of optical error. These errors can be due to color change in the liquid, lamp aging and window scattering. These errors effect both the scatter and direct beam signals.

The Model OUM670 electronic instrument is connected to the Scatter and the Direct beam detectors and processes these signals such that the Ratio of the Direct and Scatter Beam is computed from the following equation:

$$T_s = \frac{[S-(1-L_a+1-W_a+1-C_a)]}{[D-(1-L_a+1-W_a+1-C_a)]}\,eq(1)$$

Where :

T_s = Net Turbidity Signal
S = Scatter Beam Signal
D = Direct Beam Signal
L_a = Lamp Aging
W_a = Window Absorbance
C_a = Color Absorbance

Since optical errors and variables are common to both the scatter and the direct signals, then it follows that these errors will appear in both the numerator and the denominator in the above equation. It is obvious that the above equation reduces to :

$$T_s = \frac{S}{D}\,eq(2)$$

The dual beam forward scatter turbidity measurement is only sensitive to the particle content of the fluid stream and ignores optical parameters that are common to both channels. In practical terms, if the turbidity particle content in the liquid was 1.5 ppm it would not matter if the liquid was crystal clear or highly colored. Below is the optical diagram for a typical Model OUSTF10 Dual Beam Forward Scatter Turbidity Sensor

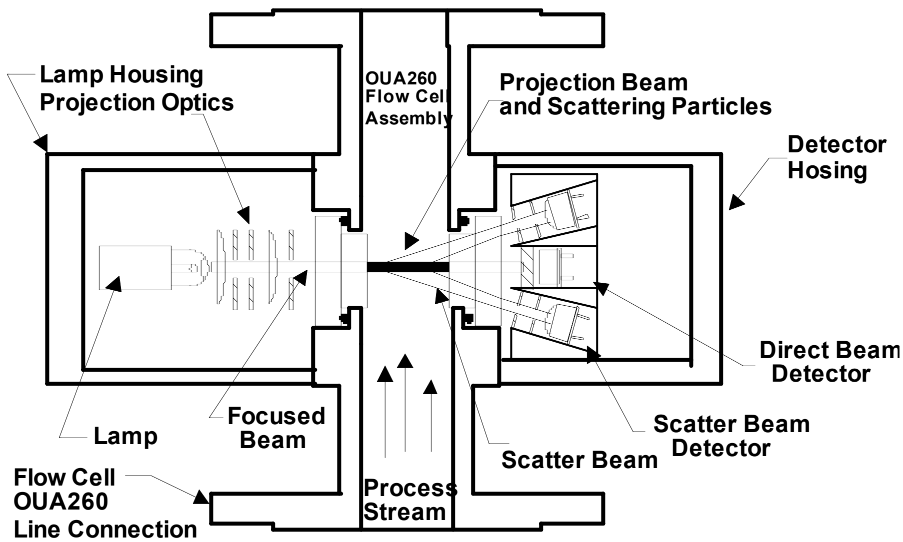


Fig. 2 - Typical OUSTF10 Forward Scatter Inline Sensor

Figure 2 illustrates the optical sensor and the lamp assembly mounted on a standard flow cell. The scatter beam detectors are focused to accept only light scattered by entrained particles in the process stream. These detectors will not register light scattered by the flow cell windows or direct light from the projected beam.

2. Specifications

2.1 Model OUM670 Forward Scatter Turbidimeter Instrument Specifications

Case Size:	Type 4 Cassette Module, 3U high by 14 hp wide
Signal Inputs:	Supplied by the sensor's detectors
Display:	3-1/2 digit LCD DVM, 10 mm high
Range:	0 - 200 ppm (DE) with 4 front panel selected full scale ranges.
Accuracy:	± 1% Full Scale (any range)
Linearity:	± 1% of Selected Range
Resolution:	10 ppb (Parts Per Billion)
Repeatability:	±0.5% (any range)
Response:	100 msec, 10 to 90% of scale
Bubble Reject:	Front panel selectable, 60db suppression
Analog Output:	4-20mA into 0-600 ohms load
Alarm Output:	SPDT relay, front panel set point
Fail Safe Action:	Full scale up for lamp fail or total obscuration
Operating Temperature:	0 to 55^{o} Centigrade
Power Requirements:	100-135/200-270 Vac, 50/60 Hz, 25 VA
Options:	EC-600 Environmental Enclosure, NEMA 4, IP65 EC-602 Panel Mount Bezel, NEMA 4, IP65 Explosion Proof Enclosure, Class 1, Division 1, Group D

2.2 Model OUSTF10 Dual Beam Forward Scatter Turbidity Sensor Series with OUA260 Flow Cell

Line Size:	1" (25mm) to 4" (100mm) Process Line Diameter
Line Connection:	NPT, Raised Face Flange, Tri-Clover Fitting, RTJ, and other are available on special order.
Sensor Material:	316 Stainless Steel
Window Material:	Quartz, Sapphire, Pyrex (not available for 4" flow cells)
Gasket Material:	Buna 'N', EPR, Silicon, Viton, Kalrez, TFE Coated Viton
Process Temperature:	120^{o}C continuously, fully sterilizable
Operating Pressure:	400 psig (25 Bar) at maximum temperature
Light Source:	Incandescent lamp, rated at 25,000 hours
Detectors:	Hermetically sealed Silicon Photodiodes, linear for 9 decades min.
Power Requirements:	Supplied by Model OUM670
NEMA Rating:	NEMA 4, NEMA 4X, IP65
Options:	Air purge window rings. Optical Filters for particular spectral response. Explosion Proof Lamp Housing FM, SAA Class 1, Div 1, Groups B,C,D

3. Installation

3.3 Unpacking

Inspect the instrument, sensor and cable for any signs of shipping damage. Report any visual damage or discrepancies to Endress+Hauser Conducta Inc, and the Shipper.

Figures 3, 4 and 5 depict the dimensions for the instrument, panel mount, bezel and NEMA 4/IP65 wall mount enclosure. When mounting the instrument, select a location that is free of excessive heat and mechanical vibration. If a panel mount bezel is being used, use the supplied drawing for the panel cutout. Attach the bezel to the panel securely before and then mount the instrument in the bezel frame.

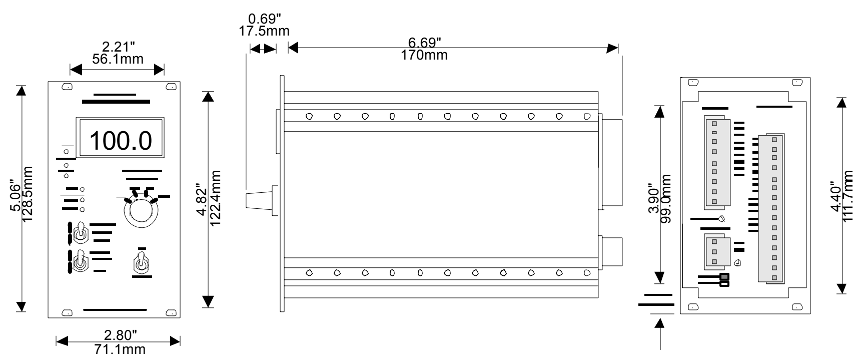


Fig. 3 - Model OUM670 Forward Scatter Turbidimeter Module Dimensions

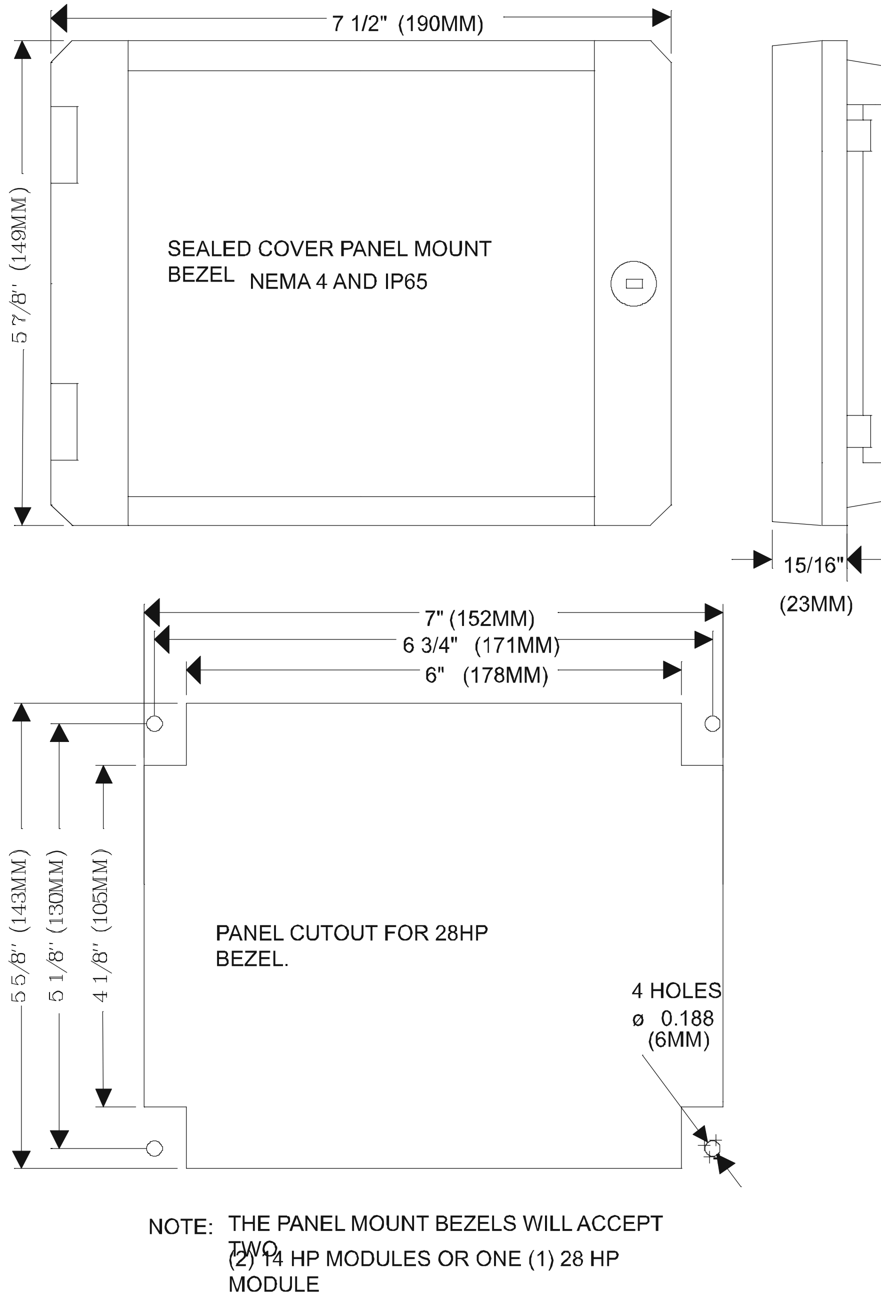


Fig. 4 - 600 Series Panel Mount Bezel, NEMA4/IP65 Rated

If a wall mount enclosure is used, securely attach to a vertical surface. The mounting hole pattern is shown in figure 5. Conduit holes are located on the bottom edge of the enclosure. The instrument housing is hinged to the lower part of the case. A large 1/4 turn locking screw on the right hand side of the enclosure, when turned CCW, opens the enclosure body, allowing easy access to the Model OUM670 rear panel for cable connection.

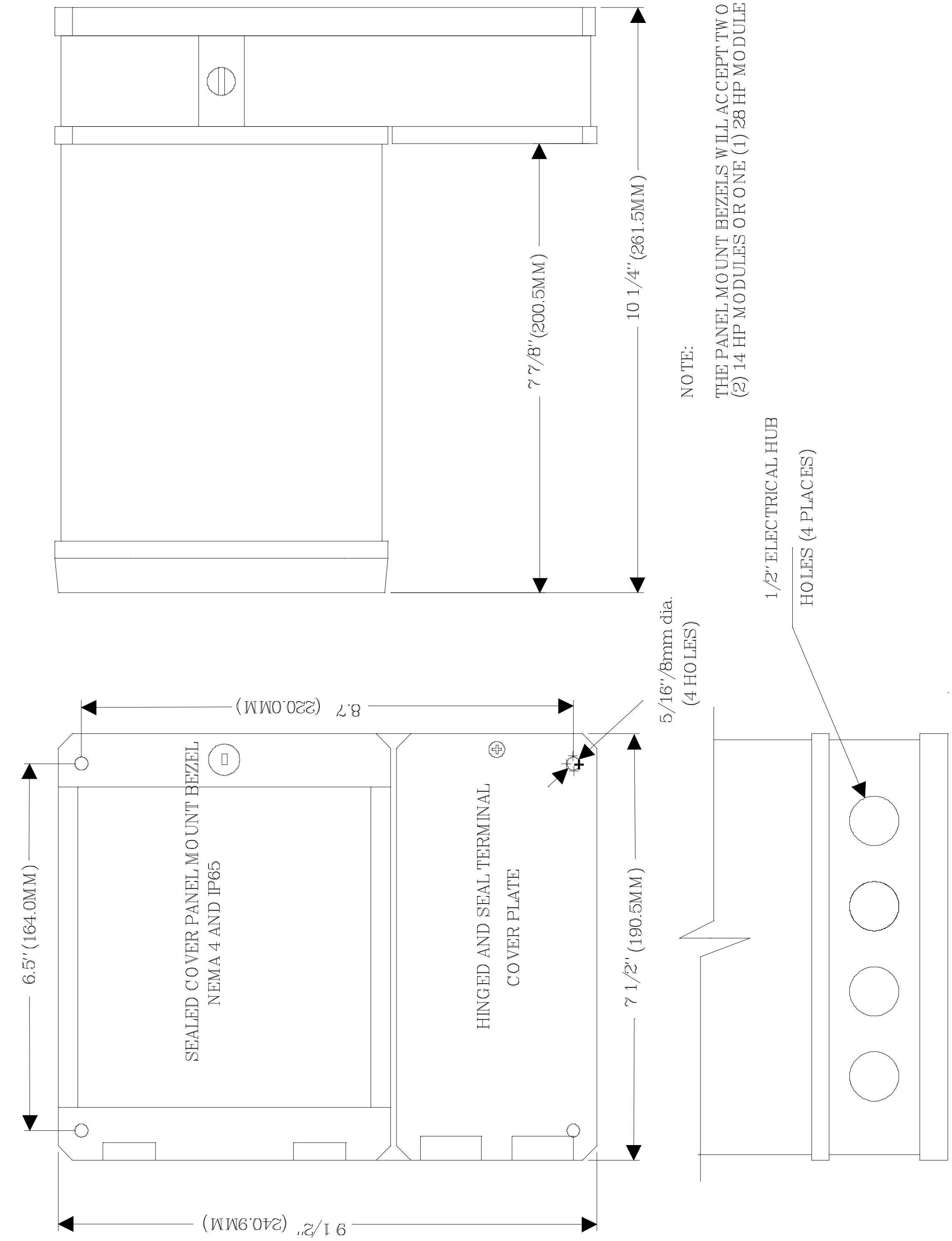


Fig. 5 - Model OUM670 Forward Scatter Turbidimeter NEMA4/IP65 Enclosure

3.4 Electrical Connection

Each module has 2 analog outputs, a Voltage output of 0-10vdc and a current output of 4-20 mA. The voltage output is intended for local indicators or recorders. Resistive dividers can be used to scale the voltage to the desired value as long as the total resistive load is 10,000 ohms or more. The 4-20 mA analog output is used to interface into industrial process controllers and/or computers for monitoring and control.

All electrical connections to the Model OUM670 are located on the rear panel. All wiring should follow local electrical codes. Check the rear panel label for the AC voltage that the instrument has been configured for. If the voltage is different from that indicated, the instrument must be changed for the proper power. Refer to the diagrams and schematics at the end of the manual for input voltage selection.

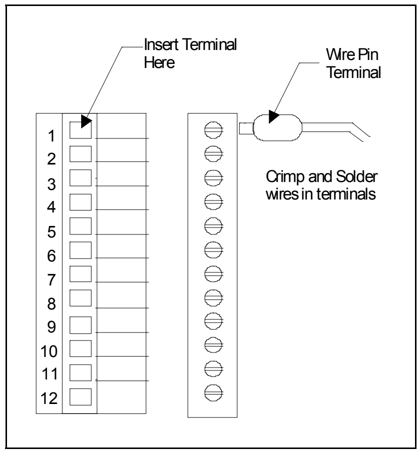


Fig. 6 - Terminal Preparation and Connector Assembly

The cables supplied with each Model OUM670 have been terminated to suit the supplied sensor and shouldnot be shortened or lengthened without referring to the factory first. The remainder of the wiring, AC power, analog outputs and alarms are done at the installation site. The label on the rear panel is the terminal callout. Figure 6 is an illustration of the termination for each wire. After crimping on the wire pins, it is recommended that the pins be soldered. Insert the pins in the appropriate position on the connector. Check wiring before inserting the connector into the instrument receptacle and applying power. The installation of the system is shown in the field wiring diagram (See Field Wiring Diagram for the Model OUM670 / OUSTF10 Sensor Series). Connect the sensor cable and the lamp cable as shown. If the cables are to be run in conduit, both cables can be in the same conduit.

DO NOT PLACE THE SENSOR CABLES IN A CONDUIT THAT CONTAINS POWER OR CONTROL WIRING.

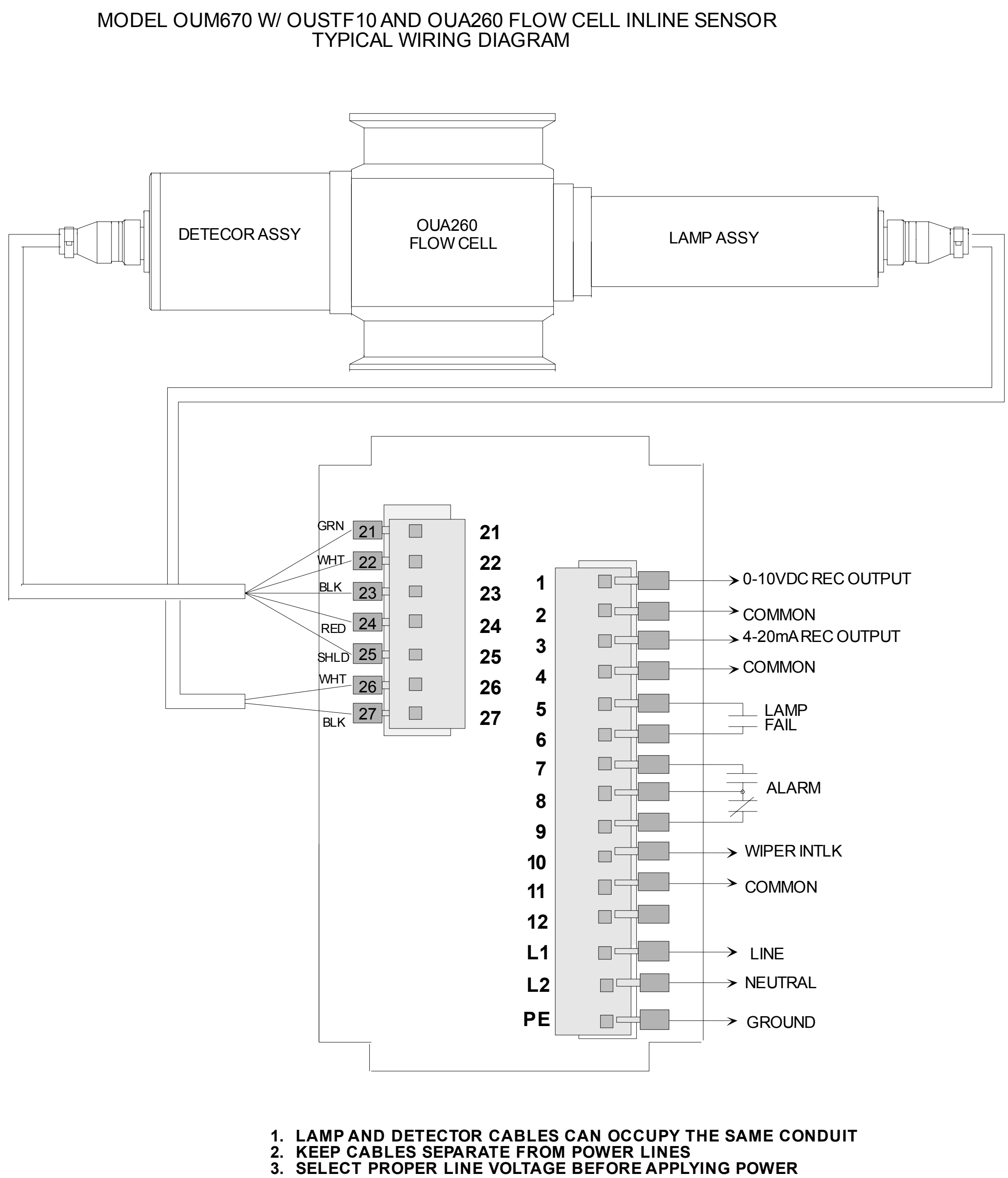


Fig. 7 - Model OUM670 Forward Scatter Turbidimeter Field Wiring Diagram

3.5 Cable OUK20 Structure and Termination of Measurement Cable

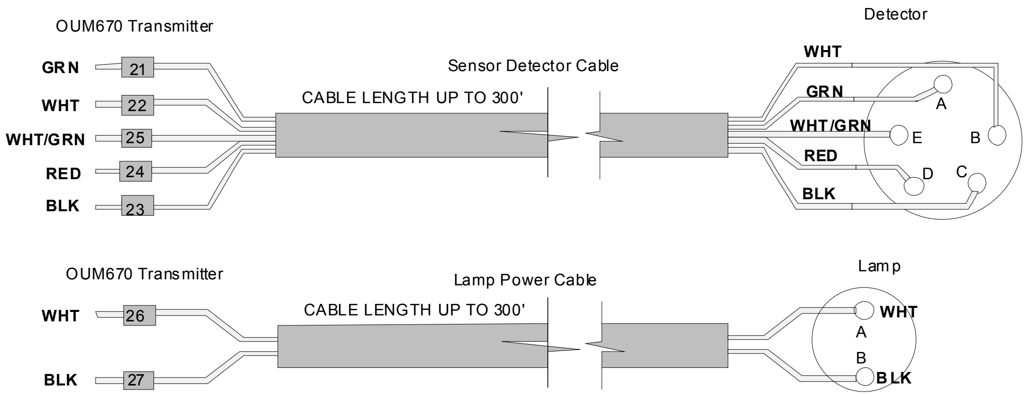


Fig. 8 – OUK20 Lamp and Detector Forward Scatter Turbidimeter Field Wiring Diagram

4. The Model OUSTF10 Inline Sensor

4.6 General Information

The OUSTF10 Dual Beam Forward Scatter series of inline sensors for the Model OUM670 Forward Scatter Turbidimeter allow the configuration of a measurement system for specific applications. All sensors have interchangeable components. The sensors are equipped with incandescent lamps with an anticipated life of 25,000 hours.

4.7 Sensor Installation

The inline sensors are designed for installation directly on process lines or in process by-pass/side/slip stream lines. Sensors can be mounted either vertically or horizontally. If the sensor is mounted horizontally, the sensor arms must also be horizontal. This insures that the optical windows are in a vertical position which will avoid sediment accumulation on the windows.

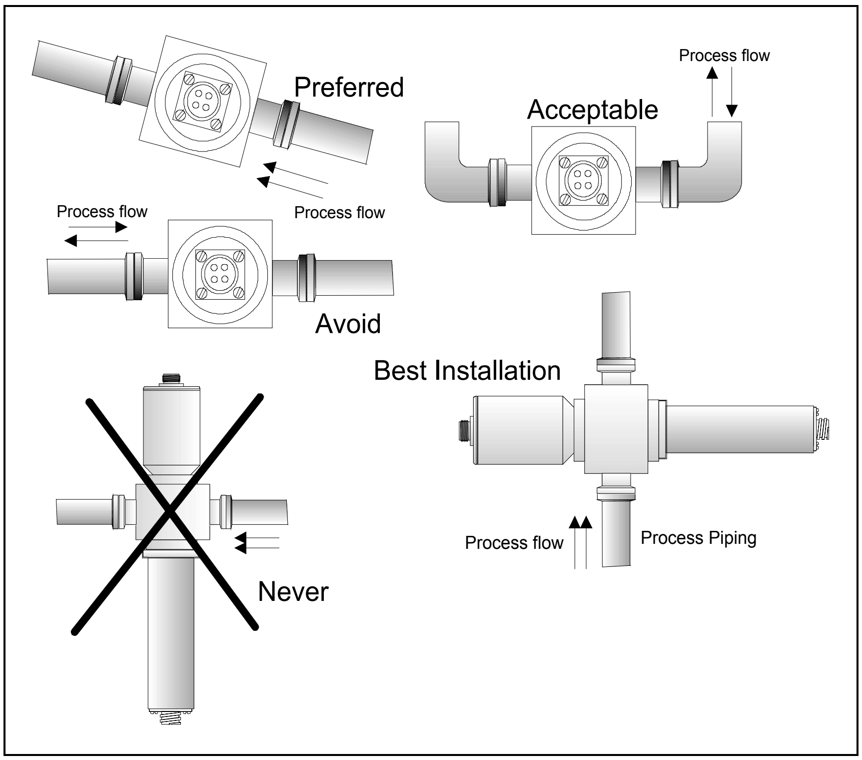


Fig. 9 - Installation of OUSTF10 Series Sensors in Process Lines

The sensor should be located upstream of pressure regulators and valves so that the sensor is operating under pressure. This will eliminate the possibility of air or gas bubbles that cause measurement error. **The sensor should be located in a section of pipe that remains full at all times and does not have entrained bubbles.**

After the sensor has been installed on the process line, connect the lamp and detector cables. This completes the installation of the sensor.

4.8 Sensor Installation with Air Purge Option

If the sensor is to be installed in an area where the process temperature is lower than ambient, or in a damp or humid environment, water condensation in the optical housings may occur. In this case, a dry air purge must be connected to the sensor optics housings. Special window rings with air purge connections are available from the factory. Connect a clean, dry source of air to each air purge connector as shown in the sensor installation drawing. The air flow requirement is less than 0.1SCFM, maintained a small positive pressure in the housings and keeping moisture out.

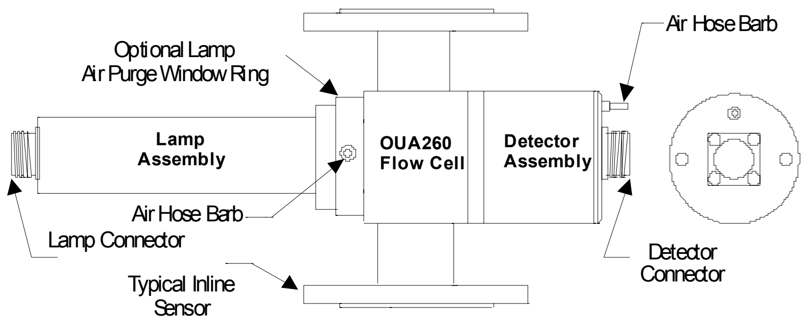


Fig. 10 - Air Purge Inline Sensor Illustration

5. The Model OUM670 Forward Scatter Turbidimeter

The ModelOUM670 complete with OUSTF10 inline sensor has been carefully tested and calibrated at the factory and should require no field re-calibration. It is designed for long term stability and requires a minimum of maintenance and calibration. Several features of the Model OUM670 Forward Scatter Turbidimeter should be discussed before initial start-up.

5.1 Fail Safe Operation

As the solids concentration increase the amount of light seen by the scatter beam detectors increases. When this concentration becomes too great, secondary scattering and absorbance adversely effects the turbidity reading. The Model OUM670 incorporates circuitry that monitors the performance of the sensor. If the solids concentration exceeds the limits of the instrument, this circuitry will force the current output to full scale.

5.2 Bubble Reject

The purpose of Bubble Reject is to control and suppress optical signal transients. These transients can be due to large particles, electrical noise and entrained air bubbles in the process stream. When the Bubble Reject mode is switched on, it effectively suppresses both positive and negative 'spiking' on the turbidity signal.

5.3 Range Selector

The **RANGE SELECTOR** located on the front panel provides 4 calibrated full scale sensitivities in a x10 sequence. The decimal point tracks with the 0-200, 0-20 and the 0-2 range. In the 0 -0.2 range the there is no visible decimal point. When the decimal point is not visible, the instrument is in it's most sensitive range. In operation, select the range that gives the best indication for the solids concentration of the process stream.

5.4 Lamp Fail

A lamp failure indicator on the front panel will illuminate due to a lamp failure, cable breakage or power supply malfunction. An alarm relay is also activated to when this failure is detected.

5.5 Analog Outputs

The Model OUM670 has 2 analog outputs that are simultaneously available. A 0-10Vdc is available for local recording and control as well as a 4-20mA output. Both outputs track with the range selected. The current analog output is set at the factory for 4-20mA. An output of 0-20mA can be selected by a simple jumper change on the main PCB. In changing current outputs, no re-calibration of the instrument is necessary.

5.6 Front Panel Controls

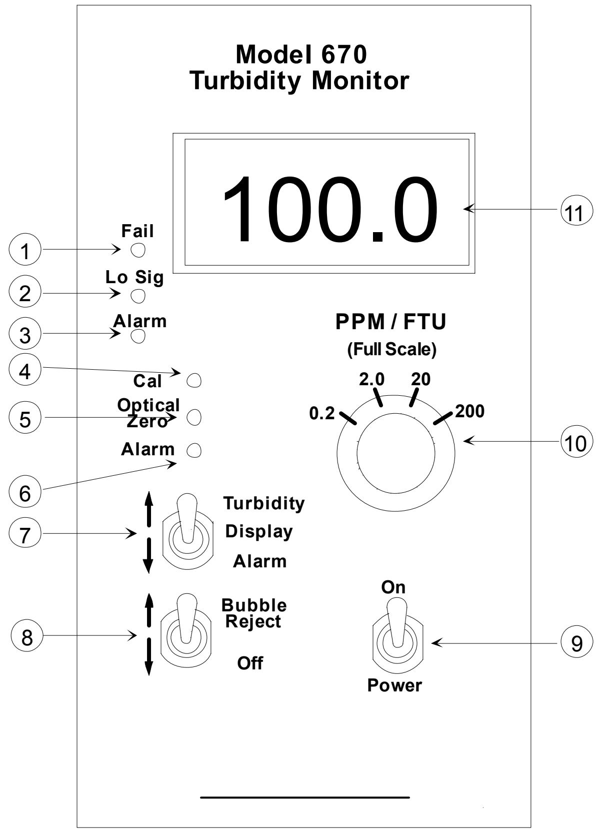


Fig. 11 - Model OUM670 Front Panel Controls

The position of the controls and indicators is shown in Figure 10. Their functions are as follows:

- The **FAIL LED** lamp when energized indicates that either the sensor lamp has failed and/or the lamp power cable is severed or disconnected.
- The **LO SIG** lamp is energized whenever the process exceeds the range of the instrument. When this lamp is lit, the DVM panel meter and the analog output will go full scale, alerting that an over-range condition exists.
- The **ALARM** lamp is energized whenever the process value exceeds the alarm set point. When this lamp is lit, the alarm relay is energized.
- The **CAL** trim control is used to calibrate the span of the instrument.
- The **OPTICAL ZERO** trim control is used to 'zero' the instrument when a particle free liquid is in the sensor.
- The **ALARM** adjustment is used to set the process value where an alarm is required to trip.
- The **TURBIDITY-ALARM** toggle switch controls the value displayed on the panel meter. This switch is normally in the TURBIDITY position. When in the ALARM position, the alarm set point is displayed.
- The **BUBBLE REJECT** switch controls the 'transient suppression' circuit and when in the **'ON'** position engages this circuit. When the Bubble Reject is ‘ON’, optical transients or spikes due to bubbles or large particles are suppressed or eliminated.

- The **POWER** toggle switch applies power to the instrument when in the **'ON'** position.
- The **RANGE** selector switch sets the full scale range of the system. The analog outputs track with the range setting.
- The panel display indicates either the current process value or the alarm setpoint. The DVM is a 3 1/2 digit display. The decimal point tracks with the range switch in the following manner:

Range	Display
0-200	199.9
0-20	19.99
0-2	1.999
0- 0.2	1999

Note: In the 0-0.2 PPM/FTU range no decimal point is displayed.

6. Start Up and Putting into Service

Before powering up the instrument for the first time, re-check the installation and the wiring using the installation diagrams as a guide.

The following procedure should be followed for initial start up.

1. Set the front panel controls in the indicated position:
   Range Switch **Highest Range (200 ppm)**
   Bubble Reject **'Off'**

2. Turn the **POWER** switch **'ON'** and leave the instrument to warm up for 10 minutes.

3. Flow process through the sensor at normal operating pressure and temperature.

4. Change the **RANGE** switch through its ranges until a mid-scale (100.0 i.e.) value is seen on the display.

7. Calibration

7.1 FTU Calibration using Formazin

FTU configured instruments are calibrated using a Formazin turbidity standard solution. Formazin is a white colloidal suspension and is prepared as follows:

1. Dissolve 1g of Hydrazine Sulfate in 100ml of high purity water in a volumetric flask.

2. Dissolve 10g of Hexamethylenetetramine in 100ml of pure water in a volumetric flask.

3. Mix 5ml of each of the above solutions and allow them to stand for 24 to 48 hours at room temperature (25 $\pm 3^{o}$ C)

4. After the suspension has formed, dilute with high purity water to 100ml. This Stock Suspension is defined as 400 FTU (Formazin Turbidity Unit). It should be noted that 1 FTU = 1 NTU (Nephelos Turbidity Unit) and the 4 FTU = 1 EBC (European Brewery Congress Unit). This Prepared suspension is stable and can be stored in an opaque bottle in a cool, dry area for up to 1 month. The suspension can diluted to prepare a series of optical 'transfer standards' for checking the calibration of the Model 670 Turbidimeter and its sensor.

ml of Stock Suspension	Distilled Water Added	Value in FTU	Value in EBC
100 ml	-	400 FTU	100 EBC
50 ml	50 ml	200 FTU	50 EBC
25 ml	75 ml	100 FTU	25 EBC
20 ml	80 ml	80 FTU	20 EBC
10 ml	90 ml	40 FTU	10 EBC
5 ml	95 ml	20 FTU	5 EBC
1 ml	99 ml	4 FTU	1 EBC

Table 1 - Formazin Standard Suspension Dilutions

Care must be exercised in diluting the stock suspension. The accuracy of the solutions is very dependent upon the procedure used. Use only high purity water. Dilutions creating solutions below 1 EBC and 4 FTU are not recommended.

Follow the following procedure to calibrate the instrument:

1. Prepare a 100FTU Solution

2. Set the instrument range to 0 - 200FTU

3. Rinse out with and fill the sensor with high purity turbidity free water and check the zero of the instrument. Adjust the ZERO control if necessary.

4. Empty the sensor and fill with a 100FTU solution. Empty the solution out of the cell, and refill again with the 100FTU solution (this is to make sure dilution by water left in the cell from the zero check is minimized). Adjust the CAL control until the display reads 100.

5. Repeat steps 3 and 4 until the readings are correct.

7.2 PPM Calibration using Diatomaceous Earth

PPM configured instruments are calibrated using a Diatomaceous Earth (DE) turbidity standard solution. DE is used in many filtration processes as the filter media, therefore, in applications where the Model OUM670 is used to monitor filter influent or effluent for solids content, the measurement will directly correlate to the calibration. Where other materials are being measured, the indicated values on the instrument may need to be correlated to the actual process values.

It should be noted that the accuracy and the repeatability in using DE as a standard is directly related to sample preparation and procedure. DE in suspension settles fairly rapidly, so it is essential that the sample is thoroughly mixed and that the instrument display readings are taken as soon as stability is observed.

A 1000 ppm DE in water suspension is prepeared by adding 1g of dry DE into 1 liter of high puriy water. This 100 ppm suspension can be diluted with high purity water to produce a series of diferent value solutions. It is important to agitate the suspension thoroughly before diluting. The following table shows the proportions needed to produce a series of standard samples:

ml of 1000 ppm solution	High Purity Water Added	PPM of Suspension
1.0 ml	99.0 ml	10 PPM
2.0 ml	98.0 ml	20 PPM
5.0 ml	95.0 ml	50 PPM
10.0 ml	90.0 ml	100 PPM
50.0 ml	50.0 ml	500 PPM
100.0 ml	-	1000 PPM

Table 2 - Diatomaceous Earth Standard Suspension Dilutions

Follow the following procedure to calibrate the instrument:

1. Prepare a 100FTU Solution

2. Set the instrument range to 0 - 200FTU

3. Rinse out with and fill the sensor with high purity turbidity free water and check the zero of the instrument. Adjust the ZERO control if necessary.

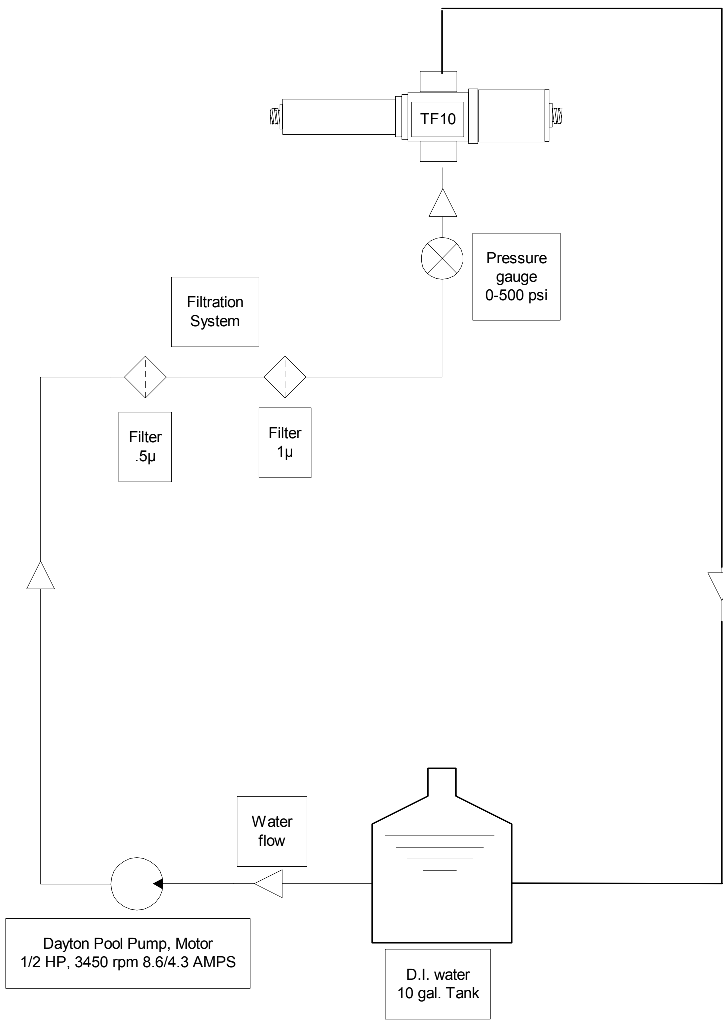
4. Empty the sensor and fill with a 100FTU solution. Empty the solution out of the cell, and refill again with the 100FTU solution (this is to make sure dilution by water left in the cell from the zero check is minimized). Adjust the CAL control until the display reads 100.

5. Repeat steps 3 and 4 until the readings are correct.

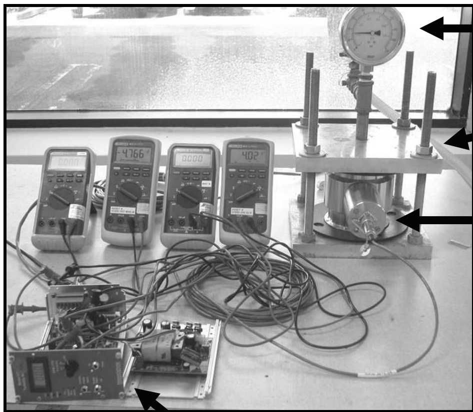
NB: Additional set up instruction for optical zero in OUSTF10

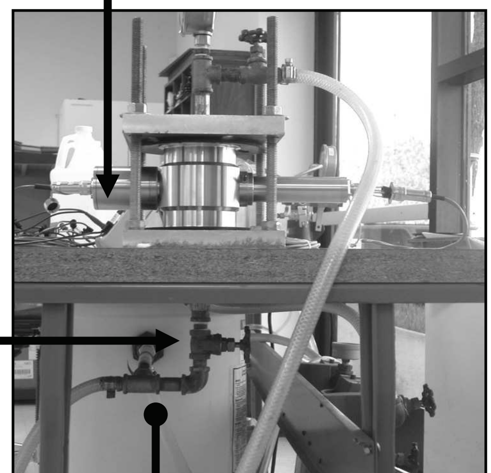
It is difficult to achieve optical zero in any turbidity sensor unless the air bubbles are busted with high pressure. Hence, the customers that need very low NTU measurement, may implement a filtration loop for zero point calibration.

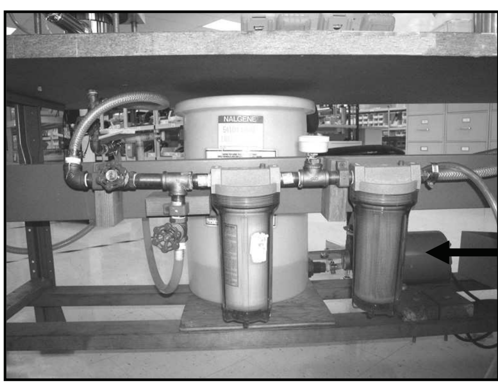
Here is a brief schematic of filtration loop:

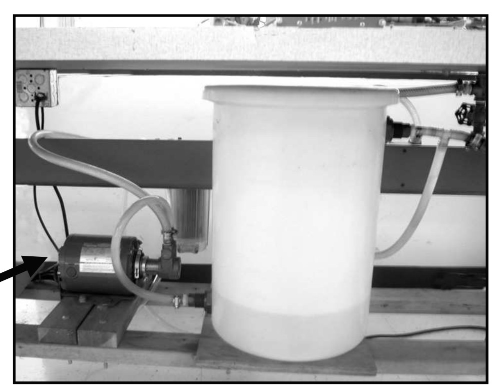


The basic idea is to run a filtrered water flow at high pressure (300-400 PSI) using a pump so that water bubbles cease to exist due to additional pressure and thus perfecting a Turbidity zero free from the bubbles.


Pressure Gauge
Top flow
OUSTF10
Model OUM670


Bottom flow
Tank


NALGENE
Filter

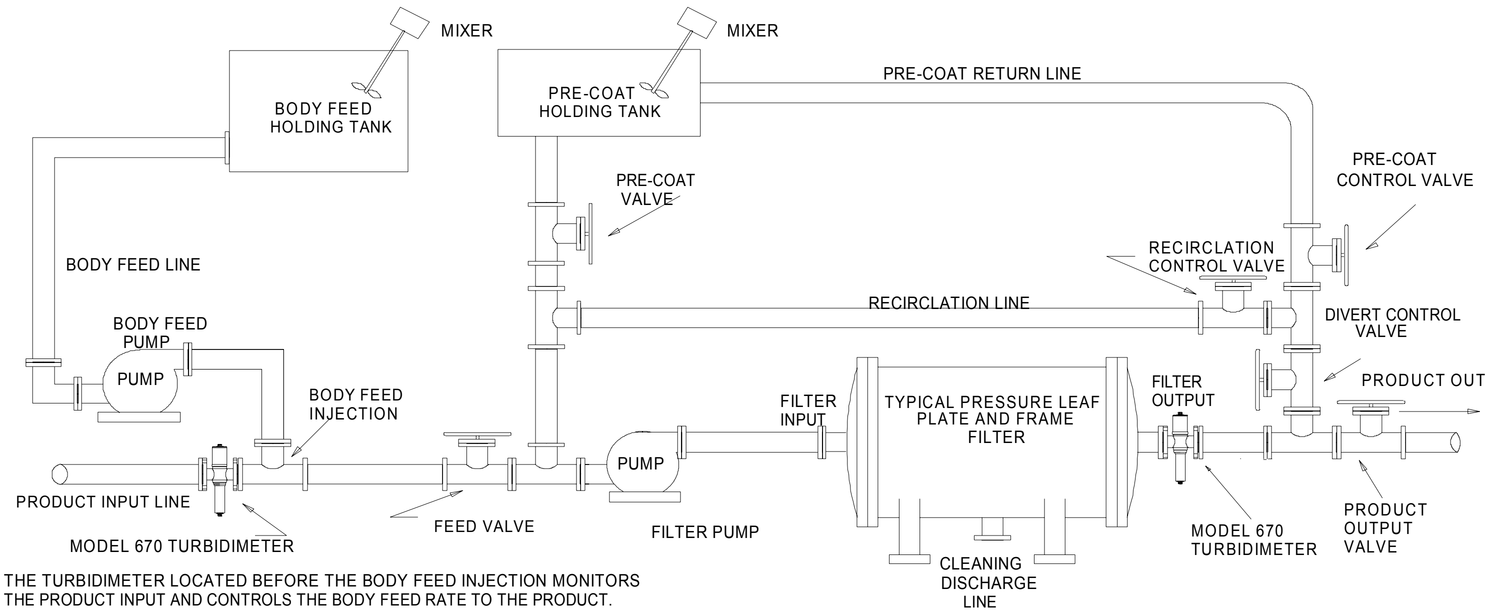

Pump

8. Operation of the Model OUM670 Forward Scatter Turbidimeter

In operation, the Model OUM670 can be used not only as a monitor but as a primary control element. In filtering operations, such as shown in Figure 11 (a typical pre-coat filter system), a Model OUM670 turbidimeter has been installed in both the input and the output piping of the filter.

The sensor located on the input side monitors the solids concentration of the liquid to be filtered. Since the flow rate to this type of filter is held constant, monitoring the influent is important since the output of the Model OUM670 is used as the control element for the body feed pump which injects material to maintain the porosity of the filter. As the influent solids content varies, the control output of the Model OUM670 can be used to vary the body feed injection rate.

The Model OUM670 placed on the effluent side of the filter monitors the filter efficiency. During the pre-coat cycle, monitoring the effluent will indicate when the pre-coat cake is established and the filter is operational. When this point is reached, the filter can be placed on-line and then the Model OUM670 will monitor the filter efficiency. If the Model OUM670 is used as a control element, whenever the effluent of the filter is above a pre-determined set point the output can be diverted. Changes in flow and pressure surges can result in the increase particle concentration of the filter's output. In most instances, these fluctuations are transitory in nature and the turbidity increase can be controlled by recirculating the output until the turbidity level is within operating limits. When the turbidity level returns to 'normal' the filter is placed back on-line. This type of control on both the influent and the effluent not only improves overall system operation but maintains a consistent product quality.



THE TURBIDIMETER LOCATED BEFORE THE BODY FEED INJECTION MONITORS THE PRODUCT INPUT AND CONTROLS THE BODY FEED RATE TO THE PRODUCT. IF SOLIDS CONTENT EXCEEDS A PRESET LEVEL THE FEED PUMP CAN BE SHUT OFF OR THE FEED VALVE CLOSED TO PREVENT DAMAGE TO THE FILTER. IF DURING A FILTER RUN THE PRODUCT OUTPUT EXCEEDS A PRESET LEVEL DUE TO FILTER UPSET, THE DIVERT VALVE IS OPENED AND THE PRODUCT OUTPUT VALVE IS CLOSED AND THE FILTER IS PLACED IN THE RECIRCLATION MODE. WHEN THE UPSET HAS CLEARED, THE FILTER IS PLACED BACK ON STREAM. RUN IN THIS CONDITION UNTIL THE TURBIDIMETER REACHES DESIRED SOLIDS CONCENTRATION AND THE DIFFERENTIAL PRESSURE ACROSS THE FILTER IS AT NORMAL OPERATING RANGE. AT THIS POINT OPEN THE RECIRC VALVE AND CLOSE THE PRE-COAT VALVES. OPEN THE FEED VALVE AND RUN IN RECIRCLATION UNITL TURBIDIMETER REACHES DESIRED PRODUCT SOLIDS CONTENT.

PRE-COAT CYCLE
1. BODY PUMP OFF
2. FEED VALVE CLOSED
3. PRODUCT VALVE CLOSED
4. RECIRCLATION VALVE CLOSED
5. PRE-COAT VALVES OPEN
6. DIVERT VALVE OPEN
7. FILTER PUMP ON

NORMAL RUN
AFTER THE PRE-COAT CYCLE IS COMPLETE AND THE PRODUCT IS AT DESIRED SOLIDS CONTENT, VALVES ARE IN THE FOLLOWING POSITION.

1. RECIRCLATION VALVE OPEN
2. PRODUCT OUTPUT VALVE OPEN
3. DIVERT VALVE CLOSED.
4. FEED VALVE OPEN
5. BODY FEED PUMP ON

Fig. 12 - Typical Filter System with Turbidity Monitoring

9. Model OUM670 Instrument and Sensor Maintenance

The Model OUM670 Forward Scatter Turbidimeter has been designed and manufactured for a long and trouble free life. Should the unit fail in operation please contact your local Sales Representative to schedule a return for repair and re-calibration.

The OUSTF10 sensors are designed to be rugged and withstand most environments. They do, however, contain sensitive optical components, so appropriate care should be taken whenever servicing them. Clean all optical components with dry lens cleaning tissues. If films or other contaminants are to be removed, use a lens tissue and a cleaning solution such as ethanol. The detector and lamp housings are easily removed from the sensor without the integrity of the window seals being broken which allows maintenance without interruption of the process stream.

9.1 Fuse Replacement

The instrument's fuse is located on the rear of the main PCB. Replace the fuse with the same type and rating. Should the unit not operate after fuse replacement please contact your local Sales Representative.

9.2 Lamp Voltage Adjustment

After replacing the lamp power cable or changing it's length for any reason, the lamp Voltage must be measured and checked at the lamp connector on the sensor. The Voltage measured at the sensor connector should read 4.8 Vdc +/- 0.1 volt. **(When replacing the lamp a recalibration is required, refer to section 7 for the proper calibration procedure)**

Figure 12 shows the location of the Lamp Voltage adjustment control in the instrument. This is located on the top panel of the enclosure. Once an instrument has been installed and is operating, the lamp Voltage need only be checked if the power supply is replaced or the lamp cable length is changed.

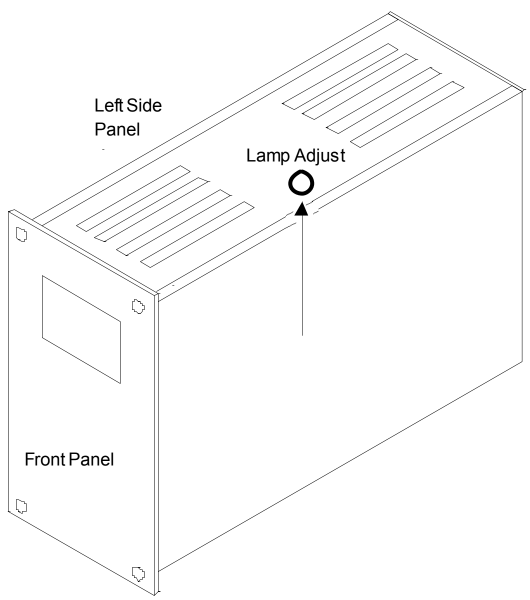


Fig. 13 - Lamp Voltage Adjust Location.

THE LAMP VOLTAGE IS ADJUSTED ONLY WHEN CABLE LENGTH IS CHANGED OR A POWER SUPPLY PCB HAS BEEN REPLACED.

9.3 Lamp Replacement (Standard Sensor)

If lamp failure is suspected, remove the cable connector from the detector optical housing (the wider housing) and unscrew it from the sensor. With power on the instrument, look through the sensor window to see if the lamp is operating or not. If no light can be seen through the flowcell, replacement of the lamp is necessary.

To replace the lamp, disconnect the lamp cable from the lamp housing and unscrew it from the sensor body.
Remove the 4 screws and washers from the lamp connector and carefully remove the lamp module and projection optics from the housing. The lamp assembly and the connector are integral. This assembly screws into the projection optics assembly.

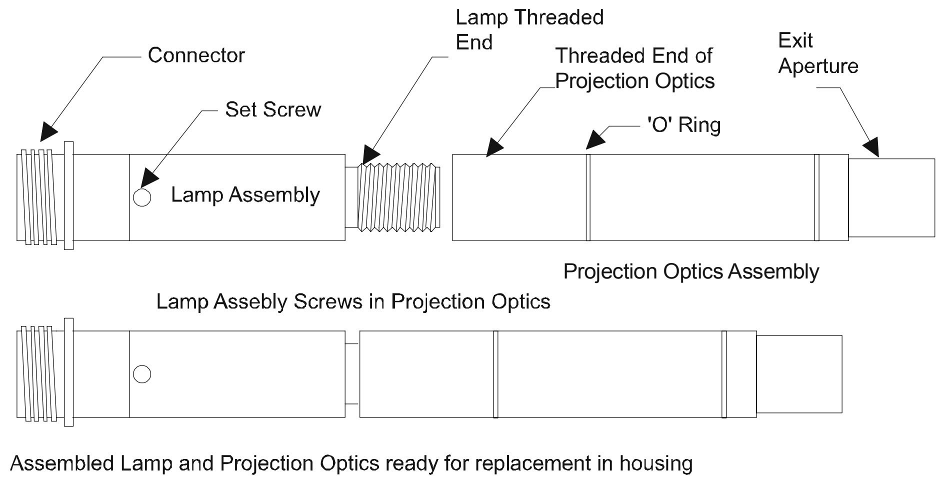


Fig. 14 - Lamp Replacement for Standard Turbidity Projection Optics

Carefully unscrew the lamp assembly and replace with a new lamp. Do not over tighten.

Insert the reassembled projection optics assembly with the connector mounting holes aligned to the tapped holes in the lamp housing body. The 'O' ring located on the projection optics assembly centers the module in the housing. A second 'O' ring fits in the end grove of the lamp housing and the connector body. Place this 'O' ring in the lamp housing first. The fit between the 'O' ring and the lamp housing may seem tight, but this is normal. Insert the projection optics assembly fully and replace the 4 screws and washers.

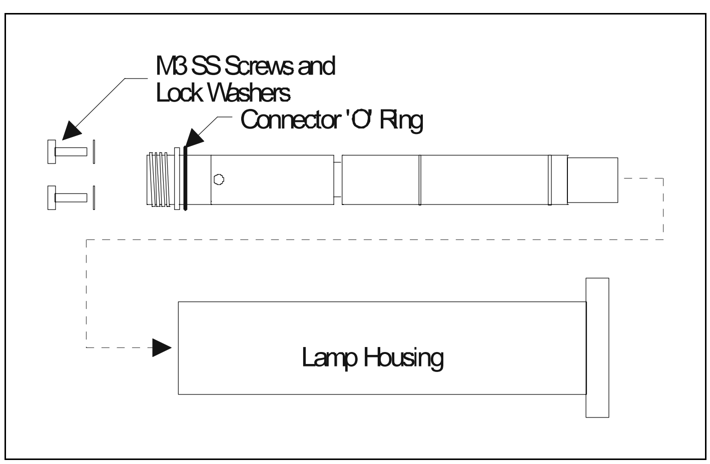


Fig. 15 - Mounting Lamp Optics in Housing.

9.4 OUA260 Window and Gasket Replacement

To replace the windows or window gaskets in the flow cell, use the following procedure:

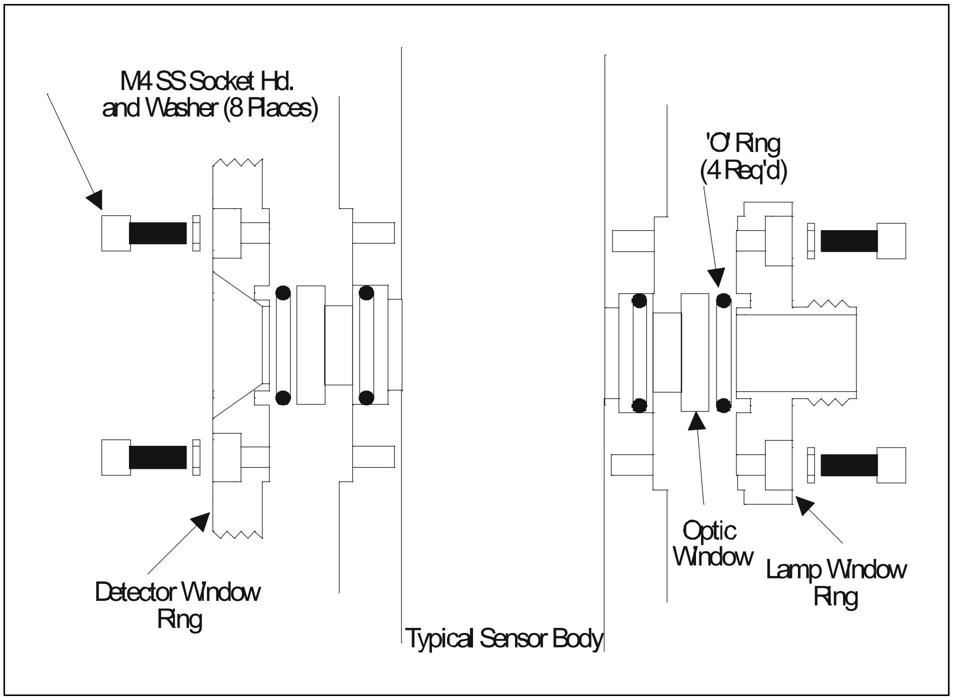


Fig. 16 - Typical Window Assembly for OUSTF10 Turbidity Sensors

1. Disconnect and unscrew the lamp and the detector housings from the flowcell.
2. Remove the window retaining ring by first removing the 4 socket head locking screws.
3. Lift off the window back 'O' seal.
4. Gently push the windows out of the sensor and remove the front window 'O' seal.
5. Carefully clean and inspect the windows for any signs of abrasive wear or chipping. If any is noted, the windows should be replaced. The 'O' rings that are removed should be discarded and replaced with new 'O' rings of the same type. Re-assemble the sensor in the reverse order.

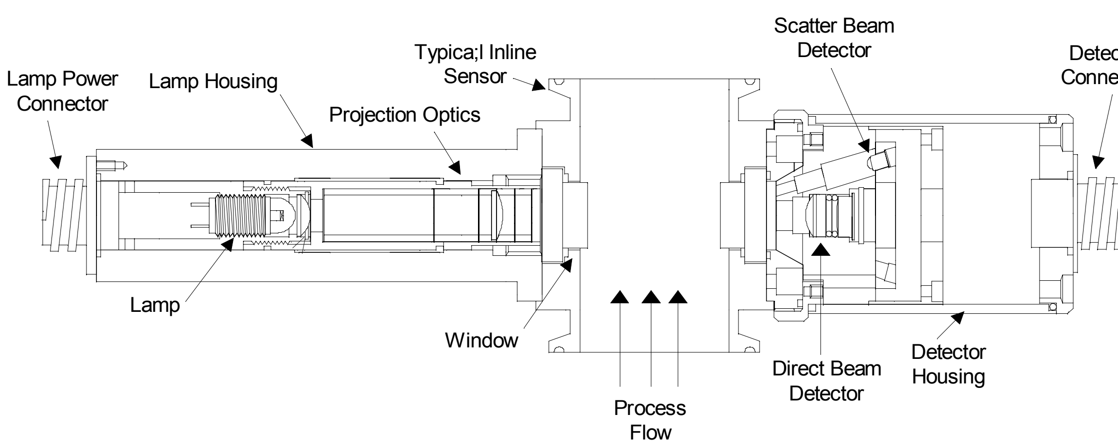


Fig. 17 - Exploded View of Typical OUSTF10 Inline Sensor (with OUA260 Flow Cell)

9.5 Detector Replacement

The detector assembly cannot be serviced in the field. If it is determined that the detector assembly has failed, please contact your local Sales Representative to schedule a return or replace the detector assembly completely.

10. Spare Parts

10.1 Model OUM670 Forward Scatter Turbidimeter

DESCRIPTION	Reference No.	Part Number
MODEL 670 POWER SUPPLY	A020-0021-00	63009349
MODEL 670 MAIN PCB	A020-0670-00	63009386
FUSE, 1/2A 250V, SLO-BLO (115VAC)	1678-0016-00	63006916
FUSE, 1/4A 250V, SLO-BLO (230VAC)	1678-0015-00	63006915

10.2 Model OUSTF10 Dual Beam Turbidity Sensor

DESCRIPTION	Reference No.	Part Number
REPLACEMENT LAMP (AMP) Black Plastic	A011-0670-01	63009248
REPLACEMENT LAMP (AN) Military Green	A011-3670-01	63009281
REPLACEMENT LAMP (TMW) SS	A011-0670-22	63009251
SENSOR WINDOW, PYREX (2 REQ'D) 4CM pathlength	1420-0140-00	63006634
SENSOR WINDOW, QUARTZ (2 REQ'D) 4CM pathlength	1420-0140-01	63006635
SENSOR WINDOW, SAPPHIRE (2 REQ'D) 4CM pathlenth	1420-0140-04	63006636
Silicone Window 'O' Ring Kit	A000-0670-00	63009122
Viton Window 'O' Ring Kit - (USP Class VI)	A000-0670-01	63009123
EPDM Window 'O' Ring Kit - (USP Class VI)	A000-0670-05	63009126
Buna "N" Window 'O' Ring Kit	A000-0670-02	63009124
PTFE Coated Viton 'O' Ring Kit	A000-0670-16	63009127
Kalrez Window 'O' Ring Kit	A000-0670-04	63009125

11. Schematic Diagrams

The following schematics are supplied for troubleshooting purposes. If a fault is found on any of the Model OUM670 circuit boards, please contact your local Sales Representative.

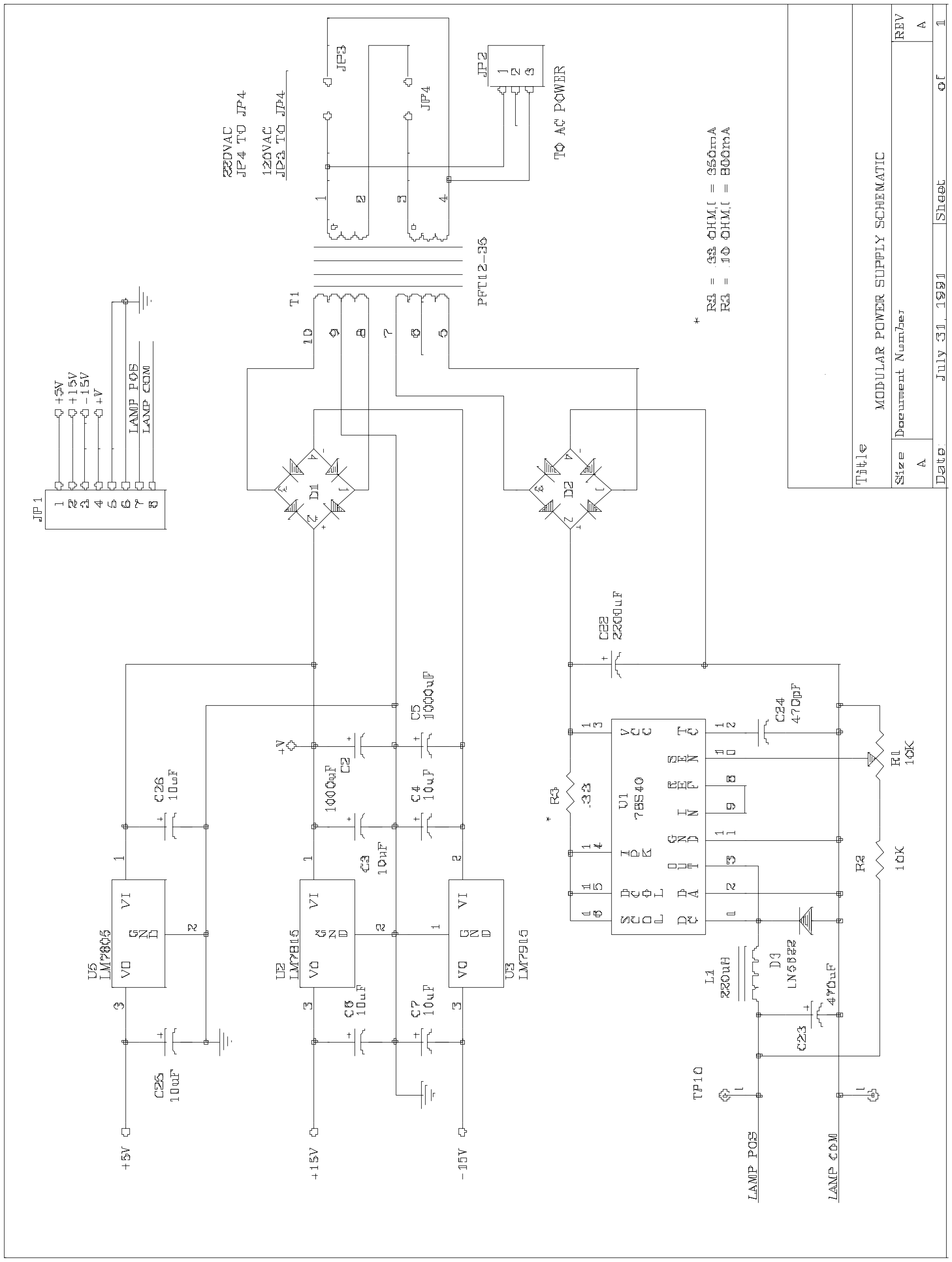


Fig. 18 - Model OUM670 Power Supply Schematic

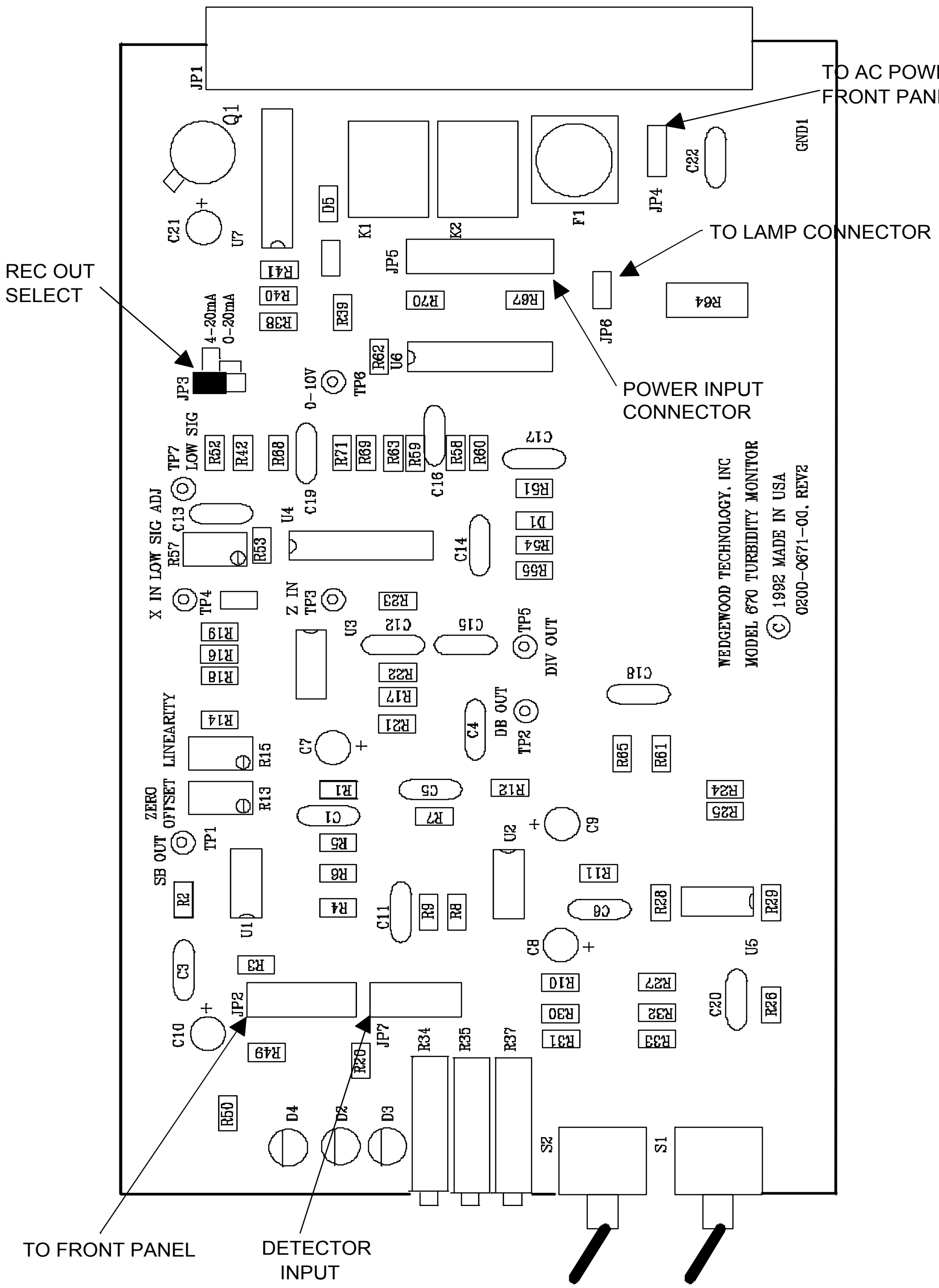


Fig. 19 - Model OUM670 Main PCB Component and Control Location

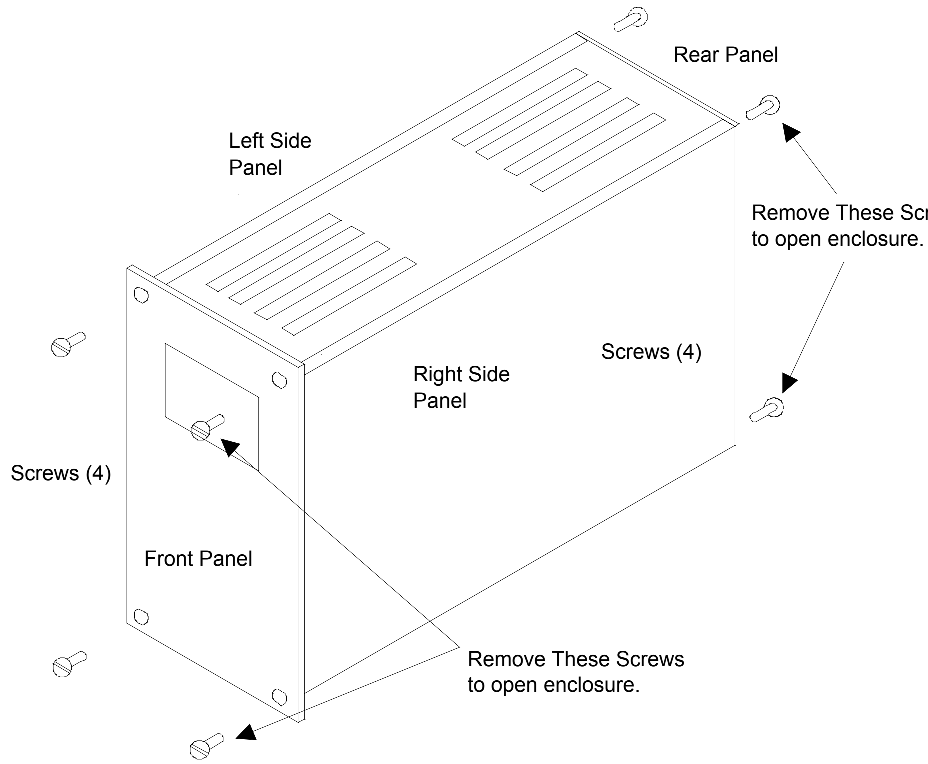


Fig. 20 - Enclosure Disassembly

12. Ordering Information

Code	Power Supply
	115 VAC
	230 VAC

Code	Measuring Range
A	0 – 200 PPM
B	0 – 200 FTU

Code	Calibration Options
0	Spare Part – Electronic Calibration Only
1	Calibrated With Sensor, position to be specified
9	Special Version, to be specified

OUM670				Complete Order Code

Table 3 – OUM670 Turbidity Monitor Ordering Information

Code	Wavelength / Optical Filter Option
W	Without Filter (passes all visible and NIR light
X	Long Pass (Passes NIR light -780nm and above)
Y	Special Version

Code	Calibration / Validation
0	Standard (Liquid Calibration required
9	Special Version

Code	Lamp Type
B	Collimated Incandescent

Code	Lamp Approval
0	Standard – General Purpose
1	FM Div I, Div 1
2	ATEX II 2G Eexd IIC T5

Code	Assembly
A	Isolated Order / Spare Part
B	Assembly to Flow Cell
Y	Special Version

OUSTF10						Complete Order Code

Table 4 – OUSTF10 Low Level Turbidity Sensor Ordering Information

	1	OUSTF10			
	2	OUSAF21/OUSAF22			
	3	OUASAF23			
		Transmitter			
		A	OUS900 Series		
		B	OUS600 Series		
		C	OUS700 Series		
			Cable Length		
			10	10 ft/3m	
			15	15 ft/4.5m	
			25	25 ft/7.5m	
			50	50 ft/15m	
			88	Custom length per foot	
			89	Custom length per meter	
				Barrier	
				A	No Hazardous Area
				B	FM, Busbar IS Barrier (included)
				C	ATEX, Busbar IS Barrier (included)
				D	FM, DIN Rail IS Barrier (included)
				E	ATEX, DIN Rail IS Barrier (included)
OUK20					Complete Order Code

Table 5 – OUK20 Cable Set Ordering Information

A	OUSAF4x
B	OUSAF12/OUSAF22/OUSAF23
C	OUSAF13
D	OUSTF10
E	B60x
	Process Connection
A1	TriClamp®316/316LSS
A2	TriClamp® Kynar
B1	Flange ASME RFF Class 150, 316SS
B2	Flange ASME RFF Class 300, 316SS
D1	Female NPT, 316/316SS
D2	Female NPT, Kynar
E1	Swagelok BVCO
E2	Swagelok Tube
F1	Tube Stub
Y9	Special Version
	Mean Diameter
A	0.25"
B	0.375"
C	0.5"
D	0.75"
E	1" Low Volume
F	1" Standard
G	1.5"
I	2"
J	2.5"
K	3"
L	4"
Y	Special Version
	Optical Pathlength
01	0.5 mm with POPL
03	1mm with POPL
04	2mm with Standard
05	2mm with POPL
06	5mm Standard
07	5mm with POPL
08	10mm Standard
09	20mm Standard
10	30mm Standard
11	40mm Standard
12	50mm Standard
13	60mm Standard
14	70mm Standard
15	80mm Standard
16	90mm Standard
80	Not Needed (B60x)
99	Special Version
	Window Material
A	Pryex (not available for UV sensors)
B	Quartz
C	Sapphire
X	Without Windows (B60x only)
	Sealing Material
1	EPDM – FDA, USP Class VI
2	Kalrez – FDA, USP Class VI
3	Silicone - FDA
4	Viton – FDA, USP Class VI
9	Special Version
	Air Purge
A	Not used
B	Standard
Y	Special Version
	Certification
1	Basic Documentation Package
3	Life Sciences Documentation (includes 3.1)
Y	Special Version
	Options
A	No Options
B	Mounting Holes
C	Cleaning Port
D	Manual Wiper
E	Pneumatic Wiper
Y	Special Version
OUA260	Complete Order Code

Table 6 – OUA260 Flow Cell Ordering Information

WARRANTY

Endress+Hauser Conducta Inc., warrants its products to be free from defects in workmanship and material. Endress+Hauser Conducta Inc liability is limited to replacing the instrument or any part thereof that is returned by the original purchaser, transportation paid, to the factory within one (1) year after the date of shipment, provided that Endress+Hauser examination shall disclose that a defect existed under proper and normal use.

Endress+Hauser Conducta Inc. shall not be liable for consequential or incidental damages.