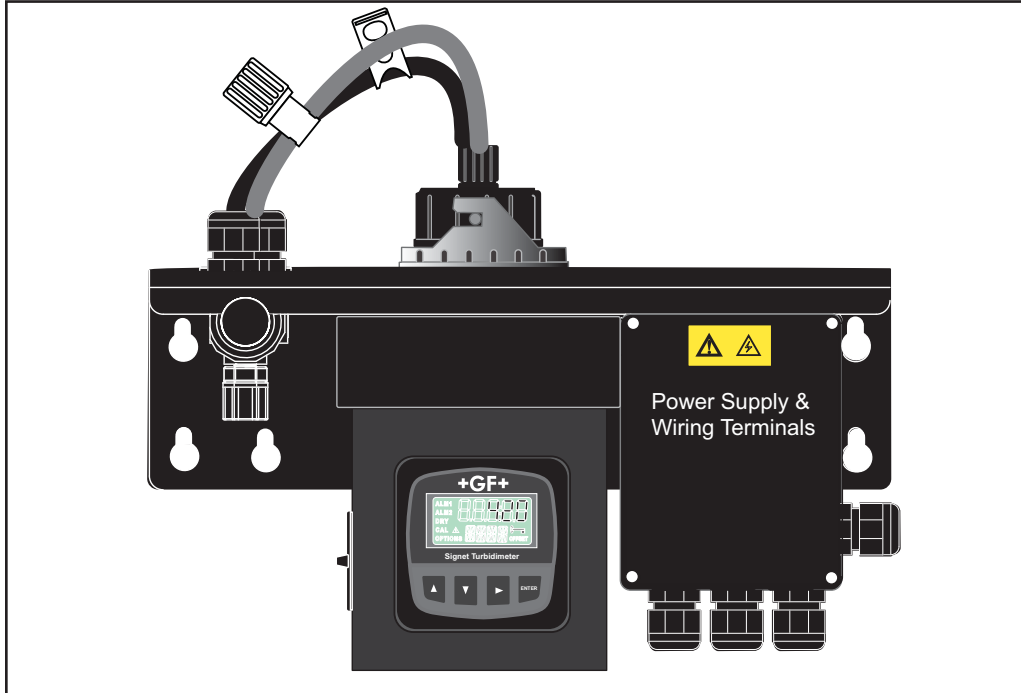


# Signet 4150 Turbidimeter



3-4150.090

Rev B 09/08



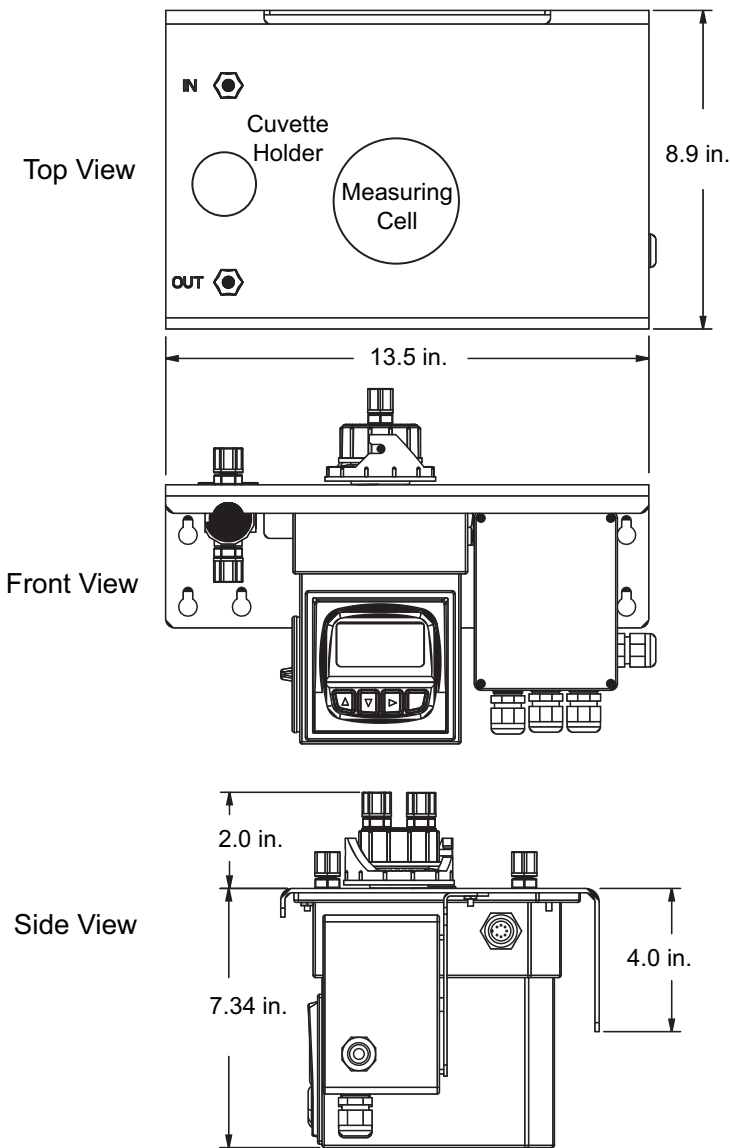
## Description

The Signet 4150 Turbidimeter provides accurate and reliable water quality monitoring for municipal and industrial applications. The 4150 utilizes the Nephelometric method via white light technology as required by the U.S. EPA 180.1 standard. Periodic calibration is mandatory with most turbidity systems, and the 4150 makes it fast and easy with sealed, reusable primary calibration standards. Two dry contact relays serve as high or low alarms, with programmable setpoints and time-based delays to prevent false alarms. Additional features include an ultrasonic automatic cleaning system, a bright backlight for the display, and a convenient holder for the cuvette during calibration. The 4150 is the perfect choice for finished or raw water applications.

## Specifications

Measurement Range	0 to 100.0 NTU or 0 to 1000.0 NTU	Maximum Inlet Pressure	Integral pressure regulator rated 1380 kPa (200 PSI)
Accuracy		Flow Rate	0.1 L/m to 1 L/m (0.026 GPM to 0.26 GPM)
<40 NTU:	±2% of reading or ±0.02 NTU whichever is greater	Operating Temperature	1°C to 50°C (34°F to 122°F)
>40 NTU:	±5% of reading	Sample Temperature Range	1°C-50°C (34°F – 122°F)
Resolution	0.0001 NTU (below 10 NTU)	Power Supply	100 to 240 VAC, 47 to 63 Hz, 80 VA
Response Time	Adjustable	Insulation Rating	Double Insulated Pollution Degree 2 Overvoltage Category II
Display	Multi-Line LCD with backlighting	Altitude	2000 meters maximum
Alarm Relays (2)	120-240 VAC, 2A Form C Relay	Relative Humidity	Maximum 95% RH non-condensing
Analog Output	Active 4-20 mA/RS485, 600 Ω drive	Enclosure Rating	IP 66 /NEMA 4X
<b>Wetted Materials</b>		Environmental Conditions	Not recommended for outdoor use
• Tubing:	Nylon	<b>Regulatory Compliance And Certifications</b>	
• Measuring cuvette:	Borosilicate Glass	White Light Version	Compliant to U.S. EPA 180.1
• Glass washer seal:	Silicon	ETL Certified	CSA 22.2 No. 1010-1-92
• Pressure regulator:	Polypropylene	Shipping Weight	2.5 kg (5.5 lbs.)
	316 Stainless Steel		
	Delrin® by Dupont™		
• Inlet tube:	316 Stainless Steel		

## Dimensions



### Safety

This manual contains basic instructions that must be followed during the commissioning, operation, care and maintenance of the instrument. The safety protection provided by this equipment may be impaired if it is commissioned and/or used in a manner not described in this manual. Consequently, all responsible personnel must read this manual prior to working with this instrument.

### Disclaimer

Georg Fischer Signet LLC accepts no responsibility for damage caused by the introduction of vapors, fluids or other materials into the instrument process stream which is not compatible with the wetted materials. A list of the wetted materials can be found in the specifications on page 1 of this manual.

**Material Safety Data Sheets (MSDS) are available online at <http://www.gfsignet.com/msds.htm>.**

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### Unpacking and Inspecting the Instrument and Accessories

The table below indicates the items in the turbidimeter shipment.

Item	Quantity
3-4150-X Turbidimeter	1
3-4150.090 Instruction Manual	1
3-4150.380 Desiccant Pack (Do not open until ready to install)	1
4150-0009 Measurement Cuvette	1
4150-0005 Tubing Kit: 1 ea. shutoff clamp 1 ea. backpressure valve 2 ea. connecting tubing with fittings for flow through assembly	1

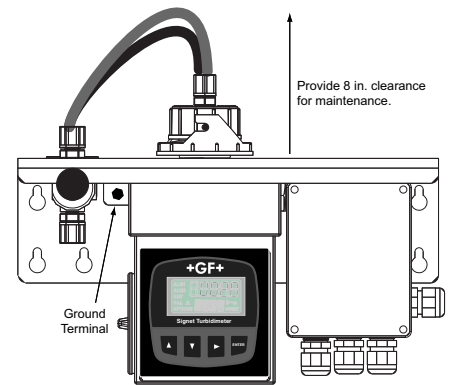
Remove the instrument from the packing carton. Carefully inspect all items to ensure that no visible damage has occurred during shipment. If the items received do not match the order, please immediately contact the local distributor or the Georg Fischer Signet Customer Service department.

## Installation and Commissioning

### Mounting & Site Selection

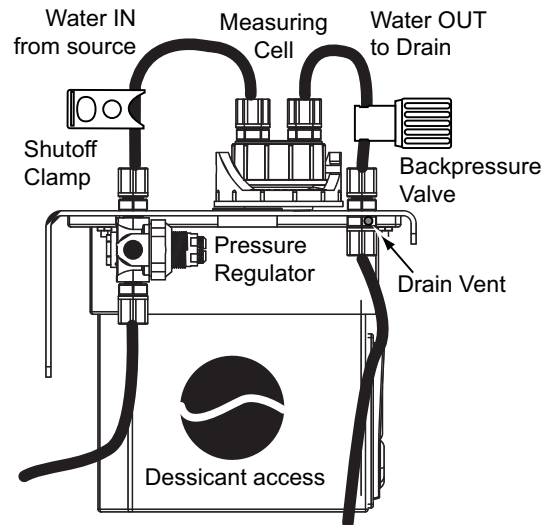
The 4150 is designed to be wall mounted. All the necessary hardware is included.

- Mount the 4150 within 2-3 meters (6-10 ft) of the sampling point to ensure a quick response time.
- For ease of service there should be about 20 cm (8") free area above the instrument for calibration and cuvette maintenance.
- Choose a location that is easily accessible for operation and service.
- The display should be positioned at eye level.
- The overall mounting dimensions of the instrument are shown on page 2.
- Four pan head screws and four wall anchors are provided to mount the wall bracket.



### Plumbing

- Use 4.75 mm (3/16") ID, 8 mm (5/16") OD flexible tubing for the water supply connections.
  - Opaque tubing (not supplied) should be used if the tubing will be exposed to sunlight, to prevent algae growth.
- The 4150 requires only 1 psi head pressure to operate.
- The flow through cuvette is rated for a flow of 100 mL/m to 1 L/m (0.026-0.26 GPM).
- The integral pressure regulator is rated for a maximum pressure of 200 PSI.
- Fluid temperature must not exceed 50°C (122°F).
- The shutoff clamp is used to interrupt the flow during cuvette maintenance.
- Route the sensor drain tubing to a suitable drain. Do not reintroduce the drain sample to the process stream.

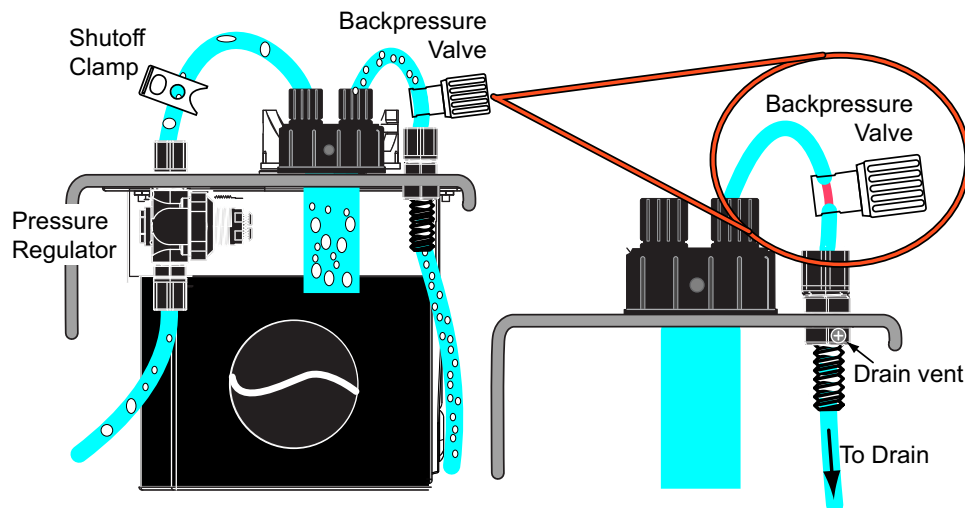


### Adjust the Flow to Eliminate Bubbles

The cuvette must be free of air bubbles to provide accurate measurement. The 4150 provides two tools to make this adjustment.

Open the SHUTOFF CLAMP to allow water to flow through the cuvette.

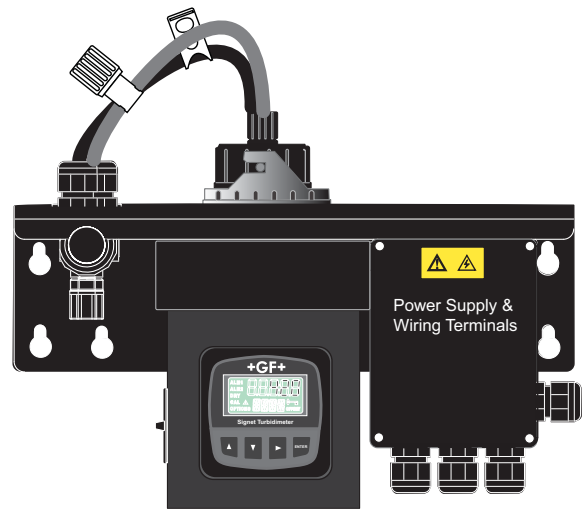
1. If the flow is gravity-fed, remove the screw that is blocking the **DRAIN VENT**. This allows for atmospheric equalization and helps to eliminate bubbles. The vent may leak for a few seconds, until the flow is well established.
2. Adjust the **BACKPRESSURE VALVE** to prevent air from coming out of solution, which may be observed as tiny air bubbles in the cuvette:
  - Remove the measuring cuvette from the measuring cell and place it in the cuvette holder so it is visible while making these adjustments.
  - If bubbles are visible inside the cuvette, turn the BACKPRESSURE VALVE until the bubbles disappear.



## Electrical Connections

All of the electrical connections to the 4150 are made inside the power supply, located to the right of the display. The connections are labeled within the terminal box and are self-descriptive.

Follow all local and government recommendations and methods for installation of electrical connections to and between the instrument and other peripheral devices.



## WARNING

This instrument requires AC voltages that can injure or kill. Wiring should be done by qualified personnel only.

### Power

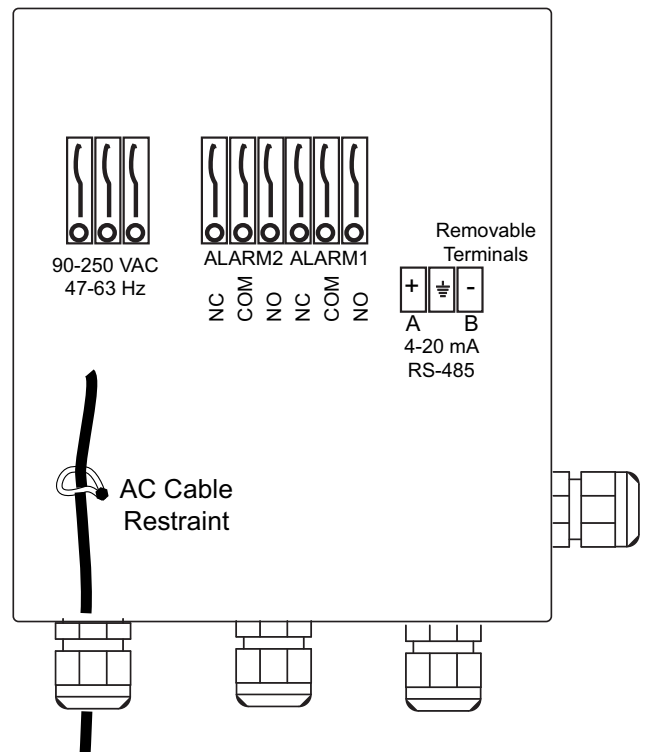
- Install a circuit breaker in the AC line before the 4150 power connection to allow for service.
- The 4150 is not supplied with a power cord.
- The power cable bulkhead will accept cable diameters from 5.8mm (.230 in.) up to 10 mm (.395 in.).
- All terminals are designed to accept wires in the range of 14-28 AWG.
- All wires should be stripped to a length of 6 mm (1/4").
- A strain relief strap is provided to reduce tension on the power terminals.

### RS-485

- The RS-485 half-duplex (2-wire) digital interface operates with differential levels that are not susceptible to electrical interferences.
- The last device on each bus may require terminating with a 120-ohm resistor to eliminate signal reflection on the line.
- Do not run RS-485 cables in the same conduit as power.

### 4-20 mA

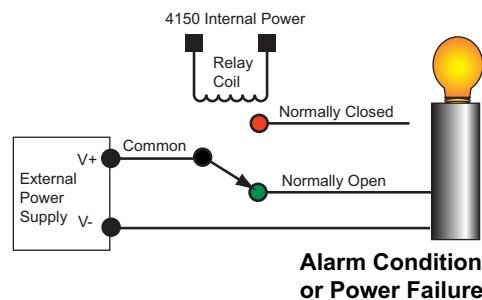
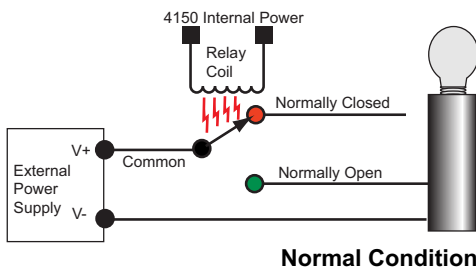
- The active 4-20 mA output is driven by a 15 VDC power source and can drive external loads up to 600 ohms.
- Do not run 4-20 mA cables in the same conduit as power.



### Relays

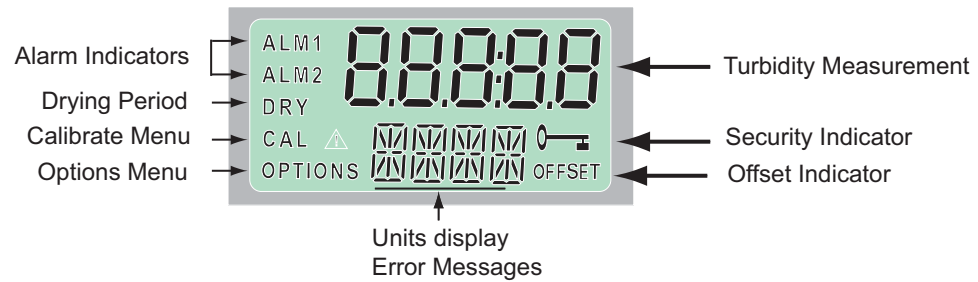
Both Alarm relays are configured for fail-safe operation. The normal condition is with power applied to the 4150 and in a non-alarm condition.

- The relays are rated for 2 A maximum.
- If power is removed from the 4150, the relays will be in an alarm state.



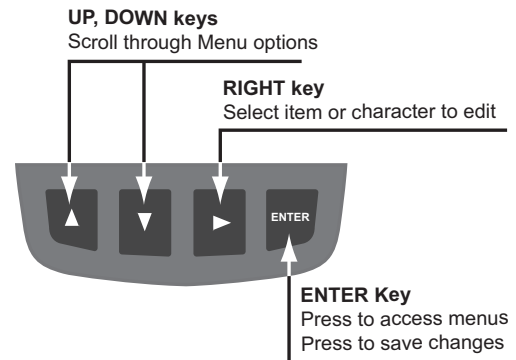
## The Display

All of the elements on the LCD are identified here:

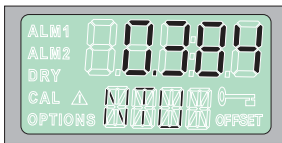


## The Keypad

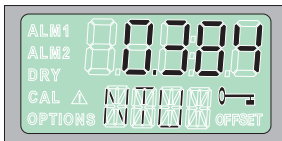
4 keys are used to set up, calibrate and operate the 4150.



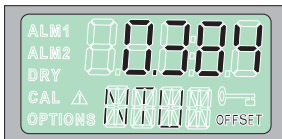
## Display Icons and Functions



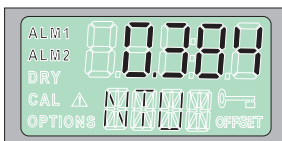
During normal operation, the instrument will have the Units selection displayed on the lower row of the display and the measured reading on the upper row of the display.



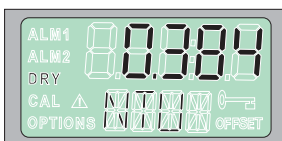
The instrument is equipped with a security access code to protect the instrument settings from inadvertent modification. If the CODE feature is enabled in the OPTIONS menu, the KEY icon is displayed.



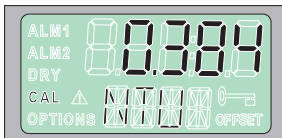
If OFFSET is displayed, the 4150 output has been adjusted to match an external reference measurement.



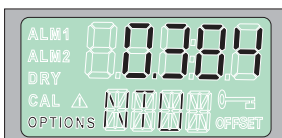
The ALM1 and ALM2 icons are displayed if the 4150 measurement has exceeded a HIGH or LOW alarm setpoint.



DRY indicates that the 4150 is in a drying period, following the replacement of the cuvette. The internal fan will circulate air to clear condensation from the cuvette. NOTE: DRY is not an alarm condition. During a DRY period the ultrasonic cleaning system is disabled, but the instrument is still operating.)



- CAL is displayed when the 4150 is being calibrated.
- The alarm relays are held in their NORMAL condition when CAL is displayed.
  - The 4150 will return to normal operation if no keys are pressed in the CAL menu for 6 minutes.



- OPTIONS is displayed when the 4150 is being configured.
- The alarm relays are held in their NORMAL condition when OPTIONS is displayed.
  - The 4150 will return to normal operation if no keys are pressed in the OPTIONS menu for 10 minutes.

## Security Access Feature

If CODE is enabled in the OPTIONS menu, the Access code (▲-▲-▲-▼) must be entered to gain access to CAL or OPTIONS menus.

- Press and hold the ► key for 2 seconds to access the CALIBRATE menu.
- Press and hold the ► key for 5 seconds to access the OPTIONS menu.

### Access to CALIBRATE Menu

1. Press the ▲ key
2. Press the ▲ key
3. Press the ▲ key
4. Press the ▼ key

**ALM RELAY**  
is now LOCKED

100 NTU Calibration for  
4150-3, 4150-4 Only

5. Press the ▲ and ▼ keys to select the NTU standard value needed.

Alarm relay contacts are held at the last valid condition while the instrument is in the CALIBRATE or in the OPTIONS menu.

While in the CALIBRATE menu, the instrument has a time-out feature that automatically returns the system to normal operation if no keys are pressed for 6 minutes.

### CALIBRATE

The 4150 is calibrated and tested prior to leaving the factory, and is ready to use directly out of the box.

The EPA recommends that on-line turbidity systems be calibrated at least once every three months if they are used for EPA reporting.

The 4150 is designed to recognize the specific NTU values of certified calibration standards to make periodic recalibration very safe, quick and simple. The CALIBRATE menu is dedicated to this method of calibration.

The OFFSET function found in the OPTIONS menu allows a single-point alignment with an external measurement device.

OFFSET is not a substitute for calibration, but it may be useful if standard solutions are not readily available.

### Access to OPTIONS Menu

1. Press the ▲ key
2. Press the ▲ key
3. Press the ▲ key
4. Press the ▼ key

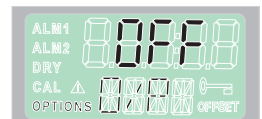
**ALM RELAY**  
is now LOCKED

5. Press the ▲ and ▼ keys to select the OPTIONS function that will be modified.

While in the OPTIONS menu, the instrument has a time-out feature that automatically returns the system to normal operation if no keys are pressed for 10 minutes.

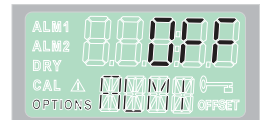
### Output Options:

Select the 4-20 mA output or the RS485 Digital output.



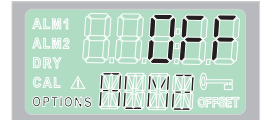
### Alarm 1 Option:

Turn on the 1st ALARM RELAY.



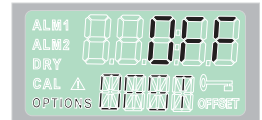
### Alarm 2 Option:

Turn on the 2nd ALARM RELAY.



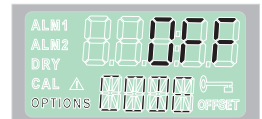
### Offset option:

Turn the OFFSET option ON or OFF.



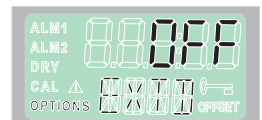
### Code option:

Turn the Access Code ON or OFF.



### Extended Options:

Display many single-set options like brightness and decimal location.



## Calibration Standards

If the Signet 4150 will be used over the entire range, a 3-point calibration is required. Calibration standard kits include three cuvettes and three different turbidity solutions.

- For 4150-1 and -3 (range 0-100 NTU): P/N 3822-4001 (code 159 001 585) calibration kit, turbidity, 100, 10 & 0.02 NTU
- For 4150-5 (range 0-1000 NTU): P/N 3822-4003 (code 159 001 586) calibration kit, turbidity, 1000, 10 & 0.02 NTU
- A Formazin stock solution kit is also available (P/N 3822-4002). Formazin is very unstable, so it is important to ensure that a fresh stock suspension of Formazin is used to achieve the accuracy quoted for the instrument. The primary calibration standards are much more stable than Formazin and have a shelf life of 12 months.
- If the application is limited to measurements below 10 NTU, such as potable water, a 2-point calibration may be performed using only a 10 NTU and a 0.02 NTU standard.
- New calibration standard cuvettes should be indexed to the specific instrument before being used the first time. See pg. 14.

**IMPORTANT!** Calibration does NOT remove OFFSET values.  
ALWAYS turn the OFFSET function OFF (Options menu) before performing a full calibration.

### Calibration Tips

- Keep the measurement cell covered as much as possible during the calibration period.
- Replace the cuvette immediately after the calibration to prevent premature saturation of the desiccant.
- During calibration, the fan is turned off to extend the life of the desiccant.
- The fan will be turned on during calibration countdowns and after returning to the AUTO mode or after five minutes, whichever comes first.

## Calibration Procedure

1. **Access the Calibrate menu by pressing the ENTER key for 2 seconds.**
2. **Enter the access security code if necessary. (See pg. 6)**
  - CAL will be illuminated on the display.
  - The upper display will show the measured NTU value.
  - The lower display will alternate the value of the first NTU standard and -- } }
3. **Remove the measuring cuvette and place it in the cuvette holder.**



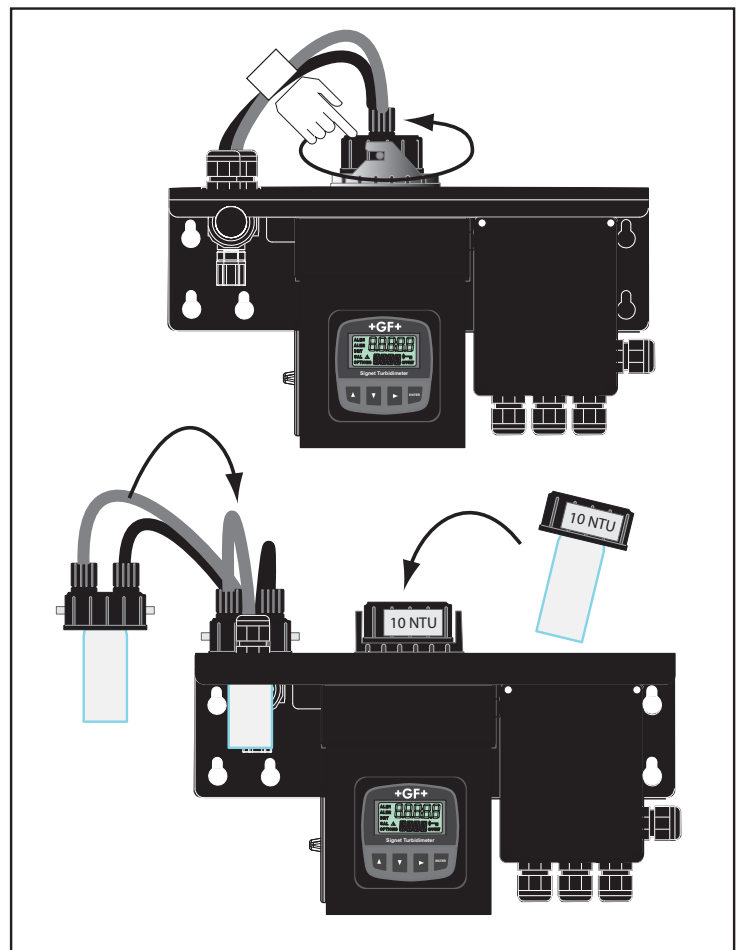
### CAUTION!

Do not touch the glass surface of the cuvette!  
Substances on the surface of the glass  
will cause errors in the measurement.

Do not remove the glass cuvette from the cap while  
holding the assembly over the measuring cell.

Do not allow any debris to fall into the measuring cell.

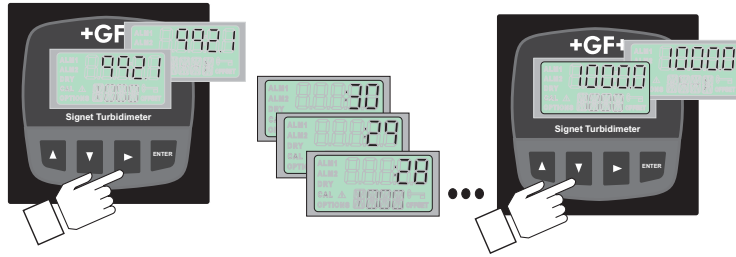
Do not leave the measuring cell open longer than  
necessary. Extended exposure to the atmosphere may  
shorten the effective life of the desiccant.



#### 4. Insert the Standard cuvette requested by the 4150.

The first NTU standard requested will be either 1000 or 100, depending on the range of the 4150.  
If the application will be limited to low Turbidity values (less than 10 NTU), press the ▼ key to go to the 10 NTU calibration.

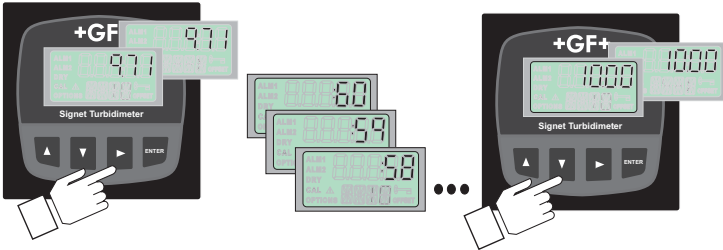
- Press the ► key. The 4150 will begin the calibration process. The upper display will count down the progress. When the process is complete, the upper display shows the new NTU value, while the lower display alternates the value of the NTU standard and -- }.



- Press the ▼ key. The lower display will show the next NTU Standard value and -- }.

#### 5. Insert the 10 NTU Standard cuvette.

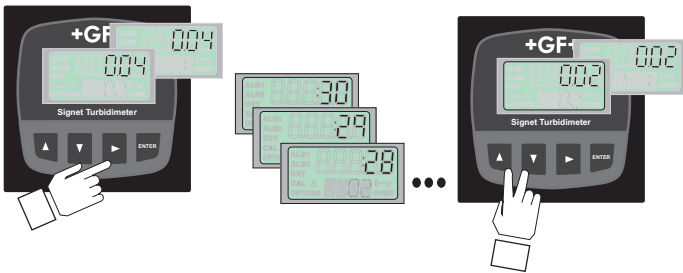
- Press the ► key. The 4150 will begin the calibration process. The upper display will count down the progress. When the process is complete, the upper display shows the new NTU value, while the lower display alternates the value of the NTU standard and -- }.



- Press the ▼ key. The lower display will show the next NTU Standard value and -- }.

#### 6. Insert the 0.02 NTU Standard cuvette.

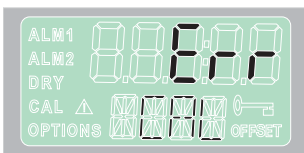
- Press the ► key. The 4150 will begin the calibration process. The upper display will count down the progress. When the process is complete, the upper display shows the new NTU value, while the lower display alternates the value of the NTU standard and -- }.



When calibration is complete, press the ▲ and ▼ keys together to exit the CAL menu and return to normal operation.

#### Calibration Error

If the 4150 displays Error after calibration, the calibration standards were out of calibration range, or the standard did not match the NTU value being requested by the 4150. **The instrument cannot be used until the error is resolved.**



1. Check the standards and recalibrate:  
Press and hold the ENTER key for 2 seconds and start the calibration sequence again.
2. Restore the factory calibration:
  - Press and hold the ▲ key and the ► key for about 2 seconds.



#### IMPORTANT!

This action will reset all of the **CALIBRATE** and **OPTION** menus back to factory settings.

## Instrument Offset

The OFFSET function allows the 4150 to be calibrated to match a process grab sample. This procedure is not recommended in lieu of regular instrument calibration. This function is only useful at turbidity levels in the immediate vicinity of the grab sample and not in the full range of the instrument. The OFFSET icon is illuminated whenever an offset is applied.

The maximum offset is  $\pm 1.00$  NTU. If the 4150 varies from the sample by more than 1 NTU a full calibration is required.

**IMPORTANT!** Offset values will remain in the memory even after a complete calibration. ALWAYS turn the OFFSET function OFF (Options menu) before performing a full calibration.

1. Insert a cuvette filled with the sample water and record the turbidity reported by the 4150.
2. Measure the turbidity of the sample using a laboratory turbidimeter.
3. Compare the turbidity reported by the 4150 to that obtained in the laboratory. Subtract the Lab value from the 4150 value.

### Example:

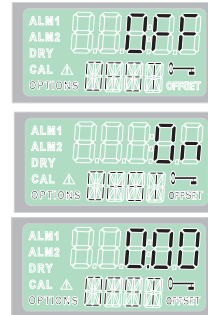
**Laboratory sample measures 4.20 NTU, while the 4150 reads 4.50 NTU, or 0.3 NTU high. The OFFSET needs to be set to -0.3**

4. Press and hold the ENTER key until OPTIONS is illuminated on the display.
5. Push the ▼ key until OFST is displayed on the lower row.
6. If the upper display says ON, go to step 7.

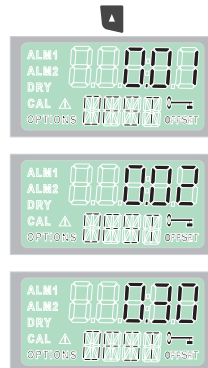
If the upper display says OFF:

- Press the ► key and then ▼ to turn the OFFSET function ON.
- Press the ENTER key to save the change.
- Press the ▼ key to display the OFFSET value in the upper display.

7. Press the ► key. The upper display will begin blinking.

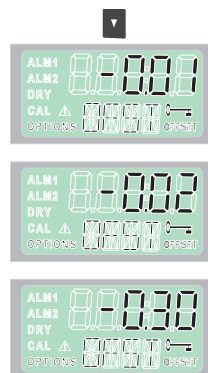


8. If the OFFSET value is a POSITIVE number, press the ▲ key to scroll to a positive offset value.



Scroll UP for positive Offset.

If the OFFSET value is a NEGATIVE number, press the ▼ key to scroll to a negative offset value.



Scroll DOWN for negative Offset.

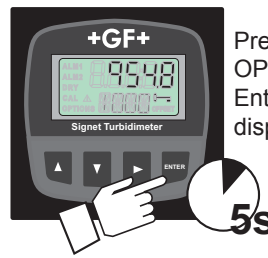
9. Press the ENTER key to save the changes.

Press the ▲ and ▼ keys simultaneously to exit the OPTIONS menu and return to normal operation.



## Options menu

The OPTIONS menu contains settings that are generally set once then rarely changed. The factory setting for all the items in the OPTIONS menu is OFF. When an option is turned ON, settings related to that option will appear in the menu.



Press and hold the ENTER key until OPTIONS is illuminated on the display. Enter the ACCESS CODE if the key is displayed.

	<p><b>Output Options:</b> Select the 4-20 mA output or the RS485 Digital output.</p>
	<p><b>Alarm 1 Option:</b> Turn ALARM RELAY 1 ON or OFF.</p>
	<p><b>Alarm 2 Option:</b> Turn ALARM RELAY 2 ON or OFF.</p>
	<p><b>Offset option:</b> Turn the OFFSET option ON or OFF.</p>
	<p><b>Code option:</b> Turn the Access Code ON or OFF.</p>
	<p><b>Extended Options:</b> Enable access to performance and setup options like brightness and decimal location.</p>

## OPTIONS: Output (O/P)

1. The lower display should show O/P. If it does not, Push the ▼ key until the lower display shows O/P.
2. Press the ► key. The upper display will begin blinking.
3. Press the ▲ or ▼ keys to scroll to the 4-20 mA output or the RS485 Output.
4. Press the ENTER key to save the selection.
5. See instructions for 4-20 settings below.
6. See instructions for configuring the RS-485 port below.

**Section 7.2**

**Section 7.3**

## Setting the 4-20 mA Output

1. Press the ▼ key. The lower display shows LOLM (Low Limit).
2. Press the ► key. The upper display will begin blinking.
3. Press the ▲ and ▼ keys to scroll to the NTU value at 4 mA.
4. Press the ENTER key to save the setting.
5. Press the ▼ key. The lower display shows UPLM (Upper Limit).
6. Press the ▲ and ▼ keys to scroll to the NTU value at 20 mA.
7. Press the ENTER key to save the setting.

Press the ▲ and ▼ keys simultaneously to exit the OPTIONS menu and return to normal operation.

## Configuring the RS-485 Port Output

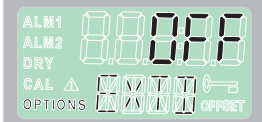
1. Press the ▼ key. The lower display shows BAUD.
2. Press the ► key. The upper display will begin blinking.
3. Press the ▲ and ▼ keys to scroll to the baud rate required (1200, 2400, 4800, 9600, or 19200)
4. Press the ENTER key to save the setting.
5. Press the ▼ key. The lower display shows ADDR (Address).
6. Press the ► key. The upper display will begin blinking.
7. Press the ▲ and ▼ keys to scroll to the correct address. Address options are from 1 to 255.
8. Press the ENTER key to save the setting.
9. Press the ▼ key. The lower display shows MBUS.
10. Press the ► key. The upper display will begin blinking.
11. Press the ▲ and ▼ keys to select ASCII or RTU. Press the ENTER key to save the setting.

Press the ▲ and ▼ keys simultaneously to exit the OPTIONS menu and return to normal operation.

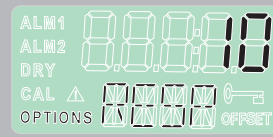
## OPTIONS: Extended



Press the ▼ key. The lower display shows EXTD (Extended menu)



The EXTENDED menu contains many single-set options like brightness and decimal location. The EXTENDED option will always revert to OFF when you exit the menu.



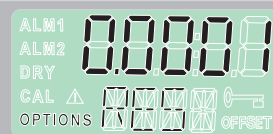
### OPTIONS: Extended: Response Time

The response time determines how quickly the 4150 responds to changes in the NTU measurement. 1 = approx. 5 seconds, 100 = approx. 500 s.

Select a high value to avoid reading air and other anomalies.

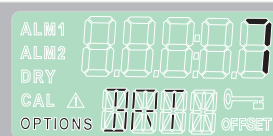
Select a low value to react to rapid changes in the measurement.

Set the response time using the ▲ and ▼ keys. Press the ENTER key to save the new setting.



### OPTIONS: Extended: Display Resolution

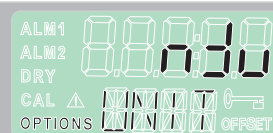
The 4150 can display up to four decimal places. The factory setting is 0.01. Set the resolution by pressing the ▲ or ▼ keys. Press ENTER key to save the selection.



### OPTIONS: Extended: LCD Backlight Brightness

The LCD backlight brightness can be adjusted. Ten levels are available. The default brightness is 8.

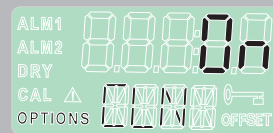
Set the brightness by pressing the ▲ or ▼ keys. Press ENTER key to save the selection.



### OPTIONS: Extended: Units

All instruments are shipped from the factory set in NTU mode. The 4150 can also display in FNU (Formazin Nephelometric Units). Use the ▲ and ▼ keys to change to FNU.

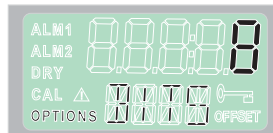
Press ENTER key to save the selection.



### OPTIONS: Extended: Ultrasonic Cleaning (3-4150-3 and 3-4150-5 models only)

The default mode is On. Use the ▲ and ▼ keys to turn OFF.

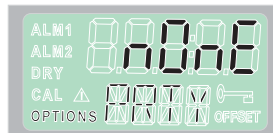
Press the ENTER key to save the selection.



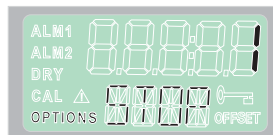
### OPTIONS: Extended: RS485 Parameters

These menus will only appear if the RS485 is selected as the OUTPUT option. Factory settings are:

8 Bits

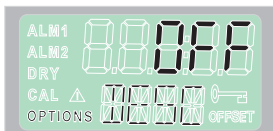


No (nOnE) Parity



1 Stop Bit. Make selections using the ▲ and ▼ keys.

Press the ENTER key to save the selection.



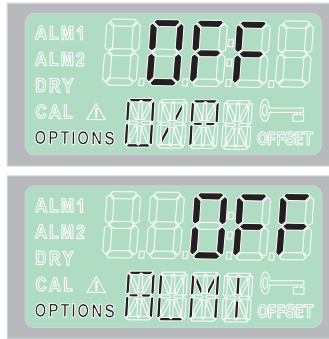
### OPTIONS: Extended: Desiccant Alarm

Turn ON to activate the alarms and send the 4-20 mA to 2 mA when the humidity detector indicates that the internal environment is close to the point where humidity could cause condensation.

Press the ENTER key to save the selection.

## OPTIONS: Alarm Relays

The 4150 has two relays that can be programmed to serve as High or Low alarms. The relays are factory set to OFF. When activated, each relay can be programmed with a Setpoint (S/P), a Delay ON time and a Delay OFF time.



1. Press the ▼ key to scroll to the ALM1 display.

2. Press the ► key to begin programming Alarm #1. The upper display begins blinking.

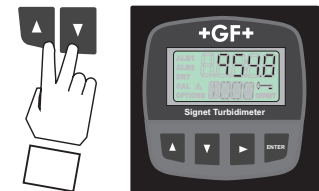
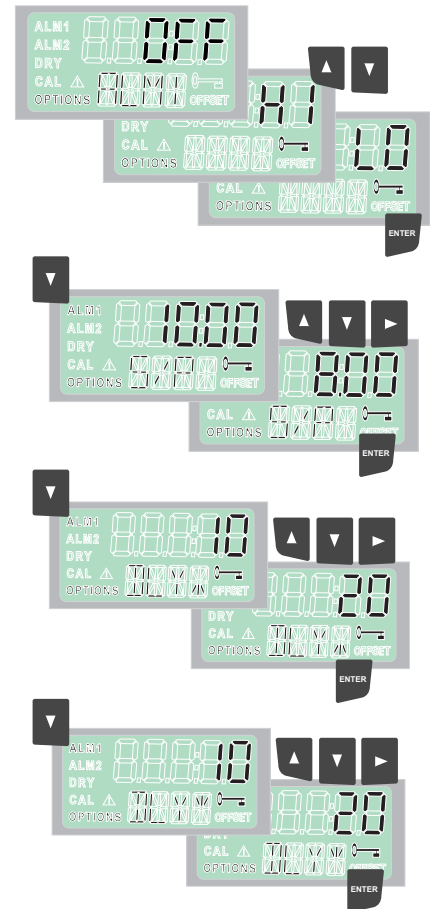
3. Press the ▲ and ▼ keys to select Hi or Lo operating mode for this relay. Press the ENTER key to save the setting.

4. Press the ▼ key. The lower display shows S/P (Set Point). The ALM1 or ALM2 icons will be displayed to indicate which relay is being set. Press the ► key. The upper display begins blinking. Press the ▲ and ▼ keys to scroll to the NTU value where the Alarm will be activated. Press the ENTER key to save the setting. Press the ▼ key to scroll to the next menu item.

5. Press the ▼ key. The lower display shows DLY ▲ (Delay ON). Press the ► key. The upper display begins blinking. Press the ▲ and ▼ keys to scroll to the time (from 1 second to 100 seconds) before the Alarm relay will be activated. Press the ENTER key to save the setting. Press the ▼ key to scroll to the next menu item.

6. Press the ▼ key. The lower display shows DLY ▼ (Delay OFF). Press the ► key. The upper display begins blinking. Press the ▲ and ▼ keys to scroll to the time (from 1 second to 100 seconds) before the Alarm relay will be deactivated. Press the ENTER key to save the setting.

Press the ▼ key again to go to ALM2 display. Press the ► key to begin programming ALM2. The upper display begins blinking. Repeat steps 3 through 6.

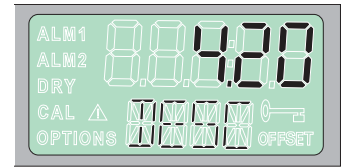


Press the ▲ and ▼ keys simultaneously to exit the OPTIONS menu and return to normal operation.

## Vapor Purge System

If the air inside the 4150 is too humid it will cloud the optical glass cuvette surface and will interfere with the transmission of light. A continuous vapor purge system in the 4150 keeps the inside of the instrument dry.

- The air inside the unit is dried by a replaceable desiccant pouch (order number 3-4150.380) located under the measuring cell.
- System heat is used to warm the air.
- A fan inside the instrument continuously circulates heated dry air around the measuring cell and the flow-through cuvette.
- A humidity detector in the 4150 continuously monitors the desiccant condition. When the internal environment approaches the point where condensation may occur, the instrument will display DESC as a warning that the desiccant pouch needs to be replaced.
- The DESC warning does not interrupt the operation of the 4150, but the measurement is not reliable until the condensation is cleared from the glass cuvette.
- If DESC ALARM is turned on (see OPTIONS: EXTENDED on pg 11), both relays will go into alarm condition and the 4-20 mA output will be forced to 2 mA.

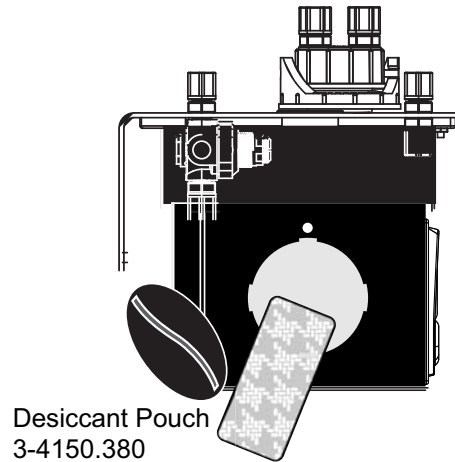


## Replacing Desiccant

- To install or remove the desiccant pouch, open the round port on the side of the 4150.
- Open the desiccant bag and place it inside the instrument.
- Close the access door quickly to minimize exposing the desiccant to the atmosphere.

## Operating Tip

- To speed up recovery after a DESC alarm, disconnect the sensor interconnect cable for 2 seconds and then reconnect it.



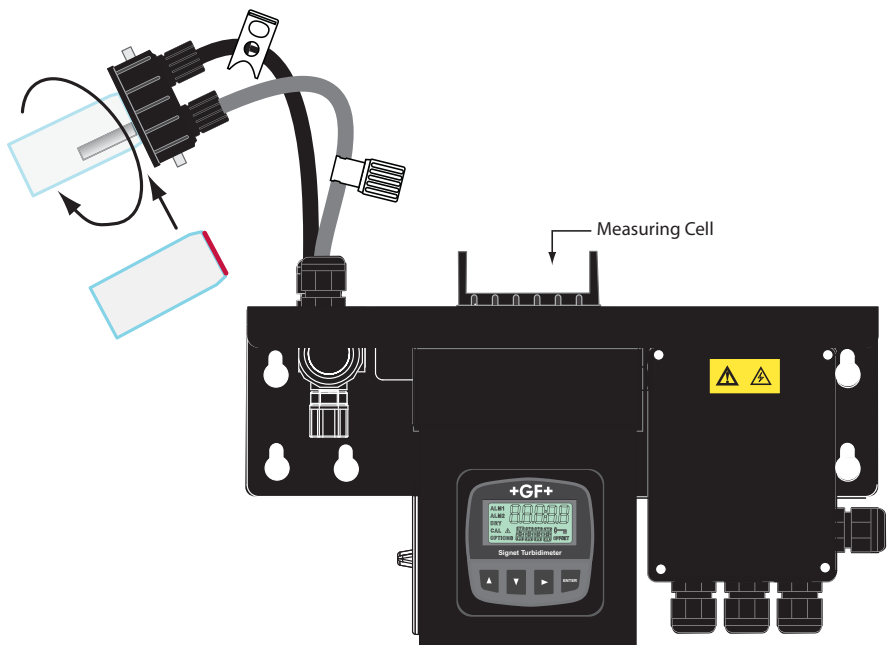
## Cleaning the Flow Through Cuvette

All glass cuvettes must be clean and free of marks or scratches.

- Clean the interior and exterior with a detergent solution and then rinse several times with distilled or deionized water.

## To replace a cuvette:

- Shut off the flow using the shutoff clamp.
- Unscrew the old cuvette and replace with a fresh clean one.
- Do not touch the glass surface of the cuvette. Fingerprints can compromise the accuracy of the measurement.



### CAUTION

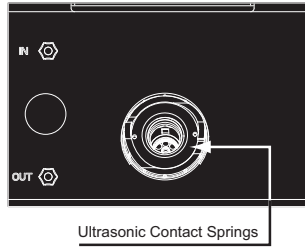
Move the cuvette away from the measuring cell opening to prevent accidental spills into the instrument.

## Ultrasonic Cleaning

- The 3-4150-3 and the 3-4150-5 feature a special flow-through cuvette with an ultrasonic piezo attached to the base. Spring contacts inside the cuvette housing send a high frequency signal to the piezo transducer. The vibration helps prevent scaling and other suspended solids in the process water from adhering to the inside surface of the optical glass.
- The ultrasonic system is not intended to clean dirty cuvettes, or to replace manual cleaning entirely, but it will dramatically increase the time between cleaning.

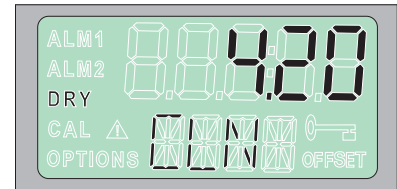


Flow-through Cuvette with Ultrasonic Transducer (4150-0004)



Ultrasonic cleaning feature for 3-4150-3 and the 3-4150-5 only.

- The 4150 will show CLN on the lower display if a problem is detected with the cuvette:
  - Incorrect cuvette installed.
  - No contact between cuvette piezo and springs.



The external surface of the ultrasonic cuvette must be completely dry before it is inserted into the sensor. If there is any visible moisture present on the cuvette or transducer, there is a great risk of damaging the sensor electronics and the transducer.

- CLN is an alarm condition. Any active relays will be set to alarm state and the 4-20 mA will be locked to 2 mA.
- After installing a cuvette, there will be a 30 minute period 4150 will show DRY on the lower display. During this time, the ultrasonic circuit will not operate to allow the Vapor Purge system to remove all moisture from the ultrasonic transducer.
- The Vapor Purge system will NOT remove large droplets of water, only residual moisture. The DRY message is normal and is not considered an alarm condition; therefore no alarms will be implemented. If the cuvette is removed during this period no CLN alarm is posted until the 30 minute DRY period times out.

## Indexing Calibration Cuvettes

To achieve the greatest accuracy, and account for normal scratches and aberrations in cuvette glass when calibrating, calibration cuvettes should be indexed using the indexing rings supplied with the Standard Kits.

The following steps allow repeatable indexing of calibration standards:

1. With the instrument in AUTO mode, remove the measuring cuvette and insert the standard cuvette.
2. Slowly rotate the cuvette inside the optical well, one complete revolution (360°).  
While rotating the standard slowly, observe the measured turbidity and locate the position of the cuvette having the lowest reading.
3. With the calibration standard positioned at the location having the lowest turbidity reading, install the Indexing Ring over the cap on the standard so that the pointer of the Indexing Ring faces directly forward.

When using the standards in future, always insert the standard so that the pointer of the indexing ring faces forward. Slowly rotate the standard back and forth about 5° to find the lowest point. The standard is now indexed and ready for use.

## Troubleshooting

### Signet 4150 Fault Detection

The Signet 4150 performs continuous diagnostic monitoring. There are three levels of fault detection: warnings, errors and failures.

#### Warning

A warning is simply a screen indication of a problem. The measurement is not interrupted and no alarms are activated.

- When the desiccant becomes saturated, a screen warning of **DESC** will appear.

#### Error

An error indicates a failure or a problem that usually can be corrected by the operator. These errors include:

- Lamp out (**LAMP**)
- 4-20 mA loop open (**MA**)
- Bad calibration (**CAL**)
- Desiccant alarm activated and replacement required (**DESC**)
- Ultrasonic transducer is not making contact or the flow through cuvette has been removed (**CLN**)

If any of these conditions occurs, both relays will be set to the alarm state and the 4-20 mA output will be held at 2 mA.

#### System FAIL Message

A failure is a system fault. This is NOT a problem that the operator can correct, and the unit must be returned to the factory for service.

If a failure occurs, the instrument will not function properly and will display the word **FAIL** on the lower row. Both alarm relays will be activated and the 4-20 mA output will be held at 2 mA (if 4-20 mA is selected).

## Troubleshooting

Symptom	Possible Cause	Solution
Lower display shows MA	4-20 mA loop open	Check Loop wiring
Lower display shows DESC	Desiccant pouch saturated	Change desiccant pouch
Lower display shows LAMP	Lamp failed	Return to factory for service
Lower display shows FAIL	Major system fault	Return to factory for service
Readings are higher than expected	Bubbles in solution Condensate or leaky cuvette Flow through cuvette dirty Instrument out of calibration	Ensure that the drain vent is open and is not obstructed. Apply backpressure. Check flow through cuvette for condensate or leaks. Clean cuvette. Recalibrate
Readings are erratic	(1) Bubbles in solution (2) Debris in flow through	(1) See above (2) Clean debris from cuvette
Readings are lower than expected	Instrument out of calibration	Recalibrate.
Upper display flashes	Sample Over-Range	Check sample. Sample may be too high to read.

<b>Signet Part Number</b>	<b>Code</b>	<b>Description</b>
3-4150-1	159 001 596	Turbidimeter, White Light, 0 to 1000 NTU
3-4150-3	159 001 598	Turbidimeter, White Light, 0 to 100 NTU With AutoClean
3-4150-5	159 001 600	Turbidimeter, White Light, 0 to 1000 NTU With AutoClean
3822-4001	159 001 585	*Calibration Kit, Turbidity, 100, 10 & 0.02 NTU
3822-4003	159 001 586	*Calibration Kit, Turbidity, 1000, 10 & 0.02 NTU
3-4150.380	159 001 588	Replacement Desiccant
4150-0007	159 001 602	Replacement cuvette set (3 glass cuvettes)
4150-0004	159 001 589	Replacement cuvette with ultrasonic transducer
3822-4002	159 001 591	*Formazin Stock Kit
3822-4000	159 001 592	*Formazin Stock Solution, 4000 NTU, 500 ml
4150-0001	159 001 593	Pressure Regulator
4150-0005	159 001 595	Tubing Kit: shutoff clamp backpressure valve 2 lengths connecting tubing with fittings for flow through assembly drain vent

\* Material Safety Data Sheets (MSDS) are available online at <http://www.gfsignet.com/msds.htm>.



Georg Fischer Signet LLC, 3401 Aerojet Avenue, El Monte, CA 91731-2882 U.S.A. • Tel. (626) 571-2770 • Fax (626) 573-2057  
For Worldwide Sales and Service, visit our website: [www.gfsignet.com](http://www.gfsignet.com) • Or call (in the U.S.): (800) 854-4090