1720D Low Range Process Turbidimeter

dld/dp 1/99 2ed
Rev. 2, 12/99

TRADEMARKS OF HACH COMPANY

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AccuVac®

AccuVer™

AccuVial™

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AgriTrak™

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APA 6000™

AquaChek™

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TitraStir®

TitraVer®

ToxTrak™

UniVer®

VIScreen™

Voluette®

WasteAway™

ZincoVer®

CERTIFICATION

Hach Company certifies this instrument was thoroughly tested, inspected, and found to meet its published specifications when it was shipped from the factory.

The 1720D Sensor has been tested and is certified as indicated to the following instrumentation standards:

Product Safety:

The 1720D Sensor was tested with a Hach Digital Display Module (DDM) and a PS1201 Power Supply.

Listed by ETL to UL 3101-1 (Listing # H0492805390).
Certified by ETL to CSA C22.2 No. 1010.1 (Certification # H0492805390).
Certified by Hach Company to EN 61010-1 (IEC 1010.1),
supporting test records by ETL.

Immunity:

The 1720D Sensor was tested with a Hach Digital Display Module (DDM) and PS1201 Power Supply.

EN50082-2 (European Generic Immunity Standard) per 89/336/EEC EMC:
Supporting test records by Hach Company, certified compliance by
Hach Company.

Required Standard/s include:
EN 61000-4-2 “1995” (IEC 1000-4-2) Electro-static Discharge
EN 61000-4-4 “1995” (IEC 1000-4-4) Electrical Fast Transients/Bursts
EN 61000-4-11 “1995” (IEC 1000-4-11) Voltage Dips, Interruptions
and Variations
ENV 50140 “1993” (IEC 100-4-3) Radiated RF Electro-magnetic Fields
ENV 50141 “1993” Conducted Disturbances Induced by RF Fields
ENV 50204 “1993”Radiated Electro-magnetic Field (Pulse Modulated)

Additional Standard/s include:
EN 61000-4-5 “1995” (IEC 1000-4-5) Surge (Level 2)

Emissions

The 1720D Sensor was tested with a Hach Digital Display Module (DDM) and PS1201 Power Supply.

EN 50081-2 (Emissions) per 89/336/EEC EMC: Supporting test records by Intellistor O.A.T.S., certified compliance by Hach Company.

Required Standard/s include:
EN 55011 (CISPR 11) Emissions, Class A Limits

Additional Standard/s include:
EN 61000-3-2 (IEC 1000-3-2) Harmonic Disturbances Caused by Electrical Equipment.

EN 61000-3-3 (IEC 100-3-3) Voltage Fluctuation (Flicker) Disturbances Caused by Electrical Equipment.

CERTIFICATION, continued

Canadian Interference-Causing Equipment Regulation, ICES-003, Class A:

Supporting test records by Intellistor O.A.T.S., certified compliance by Hach Company.

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

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

FCC PART 15, CLASS “A” LIMITS:

Supporting test records by Intellistor O.A.T.S., certified compliance by Hach Company.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

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

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 his own expense. The following techniques of reducing the interference problems are easily applied:

1. Disconnect the AC Power Supply for the 1720D Sensor from its power source to verify that it is or is not the source of the interference.

2. If the AC power supply for the 1720D Sensor is connected into the same outlet as the device with which it is interfering, try another outlet.

3. Move the 1720D Sensor away from the device receiving the interference.

4. Reposition the receiving antenna for the device receiving the interference.

5. Try combinations of the above.

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SAFETY PRECAUTIONS

Before attempting to unpack, set up, or operate this instrument, please read this entire manual. Pay particular attention to all warnings, cautions and notes. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure the protection provided by this equipment is not impaired, this equipment MUST NOT be installed or used in any manner other than that which is specified in this manual.

Use of Hazard Information

If multiple hazards exist, the signal word corresponding to the greatest hazard shall be used.

DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury

CAUTION
Indicates a potentially hazardous situation that may result in minor or moderate injury

NOTE
Information that requires special emphasis

Precautionary Labels

Please pay particular attention to labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

⚠ **This symbol, if noted on the instrument, references the instruction manual for operational and/or safety information.**

⚠ ***Section 1.5 1720D Turbidimeter Description***

⚠ ***Section 4.1 General Installation Information***

⚠ ***Section 4.5 Installing a Sample Line***

⚠ ***SECTION 5 MAINTENANCE***

SPECIFICATIONS

Specifications subject to change without notice.

Range: 0-100 nephelometric turbidity units (NTU)

Accuracy: ± 2% of reading or ±0.02 NTU (whichever is greater) from 0-40 NTU; ± 5% of reading from 40-100 NTU

Resolution: 0.001 NTU

Repeatability: Better than ± 1.0% or ± 0.002 NTU, whichever is greater

Response Time: For a full scale step change, initial response* in 1 minute, 15 seconds. Varies with flow rate, see the table below.

% Step Change	Flow Rate (mL/min)		
	250	500	750
10	2 1/2 minutes	1 1/2 minutes	1 1/4 minutes
50	6 minutes	2 1/2 minutes	2 minutes
90	9 minutes	3 1/2 minutes	3 minutes
99	12 minutes	5 minutes	4 minutes

Sample Flow Required: 250-750 mL/minute (4.0 to 11.9 gal/hour)

Storage Temperature: -20 to 60 °C

Operating Temperature: 0 to 40 °C

Operating Humidity: 5 to 95% non-condensing

Sample Temperature Range: 0 to 50 °C

Recorder Output:** Selectable for 0-20 mA or 4-20 mA. Output span programmable over any portion of the 0-100 NTU range.

Alarms:** Two turbidity set-point alarms, each equipped with an SPDT relay with unpowered contacts rated for 5A resistive load at 230 VAC.

Power Requirements: 95-240 VAC, 50/60 Hz, Auto selecting; 40 VA

Sample Inlet Fitting: 1/4"NPT female, 1/4" compression fitting (provided)

Drain Fitting: 1/2" NPT female, 1/2" hose barb (provided)

Data Communications Distance: Echelon® fieldbus compatible; utilize LonTalk® protocols. Maximum of 400 meters between devices with a 500 meter maximum per segment; distances in excess of 500 meters require a repeater. up to 3 repeaters can be used for a total network length of 2000 meters.

* Initial response is defined as a 10% step change.
** Signal Output Module (SOM) required.

Dimensions:

- Turbidimeter Body and Cap: 10 x 12 x 16 inches (25.4 x 30.5 x 40.6 cm)

Mounting:

- AquaTrend® Interface: wall, pole, panel, and floor stand
- Power Supply: wall, pole, panel, and floor stand
- Turbidimeter Body and Head Assembly: wall and floor stand

Shipping Weight:

- 1720D Turbidimeter and PS1201 Power Supply: 14 lbs. (6.35 kg)
- 1720D Turbidimeter, PS1201 Power Supply, and AquaTrend w/SOM: 18 lbs. (8.17 kg)

OPERATION

DANGER

Handling chemical samples, standards, and reagents can be dangerous. Review the necessary Material Safety Data Sheets and become familiar with all safety procedures before handling any chemicals.

DANGER

La manipulation des échantillons chimiques, étalons et réactifs peut être dangereuse. Lire les Fiches de Données de Sécurité des Produits (FDSP) et se familiariser avec toutes les procédures de sécurité avant de manipuler tous les produits chimiques.

PELIGRO

La manipulación de muestras químicas, estándares y reactivos puede ser peligrosa. Revise las fichas de seguridad de materiales y familiarícese con los procedimientos de seguridad antes de manipular productos químicos.

GEFAHR

Da das Arbeiten mit chemischen Proben, Standards und Reagenzien mit Gefahren verbunden ist, empfiehlt die Hach Company dem Benutzer dieser Produkte dringend, sich vor der Arbeit mit sicheren Verfahrensweisen und dem richtigen Gebrauch der Chemikalien vertraut zu machen und alle entsprechenden Materialsicherheitsdatenblätter aufmerksam zu lesen.

PERIGO

A manipulação de amostras, padrões e reagentes químicos pode ser perigosa. Reveja a folha dos dados de segurança do material e familiarize-se com todos os procedimentos de segurança antes de manipular quaisquer produtos químicos.

SECTION 1 GENERAL DESCRIPTION

1.1 Using This Instruction Manual

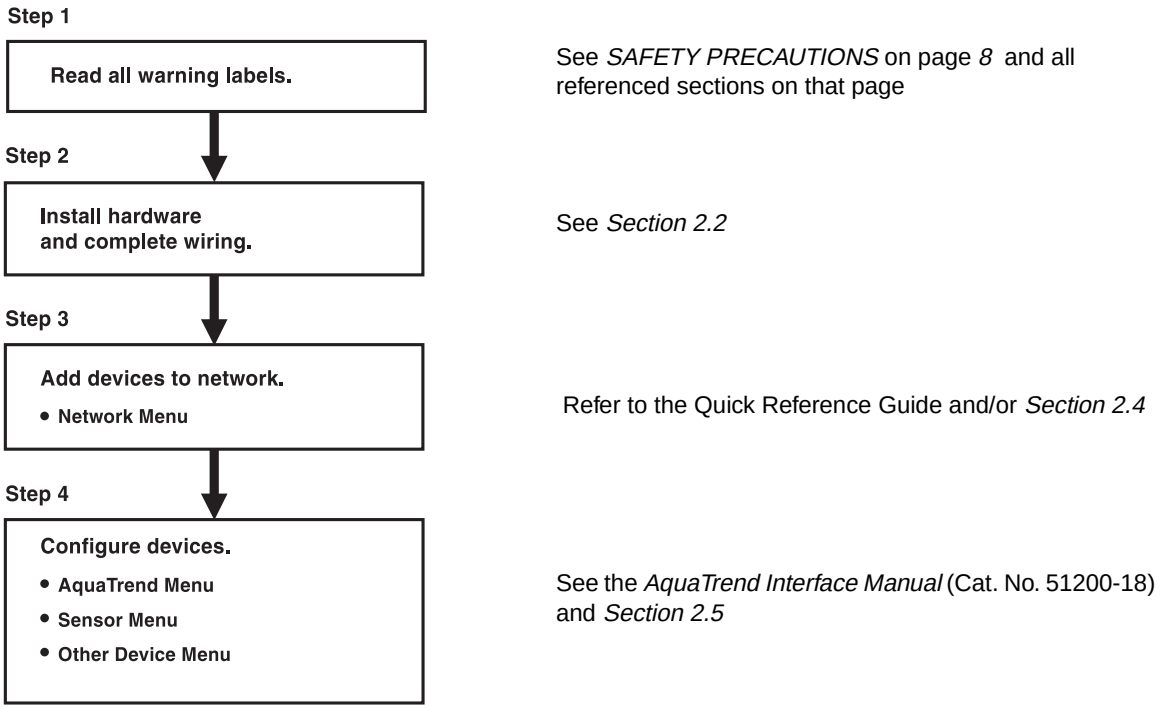
This instruction manual contains all the necessary information to set up and operate the 1720D Turbidimeter*. The instructions contained in this manual are intended for the set up of one sensor with one AquaTrend® Interface (with or without an Signal Output Module) and a PS1201 Power Supply. This manual assumes the user has some familiarity with the AquaTrend Interface and its network system. For additional information on the functionality of the AquaTrend Interface and other associated devices, refer to the instruction manuals supplied with the devices.

This manual is divided into two general sections:

- Operation — contains general information which includes instrument programming and basic setup information for initial use, menu options, alarm setting, recorder setup, and calibration information.
- Installation/Maintenance — contains information for tasks best performed by qualified service or installation personnel. This section contains mounting instructions, electrical connections, and maintenance information in illustration and text form.

Please pay special attention to information contained in NOTES, CAUTION, and DANGER statements for optimum, safe operation of this instrument. Refer to the Table of Contents or the Index to easily find specific topics.

Figure 1 General Installation Information



* U.S. Patent D402768

1.2 Unpacking the Instrument

Remove the instrument from the shipping cartons and verify that no visible damage has occurred during shipment. If you have ordered the complete package (Cat. No. 52001-00), be sure the following items are included in the cartons:

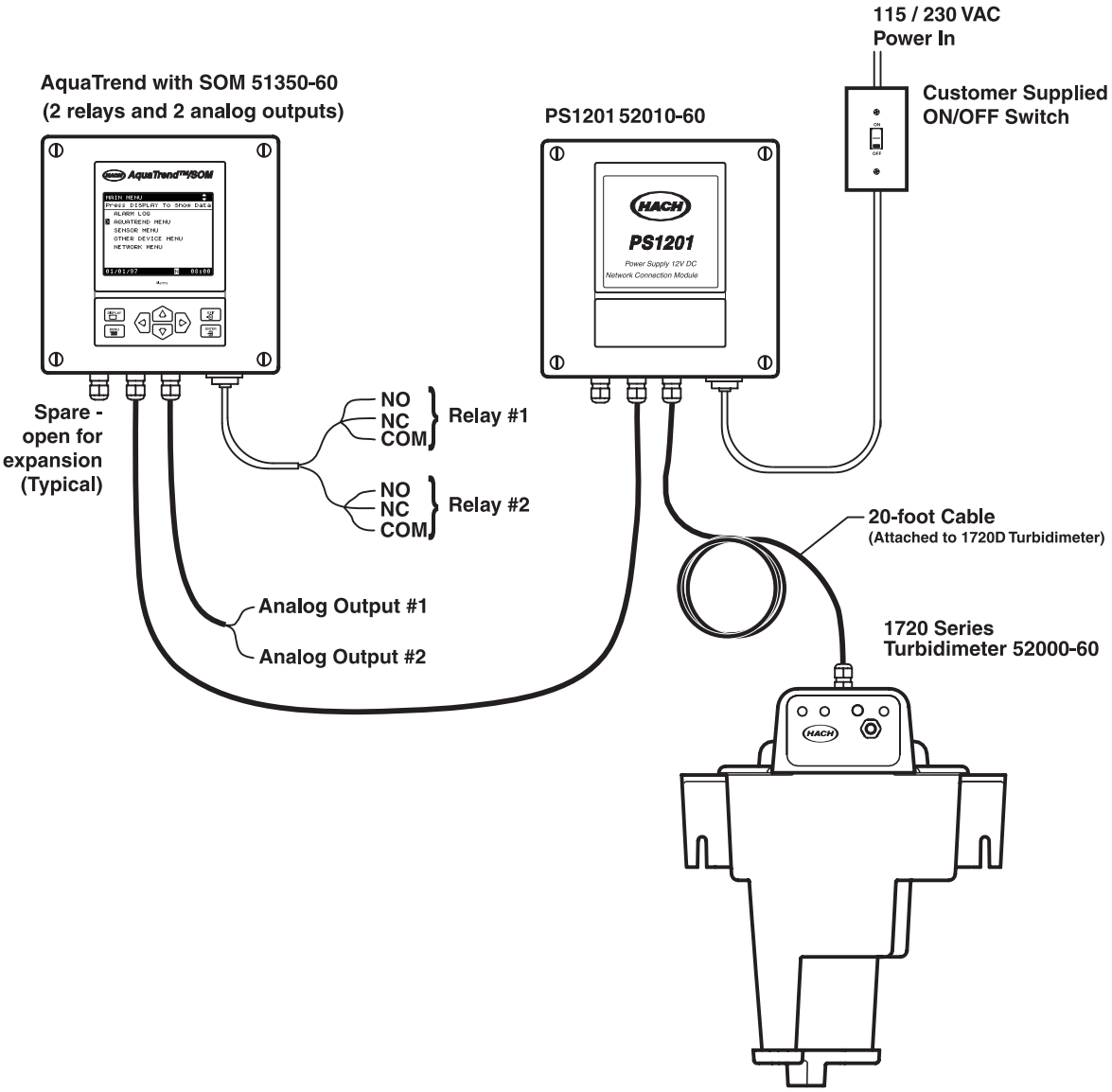
Item	Catalog Number
AquaTrend with integrated Signal Output Module (SOM)	51350-00
1720D Sensor Head	52008-00
1720D Turbidimeter Body	52006-00
PS1201 Power Supply	52010-00
Instruction Manual, AquaTrend Interface	51200-18
Instruction Manual, 1720D Turbidimeter	52000-18
Instruction Manual, PS1201 Power Supply	52010-18
Instruction Manual, Signal Output Module (SOM)	51250-18
Quick Reference Guide, 1720D Turbidimeter	52000-44
Quick Reference Guide, AquaTrend Interface	52400-44

If you have ordered the 1720D Turbidimeter Sensor portion only (Cat. No. 52000-00) ensure the following items are included in your shipping carton:

Item	Catalog Number
1720D Sensor Head	52008-00
1720D Turbidimeter Body	52006-00
PS1201 Power Supply	52010-00
Wall/Pole Mounting kit for the PS1201 Power Supply and AquaTrend Interface	51413-00
Instruction Manual, 1720D Turbidimeter	52000-18
Instruction Manual, PS1201 Power Supply	52010-18
Quick Reference Guide, 1720D Turbidimeter	52000-44

Additional items may be included, depending on the complete system ordered. If any item is missing or damaged, please contact the Hach Customer Service Department in Loveland, Colorado. Do not return any item without prior authorization. In the United States, call 1-800-227-4224. Outside the United States, contact your nearest Hach dealer.

Figure 2 Basic 1720D Turbidimeter System



1.3 System Description

Although many system configurations are possible, a highly interactive system is created by combining a 1720D Turbidimeter, the PS1201 Power Supply, and an AquaTrend w/SOM as shown in *Figure 2*. The 1720D Turbidimeter provides the stability necessary to continuously measure low levels of turbidity found in filtered water. In addition, the system provides superior sensitivity and offers lower detection limits, increased accuracy, and faster response than previous models.

Lower overall system costs result when customized systems are created using the AquaTrend Interface, up to eight 1720D sensors, and any or all of the optional equipment listed in the previous section. *Table 1* presents the maximum number of devices that may be added to any one master AquaTrend Interface.

Table 1 Master AquaTrend Interface Capabilities

Device	Number of devices that can be maintained by one Master AquaTrend Interface
Signal Output Module (SOM)	8
Serial I/O Module (SIO)	2
Digital Display Module	8
1720D Sensors or other Hach Sensors including the Signal Input Module	8
Remote AquaTrend Interface	8

Additional Hach Sensors, Digital Display modules, Serial I/O modules, Signal Output Modules, and Remote AquaTrend Interfaces can all be considered additional devices when using this manual.

1.4 Optional Equipment

The following equipment is available from Hach to expand and enhance your system. See *OPTIONAL ACCESSORIES* on page *93* of this manual for catalog numbers.

- Portable AquaTrend Interface
- Wall/Pole Mounting Kit for Portable AquaTrend Interface
- Digital Display Module (DDM)
- Signal Output Module (SOM)
- Serial I/O Module (SIO Module)
- Floor Stand for the 1720D Turbidimeter, AquaTrend Interface, and PS1201 Power Supply

1.5 ⚠ 1720D Turbidimeter Description

Hach's 1720D Turbidimeter is a continuous-reading nephelometric turbidimeter designed for low-range turbidity monitoring. This process turbidimeter consists of a 1720D head assembly, 1720D body, and PS1201 Power Supply and is capable of measuring turbidity from 0.001 to 100.0 NTU. Calibration is based on formazin, the primary turbidity reference standard adopted by the APHA *Standard Methods for the Examination of Water and Wastewater* and the U.S. Environmental Protection Agency (EPA).

DANGER
The 1720D Turbidimeter is not designed for use with samples that are flammable or explosive in nature. If any sample solution other than water is used in this product, test the sample/product compatibility to assure user safety and proper product performance.

ADVERTÊNCIAO
Turbidímetro 1720D não é concebido para uso com amostras que sejam inflamáveis ou explos-ivas. Se qualquer solução que não seja de água se usar neste produto, dever-se-á ensaiar a compati-bilidade da amostra/produto para garantir segurança ao usuário e desempenho correto do produto.

ADVERTENCIA
El Turbidímetro 1720D no está diseñado para usarse con muestras de naturaleza inflamable o explosiva. Si se empleara en este producto alguna solución de muestra que no fuera a base de agua, ponga a prueba la compatibilidad de la muestra/producto, para cerciorarse de la seguridad y del correcto funcionamiento del producto.

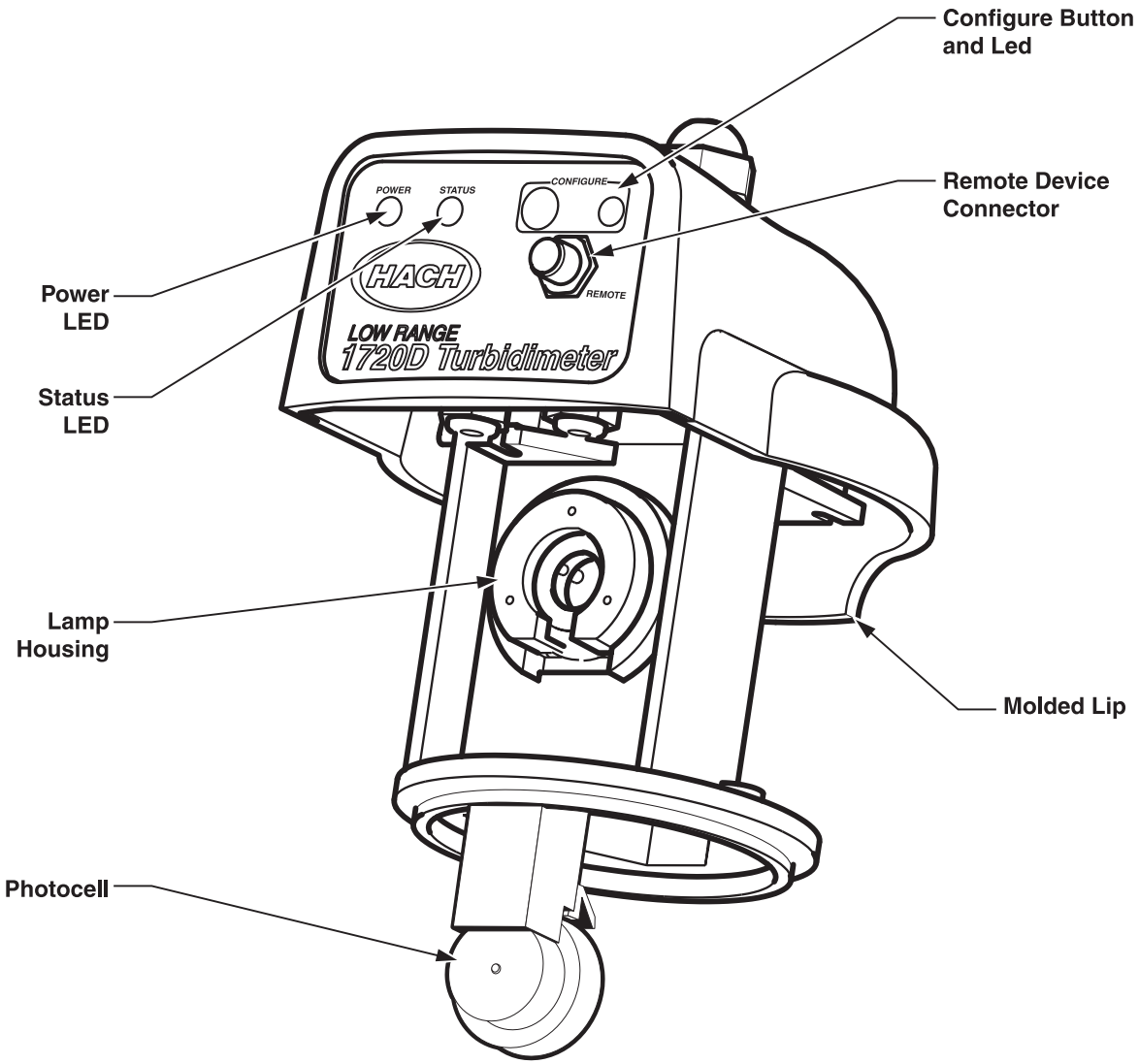
ATTENTION
Le turbidimètre 1720D n'est pas prévu pour utilisation avec des échantillons de nature inflammable ou explosive. Pour toute solution d'échantillon autre que de l'eau utilisée avec cet appareil, tester la compatibilité échantillon/appareil pour assurer la sécurité de l'utilisateur et le fonctionnement correct de l'appareil.

WARNHINWEIS
Das Trübungsmessgerät 1720D darf nicht in Verbindung mit Proben benutzt werden, die entflammbar oder explosiv sind. Wenn irgendeine andere Lösung als Wasser in diesem Gerät analysiert werden soll, muß die Proben/Gerät-Kompatibilität getestet werden, um die Sicherheitdes Benutzers und korrektes Arbeiten des Gerätes zu gewährleisten.

1.5.1 1720D Sensor Head

Electronic and optical components including the lamp and photocell are contained in the sensor head. The sensor head also contains status LEDs, the connector for remote attachments such as Digital Display Module or the Portable AquaTrend Interface, and the configure button. See *Figure 3*.

Figure 3 Turbidimeter Sensor Head

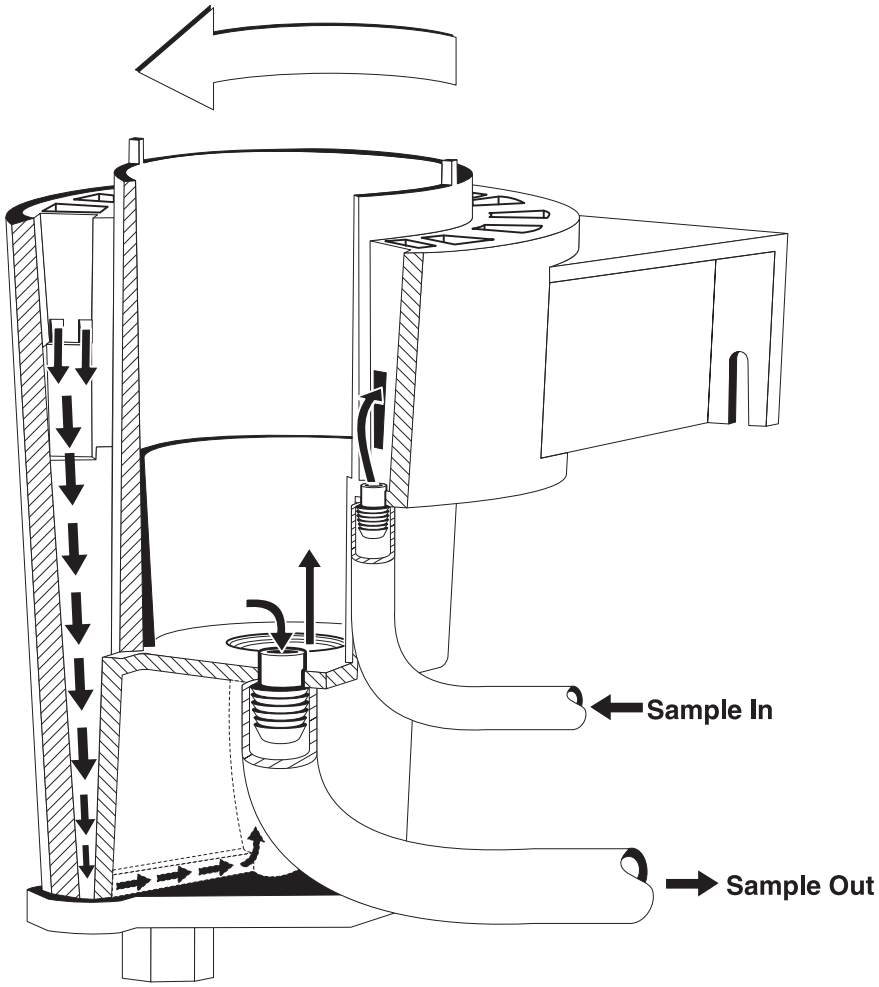


1.5.2 1720D Turbidimeter Body

The turbidimeter body is the unit through which the monitored sample flows and is measured for turbidity. The sensor head assembly is placed on the top of the body with the photocell submerged in the sample. Carefully align the head on the body so light leakage is minimized. An integral bubble trap* (removable for cleaning) channels the sample through a series of baffles where bubbles escape and are vented from the turbidimeter body (see *Figure 4*). The body is designed for wall-mounting but may be installed on an optional floor stand. See *OPTIONAL ACCESSORIES* on page *93*.

The sample inlet port is fitted with a ¼" NPT to ¼" compression fitting. The drain fitting is a ½" NPT to ½" ID tubing hose barb.

Figure 4 Sample Flow Path Through the Turbidimeter Body



* U.S. Patent 5831727

1.6 AquaTrend Interface Module

Communication and control of the 1720D sensor and modules are established via the AquaTrend Interface. Network wiring connections between the 1720D sensor, AquaTrend Interface, and other devices are made at the PS1201 Power Supply.

The AquaTrend Interface keypad and an interactive, user-friendly menu system are used to configure the network, configure a sensor or other device, program the instrument for recorder output minimums and maximums and enter turbidity level alarm set points. Many diagnostic self-tests and programming operations are available.

Easily alternate between displaying data in numeric form and graphic format by pressing the **DISPLAY** key. Because of the automatic-ranging feature with automatic decimal point positioning, no range selection is required. Indicators for turbidity level alarm conditions and certain critical system malfunctions also are shown on the AquaTrend Interface display screen.

The AquaTrend Interface enclosure is constructed of corrosion-proof materials and has been tested to NEMA 4X (indoor only), I.P. 66 industrial enclosure requirements.

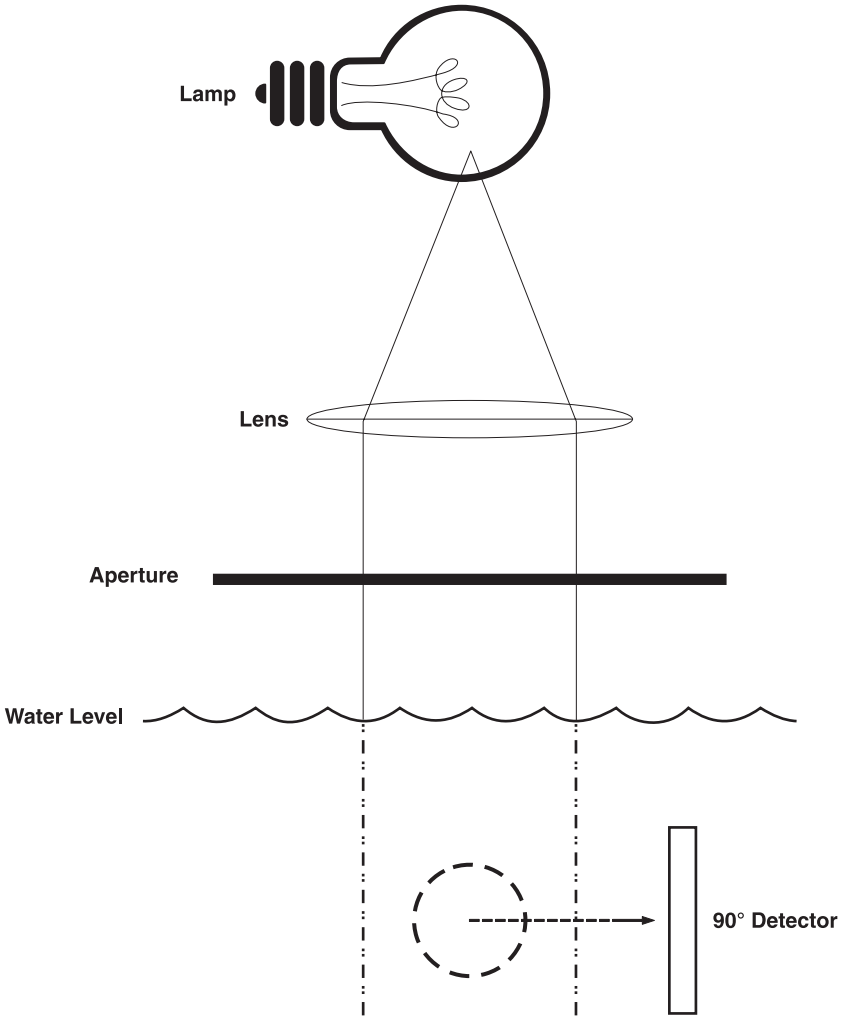
1.7 PS1201 Power Supply Module

The PS1201 power supply provides power for a variety of instrument and networking configurations. The power supply module uses AC power as its input, and is capable of operating multiple devices. The total wattage for multiple device operation may not exceed 25 watts and the distance between the power supply and the farthest device can be no more than 100 feet (30 m). Refer to the PS1201 for device wattages. Additional power supply units may be added to the system to support power requirements in excess of 25 watts or device distances exceeding 100 feet (30 m).

1.8 Principle of Operation

Turbidity is measured in the 1720D Turbidimeter by directing a strong beam of light from the sensor head assembly down into the sample in the turbidimeter body. Light scattered at 90° by suspended particles in the sample (see *Figure 5*) is detected by the submerged photocell.

Figure 5 90 Degree Detector



The amount of light scattered is proportional to the turbidity of the sample. If the turbidity of the sample is negligible, little light will be scattered and detected by the photocell and the turbidity reading will be low. High turbidity, on the other hand, will cause a high level of light scattering and result in a high reading.

Sample enters the turbidimeter body and flows through the baffle network of the bubble trap. The flow allows bubbles to either cling to surfaces of the baffle system or rise to the surface and vent to atmosphere. After traveling through the bubble trap, sample enters the center column of the turbidimeter body, rises into the measuring chamber and spills over the weir into the drain port. *Figure 4* presents a diagram of the sample flow path. A reading is taken every three seconds.

SECTION 2 START UP

2.1 Introduction

This section provides instructions for initially placing the 1720D Turbidimeter in operation or restarting the instrument after an extended shutdown. This information is presented with the assumption that the user is controlling the turbidimeter and peripheral devices with an AquaTrend® Interface. Some familiarity with the AquaTrend Interface is also assumed; please read the *AquaTrend Interface Manual* before beginning the installation.

2.2 Installation Overview Checklist

There are two phases to the installation of the 1720D Turbidimeter and its peripheral devices. The first phase is physical installation, the second phase is software setup. When all devices are physically mounted and properly wired for power and network communication, the software is used to build the network so all the devices can communicate.

To physically install the system components perform the following tasks:

1. Mount all devices to a pole, wall, or panel. (*Section 4.3* for turbidimeter installation, specific instructions for the other devices are contained in their manuals).

2. Make all wiring (power and network) connections (see the *PS1201 Power Supply Manual*).

3. Make hydraulic/sample connections (*Section 4.6*).

To set up the software on the network so all devices can communicate:

1. Review the AquaTrend Interface keypad and display (refer to the AquaTrend Interface Manual).

2. Become familiar with the turbidimeter sensor head front panel (see *Section 2.3*).

3. Add devices to the network (refer to *Section 2.4.1* and *2.4.2* and to the AquaTrend Interface Manual).

4. Set up AquaTrend Interface-specific information (refer to the AquaTrend Interface Manual).

5. Set up 1720D Turbidimeter specific information (refer to the remainder of this manual section).

2.3 Turbidimeter Head Front Panel

The turbidimeter head assembly front panel, shown in *Figure 3* on page *17*, contains the following components:

ITEM	DESCRIPTION
POWER LED	Green LED lights when power is supplied to the unit.
STATUS LED	Yellow LED blinks once every three seconds (corresponding to when a measurement is taken) in normal operation; the LED is constantly illuminated when a problem is detected by the microprocessor.
CONFIGURE LED	Yellow LED flashes once per second to indicate the device is not configured. The LED stops flashing after the device is configured by the AquaTrend Interface.
CONFIGURE BUTTON	Pressed to uniquely identify a sensor when more than one sensor is added from the AquaTrend Interface Add Device Menu. The configure LED is fully illuminated while this button is held down.
REMOTE	A Digital Display Module (DDM) or Portable AquaTrend Interface may be connected here.

See *TROUBLESHOOTING* on page *75* for additional information.

2.4 Network Setup

A “network” is the connection of one or more devices (of which at least one is a sensor) to one or more AquaTrend Interfaces. A “device” can be an additional 1720D sensor, Digital Display Module (DDM), Serial I/O module (SIO), Signal Output Module (SOM), or a remote AquaTrend Interface.

Up to eight sensors, eight Digital Displays, eight remote AquaTrend Interfaces, eight Signal Output Modules, two Serial I/O Modules and all necessary power supplies may be attached to the network.

There are two procedures for adding device(s) to the network. They are Single Sensor System (*Section 2.4.1*) and Multiple Sensor Systems (*Section 2.4.2*).

2.4.1 Single Sensor System

Use this feature when installing a complete system with no more than (1) Sensor (the 1720D Turbidimeter is being used in this procedure), (1) AquaTrend Interface or AquaTrend w/SOM, (1) SOM, (1) SIO, and (1) DDM. During this procedure, the default device names are accepted and sensor measurements are automatically assigned to appropriate channels.

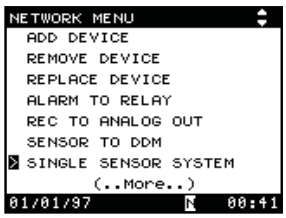
1. Press the **MENU** key to access the **MAIN MENU**.

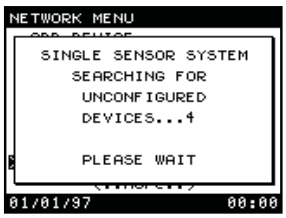
2. Select **NETWORK MENU**.

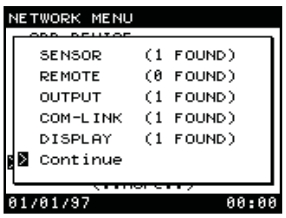
3. Select **SINGLE SENSOR SYSTEM**. A pop-up box will appear stating **EVALUATING NETWORK PLEASE WAIT.**

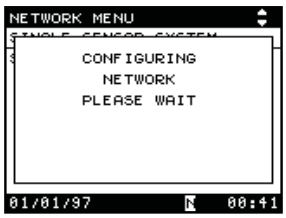
4. If the system is correctly installed, the display will next show **CONFIGURING NETWORK PLEASE WAIT.** After configuration, the display will show **OPERATION COMPLETE**.

5. Press the **DISPLAY** key to show sensor data.







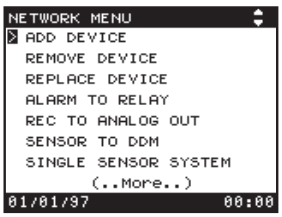


2.4.2 Multiple Sensor System

See *Section 2.4.1* for single sensor system setup information. If installing an additional sensor or another device, continue with this section.

Each connected sensor must be added to the network. When power is initially supplied to the new device, the configure LED should flash once per second. If this is not the case, the device may already be configured. Refer to *Section 2.11* and to *Section 6.6* to unconfigure the sensor before re-installing it on the system.

During the following operation, an electronic signal to configure the sensor is sent to the AquaTrend Interface. The configure light on the sensor will illuminate and remain lit until the configuration is complete. Up to eight sensors may be added to each AquaTrend Interface. If eight sensors have already been added, you will not be able to add another sensor.



1. To add a device to the AquaTrend Interface network, first press the **MENU** button to access the **MAIN MENU**.

2. Press the down **ARROW** key to move the pointer to the **NETWORK MENU** option and press **ENTER**.

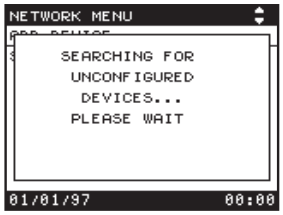
3. Select **ADD DEVICE** and press **ENTER**. If necessary, the display shows all device categories currently on the system. *Table 2* below shows device

categories. Refer to *Table 1* on page *16* for information on the maximum number of devices of each type allowed on the system.

Table 2 AquaTrend Interface Device Categories

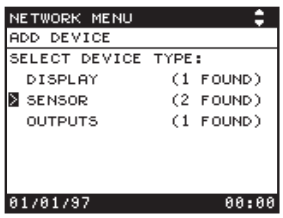
Category	Devices
SENSOR	1720D Turbidimeter, APA 6000, or other Hach Sensor
COMMUNICATIONS	Serial I/O Module
OUTPUTS	Signal Output Module
AQUATREND INTERFACE	AquaTrend Interface or Remote AquaTrend Interface
DISPLAY	Digital Display Module

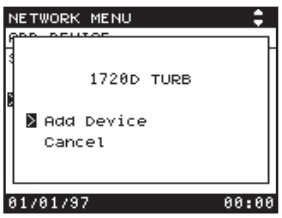
4. Choose the device category and press **ENTER**.



5. If more than one unconfigured sensor is present on the network, a pop-up box will appear asking the user to press the **CONFIGURE** button on the sensor being added. Press the **CONFIGURE** button to continue with this procedure. This button is located on the front face of the 1720D sensor head (see *Figure 3*).

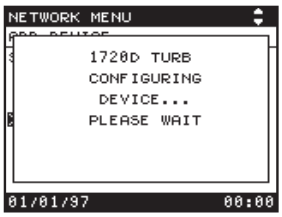
6. When the correct device is identified, select **ADD DEVICE** and press **ENTER**. After a pause (approximately 2 seconds), the display will prompt for the entry of a device name.





7. Press **ENTER** to accept the device name.

8. A pop-up box will appear to confirm the name of the device.



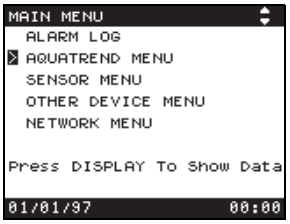
9. Press the **MENU** key to return to the **MAIN MENU**. **You must now connect the turbidity measurement to a channel before the measurement will be shown on the AquaTrend display.** See *Section 2.4.3*.

10. Repeat this procedure to add additional devices.

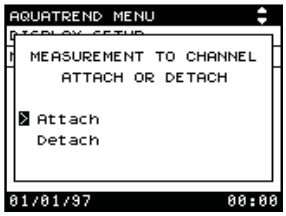
2.4.3 Attaching a Measurement to a Channel

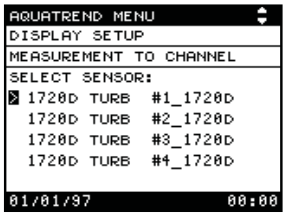
Up to eight sensors may be added to each AquaTrend Interface. Each sensor must be attached to its own channel. If all eight channels have measurements attached to them, you will not be able to attach additional measurements until you detach one. Additional information for this function is presented in the *AquaTrend Interface Manual* (Cat. No. 51200-18). Add a measurement to a channel as follows:

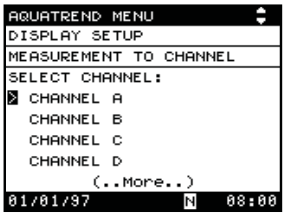
1. Press the **MENU** key to access the **MAIN MENU**.
2. Move the pointer to **AQUATREND MENU**, then press the **ENTER** key.
3. Move the pointer to **DISPLAY SETUP** and press **ENTER**.



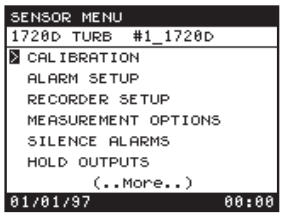
4. Choose **MEASUREMENT TO CHANNEL** and press **ENTER**.
5. Select **ATTACH** from the resulting pop-up screen and press the **ENTER** key.
6. Select the channel to which the measurement is to be attached and press the **ENTER** key.
7. Confirm the attachment by pressing **ENTER** with the pointer selecting **ATTACH** or move the pointer to **CANCEL** and press **ENTER** to exit without making changes.







2.5 1720D Sensor Setup on the AquaTrend Interface



Programmable functions in the 1720D are preset to default values. These defaults may be viewed and modified if necessary via the AquaTrend Interface. Most of the basic operational functions are modified using specific display prompts. The following sections describe how to program the turbidimeter to meet your needs.

The 1720D Turbidimeter Sensor setup menu contains calibration, alarm setup, recorder setup, and reading and diagnostic options. Move the pointer with the up and down **ARROW** keys, then select the option by pressing the **ENTER** key.

Refer to *Section 3.1* for detailed calibration information and to the sections below for information on alarms, recorder outputs, measurement options, and sensor diagnostics.

2.6 Alarm Setup

Two independent alarms can be set to trigger at any point within the 0-100 NTU range. Both high and low set point types are provided, as well as selectable hysteresis settings. In addition, hi/hi and lo/lo alarm operation can be created by using a combination of the two alarms. This feature allows the operator to be warned of a rising turbidity level before regulated limits are exceeded.

To be warned of an impending alarm at 0.5 NTU, for example, set alarm 1 to a high alarm with a set point of 0.4 NTU, and alarm 2 to a high alarm with a set point of 0.5 NTU.

A selectable hysteresis setting also eliminates alarms from cycling on and off when the turbidity level is close to the setpoint.

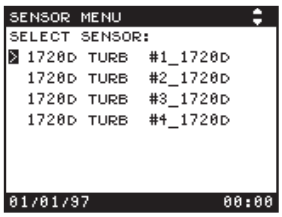
After alarms are set up, the following will occur:

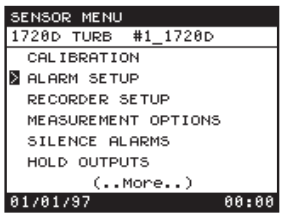
- An alarm indicator on the AquaTrend Interface (shown as a number from 1-8 in the lower portion of the display) will appear if either alarm 1 or 2 is active, or if a sensor warning is detected.
- A history of the last 14 alarms or sensor warnings will be shown in the sensor alarm log. For a description of the alarm log, see *Section 2.8*.
- If the alarm is connected to a physical relay in an SOM (see *Section 2.6.5*), that relay will trigger during the alarm condition.

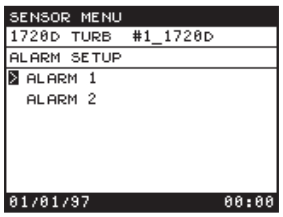
2.6.1 Alarm Setup Menu

To access the alarm setup menu for alarm 1 or 2, perform the following steps:

1. Press the **MENU** key to access the **MAIN MENU**. Move the pointer to **SENSOR MENU** and press the **ENTER** key.
2. Use the **ARROW** keys to select the appropriate sensor then press the **ENTER** key.
3. Move the pointer to **ALARM SETUP** and press the **ENTER** key.
4. Select the appropriate alarm number (1 or 2) with the up and down **ARROW** keys, and press the **ENTER** key.







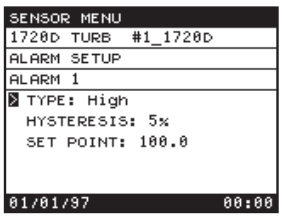
5. The current settings of alarm, type, hysteresis, and set point will be displayed.

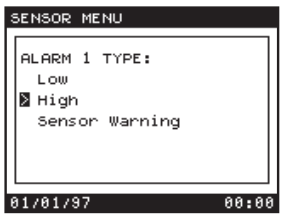
2.6.2 Alarm Types

Either alarm may be set as high, low, or sensor warning. The default setting for both alarms is high alarm type. A low alarm type triggers the corresponding SOM relay when the turbidity level falls below the set point. Similarly, a high alarm type triggers the corresponding SOM relay when the turbidity rises above the set point. A sensor warning triggers the corresponding SOM relay when the microprocessor detects a problem within the sensor electronics. For more information on sensor warnings, see *Section 2.8.3*.

To change the alarm type, perform the following steps:

1. Access the **ALARM SETUP** menu and the alarm of interest as in *Section 2.6.1*.
2. Move the pointer to **TYPE**, and press the **ENTER** key.
3. A popup window will appear with the pointer set to the current alarm type. Use the up and down **ARROW** keys to select **LOW**, **HIGH** or **SENSOR WARNING**. Press the **ENTER** key to accept the new type.



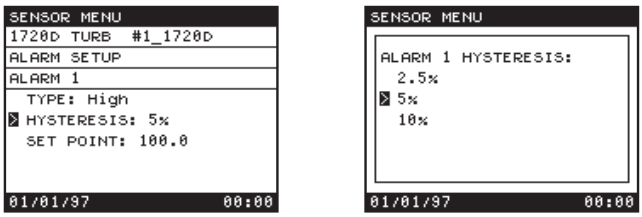


2.6.3 Alarm Hysteresis

The alarm hysteresis feature prevents alarms from cycling on and off if the turbidity level remains near the alarm set point. The default value is 5% from the turbidity level alarm set point. This means that if a high alarm was set for 0.800 NTU, the alarm condition would occur at 0.800 NTU and remain on until the turbidity dropped back to 5% below the alarm point (0.760 NTU). The default hysteresis setting for both alarms is 5%.

To change the alarm hysteresis setting for either alarm, perform the following steps:

1. Access the **ALARM SETUP** menu and specific alarm as in *Section 2.6.1*.
2. Move the pointer to **HYSTERESIS**, and press the **ENTER** key.
3. A popup window will appear with the pointer set to current alarm hysteresis. Use the up and down **ARROW** keys to select 2.5%, 5% or 10%. Press the **ENTER** key to accept the new setting.

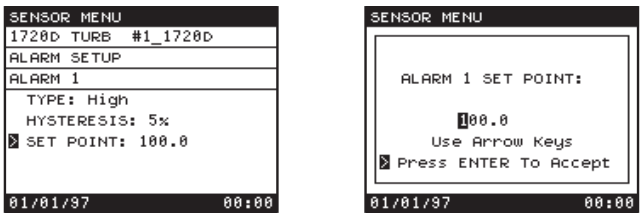


2.6.4 Alarm Set Point

The alarm set point is the turbidity value at which the alarm triggers the relay. For a high alarm type (default condition for both alarms), the alarm triggers above this point. For a low alarm type, the alarm triggers below this point. The default set point value for both alarms is 100.0 NTU.

To change the alarm set point for either alarm, perform the following steps:

1. Access the **ALARM SETUP** menu as in *Section 2.6.1*, then perform the following steps:
2. Move the pointer to **SET POINT**, and press the **ENTER** key.
3. A popup window will appear showing the current alarm set point. Use the **ARROW** keys to change the value (up and down arrow to increase or decrease the digit, right and left arrow to move to the next digit). Press the **ENTER** key to accept the new set point.



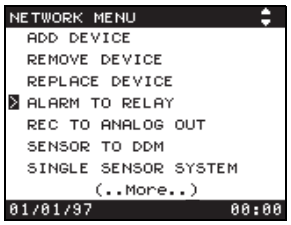
2.6.5 Attaching an Alarm to a Relay

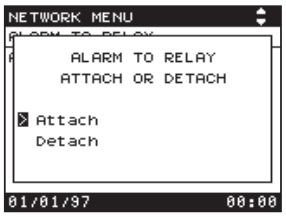
After the alarm settings are established (see *Section 2.6.1* through *Section 2.6.4* above), the alarms must be attached to physical relays in SOMs (via the AquaTrend Interface menu). The SOMs contain two relays and two analog outputs and can be purchased as an integral part of an AquaTrend/SOM unit, or as a separate module.

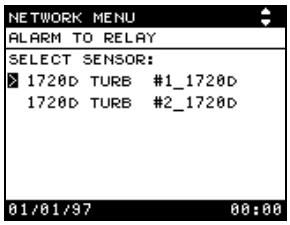
Note: *Two alarm outputs are available per sensor therefore, one sensor can control physical relays on the same SOM or two separate SOMs.*

To attach an alarm to a relay, perform the following steps:

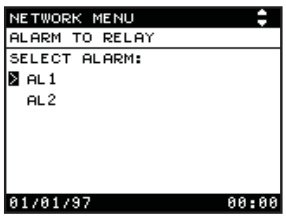
1. Press the **MENU** key to access the **MAIN MENU**.
2. Move the pointer to **NETWORK MENU** and press the **ENTER** key.
3. Move the pointer to **ALARM TO RELAY** and press the **ENTER** key.
4. Select **ATTACH** and press **ENTER**.
5. Select the sensor with the alarm of interest and press the **ENTER** key.

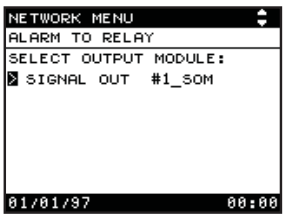


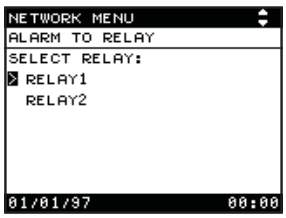




6. Select the appropriate sensor alarm number (AL1 or AL2) with the up and down **ARROW** keys, and press the **ENTER** key.
7. Select the name of the SOM containing the physical relay and press the **ENTER** key.
8. If necessary, select the appropriate SOM relay number (1 or 2) and press the **ENTER** key.
9. A summary of the attachment is displayed. Press **ENTER** to connect the alarm to the relay.







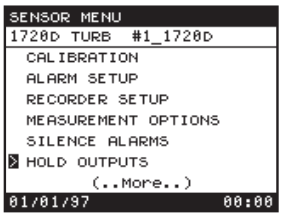
For more information on attaching alarms to relays, refer to the Signal Output Module (SOM) instruction manual, Cat. No. 51250-18.

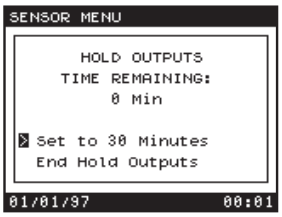
2.6.6 Hold Outputs

When Hold Outputs is activated, the timer will count down from 30 minutes to zero, at which time the alarm settings are restored and recorder outputs are reactivated automatically. Hold Outputs may be manually started or stopped from the **SENSOR MENU**. Removing power from the instrument also ends the Hold Outputs feature.

To Hold Outputs, perform the following steps:

1. Press the **MENU** key to access the **MAIN MENU**.
2. Move the pointer to **SENSOR MENU** and press the **ENTER** key.
3. Select the appropriate sensor and press the **ENTER** key.
4. Move the pointer to **HOLD OUTPUTS** and press the **ENTER** key.
5. The display shows **HOLD OUTPUTS** and **TIME REMAINING**. Zero (0) minutes indicates the outputs are not being held.





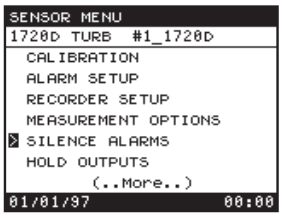
- To set the Hold Outputs timer to 30 minutes, press the **ENTER** key with the pointer on **SET TO 30 MINUTES**.
- To reset the timer to zero (0) ending the hold output mode, move the pointer to **END HOLD OUTPUTS**.
- To return to the Sensor Menu without changing the remaining displayed time, press the **EXIT** key.

2.7 Silence Alarms

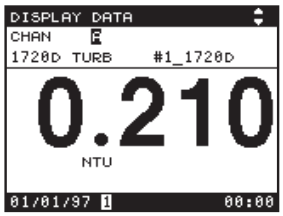
Alarm relay contacts can be opened (silenced) temporarily in emergency situations. Silence alarms may be manually started or stopped from the **SENSOR MENU**. When **SILENCE ALARMS** is activated, the timer will count down from 30 minutes to zero at which time the alarm settings are restored. Removing power from the instrument also ends the Silence Alarms feature. The silence alarm feature will activate even if the hold outputs feature is enabled.

To silence alarms, perform the following steps:

1. Press the **MENU** key to access the **MAIN MENU**. Move the pointer to **SENSOR MENU** and press the **ENTER** key.
2. Select the appropriate sensor and press **ENTER**.
3. Move the pointer to **SILENCE ALARMS** and press the **ENTER** key.
4. The display shows **SILENCE ALARMS** and **TIME REMAINING**. Zero (0) minutes indicates the alarms are not being silenced.
    - To set the **SILENCE ALARMS** timer to 30 minutes, press the **ENTER** key with the pointer on **SET TO 30 MINUTES**.
    - To reset the timer to zero (0) ending the Silence Alarms mode, move the pointer to **END SILENCE ALARMS**.
    - To return to the **SENSOR MENU** without changing the remaining displayed time, press the **EXIT** key.



2.8 Alarm Log



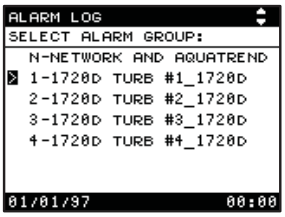
The alarm log shows system warnings and alarm conditions for the AquaTrend Interface and each attached sensor. An alarm indicator shown as a number from 1-8 (denoting sensor alarms) or as an N (denoting AquaTrend or Network Alarms) appears along the lower portion of the AquaTrend Interface display during an alarm condition.

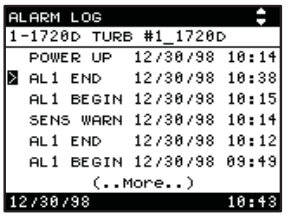
2.8.1 Reviewing the Alarm Log

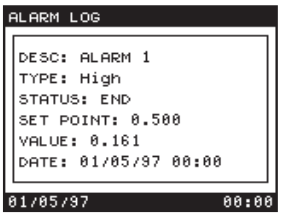
To review the entries in the 1720D alarm log, perform the following steps:

1. Press the **MENU** key to access the **MAIN MENU**.
2. Move the pointer to **ALARM LOG** and press the **ENTER** key.
3. Select the appropriate sensor and press the **ENTER** key.

A list of the 1720D alarm log entries is displayed. For more information about a particular alarm log entry, select the entry of interest and press the **ENTER** key.







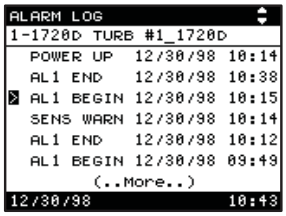
Up to 14 entries can be stored in the alarm log. The latest entry is shown at the top of the list. If more than 14 entries are stored, the newest entry will appear at the top of the list and the oldest entry will be deleted. Any active sensor warnings are automatically acknowledged (the number is removed from the lower portion of the screen) when the sensor alarm log is first displayed.

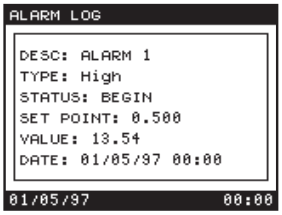
The alarm log is maintained across power outages, so alarm events before a power outage can be viewed after power is restored.

For more information on **NETWORK** and **AQUATREND** alarms, see the *AquaTrend Interface Manual*.

2.8.1.1 Alarm Begin

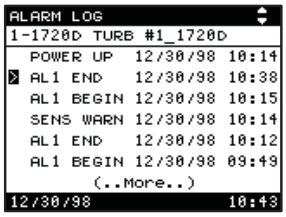
The begin alarm condition is displayed as **AL1 BEGIN** or **AL2 BEGIN**, depending on the alarm number. This entry indicates a set point alarm started, and details the time, date, type, set point, and turbidity value that triggered the alarm.

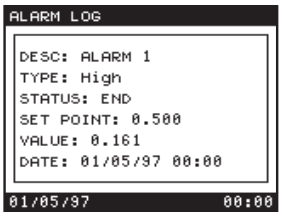




2.8.1.2 Alarm End

The end alarm condition is displayed as **AL1 END** or **AL2 END**, depending on the alarm number selected. This entry indicates that a set point alarm completed, and details the time, date, type, set point, and turbidity value that ended the alarm.



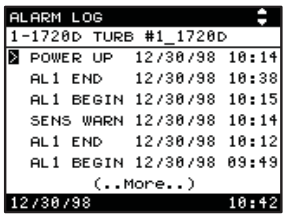


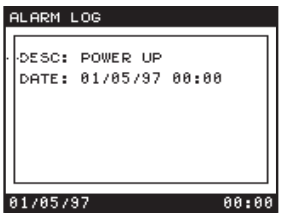
2.8.2 Power Up

A single **POWER UP** entry appears in the sensor alarm log. **POWER UP** is always the first entry in the alarm log, regardless of the time/date power was restored to the 1720D. No other occurrences of **POWER UP** appear in the alarm log.

Note: *If the 1720D does not receive the time/date from the Master AquaTrend, the power up time is displayed as 01/01/00 00:00.*

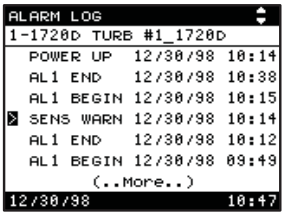
Each time power is applied to the1720D, or the 1720D is reset, the alarm log records a **POWER UP** entry. The time and date of the power up event are also displayed. The alarm log is maintained across power outages, so alarm events before a power outage can be viewed after power is restored.

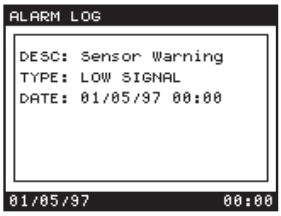




2.8.3 Sensor Warning

In the event the microprocessor detects a problem within the sensor electronics, the alarm log displays **SENS WARN**. The type of sensor warning, as well as the time and date the warning occurred are displayed.



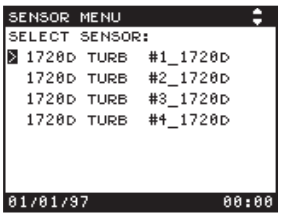


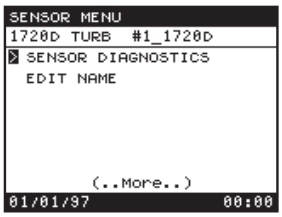
The sensor warnings that may be displayed are: **A/D TIMEOUT**, **LIGHT LEAK**, **BAD LAMP**, **SYSTEM VOLTS**, and **LOW SIGNAL**. See *Section 6.4* for more information on each type of sensor warning. Sensor warnings are automatically acknowledged (the number is removed from the lower portion of the screen) when the sensor alarm log is first displayed.

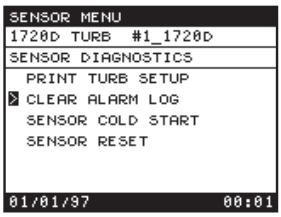
2.8.4 Clearing the 1720D Alarm Log

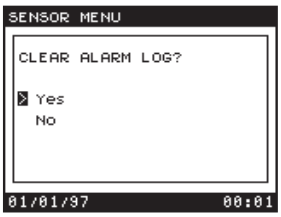
To clear the entire contents of the 1720D alarm log, perform the following steps:

1. Press the **MENU** key to access the **MAIN MENU**. Move the pointer to **SENSOR MENU** and press the **ENTER** key.
2. Select the appropriate sensor and press the **ENTER** key.
3. Select **SENSOR DIAGNOSTICS** and press the **ENTER** key.
4. Select **CLEAR ALARM LOG** and press the **ENTER** key.
5. Move the pointer to **YES**, and press **ENTER**. Reviewing the alarm log will show **NO ALARM ENTRIES** until an alarm, power up, or sensor warning occurs.

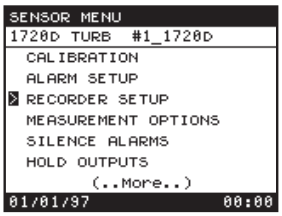








2.9 Recorder Setup



Two independent recorders can be set to cover any portion of the 0-100 NTU range. This feature, which requires that an SOM be attached to the network, allows the operator to bracket the normal turbidity level with the recorder output for the desired level of resolution on the recorder. For example, if the turbidity is normally 0.5 to 0.7 NTU, the recorder output span can be set for 0 to 1 NTU.

After recorders are set up, they must be attached to an analog output in an SOM as described in *Section 2.9.3*. Other options, such as 0-20mA or 4-20mA selection, loss of communication action, setting of analog output trim min/max, and analog output tests are described in the Signal Output Module (SOM) instruction manual, Cat. No. 51250-18.

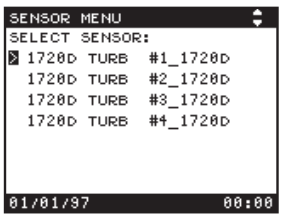
2.9.1 Recorder Minimum

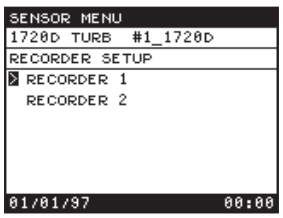
The recorder minimum is the turbidity value at the low end of the span. Once attached to a physical analog output in an SOM, this value corresponds to 4 mA (or 0 mA if so configured). Turbidity levels below this value output 4 mA (or 0 mA). Typically the recorder minimum is left at zero, but it can be set to any value. The default minimum value for both recorders is zero.

If the minimum value is set greater than the maximum value, the output will invert so that as turbidity levels increase, recorder mA values decrease. This is useful when devices require control inversely proportional to turbidity.

To change the recorder minimum for either recorder, perform the following steps:

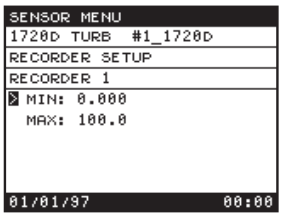
1. Press the **MENU** key to access the **MAIN MENU**.
2. Move the pointer to **SENSOR MENU** and press the **ENTER** key.
3. Select the appropriate sensor.
4. Move the pointer to **RECORDER SETUP** and press the **ENTER** key.
5. Select the appropriate recorder number (1 or 2) with the up and down **ARROW** keys, and press the **ENTER** key.





6. Move the pointer to **MIN**, and press the **ENTER** key.

7. A popup window will appear showing the current recorder minimum. Use the up and down **ARROW** keys to change the value. Press the **ENTER** key to accept the new minimum value.



2.9.2 Recorder Maximum

The recorder maximum is the turbidity value at the high end of the span. Once attached to a physical analog output in an SOM, this value corresponds to 20 mA (full scale). Turbidity levels above this value output 20 mA. The default maximum value for both recorders is 100 NTU.

If the minimum value is set greater than the maximum value, the output will invert so that as turbidity levels increase, recorder mA values decrease. This is useful when devices require control inversely proportional to turbidity.

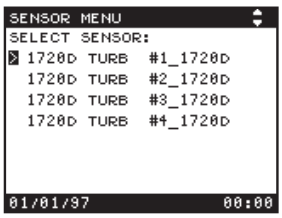
To change the recorder maximum for either recorder, perform the following steps:

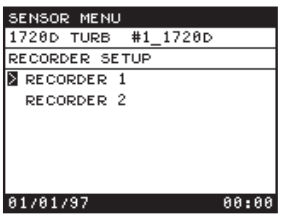
1. Press the **MENU** key to access the **MAIN MENU**. Move the pointer to **SENSOR MENU** and press the **ENTER** key.

2. Select the appropriate sensor.

3. Move the pointer to **RECORDER SETUP** and press the **ENTER** key.

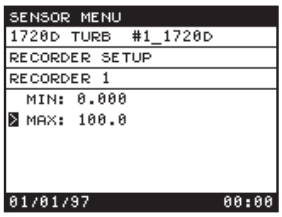
4. Select the appropriate recorder number (1 or 2) with the up and down **ARROW** keys, and press the **ENTER** key.





5. Move the pointer to **MAX**, and press the **ENTER** key.

6. A popup window will appear showing the current recorder maximum. Use the up and down **ARROW** keys to change the value. Press the **ENTER** key to accept the new maximum value.



2.9.3 Attaching a Recorder to an Analog Output

After the recorder settings are established (see *Section 2.9.1* through *Section 2.9.2* above), the recorders must be attached to analog outputs in SOMs (via the AquaTrend Interface menu). The SOMs contain two analog outputs and two relays and can be purchased as an integral part of an AquaTrend/SOM unit, or as a separate module.

Note: *Two recorder outputs are available per sensor, therefore, one sensor can control analog outputs on the same SOM or two separate SOMs.*

To attach a recorder to an analog output, perform the following steps:

1. Press the **MENU** key to access the **MAIN MENU**.

2. Move the pointer to **NETWORK MENU** and press the **ENTER** key.

3. Move the pointer to **REC TO ANALOG OUT** and press the **ENTER** key.

4. Select **ATTACH** and press **ENTER**.

5. Select the name of the sensor to attach and press the **ENTER** key.

6. Select the appropriate sensor recorder number (1 or 2) with the up and down **ARROW** keys, and press the **ENTER** key.

7. Select the name of the SOM containing the physical analog output and press the **ENTER** key.

8. If necessary, select the appropriate SOM analog output number (1 or 2) and press the **ENTER** key

9. A summary of the attachment is displayed. Press **ENTER** to connect the recorder to the analog output, or move the pointer to **CANCEL** and press **ENTER** to exit without connecting.

For more information on attaching recorders to analog outputs, see the *Signal Output Module (SOM) Manual*, Cat. No. 51250-18.

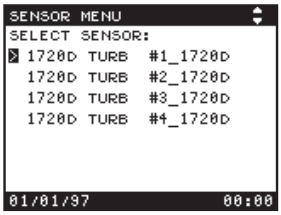
2.9.4 Adjusting the Recorder Trim

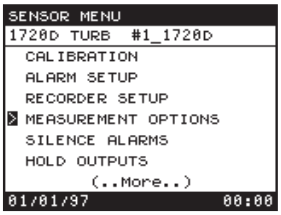
Refer to the *Signal Output Module (SOM) Manual*, Cat. No. 51250-18.

2.10 Measurement Options

Measurement options include bubble rejection mode, signal averaging, print interval, and time stamp. Access the **MEASUREMENT OPTIONS** menu as follows:

1. Press the **MENU** key to access the **MAIN MENU**.
2. Move the pointer to **SENSOR MENU** and press the **ENTER** key.
3. Select the appropriate sensor and press the **ENTER** key.
4. Move the pointer to **MEASUREMENT OPTIONS** and press the **ENTER** key.





5. Move the pointer to the option to be accessed and press the **ENTER** key.

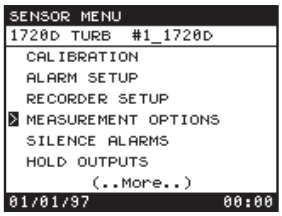
2.10.1 Bubble Rejection Mode

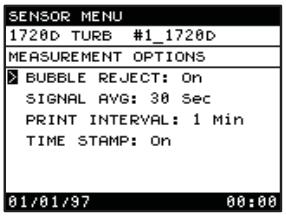
Occasionally, larger air bubbles, primarily caused by the dissolution of gasses from the sample in the turbidimeter body, will pass in front of the detector and cause brief increases or spikes in the turbidity reading. These spikes can make a recorder chart difficult to read, and false alarms can be triggered when high turbidity set point alarms are used.

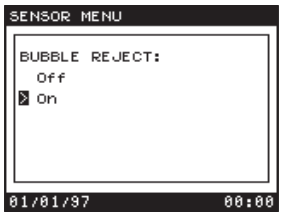
Selecting the bubble reject mode will eliminate any momentary spikes in the reading and yield a stable output. Bubble reject mode is recommended for normal operation. The default setting is **ON**. To change the Bubble Rejection Mode, proceed as follows:

1. Access the **MEASUREMENT OPTIONS** menu as in *Section 2.10* above.
2. Determine if the bubble reject mode is on or off by moving the pointer to the **BUBBLE REJECT** line. If bubble reject is off, the display will show **Off**; if it is on, the display will show **On**.

3. Press the **ENTER** key to move to the selection display. Change the displayed mode by using the **ARROW** keys to toggle between the two options, then press **ENTER** to accept.







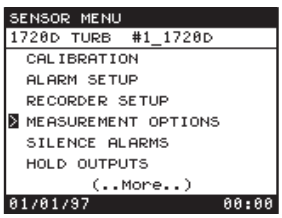
2.10.2 Signal Averaging

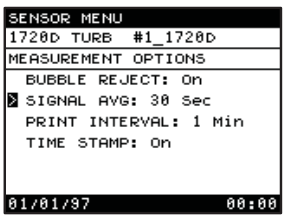
Note: *During a calibration the instrument will automatically switch to a 6 second average. After calibration, the signal average will revert to the value set prior to calibration.*

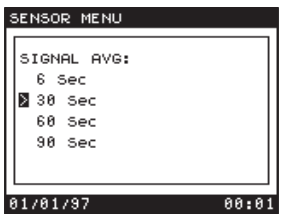
The 1720D Turbidimeter provides the capability of averaging measurements taken over time (6, 30, 60, or 90 seconds) to provide a more stable output. The default signal average time is 30 seconds. The 1720D takes a reading every 3 seconds and displays the newly averaged reading.

Change the Signal Average Time as follows:

1. Access the **MEASUREMENT OPTIONS** menu as in *Section 2.10* above.
2. Select **SIGNAL AVG** and press **ENTER**.
3. Move the pointer to the appropriate signal averaging time and accept it with the **ENTER** key. The selection will be retained until changed.





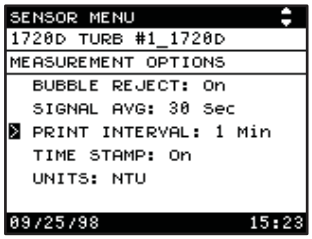


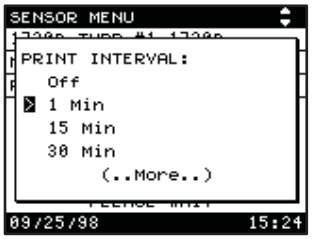
2.10.3 Print Interval

The 1720D turbidimeter can automatically print a reading to a printer or computer via a SIO (Serial I/O) module. Up to two SIOs can be added to the AquaTrend Interface network. To connect the SIO module to a printer, the printer must be a serial printer (RS232C) with appropriate cables. Refer to the SIO manual for more information.

1. Access the **MEASUREMENT OPTIONS** menu as in *Section 2.10* above.
2. Select **PRINT INTERVAL** and press **ENTER**.
3. Select a print interval in the resulting pop-up box by moving the pointer to the desired setting and then pressing the **ENTER** key to accept. The default setting is one (1) minute. Selecting **OFF** disables the print interval feature.

Print intervals can be set to 1, 15, 30, or 60 minutes or 1, 4, or 24 hours.





A sample 4-hour printout from four 1720D's (via an SIO) is shown below.

```
[1]09/23/98 00:00 0.035 NTU
[4]09/23/98 00:00 0.064 NTU
[2]09/23/98 00:00 0.053 NTU
[3]09/23/98 00:00 0.166 NTU
[1]09/23/98 04:00 0.037 NTU
[4]09/23/98 04:00 0.066 NTU
[2]09/23/98 04:00 0.187 NTU
[3]09/23/98 04:00 0.039 NTU
[1]09/23/98 08:00 0.054 NTU
[4]09/23/98 08:00 0.156 NTU
[2]09/23/98 08:00 0.188 NTU
[3]09/23/98 08:00 0.031 NTU
```

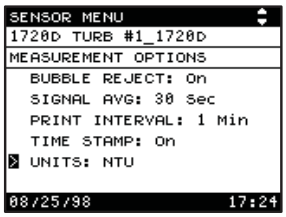
If two SIOs are being used, the information will be sent to both at the same print interval.

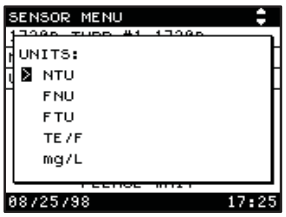
More detailed information on SIO functionality can be found in the *Serial I/O Manual*, Cat. No. 52074-18

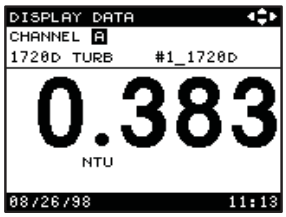
2.10.4 Units

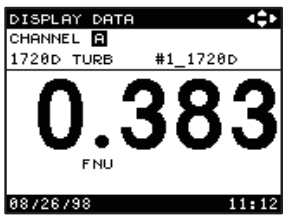
The units displayed can be changed using the steps below. All units are 1.0 multipliers of NTU, so a calibration can be performed in any of the reading units. The mg/L units are intended for use with Kaolin Clay for reporting regulations in Japan.

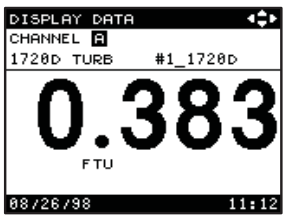
1. Access the **MEASUREMENT OPTIONS** menu as in *Section 2.10* above.
2. Select **UNITS** and press **ENTER**. Units of NTU, FNU, FTU, TE/F, and mg/L are displayed.
3. Select the specific units to be displayed and press **ENTER**.

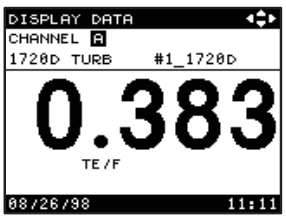


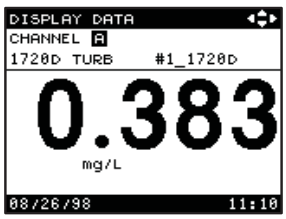












2.10.5 Time Stamp

The 1720D Turbidimeter can print the time and date with each print interval reading. When the time stamp feature is set to **ON**, the date, time, units, and state of alarms/sensor warnings are displayed. In addition, any alarms are printed when they begin/end. A sample is shown below.

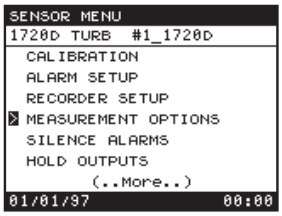
```
01/01/97 00:00 0.035 NTU
01/01/97 00:00 AL1 BEGIN
01/01/97 00:01 0.900 NTU *A
01/01/97 00:02 AL2 END
01/01/97 00:03 0.035 NTU
```

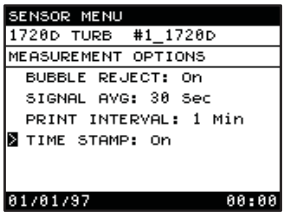
When the time stamp feature is set to **OFF**, only the turbidity readings are printed as shown below:

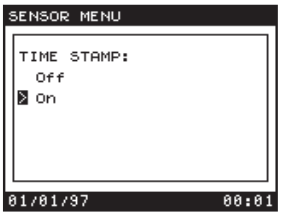
```
0.035
0.900
0.035
```

Access the Time Stamp option as follows:

1. Access the **MEASUREMENT OPTIONS** menu as in *Section 2.10* above.
2. Select **TIME STAMP** and press the **ENTER** key.
3. Move the pointer to the appropriate time stamp setting and accept it with the **ENTER** key.





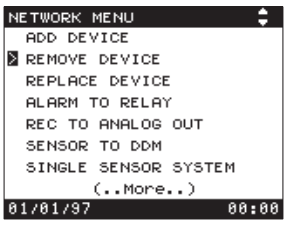


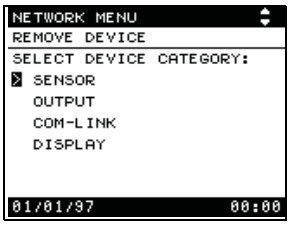
4. Press the **DISPLAY** key to return to display mode.

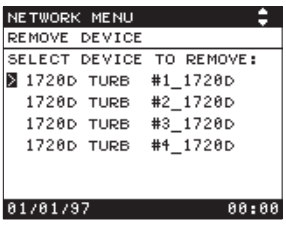
2.11 Removing a Device

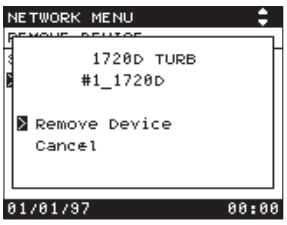
To function properly, the AquaTrend network system must keep track of all devices on the network. If it is necessary to remove a device from the system, the correct way is to first use the **REMOVE DEVICE** option in the **NETWORK MENU** and then physically remove the device by disconnecting wiring connections and removing it from the mounting if necessary. Remove the device from the network as follows:

1. Press the **MENU** key to access the **MAIN MENU**.
2. Move the pointer to the **NETWORK MENU** option and press the **ENTER** key.
3. Move the pointer to **REMOVE DEVICE** and press the **ENTER** key. After choosing **REMOVE DEVICE**, the display may prompt for the selection of a device type. All types of connected devices will be shown on the display.
4. If necessary, move the pointer to the device type that is to be removed and press **ENTER**. All connected devices of that type will be displayed.
5. If necessary, move the pointer to the specific device to be removed and press **ENTER**. A pop-up box will appear, so you can verify that this is the device you want to remove.
6. Press **ENTER** to remove the device or move the pointer to **CANCEL** and press **ENTER** if the displayed device is not the one to be removed.









7. Remove all physical connections.

If this procedure is ineffective refer to *Section 6.6.*

2.12 Replacing a Device

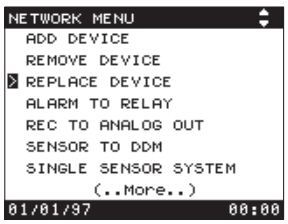
Replacing a device may be necessary if the device becomes inoperable. Replace the device as follows:

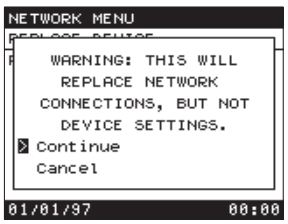
1. Disconnect power to the PS1201.
2. Make all power and network wiring connections to the new device as if it will be added to the system in the normal manner. See the *PS1201 Manual* for instructions.
3. Supply power to the system and press the **MENU** key to access the **MAIN MENU**.
4. Move the pointer to the **NETWORK MENU** option and press the **ENTER** key.
5. Move the pointer to **REPLACE DEVICE** in the Network Menu and press **ENTER.**

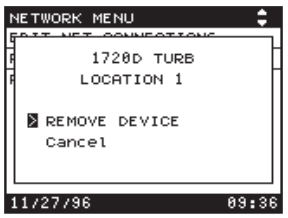
A pop-up box will appear with the following statement:

WARNING: THIS WILL REPLACE ALL NETWORK CONNECTIONS, BUT NOT DEVICE SETTINGS.

This means that although the AquaTrend Interface network connections of the old device will be transferred to the new device, you will still need to set device specific information.







Items that are transferred to the new device:

- MEASUREMENT TO CHANNEL attachments
- ALARM TO RELAY attachments
- RECORDER TO ANALOG OUTPUT attachments
- SENSOR TO DDM assignments
- Device Name is transferred to the new device if possible

Items that are not transferred to the new device:

- Settings for Units, Signal Averaging, and other measurement options
- Calibrations and calibration standards values
- Alarm levels, recorder min/max, etc.
- Other items in the device's menu

6. Press **ENTER** to continue or, if you decide not to replace the device, move the pointer to **CANCEL** and press the **ENTER** key.

If you chose **CONTINUE,** all settings accessed from menus controlled by that device must be redone. This includes all options shown under the **SENSOR MENU.** Settings accessed via the **NETWORK MENU** will remain.

All types of connected devices will be shown on the display. Move the pointer to the device type that is to be replaced and press **ENTER**. All connected devices of that type will be displayed. Move the pointer to the device to be replaced and press **ENTER**.

A pop-up box will appear, confirming the device has been replaced.

2.12.1 Edit Name

The name of any sensor may be changed as follows:

1. Press the **MENU** key to access the **MAIN MENU**.

2. Move the pointer to **SENSOR MENU** and press the **ENTER** key.

3. Select the sensor of interest and press **ENTER**.

4. Select **EDIT NAME** and press the **ENTER** key.

5. Use the **ARROW** keys (right or left arrows to move to another character space in the name and up or down arrows to scroll through the available characters) to create a new name (up to 12 characters). Press **ENTER** to accept the displayed name.

SECTION 3 CALIBRATION

The 1720D Turbidimeter is factory-calibrated using StablCal® Stabilized Formazin before shipment. The instrument must be recalibrated before use to meet published accuracy specifications. In addition, recalibration is recommended after any significant maintenance or repair and at least once every three months during normal operation. **The turbidimeter body and bubble trap must be thoroughly cleaned before initial use and prior to each calibration.** See *Section 5.1.3*. The sections that follow give instrument calibration and verification information. In addition, details on preparing standards and using StablCal Stabilized Formazin are presented.

3.1 Calibration Overview

3.1.1 Calibration Procedures Compared

Note: *Calibration is optimized if performed at the same temperature as operating conditions.*

Five calibration procedures are presented in this manual. *Table 3* summarizes each method ("A" denotes the best in each category).

Table 3 Calibration Procedures Compared

Calibration Type	Time	EPA Reporting	Standards Required	Reagent Cost	Accessory Cost	Accessories Required
User-prepared	C	Yes	2	B	B	Cal Cylinder, TenSette® Pipet, 4000 NTU Formazin
StablCal Standards	B	Yes	1	C	B	Cal Cylinder, StablCal standard
Comparative	C	Yes	1	A	A	None
ICE-PIC™ Module	A	No	1	A	C	ICE-PIC Fixture
Multi-turb	B	Yes	1	C	B	Cal Cylinder, StablCal standard

Similarly, two calibration curve verification methods are presented in this manual, as described *Table 4* ("A" denotes the best in each category).

Table 4 Calibration Verification Procedures Compared

Type	Time	Standards Required	Reagent Cost	Accessory Cost	Accessories Required
StablCal	B	1	C	B	Cal Cylinder, StablCal standard
ICE-PIC	A	1	A	C	ICE-PIC Fixture

3.1.2 Calibration Guidelines

To achieve the most accurate calibrations:

- Always clean the photocell window per the instructions in *Section 5.1.2 Cleaning the Photocell Window*. Rinse the photocell with deionized water and dry with a soft, lint-free cloth before calibrating.
- Always clean the turbidimeter body and calibration cylinder per the instructions in *Section 5.1.3 Cleaning the Turbidimeter Body and Bubble Trap*. Rinse both with deionized water before calibrating.
- Store the calibration cylinder upside-down to minimize contamination between calibrations.
- Do not stir or mix dilution water. Noisy (fluctuating) readings will result.
- Gently invert StablCal standards for 1 minute before opening. Do not shake. This ensures a consistent turbidity of the standard.
- If the 20.0 NTU standard is allowed to sit in the Calibration Cylinder for more than 15 minutes, it must be remixed (gently swirled in the calibration cylinder) before use to ensure a consistent turbidity.
- Discard all standards after use per the instructions on the container. Never transfer the standard back into its original container. Contamination will result.
- Before any calibration, zero the electronics per the instructions in *Section 3.1.3 Zero Electronics*.

3.1.3 Zero Electronics

To compensate for light or other interference in turbidity readings, the electronics must be "zeroed" as part of the normal calibration procedure. Zero the electronics as follows:

Note: *Dark values are defined as the light detected by the instrument when the lamp is not lit.*

1. Press the **MENU** key to access the **MAIN MENU**. Select **SENSOR MENU** and press the **ENTER** key.
2. Select the sensor to be calibrated using the arrow keys and press the **ENTER** key.
3. Select **CALIBRATION** from the menu choices and press **ENTER**.
4. Move the pointer to **ZERO ELECTRONICS** and press the **ENTER** key.
5. Make sure the turbidimeter head is aligned on the calibration cylinder and press the **ENTER** key to continue. The display will show **PLEASE WAIT** for approximately 30 seconds while dark values are read. **Do not remove the turbidimeter head during this waiting period.** If the head is removed while **PLEASE WAIT** is shown on the display, repeat this step.
6. Press **ENTER** to return to the **CALIBRATION** menu.

3.2 Calibration Procedures

Five calibration procedures are presented in this section. *Table 3* in *Section 3.1* describes the benefits of each procedure.

3.2.1 User-prepared Calibration Procedure

This procedure requires the user to dispense 5 mL of 4000-NTU formazin into a calibration cylinder. If you are uncomfortable pipeting chemicals, use the StablCal procedure described in *Section 3.2.2*. **Do not use StablCal standards with the User-Prepared Calibration procedure**, instead see *Section 3.2.2*.

An optional calibration kit containing all components necessary for the User-prepared Calibration procedure is available (Cat. No. 44156-00). This Formazin Calibration Kit contains a TenSette Pipet, a 500-mL bottle of 4000-NTU Formazin Primary Standard, and a calibration cylinder. Each component may also be ordered separately as follows:

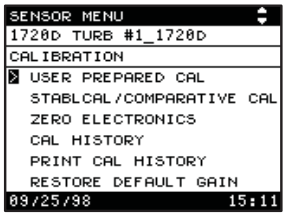
- Formazin Primary Standard (500 mL, 4000-NTU) - Cat. No. 2461-49
- Calibration Cylinder - Cat. No. 44153-00
- TenSette Pipet, 1.0 to 10.0 mL - Cat. No. 19700-10
- TenSette Pipet Tips, 1.0 to 10.0 mL (50/pkg) - Cat. No. 25589-00

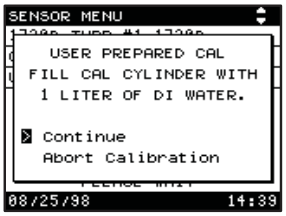
Perform the user-prepared calibration method as follows:

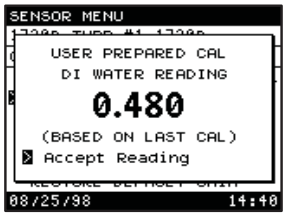
Note: *The Hold Outputs feature is automatically enabled during the zero electronics and calibration procedure, holding attached SOM outputs at their pre-calibration settings.*

1. Zero the electronics as described in *Section 3.1.3*.
2. Press the **MENU** key to access the **MAIN MENU**. Select **SENSOR MENU** and press the **ENTER** key.
3. Select the sensor to be calibrated using the arrow keys and press **ENTER**.
4. Select **CALIBRATION** from the menu choices and press **ENTER**.
5. Move the pointer to **USER PREPARED CAL** and press **ENTER** to begin the calibration procedure. During calibration, the instrument will automatically switch to a 6-second signal average. After calibration, the signal average will revert to the value set prior to calibration.
6. The display will prompt **FILL CAL CYLINDER WITH 1 LITER OF DI WATER**. Accurately measure 1.0 liter of low turbidity dilution water and pour it into a clean, dry calibration cylinder. Pour carefully to minimize bubbles.

Note: *See Preparing Dilute Formazin Standards on page 63 for information on preparing dilution water.*







7. Remove the head assembly from the turbidimeter body. Clean the photocell window per the instructions in *Section 5.1.2* on page *71*. Check the lamp and lens for scaling or filming, and clean them if necessary (see *Section 5.1 Scheduled Maintenance*).

8. Place the head assembly on the calibration cylinder. Gently tap the cylinder to free any bubbles adhering to the photocell window.

9. Press **ENTER** to begin reading the dilution water value or, to exit without updating the calibration, move the pointer to **ABORT CALIBRATION** and press the **ENTER** key.

10. After waiting a minimum of one minute, press **ENTER** to accept the reading of the dilution water. The value displayed is based on the previous calibration, and will be updated after the calibration is accepted. The number is displayed for stability purposes only.

11. The display will prompt **DISPENSE 5 mL OF 4000 FORMAZIN INTO CAL CYLINDER AND SWIRL**. Attach a clean, dry pipet tip to the end of a TenSette Pipet. Set the dispenser knob to the 5-mL position. Gently invert the 4000-NTU formazin bottle several times to mix the solution. Depress the pipet plunger and immerse the end of the tip one-half inch into the 4000-NTU formazin. Slowly release the plunger to draw 5 mL of 4000-NTU formazin into the tip.

12. Set the pipet knob to the 6-mL position to ensure all the 4000-NTU formazin is dispensed. Lift the turbidimeter head assembly out of the calibration cylinder and smoothly depress the pipet plunger to dispense the 4000-NTU formazin into the calibration cylinder.

13. Gently stir the formazin solution in the cylinder and replace the head assembly.

14. Press **ENTER** to begin reading the 20-NTU standard, or to exit without updating the calibration, move the pointer to **ABORT CALIBRATION** and press the **ENTER** key.

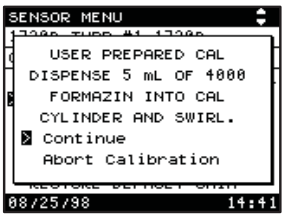
15. After waiting a minimum of one minute, press **ENTER** to accept the value of the 20-NTU standard. The value displayed is based on the previous calibration, and will be updated after the calibration is accepted. The number is displayed only for stability purposes.

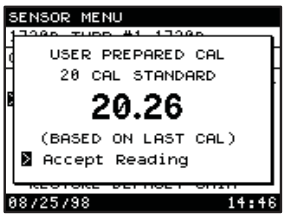
16. If the calibration was performed correctly, the display will show **SUCCESSFUL CAL.** Press **ENTER** to accept the calibration and store it in non-volatile memory. If an improper calibration is detected, the message **QUESTIONABLE CAL** will be displayed. Refer to *SECTION 6 TROUBLESHOOTING* in this manual for more information.

17. Replace the instrument head assembly on the turbidimeter body and press the **DISPLAY** key. The instrument is now calibrated.

18. Discard the formazin standard according to the directions on the standard bottle. Rinse the calibration cylinder with deionized water and store upside down to minimize dust buildup.

Note: *The Hold Outputs feature is automatically set to 5 minutes after a calibration is accepted or aborted, to allow time for the turbidimeter head to be placed on the body. To cancel Hold Outputs immediately, see Section 2.6.6 Hold Outputs.*





3.2.2 StablCal Calibration Procedure

This procedure requires 1 liter of 20-NTU StablCal standard. No other standards are required. Use the StablCal Calibration method for simple, quick calibration. A StablCal Standard may be used to calibrate for reporting purposes as cited in EPA-accepted Hach method 8195. Like the Comparative Calibration method, the turbidity reading for a single calibration point is adjusted to a known value. Since the value of the StablCal Stabilized Formazin Standard is specified, variables introduced when mixing user-prepared formazin are avoided. **Do not use user-prepared formazin or 4000-NTU formazin with this procedure**.

An optional calibration kit containing all components necessary for this procedure is available (Cat. No. 26596-00). This StablCal Calibration Kit contains a 1-liter bottle of 20.0-NTU StablCal and a calibration cylinder. Individual components may also be ordered separately as indicated below:

- StablCal Standard, 20.0-NTU (1 L) - Cat. No. 26601-53
- Calibration Cylinder - Cat. No. 44153-00

Perform the StablCal calibration method as follows:

Note: *The Hold Outputs feature is automatically enabled during the zero electronics and calibration procedure, holding attached SOM outputs at their pre-calibration settings.*

1. Zero the electronics as described in *Section 3.1.3*.

2. Press the **MENU** key to access the **MAIN MENU**. Select **SENSOR MENU** and press the **ENTER** key.

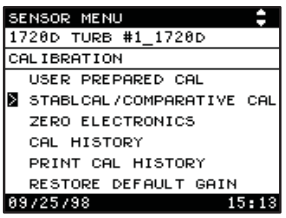
3. Select the sensor to be calibrated using the arrow keys and press **ENTER**.

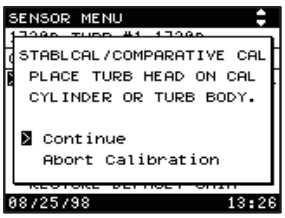
4. Select **CALIBRATION** from the menu choices and press **ENTER**.

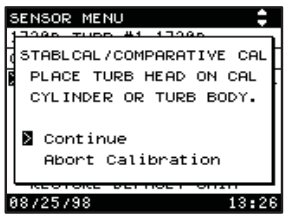
5. Move the pointer to **STABLCAL/COMPARATIVE CAL** and press **ENTER** to begin the calibration procedure. During calibration, the instrument will automatically switch to a 6-second signal average. After calibration, the signal average will revert to the value set prior to calibration.

6. The display will prompt **ENTER CALIBRATION STANDARD VALUE**. Use the arrow keys to enter **20.00**, then press **ENTER** to accept the calibration standard value.

Note: *1.0-NTU StablCal (Cat. No. 26598-53) may be used in place of 20.0-NTU StablCal, however, the accuracy of this method is valid only near the calibration point. The specified accuracy of the 1720D may not be valid over the full operating range when this calibration method is used. Enter* **1.000** *if calibrating with 1.0-NTU StablCal.*







7. The display will prompt **PLACE TURB HEAD ON CAL CYLINDER OR BODY.** Gently mix a one liter bottle of StablCal standard. Pour it into a clean, dry calibration cylinder. Pour slowly and carefully to minimize bubbles.

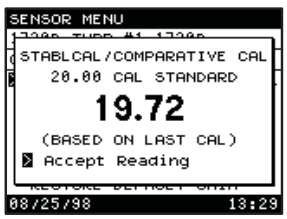
Note: *The StablCal standard is premeasured into a 1-liter container. To use it, simply mix by inverting the bottle for 1 minute, then pour the entire contents into a calibration cylinder. Do not shake.*

8. Remove the head assembly from the turbidimeter body. Clean the photocell window per the instructions in *Section 5.1.2* on page *71*. Check the lamp and lens for scaling or filming, and clean them if necessary (see *Section 5.1 Scheduled Maintenance*).

9. Place the head assembly on the calibration cylinder. Gently tap the cylinder to free any bubbles adhering to the photocell window.

10. Press **ENTER** to begin reading the StablCal standard or, to exit without updating the calibration, move the pointer to **ABORT CALIBRATION** and press the **ENTER** key.

11. After waiting a minimum of one minute, press **ENTER** to accept the reading of the StablCal standard. The displayed value is based on the previous calibration, and will be updated after the calibration is accepted. The number is displayed for stability purposes only.



12. If the calibration was performed correctly, the display will show **SUCCESSFUL CAL.** Press **ENTER** to accept the calibration and store it in non-volatile memory. If an improper calibration is detected, the message **QUESTIONABLE CAL** will be displayed.

Refer to *Section 6.4 Troubleshooting* in this manual for more information.

Note: *The Hold Outputs feature is automatically set to 5 minutes after a calibration is accepted or aborted, to allow time for the turbidimeter head to be placed on the body. To cancel Hold Outputs immediately, see Section 2.6.6 Hold Outputs.*

13. Replace the instrument head assembly on the turbidimeter body and press the **DISPLAY** key. The instrument is now calibrated.

14. Discard the StablCal standard according to the directions on the standard bottle. Rinse the calibration cylinder with deionized water and store upside down to minimize dust buildup.

3.2.3 Comparative Calibration Procedure

Calibration by comparison should be used only when a Formazin calibration kit is not available or when recommended or specified by regulatory agencies. This method permits the sample water turbidity to be determined using a laboratory turbidimeter. The value determined by the laboratory turbidimeter is then entered into the 1720D Turbidimeter and the slope of the existing 1720D calibration is adjusted. This practice is approved by the U.S. Environmental Protection Agency and Standard Methods.

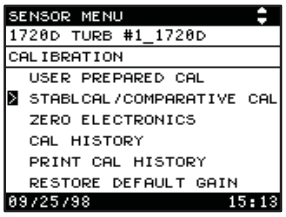
The accuracy of this method is valid only near the calibration point (the value read by the laboratory turbidimeter). The specified accuracy of the 1720D may not be valid over the full operating range when this calibration method is used.

- Before performing this method, make sure the laboratory turbidimeter to be used is calibrated properly with primary turbidity standards according to the manufacturer's directions.
- Sample cells for the laboratory instrument must be free from dirt, fingerprints and scratches.
- For greatest accuracy and convenience, move the laboratory instrument to a location close to the on-line unit(s) to be calibrated.
- Make sure the time between measurement with the laboratory turbidimeter and making adjustments on the on-line instrument is minimal.
- Clean the photocell window before taking readings and before calibration.
- Maintain the same physical conditions throughout the calibration.

Perform the comparative calibration method as follows:

Note: *The Hold Outputs feature is automatically enabled during the zero electronics and calibration procedure, holding attached SOM outputs at their pre-calibration settings.*

1. Zero the electronics as described in *Section 3.1.3*.
2. Press the **DISPLAY** key to return to the display mode.
3. Remove the head assembly from the turbidimeter body. Clean the photocell window per the instructions in *Section 5.1.2* on page *71*. Check the lamp and lens for scaling or filming, and clean them if necessary (see *Section 5.1 Scheduled Maintenance*).
4. Place the head assembly back on the turbidimeter body.
5. Take a grab sample from the 1720D sample outlet line.
6. Turn off the flow to the 1720D turbidimeter. Take care to avoid introducing air bubbles into the sample.
7. Record the current 1720D NTU reading.
8. Immediately measure the turbidity in the laboratory instrument and record the stable reading. If the 1720D reading differs from the laboratory turbidimeter reading by more than 5%, continue with the remaining steps of this procedure.



9. Press the **MENU** key to access the **MAIN MENU**. Select **SENSOR MENU** and press the **ENTER** key.

10. Select the sensor to be calibrated using the arrow keys and press **ENTER**.

11. Select **CALIBRATION** from the menu choices and press **ENTER**.

12. Move the pointer to **STABLCAL/COMPARATIVE CAL** and press **ENTER** to begin the calibration procedure. During calibration, the instrument will automatically switch to a 6-second signal average. After calibration, the signal average will revert to the value set prior to calibration.

13. The display will prompt **ENTER CALIBRATION STANDARD VALUE**. Use the arrow keys to enter the value displayed by the laboratory turbidimeter. Press **ENTER** to accept the calibration standard value.

14. The display will prompt **PLACE TURB HEAD ON CAL CYLINDER OR BODY**. Ensure the 1720D head is placed on the turbidimeter body.

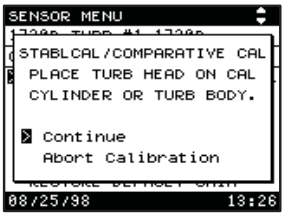
15. Press **ENTER** to begin reading the comparative solution or, to exit without updating the calibration, move the pointer to **ABORT CALIBRATION** and press the **ENTER** key.

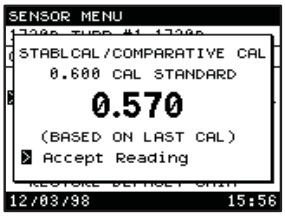
16. After waiting a minimum of one minute, press **ENTER** to accept the reading. The value displayed is based on the previous calibration, and will be updated after the calibration is accepted. The number is displayed for stability purposes only.

17. If the calibration was performed correctly, the display will show **SUCCESSFUL CAL.** Press **ENTER** to accept the calibration and store it in non-volatile memory. If an improper calibration is detected, the message **QUESTIONABLE CAL** will be displayed. Refer to *Section 6.4 Troubleshooting* in this manual for more information.

18. Press the **DISPLAY** key. The instrument is now calibrated.

Note: *The Hold Outputs feature is automatically set to 5 minutes after a calibration is accepted or aborted, to allow time for the turbidimeter head to be placed on the body. To cancel Hold Outputs immediately, see Section 2.6.6 Hold Outputs.*





3.2.4 ICE-PIC Non-Reporting Calibration Procedure

The optional ICE-PIC module allows the 1720D turbidimeter to be calibrated and verified without the use of formazin or StablCal standards. **This method is not approved as a primary calibration method by the U.S. Environmental Protection Agency or Standard Methods for reporting purposes**. It may be used, however, to calibrate for process control applications where agency reporting is not required (such as individual filter effluents in a drinking water plant).

Three ICE-PIC modules are available, however, only the 20.0-NTU ICE-PIC module is recommended for calibration where specified accuracy is required across the full operating range of the instrument.

- ICE-PIC Module, 20.0 NTU - Cat. No. 52250-00
- ICE-PIC Module, 1.0 NTU - Cat. No. 52215-00
- ICE-PIC Module, 0.5 NTU - Cat. No. 52225-00

Perform the ICE-PIC calibration method as follows:

Note: *The Hold Outputs feature is automatically enabled during the zero electronics and calibration procedure, holding attached SOM outputs at their pre-calibration settings.*

1. Zero the electronics as described in *Section 3.1.3*.

2. Press the **MENU** key to access the **MAIN MENU**. Select **SENSOR MENU** and press the **ENTER** key.

3. Select the sensor to be calibrated using the arrow keys and press **ENTER**.

4. Select **CALIBRATION** from the menu choices and press **ENTER**.

5. Move the pointer to **STABLCAL/COMPARATIVE CAL** and press **ENTER** to begin the calibration procedure. During calibration, the instrument will automatically switch to a 6-second signal average. After calibration, the signal average will revert to the value set prior to calibration.

6. The display will prompt **ENTER CALIBRATION STANDARD VALUE**. Use the arrow keys to enter **20.00**, followed by **ENTER** to accept the calibration standard value.

Note: *A 1.0-NTU or 0.5-NTU ICE-PIC Module may be used in place of the 20.0-NTU Module, however, the accuracy of this method is valid only near the calibration point. The specified accuracy of the 1720D may not be valid over the full operating range when this calibration method is used. Enter **1.000** or **0.500** if calibrating with a 1.0-NTU or 0.5-NTU ICE-PIC Module, respectively.*

7. The display will prompt **PLACE TURB HEAD ON CAL CYLINDER OR BODY**. Remove the head assembly from the turbidimeter body. Clean the photocell window per the instructions in *Section 5.1.2 Cleaning the Photocell Window*, and dry with a soft, lint-free cloth. Check the lamp and lens for scaling or filming, and clean them if necessary (see *Section 5.1 Scheduled Maintenance*).

8. Remove the protective cover from the ICE-PIC module. Do not touch any of the optical components of the ICE-PIC module, handle the device by the edges only. Place the ICE-PIC module into the turbidimeter body with the alignment tabs of the ICE-PIC module resting on the alignment pins of the turbidimeter body.

9. Place the turbidimeter head on the ICE-PIC module with the photodetector inserted into the hole in the top. Align the head assembly so the glass surface of the photodetector faces toward the center of the ICE-PIC module.

10. Press **ENTER** to begin reading the turbidity or, to exit without updating the calibration, move the pointer to **ABORT CALIBRATION** and press the **ENTER** key.

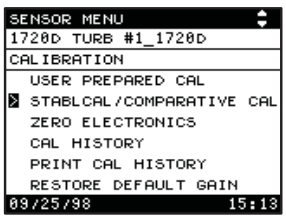
11. After waiting a minimum of one minute, press **ENTER** to accept the reading of the ICE-PIC module. The value displayed is based on the previous calibration, and will be updated after the calibration is accepted. The number is displayed for stability purposes only.

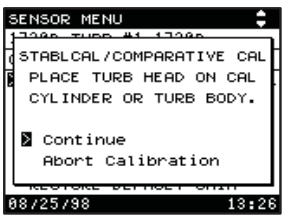
12. If the calibration was performed correctly, the display will show **SUCCESSFUL CAL.** Press **ENTER** to accept the calibration and store it in non-volatile memory. If an improper calibration is detected, the message **QUESTIONABLE CAL** will be displayed. Refer to *Section 6.4 Troubleshooting* in this manual for more information.

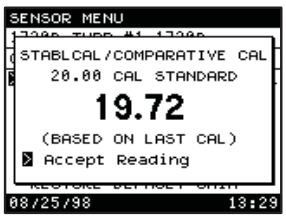
Note: *The Hold Outputs feature is automatically set to 5 minutes after a calibration is accepted or aborted, to allow time for the turbidimeter head to be placed on the body. To cancel Hold Outputs immediately, see Section 2.6.6 Hold Outputs.*

13. Remove the turbidimeter head from the ICE-PIC module and immediately replace the protective cover on the ICE-PIC module.

14. Replace the instrument head assembly on the turbidimeter body and press the **DISPLAY** key. The instrument is now calibrated.







3.2.5 Multiple Turbidimeter Calibration Procedure

This procedure allows up to 8 turbidimeters to be calibrated using a single 1-liter bottle of StablCal standard and one optional calibration cylinder. Each instrument must be calibrated sequentially (one after another), within one hour of opening the StablCal standard bottle. A new 1-liter bottle of StablCal is required for each additional set of 8 turbidimeters, to meet the published accuracy specifications of the 1720D turbidimeter.

An optional calibration kit containing all components necessary to calibrate up to 8 turbidimeters is available (Cat. No. 26596-00). This StablCal Calibration Kit contains a 1 liter bottle of 20.0-NTU StablCal, and a calibration cylinder. Individual components may also be ordered separately as indicated below:

- StablCal Standard, 20.0 NTU (1 L) - Cat. No. 26601-53
- Calibration Cylinder - Cat. No. 44153-00

Perform a multiple turbidimeter calibration as follows:

1. Gently mix a one liter bottle of 20.0-NTU StablCal standard. Pour it into a clean, dry calibration cylinder. Pour slowly and carefully to minimize bubbles.

Note: *The StablCal standard is premeasured into a 1-liter container. To use it, simply mix by inverting the bottle for 1 minute, then pour the entire contents into a calibration cylinder. Do not shake.*

2. Follow the instructions in *Section 3.2.2 StablCal Calibration Procedure* to calibrate the first turbidimeter. Do not discard the StablCal standard solution after this procedure.

3. Repeat step 2 for each additional turbidimeter (up to 8 total). If more than 8 turbidimeters are being calibrated, discard the StablCal standard after 8 turbidimeter calibrations according to the directions on the standard bottle. Rinse the calibration cylinder with deionized water and dry with a lint free cloth. Gently mix and pour a new one liter bottle of 20.0-NTU StablCal standard solution for the next 8 turbidimeters.

4. After all calibrations are complete, discard the StablCal standard according to the directions on the standard bottle. Rinse the calibration cylinder with deionized water and store upside down to minimize dust buildup.

3.3 Calibration Curve Verification Procedures

3.3.1 StablCal® Calibration Verification Procedure

This procedure is used to verify instrument accuracy below 1.0 NTU.

Note: *Use StablCal Standards for this procedure. Do not use other turbidity standards as they may not yield accurate results due to the nature of the materials used in the manufacture of these products.*

1. Turn off the sample flow to the turbidimeter.
2. Place a container underneath the turbidimeter body. Remove the drain plug from the bottom of the body (release the lock on the bottom of the plug and move the plug back and forth to ease it out) and drain the sample.
3. Perform the cleaning procedure specified in *Section 5.1.3* on page *72*. If the turbidimeter body is not clean this verification will not work.
4. After cleaning, replace the plug and lock it into place.
5. Gently invert a 1-liter bottle of 1.0 NTU StablCal Standard 50 times. Invert carefully to avoid creating bubbles in the standard. Do not shake!
6. Carefully pour just enough of the 1.0 NTU StablCal Standard into the turbidimeter body to bring the level up to the overflow weir (inside the turbidimeter body). This will equal approximately 1 liter.
7. Check the photocell for film or debris. Clean if necessary (see *Section 5.1.3*).
8. Place the turbidimeter head on the body. Make sure the head is seated properly by ensuring it is lined up with the bubble trap cover.
9. Wait approximately 3-5 minutes for any bubbles to dissipate and the reading to stabilize.
10. The displayed value should be 1.00 ±0.05 NTU (0.95-1.05 NTU).

Note: *The accuracy of the StablCal Standard is ±0.05 NTU (0.95-1.05 NTU).*

11. If the reading is not 1.00 ±0.05 NTU (0.95-1.05 NTU), recalibrate the instrument.
12. Discard the StablCal Standard per the instructions on the package and rinse the turbidimeter body well with deionized water. Restore the flow.

3.3.2 ICE-PIC Calibration Verification Procedure

The optional ICE-PIC module offers a quick and easy method of calibration verification. There is no need to stop or divert sample flow or to drain the turbidimeter body. To ensure instrument stability, the module is designed to be placed inside the 1720D turbidimeter body. The module may also be placed on a flat surface for use.

Three ICE-PIC modules are available, however only the 20.0-NTU ICE-PIC module is recommended for verification of the 1720D turbidimeter.

- ICE-PIC Module, 20 NTU - Cat. No. 52250-00
- ICE-PIC Module, 1.0 NTU - Cat. No. 52215-00
- ICE-PIC Module, 0.5 NTU - Cat. No. 52225-00
- ICE-PIC Module 3-pack (0.5, 1.0, and 20 NTU) Cat. No. 52003-00

Perform an ICE-PIC module calibration verification as follows:

1. Activate the Hold Outputs feature to hold attached SOM outputs at their pre-verification settings. See *Section 2.6.6 Hold Outputs* on page *30*.

2. Remove the head assembly from the turbidimeter body.

3. Use a soft, lint-free cloth to remove ALL moisture from the photodetector and the turbidimeter head. Do not allow any moisture to remain on the photodetector or turbidimeter head. Moisture introduced into the components of the ICE-PIC module will negatively affect performance. The module will not operate properly if the optical components have scratches, smudges, water drops, or other debris on them.

4. Place the ICE-PIC module into the turbidimeter body with the alignment tabs of the ICE-PIC module resting on the alignment pins of the turbidimeter body.

5. Remove the protective cover from the ICE-PIC module. Do not touch any of the optical components of the ICE-PIC module. Handle the device by the edges only.

6. Place the turbidimeter head on the ICE-PIC module with the photodetector inserted into the hole in the top. Align the head assembly so the glass surface of the photodetector faces toward the center of the ICE-PIC module.

7. After waiting a minimum of one minute, record the displayed turbidity value. The table below shows the acceptable NTU values for each available ICE-PIC module:

ICE-PIC Module	Cat. No.	ICE-PIC Accuracy	Acceptable Low Range NTU Value	Acceptable High Range NTU Value
20-NTU	52250-00	20 NTU ±10%	18.0	22.0
1.0-NTU	52215-00	1.0 NTU ±10%	0.90	1.10
0.5-NTU*	52225-00	0.5 NTU ±10%	0.45	0.55

* Not recommended for calibration of the 1720D turbidimeter.

8. If the reading is within the specified range, the calibration verification is complete. If the reading is not within specifications, recalibrate the turbidimeter with StablCal® Stabilized Formazin or user-prepared Formazin and repeat this procedure. Refer to the ICE-PIC module manual for more information.

9. Remove the turbidimeter head from the ICE-PIC module and immediately replace the protective cover on the ICE-PIC module.

10. Remove the ICE-PIC module from the turbidimeter body.

11. Reinstall the turbidimeter head on the turbidimeter body.

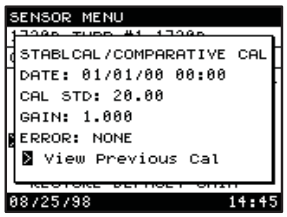
12. Deactivate the Hold Outputs feature. See *Section 2.6.6* on page *30*.

3.4 Calibration History

3.4.1 Viewing the Calibration History Log

The view calibration history log feature allows the details of the last 8 calibrations to be displayed on the AquaTrend. Calibrations are added so that the newest calibration is displayed first, and the oldest calibration is displayed last. After 8 calibrations, the oldest calibration is deleted.

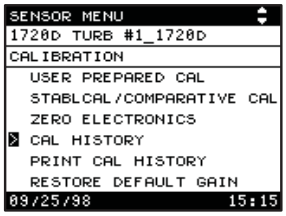
The details displayed in each calibration log entry include:

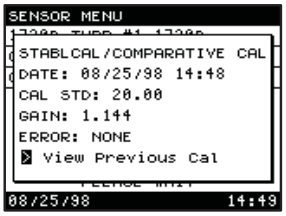


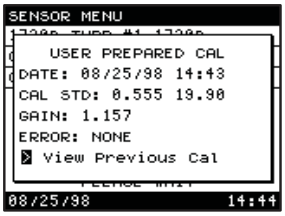
- Calibration type: User-prepared Cal or StablCal/Comparative Cal
- Date and time: Date/time calibration was completed
- Calibration Standard: Dilution water and the standard are displayed for User-Prepared Cal
- Gain Correction factor: 1.0 indicates default calibration
- Error: See *SECTION 6 TROUBLESHOOTING* in this manual for more information.

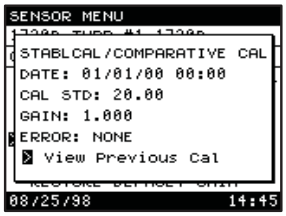
To view the details of the last 8 calibrations, perform the following steps:

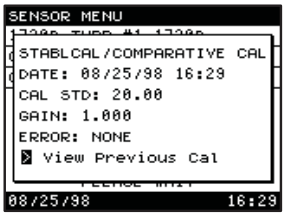
1. Press the **MENU** key to access the **MAIN MENU**. Select **SENSOR MENU** and press the **ENTER** key.
2. Select the desired sensor using the arrow keys and press the **ENTER** key.
3. Select **CALIBRATION** from the menu choices and press **ENTER**.
4. Move the pointer to **CAL HISTORY** and press **ENTER**. The details of the latest calibration are displayed.
5. If the details of another calibration are available, the prompt shows **VIEW PREVIOUS CAL**. Press **ENTER** to view the previous calibration. Repeat this step until all calibration details have been viewed, or press **EXIT** to return to the calibration menu.
6. At the final calibration history screen, the prompt shows **RETURN**. Press **ENTER** to return to the calibration menu.











3.4.2 Printing Calibration History Log

The print calibration history log feature allows the details of the last 8 calibrations to be sent to a computer or printer via the SIO. Calibrations are printed so that the newest calibration is printed first, and the oldest calibration is printed last. The time/date of each calibration separates each calibration log entry. The same information displayed in *Section 3.4.1* is printed.

To print the details of the last 8 calibrations, perform the following steps:

1. Press the **MENU** key to access the **MAIN MENU**. Select **SENSOR MENU** and press the **ENTER** key.
2. Select the desired sensor using the arrow keys and press the **ENTER** key.
3. Select **CALIBRATION** from the menu choices and press **ENTER**.
4. Move the pointer to **PRINT CAL HISTORY** and press **ENTER**. The display shows **PLEASE WAIT** while the calibration history log is printed.

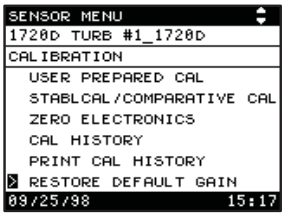
A sample printout is shown below:

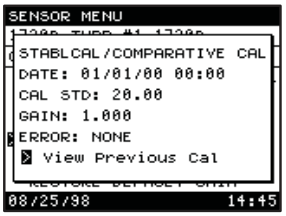
```
[1]HACH 1720D V2.1 #1_1720D
[1]DATE: 08/20/98 10:14
[1] USER PREPARED CAL
[1] CAL STD: 0.035 19.90
[1] GAIN: 1.059E0
[1] ERROR: NONE
[1]DATE: 08/20/98 09:54
[1] USER PREPARED CAL
[1] CAL STD: 0.056 19.90
[1] GAIN: 1.343E0
[1] ERROR: NONE
[1]DATE: 08/20/98 08:23
[1] STABLCAL/COMPARATIVE CAL
[1] CAL STD: 20.0
[1] GAIN: 1.033E0
[1] ERROR: NONE
[1]DATE: 08/20/98 8:14
[1] USER PREPARED CAL
[1] CAL STD: 21.52 19.90
[1] GAIN: 1.259E0
[1] ERROR: DI WATER > 10
```

3.5 Restoring the Default Gain

The default calibration gain can be restored by selecting **RESTORE DEFAULT GAIN** from the calibration menu, then selecting **YES**. This selection sets the calibration gain (also called the calibration correction factor) back to 1.0. This is useful when a calibration has been done improperly and 100 NTU or -100 NTU are always displayed. Note that the default gain is NOT the factory calibration, so the instrument must be calibrated after performing this operation. See *Section 3.2* on page *47* for calibration procedures.

The following screen is displayed in the calibration history log after a restore default gain operation has been performed.





3.6 Preparing Formazin Standards

DANGER
To familiarize yourself with handling precautions, dangers and emergency procedures, always review the Material Safety Data Sheets prior to handling containers, reservoirs, and delivery systems that contain chemical reagents and standards. Protective eye wear always is recommended when contact with chemicals is possible.

ADVERTENCIA
Para familiarizarse con las precauciones de manipulación, los peligros y los procedimientos de emergencia, siempre estudie las Hojas de Datos de Seguridad de los Materiales antes de manipular recipientes, depositum y systemizes de entrega que contengan reactivos y patrones químicos. Siempre se recomienda el uso de protectores oculares cuando sea posible el contacto con productos químicos.

AVISO
Para familiarizar-se com as precauções de manipulação, riscos e procedimentos de emergência, examine sempre o Folheto de Dados de Segurança antes de manipular os recipientes, tanques e sistemas de distribuição que contenham reagentes químicos e outros elementos padronizados. Se recomenda sempre o uso de protetores para olhos, quando possa acontecer contato com os produtos químicos.

ATTENTION
Pour se familiariser avec les précautions à prendre lors de la manipulation, les dangers et les procédures d'urgence, toujours lire les Fiches de Données de Sécurite de manipuler les récipients, les réservoirs et les systèmes de distribution contenant les réactifs chimiques et les solutions étalons. Il est toujours recommandé de porter des lunettes de protection lorsqu'un contact avec les produits chimiques est possible.

WARNHINWEIS
Es wird dringend empfohlen, die Sicherheitsdatenblätter vor der Handhabung von Behältern, Tanks und Zufuhrsystemen, die chemische Reagenzien und Standardsubstanzen enthalten, aufmerksam durchzulesen, damit Sie sich mit den beim Umgang mit diesen Chemikalien notwendigen Vorsichtsmaßnahmen, Risiken und Notfallschutzmaßnahmen vertraut machen, Es wird empfohlen, in allen Situationen, in denen mit einem Kontakt mit Chemikalien zu rechnen ist, eine Schutzbrille zu tragen.

Formazin is the recognized primary standard for turbidity. Formazin standards can be prepared at turbidity values up to 4000 NTU. A 4000 NTU formazin stock solution is available and can be diluted to the appropriate NTU values, see *Section 3.6.2 Preparing Dilute Formazin Standards* for dilution instructions.

Reagents and apparatus are available from Hach. Obtain descriptions and catalog numbers from *REPLACEMENT PARTS AND REAGENTS* on page *93*.

Formazin stock solution can be made on-site as detailed in *Section 3.6.1* (refer to the MSDS supplied with the formazin for appropriate safety equipment and precautions).

3.6.1 Preparing 4000 NTU Formazin Stock Solution

If you prefer to make the 4000 NTU formazin stock solution instead of purchasing it from Hach, use the following procedure. Very accurate measurements and consistent lab techniques must be used. Do not deviate from the presented procedure.

Required Reagents and Apparatus:

- Hydrazine sulfate ($N_2H_4 \cdot H_2SO_4$), reagent grade, 5.000 g
- Hexamethylenetetramine, pure, 50.000 g
- Volumetric flask, 1-liter, 1
- Volumetric flask, 500-mL, 1

1. Dissolve 5.000 grams of reagent grade hydrazine sulfate ($N_2H_4 \cdot H_2SO_4$) in the Class A 1-liter flask containing about 400 mL of ultra-filtered deionized water.

2. Dissolve 50.000 grams of pure (>99% purity) hexamethylenetetramine in the 500-mL flask containing about 400 mL of ultra-filtered deionized water.

3. Pour the hexamethylenetetramine solution into the 1-liter volumetric flask containing the hydrazine sulfate solution. Rinse the flask that contained the hexamethylenetetramine with small aliquots of ultra-filtered deionized water, adding these rinsings to the hydrazine sulfate solution. Dilute to the mark with ultra-filtered deionized water.

4. Stopper the flask and gently invert several times to mix.

5. Allow the solution to stand for 48 hours at 25 ±1 °C (68 to 72 °F). During this time, the white polymer suspension will develop. The resulting standard is 4000 NTU.

6. Immediately before dilution, invert the flask containing the stock suspension to mix.

7. Dilute the stock suspension before use with ultra-filtered deionized water to achieve a standard of the desired NTU value.

3.6.2 Preparing Dilute Formazin Standards

Dilution rates for several standard suspensions are listed below. Clean glassware and precise measurements are critical in accurately preparing standards. Dilution water purity also is extremely important. Thoroughly mix the 4000 NTU stock suspension before removing a portion for dilution.

NTU Value	mL of 4000 NTU Stock per Liter
100	25.0
50	12.5
20	5.0
10	2.5
4	1.00
2	0.50

Example:
To prepare a 20.0 NTU standard, use a Class A pipet to measure 5.00 mL of 4000 NTU stock solution into a 1-liter flask. Fill to the mark with ultra-filtered dilution water. Stopper the flask and invert several times to mix.

Notes

- Making standards below 2 NTU is not recommended. The level of precision and cleanliness required makes accurate and repeatable preparation of low turbidity standards very difficult. Discrepancies between the intended value of the standard and the instrument reading may be substantial and are therefore not reliable for checking instrument accuracy.
- Dilution water turbidity may be significant in the preparation of a 2 NTU standard. Ultra-filtered water prepared through a 0.2 µm filter is recommended. Measure the dilution water turbidity on a calibrated laboratory turbidimeter. Add the dilution water turbidity to the nominal value of the standard prepared.
- Formazin standards at 2 NTU are stable for only a short time. Prepare standards immediately before use and discard after use. These standards cannot be stored for long-term use.

INSTALLATION/MAINTENANCE

DANGER

Some of the tasks in this section of the manual have safety issues associated with them. Because the potential for injury to individuals and equipment exists when these safety issues are not addressed, Hach Company strongly recommends that qualified personnel conduct the installation, and that all installation personnel review the associated instructions carefully.

PELIGRO

Algunas de las tareas comprendidas en esta sección del manual pueden ocasionar daños a las personas y al material si no observan la medidas de suguridad. Hach Company recomienda encarecidamente que el material sea instalado por un personal cualificado y que el personal encargado de la instalación lea atentamente estas instrucciones.

PERIGO

A execução de algumas tarefas previstas nesta secçao do manual pode causar ferimentos às pessoas ou estragos no equipamento se não forem observadas precauções de suranca. A Hach Company recomenda vivamente que o equipmento seja instalado por pessoal qualificado e que todas as pessoas afectadas à sua instalação leiam atentamente estas instruções.

DANGER

Certaines tâches dans ce chapitre du mode d'emploi peuvent causer des blessures aux personnes et endommager le matériel si les consignes de sécurité ne sont pas suivies. Hach Company recommande vivement que l'installation soit faite par du personnel qualifié et que toutes les personnes effectuant l'installation lisent attentivement ces instructions.

GEFAHR

Einige der in diesem Abschnitt der Betriebsanleitung beschriebenen Arbeiten können bei Nichtbeachtung der Sicherheitsvorschriften zu Verletzungen von Personen oder Schäden am Gerät führen. Es wird dringend empfohlen, die Installation ausschließlich von qualifiziertem Personal duchführen zu lassen; mit der Installation befaßte Personen sollten diese Anweisungen aufmerksam lesen.

SECTION 4 INSTALLATION

4.1 ⚠ General Installation Information

The nature of tasks described in this section of the manual require individuals to be technically knowledgeable of the associated dangers. Burns, shock, eye damage, fire and chemical exposure may occur if this work is not done by qualified personnel. Hach Company assumes individuals performing these tasks are qualified and aware of proper safety procedures. Always review appropriate Material Safety Data Sheets (MSDS) before working with chemicals.

DANGER
This instrument should be installed by qualified technical personnel to ensure adherence to all applicable electrical and plumbing codes.

ADVERTÊNCIAO
Este instrumento debe ser instalado por personal técnico capacitado para asegurar elo cumplimiento con todos los códigos eléctricos y de plomería aplicables.

ADVERTENCIA
Este instrumento deve ser instalado por pessoal técnico qualificado para asergurar o cumprimento de todas as normas elétricas e de canalização aplicáveis.

ATTENTION
Cet appareil doit être installé par du personnel technique qualifié, afin d'assurer le repect de toutes les normes applicables d'électricité dt de plomberie.

WARNHINWEIS
Um zu gewährleisten, daß alle elektrischen und sanitärinstallationstechnischen VDE-Vorschriften und gegebenefalls die Zusatzvorschriften der zuständigen Elektrizitäts- und Wasserwerke erfüllt werden, darf dieses Gerät nur von geschultem Fachpersonal installiert werden.

4.2 Environmental Requirements

The 1720D Turbidimeter body and head assembly may be installed in most water treatment and industrial locations that are protected from exposure to extreme conditions and changes in temperature.

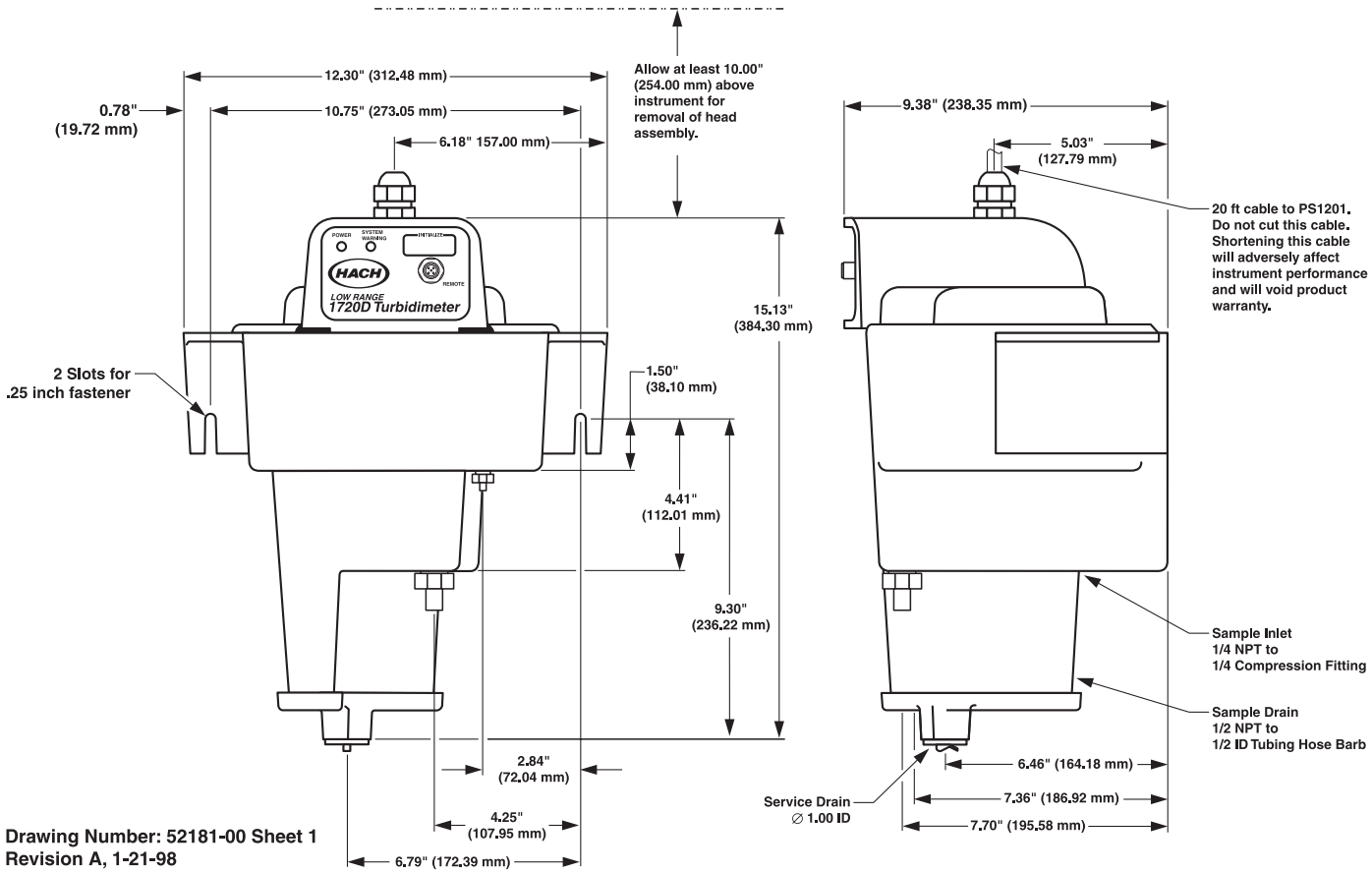
The AquaTrend® Interface Module and PS1201 Power Supply enclosures are designed for indoor installation. Ambient temperatures may range from 0 to 40 °C (32 to l04 °F) but best performance will result if temperatures do not change rapidly.

Do not mount in direct sunlight; high internal temperatures will damage the instrument.

4.3 Mounting Information

The turbidimeter body is designed for wall-mounting (although it may be mounted on the optional floor stand). **The turbidimeter sensor must be mounted within 20 feet of the power supply.**

Figure 6 1720D Dimensions



4.3.1 Mounting the Turbidimeter Body

The turbidimeter sensor should always be located as close to the sampling point as possible. The shorter the distance traveled by the sample to the turbidimeter, the faster the turbidimeter can respond and indicate changes in sample turbidity.

Clean the turbidimeter body and bubble trap before mounting using the instructions supplied in *Section 5.1.3, Cleaning the Turbidimeter Body and Bubble Trap*. Slotted mounting brackets are integral parts of the turbidimeter body. Hardware to mount the body is not supplied with the instrument. Allow at least 22 cm (approximately 10 inches) clearance for removal of the head assembly and bubble trap cover from the top of the turbidimeter body.

Leave enough room below the turbidimeter body to remove the bottom plug and to place a container under the drain when calibrating or cleaning the turbidimeter.

Note: *Make sure the top of the turbidimeter body is level.*

Install two ¼"-20 bolts 10-3/4 inches apart (on center). Leave at least ¼" of the bolt head exposed. Make sure these bolts are installed level. Hang the slotted mounting brackets of the turbidimeter body onto the bolts.

4.3.2 Installing the Head Assembly

After the power supply and turbidimeter body have been mounted and connected on-line, install the bubble trap cover, then place the head assembly on the turbidimeter body with the label facing the front. Move the head assembly back and forth slightly to ensure it is properly seated on the body of the instrument. Failure to properly seat the head will result in light leakage and erroneous readings.

The rear portion of the head assembly has a molded “lip” which may be used to hang the head assembly on the turbidimeter body edge for routine maintenance. See *Figure 3* on page *17*.

4.4 Electrical Connections

All electrical connection information is presented in the PS1201 Power Supply Manual, Cat. No. 52010-18. **Do not change the length of the cable between the PS1201 and the turbidimeter head. Increased voltage at the turbidimeter head will result, potentially damaging the instrument.**

4.5 ⚠ Installing a Sample Line

DANGER
The 1720D Turbidimeter is not designed for use with samples that are flammable or explosive in nature. If any sample solution other than water is used in this product, test the sample/product compatibility to assure user safety and proper product performance.

ADVERTÊNCIAO
Turbidímetro 1720D não é concebido para uso com amostras que sejam inflamáveis ou explos-ivas. Se qualquer solução que não seja de água se usar neste produto, dever-se-á ensaiar a compati-bilidade da amostra/produto para garantir segurança ao usuário e desempenho correto do produto.

ADVERTENCIA
El Turbidímetro 1720D no está diseñado para usarse con muestras de naturaleza inflamable o explosiva. Si se empleara en este producto alguna solución de muestra que no fuera a base de agua, ponga a prueba la compatibilidad de la muestra/producto, para cerciorarse de la seguridad y del correcto funcionamiento del producto.

ATTENTION
Le turbidimètre 1720D n'est pas prévu pour utilisation avec des échantillons de nature inflammable ou explosive. Pour toute solution d'échantillon autre que de l'eau utilisée avec cet appareil, tester la compatibilité échantillon/appareil pour assurer la sécurité de l'utilisateur et le fonctionnement correct de l'appareil.

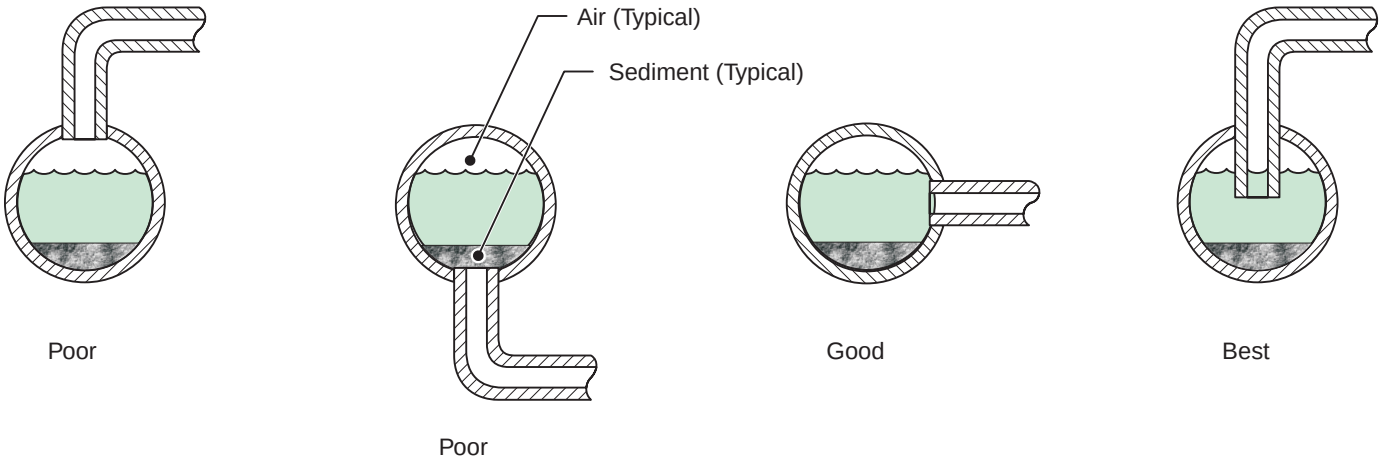
WARNHINWEIS
Das Trübungsmeßgerät 1720D darf nicht in Verbindung mit Proben benutzt werden, die entflammbar oder explosiv sind. Wenn irgendeine andere Lösung als Wasser in dem Gerät analysiert werden soll, muß die Proben/Gerät-Kompabilität getestet werden, um die Sicherheites Benutzers und korrektes Arbeiten des Gerätes zu gewährleisten.

Note: *When setting the flow rate, take care to avoid sweeping air “micro-bubbles” through the internal bubble trap. Observe the sample flow inside the turbidimeter body. If small air bubbles can be seen flowing up through the center, reduce the flow rate.*

One-fourth inch O.D. rigid or semi-rigid tubing is recommended for sample lines. Run them as directly as possible between the turbidimeter body and the sampling point to minimize sample flow lag time.

Install sample line taps into larger process pipes to minimize interference from air bubbles or pipeline bottom sediment. A tap projecting into the center of the pipe is ideal. *Figure 7* shows examples of good and poor methods of installing a sample tap.

Figure 7 Sampling Techniques



4.6 Hydraulic Connections

Sample inlet and drain connections are made on the turbidimeter body. The sample inlet fitting installed in the body is a ¼" NPT x ¼" compression fitting. One additional fitting supplied with the instrument is a ½" NPT-to-hose fitting for use with ½" ID flexible plastic tubing on the drain.

The required flow rate is 250-750 mL/minute (4.0 to 11.9 gal/hour). Flow rate into the turbidimeter may be controlled with a flow restriction device on the inlet line. Flow rates below 250 mL/min will reduce response time and cause inaccurate readings. Flow rates above 750 mL/min will cause the turbidimeter to overflow, indicating the flow rate is too high. See *Section 6.7* on page *79*.

4.7 System Power On

Ensure the head is seated on the body when power is applied, since dark readings are measured at this time. After all connections have been completed and checked, place the head on the body and supply power to the system. If power is applied while the sensor head is off the turbidimeter body, cycle the power with the sensor head on the body. See *Zero Electronics* on page *46*.

4.8 Starting Sample Flow

Start sample flow through the instrument by opening the sample supply valve. Allow the turbidimeter to run long enough for the tubing and body to become completely wetted and the reading on the display to stabilize. One to two hours may be required initially for complete stabilization.

SECTION 5 MAINTENANCE

⚠ ***CAUTION***
Maintenance should be performed by qualified technical personnel to ensure adherence to all applicable electrical and plumbing codes.

PRECAUCION
El mantenimiento debe ser realizado por personal técnico capacitado a fin de cumplir con todos los códigos eléctricos y de plomería aplicables.

PRECAUÇÃO
A manutenção deve ser efetuada por pessoal técnico qualificado a fim de se ajustar a todas as normas elétricas e de canalização aplicáveis.

PRUDENCE
Toute maintenance doit être effectuée par du personnel technique qualifié, afin d'assurer le respect de toutes les normes applicables d'électricité et de plomberie.

VORSICHT
Um zu gewährleisten, daß alle elektrischen und sanitärinstallationstechnischen Anschlüsse den VDE-Vorschriften und gegebenenfalls den Zusatzvorschriften der zuständigen Elektrizitäts- und Wasserwerke entsprechen, dürfen Wartungsarbeiten nur von geschultem Fachpersonal vorgenommen werden.

5.1 Scheduled Maintenance

Note: *Periodic calibration on a formazin primary standard is recommended for best accuracy. Hach Company recommends using StablCal Standards for ease of use. The user may also prepare their own standards (refer to Section 3.6 Preparing Formazin Standards).*

Scheduled periodic maintenance requirements of the 1720D are minimal and include calibration and cleaning of the photocell window, bubble trap, and body. Check and clean the bubble trap and turbidimeter body (as described in *Section 5.1.3*) if visual inspection shows that it is necessary. Perform other maintenance on a regular basis; experience will dictate scheduling and may depend on the installation, sample type, and season.

It is very important to maintain the cleanliness of the interior and exterior of the turbidimeter body, head assembly, the integral bubble trap, and the surrounding area. Doing so will ensure accurate, low-level turbidity measurements.

Clean the body before calibration verification and before calibration (especially at levels of 1.0 NTU or lower).

5.1.1 Calibration

Check and/or perform a calibration periodically (as experience dictates) by one of the methods described in *Section 3.1.* See *Section 3.4 Calibration History* on page *58* to see when the instrument was last calibrated.

5.1.2 Cleaning the Photocell Window

Occasional cleaning of the photocell window is required. The frequency of the cleaning will depend on the nature and concentration of dissolved and suspended solids in the sample. Biological activity is a primary factor in mineral scale deposit on the window and the amount differs with sample temperature. In general, more growth will occur in warm temperatures and less in cold.

Note: *Do not scratch the photocell window.*

Inspect the photocell window often to determine cleaning needs. Remove any organic growth or film on the photocell window before standardization or calibration. Use a cotton swab and isopropyl alcohol or a mild detergent (such as Liqui-nox®) to remove most sediment and dirt. Mineral scale buildup may require cleaning with a mild acid applied with a cotton swab followed by a detergent wash. **Do not use abrasive cleaners.**

5.1.3 Cleaning the Turbidimeter Body and Bubble Trap

Sediment may collect in the turbidimeter body after extended use. Noise (fluctuation) in the reading could indicate the need to clean the body and/or bubble trap. The 1720D bubble trap and bottom plate may be removed to make cleaning easier. Drain and clean the turbidimeter body on a regular schedule or as determined by visual inspection to remove accumulated sediment as follows:

Cleaning the Turbidimeter Body

1. Turn off sample flow to the turbidimeter body.

2. Remove the head assembly and bubble trap cover from the body. Remove the bubble trap by lifting it vertically. Set it aside to be cleaned separately.

3. Drain the body by removing the plug from the bottom of the body.

4. Replace the drain plug and fill the body to the weir with cleaning solution. This cleaning solution can consist of dilute chlorine solution (25 mL of household bleach in 3.78 liters of water) or a laboratory detergent such as Liqui-nox (1 mL detergent in 1 liter of water).

5. Use a soft brush to clean the inside surfaces of the body.

6. Remove the drain plug again and thoroughly flush the turbidimeter body with ultra-filtered deionized water. Clean and replace the plug.

Cleaning the Bubble Trap

1. Prepare a cleaning solution (as in step *4* above) in a container large enough to submerge the entire bubble trap.

2. Using a test tube brush such as Cat. No. 690-00, clean each surface.

3. Rinse the bubble trap thoroughly with ultra-filtered deionized water and reinstall it back into the turbidimeter body.

4. Replace the bubble trap cover and head assembly on the top of the body.

5. Restore sample flow to the instrument.

6. Calibrate the instrument using one of the methods in *Section 3.1*.

If the above cleaning procedures have been performed and the turbidimeter readings are still noisy, the bottom plate and gasket may need to be removed and cleaned. Carefully perform the following procedure to ensure the integrity of the turbidimeter body is maintained.

1. Turn off sample flow to the turbidimeter body.

2. Remove the head assembly, bubble trap cover, and bubble trap (by lifting it vertically) from the body.

3. Drain the body by removing the plug from the bottom of the body.

4. Lift the body off of its mounting screws.

5. With the body turned upside-down, remove the two Phillips-head screws holding the bottom plate.

6. Lift the bottom plate off the body; set the gasket aside for use in reassembly.

7. Use a soft brush and a dilute cleaning solution (as prepared above) to clean the bottom plate and inside surfaces of the turbidimeter body. Rinse the entire body and bottom plate with ultra-filtered deionized water.

8. Reassemble by inserting the gasket into the molded channel in the bottom plate.

9. Fit the bottom plate onto the turbidimeter body.

10. Reinstall both screws and carefully tighten to 15 inch-lb maximum.

11. Reinstall the turbidimeter onto the wall mounting screws.

12. Replace the bubble trap, bubble trap cover, and head assembly on the top of the body.

13. Restore sample flow to the instrument.

5.1.4 Lamp Replacement

The Lamp Assembly is located on the head assembly see *Figure 8* on page *74*. Under normal use, Hach recommends replacing the lamp once a year to maintain peak performance. Replacement bulbs have been “burned-in” at the factory and are ready for installation and use.

To change the lamp, perform the following steps:

1. With the instrument power off, disconnect the lamp leads by unplugging the connector.

2. After the bulb has cooled, remove as follows:

   a. Wear cotton gloves to protect your hands and to avoid fingerprints on the bulb.

   b. Grasp the bulb with the fingers of one hand.

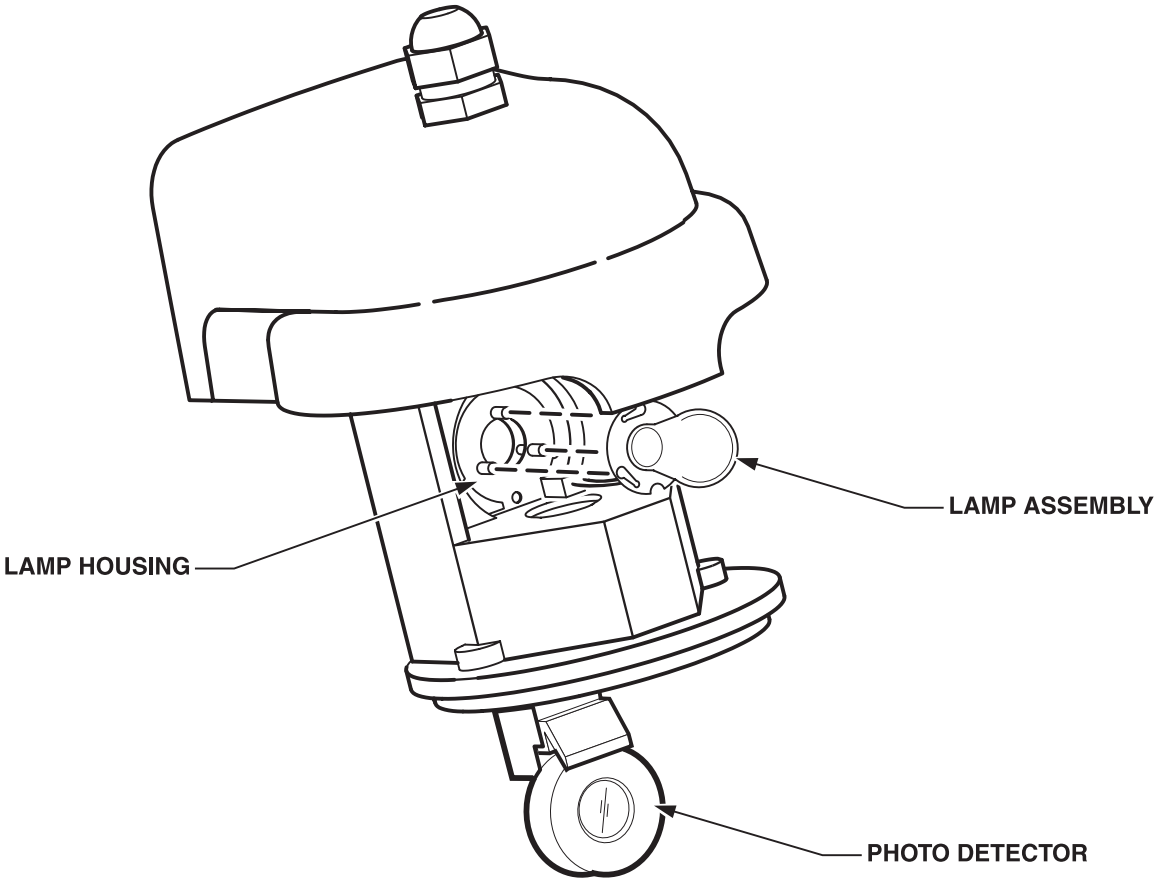
   c. Twist the bulb in a counterclockwise direction, pulling out slightly, until it is released from the housing.

   d. Pull the lamp leads and connector through the hole in the lamp housing.

Do not touch the new bulb with bare hands. Etching of the glass and reduced lamp life will result. Wear cotton gloves or grasp the lamp assembly with a tissue to avoid contamination. If contamination occurs, clean the glass bulb portion with isopropyl alcohol.

Replace the bulb by reversing the above instructions. The bulb base only fits one way; align the notch in the metal bulb flange with the hole in the lamp holder (see *Figure 8* on page *74*).

Figure 8 Lamp Replacement



SECTION 6 TROUBLESHOOTING

6.1 Introduction

The 1720D Turbidimeter incorporates a number of self-diagnostic functions to monitor key performance parameters. Continuous diagnostic functions are used to detect system failures and to actuate sensor warnings. The Alarm Log stores pertinent information about alarms and sensor warnings, and in many cases, indicates the nature of the failure.

6.1.1 Power Indicator

During normal operation, the green power LED on the turbidimeter head assembly is lit, indicating power is being supplied to the 1720D *Figure 3* on page *17*.

If the power LED is off, there is no power being supplied to the 1720D or the wiring is not properly connected. Refer to the PS1201 Power Supply manual (Cat. No. 52010-18) for detailed wiring information.

6.1.2 Configure LED

The yellow configure LED provides information about the state of the device. The following table describes the state of the device after power up and assumes the **CONFIGURE** button is not being held down.

Configuration LED	Device State	Description/Action
Flashing steady once per second	Unconfigured	Refer to *Section 2.4* for configuration instructions
Steady Off	Configured	Normal operational state
Steady On	Microprocessor not functioning properly	Call the Hach Service Department
Erratically flashing	Microprocessor not functioning properly	Call the Hach Service Department

The configure LED also lights when the **CONFIGURE** button is pressed and held.

6.1.3 Status Indicator

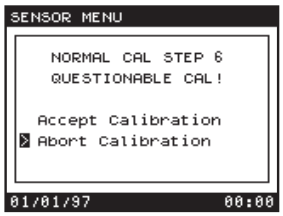
The yellow Status Indicator blinks once every three seconds (corresponding to when a measurement is taken) in normal operation. The Status Indicator lights steady when the sensor is in an alarm condition, or when a malfunction has prevented instrument operation. Alarms associated with a specific sensor are shown in the alarm log along with additional pertinent information.

6.2 Underrange/Overrange

If the sample being measured is outside the instrument range (0-100 NTU), an underrange or overrange condition may occur.

- Underrange is indicated by a negative reading, and typically indicates an improper calibration, failure to zero electronics properly, or a burned-out lamp.
- Overrange is indicated by a continuous reading of 100 NTU, and typically indicates an improper calibration or that the sample being measured is more turbid than 100 NTU.

6.3 Questionable Cal

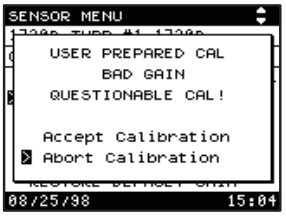


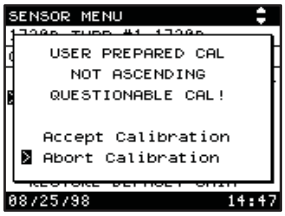
If the 1720D detects a potential problem during the calibration procedure, the message **QUESTIONABLE CAL!** is displayed during the last step of the calibration procedure.

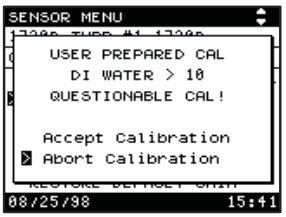
If the calibration is accepted at this point, the error entry in the **CAL HISTORY** screen will display one of the following errors. These errors can only be cleared by recalibrating the instrument.

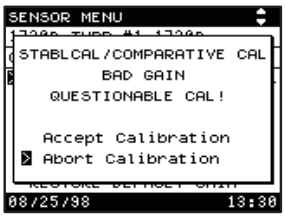
CAL Error	Possible Cause	Corrective Action
None	No calibration error detected.	None
Bad Gain	Gain is out of recommended limits. Valid gain values are 0.5 to 2.0.	Check the calibration standards and repeat the procedure.
		If the problem persists, replace the lamp (see *Section 5.1.4* on page *73*).
Not Ascending	Calibration standards were read out of order (highest value standard first).	Repeat the calibration procedure with the standards in the proper order.
Same Standard	Calibration standards (Deionized Water, 20 NTU) read the same turbidity value.	Repeat the calibration procedure with the proper standards.
Deionized Water > 10	The calculated NTU value of the deionized water is greater than 10.0 NTU.	Use filtered water if necessary and re-mix standards. Clean the calibration cylinder and repeat the calibration procedure.

The only error that will occur in the StablCal/Comparative Cal procedure is Bad Gain.









6.4 Troubleshooting

The following table presents sensor warnings displayed in the Alarm Log, their possible causes, and corrective actions. See *Section 2.8* on page *32* for information on accessing the Alarm Log.

Sensor Warning	Possible Cause	Corrective Action
Bad Lamp	Lamp burned out	Replace the lamp. See *Section 5.1.4* on page *73*
	Lamp unplugged	Restore Connection
	Red wire (+12 V) disconnected at power supply	Restore Connection
	Dislodged lamp	Reinstall lamp
	Bad circuit board in turbidimeter head	Contact the Hach Service Department
Low Signal	Photocell coated/dirty	See *Cleaning the Photocell Window* on page *71* Call the Hach Service Department
	Photocell wires disconnected	Reconnect wires
	Photocell broken/cracked	Replace photocell Contact the Hach Service Department
	Lens coated/dirty	Clean the lens using isopropyl alcohol and a cotton swab.
	Obstructed light path	Remove obstruction
	Sample turbidity >100 NTU	Switch to a high range turbidimeter (such as the Hach SS6)
	See Bad Lamp causes above	See Bad Lamp corrective actions above
Bad System Voltage	Improper wiring at power supply	See the PS1201 Power Supply manual (Cat. No. 52010-18)
	Turbidimeter head cable shortened to improper length	Contact Hach Service Department
	Fluctuation in power supply voltage	Turn power off and back on to the instrument
	Bad circuit board in turbidimeter head	Contact the Hach Service Department
A/D Converter Timeout	Fluctuation in power supply voltage	Turn power off and back on to the instrument
	Bad circuit board in turbidimeter head	Call the Hach Service Department
High Dark Counts	Light Leak—Turbidimeter head not on turbidimeter body or calibration cylinder during Power Up or Zero Electronics	Make sure the turbidimeter head is on the turbidimeter body and properly aligned and repower instrument or perform **ZERO ELECTRONICS** in the **CALIBRATION MENU**.
	Light Leak—Turbidimeter head not properly aligned on the turbidimeter body or calibration cylinder during Power Up or Zero Electronics	Make sure the turbidimeter head is properly aligned and repower instrument or perform **ZERO ELECTRONICS** in the **CALIBRATION MENU**.
	Photocell broken/cracked	Contact the Hach Service Department

The following table presents additional malfunctions which may not be recorded in the Alarm Log.

Symptom	Possible Cause	Corrective Action
Continuous Underrange (negative reading)	Calibration standards not in the correct order or incorrect dilution	Verify the accuracy of calibration standards and recalibrate the instrument. See Low Signal above.
Continuous Overrange (100 NTU)	Calibration standards not in the correct order or incorrect dilution	Verify the accuracy of calibration standards and recalibrate the instrument
Erratic Readings	Calibration standards have the same value	Verify the accuracy of calibration standards and recalibrate the instrument
High Readings	Deionized water turbidity is greater than 0.5 NTU	Clean the instrument (see *Section 5.1.3*) Access Calibration History for turbidity value of ultra-filtered water. Verify the flow is between 250 - 750 mL/min. Recalibrate the instrument
Readings shown as horizontal dashes on the display	Network wires disconnected or shorted	Reconnect network wires. Check for pinched or shorted network wires.
Sensor Menu not responding	Network wires disconnected or shorted	Reconnect network wires. Check for pinched or shorted network wires.

6.5 Cold Start

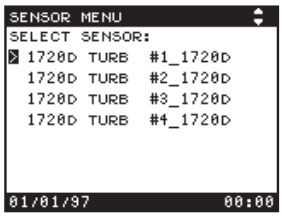
During the Cold Start procedure, the instrument erases and reprograms appropriate memory. The following device settings are replaced with the instrument default settings:

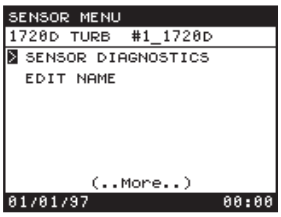
- Calibrations and calibration standard values
- Settings for Measurement Options
- Alarm levels, recorder min/max
- Sensor name

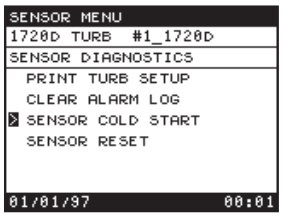
Network connections are NOT affected by the cold start procedure.

Perform a cold start as follows:

1. Press the **MENU** key to access the **MAIN MENU**.
2. Select **SENSOR MENU** and press the **ENTER** key.
3. Select the sensor to be cold started and press the **ENTER** key.
4. Select **SENSOR DIAGNOSTICS** from the Sensor Menu and press the **ENTER** key.
5. Move the pointer to **SENSOR COLD START** and press the **ENTER** key.







6. The display will show: **WARNING! RESTORE DEFAULT SETTINGS?** Select **YES** and press **ENTER** to accept.

7. Press the **DISPLAY** key to return to display mode.

At this point, the instrument will display turbidity readings based on a pre-programmed calibration curve. However, the instrument must be recalibrated to meet the accuracy specifications. A **CAL HISTORY** date and time of 00/00/00, 00:00 and gain setting of 1.0 indicates the pre-programmed calibration is in effect.

6.6 Unconfiguring the 1720D Turbidimeter

Use this procedure only if the AquaTrend will not remove the 1720D using the procedure in *Section 2.11*.

Proceed with caution! 1720D connections to the AquaTrend, SOM, and SIO will be removed by this procedure.

The manual unconfigure procedure does not change the following settings:

- Calibrations and calibration standard values
- Settings for Measurement Options
- Alarm levels, recorder min/max
- Sensor name

The 1720D network can be manually removed from the AquaTrend (and all network-applied parameters erased) with the following procedure:

1. Remove power from the 1720D; ensure the green Power LED is off.

2. Press and hold the configure button on the 1720D head (see *Figure 3*).

3. While holding the configure button down, restore power to the 1720D.

4. Release the configure button after 10 seconds.

The configure LED will begin to flash, indicating the 1720D is ready to be added to the AquaTrend network. See *Multiple Sensor System* on page *23* for information on adding the sensor to the network. Before adding the 1720D to the AquaTrend, it must be removed from the AquaTrend database. See *Removing a Device* on page *42*.

Refer to the *AquaTrend Interface Manual* for more information.

6.7 Water Overflow

A water overflow may be an indication of a flow rate into the turbidimeter inlet line in excess of published specifications or of a clogged outlet line.

Reduce the flow rate into the turbidimeter inlet line with a restriction device or remove the clog in the outlet.

APPENDIX A RS232 COMMANDS FOR THE 1720D

The following RS232 remote command set is available when an SIO is attached to the AquaTrend network. Window's Terminal or a SCADA program may be used to send/receive these commands. Refer to the SIO Manual (Cat. No. 52074-18) for more information on setting the baud rate, stop bits, etc.

Each command must be prefixed with the sensor number (1-8) or the SIO returns BAD CHANNEL. Sensor replies are prefixed with [x] where 'x' is the sensor number (1-8).

In the following examples, sensor number 1 is being used.

RS232 Calibration History

Recalls the current calibration historyincluding type of calibration, calibration date/time, calibration standard values and slope.

```
1RCH?
[1]HACH 1720D V1.0 #1 1720D
[1]TYPE: NORMAL CAL
[1]DATE: 01/01/97 00:00
[1]DI WATER: 0.041 NTU
[1]CAL STD: 20.0 NTU
[1]GAIN: 1.000
[1]ERROR: NONE
```

RS232 Instrument Setup

Recalls the current instrument setup parameters.

```
1RIS?
[1]HACH 1720D V1.0 #1 1720D
[1]ALARM 1
[1] TYPE: HIGH
[1] HYSTERESIS: 5%
[1] SET POINT: 100.
[1]ALARM 2
[1] TYPE: HIGH
[1] HYSTERESIS: 5%
[1] SET POINT: 100.
[1]RECORDER 1
[1] MIN: 0.000
[1] MAX: 100.
[1]RECORDER 2
[1] MIN: 0.000
[1] MAX: 100.
[1]BUBBLE REJECT: ON
[1]SIGNAL AVG: 30 SEC
[1]PRINT INTERVAL: 1 MIN
[1]TIME STAMP: ON
```

RS232 Measurement Reading

Recalls the current turbidity measurement in NTU.

If Time Stamp is OFF, the following is displayed:

```
1RMR?
[1]0.117
```

If Time Stamp is ON, the following is displayed:

```
1RMR?
[1] 01/01/97 00:00 0.117 NTU AW*
```

In the above example, `01/01/97` corresponds to the date; `00:00` corresponds to the time (24-hour format); `0.117` is the turbidity reading; `NTU` corresponds to the units of measure; and `AW*` indicates an alarm and/or sensor warning condition.

RS232 Instrument Name

This command sets or recalls the instrument name.

To set the name to FILTER 1, enter the following:

```
1RIN=FILTER 1
[1] OK
```

To recall the name:

```
1RIN?
[1] FILTER 1
```

RS232 Instrument ID

This command recalls the instrument ID string.

Enter the following:

```
1RID
[1] HACH 1720D V2.0
```

APPENDIX B 1720D SCADA SYSTEM CONNECTIONS

The 1720D process turbidimeter may be connected to Supervisory Control and Data Acquisition (SCADA) systems in a variety of ways. These consist of analog 4-20 mA current loops, RS232 connections, and LonWorks® direct connections. Although 4-20 mA is the most common connection type, it is the least accurate due to quantization errors (caused by the conversion from digital to analog, and analog back to digital). This method also requires the most wire, since a pair of wires are required for each current loop. The other two methods provide a straight digital connection path from the sensor to SCADA computer via a single pair of wires. Each type is briefly described in the following sections.

4-20mA SCADA Connections

The most common method for connecting process instrumentation to SCADA systems is via 4-20 mA current loops. This type of connection scheme is supported in the 1720D via the Signal Output Module (SOM) which provides two 4-20 mA analog outputs. The SOM may be mounted up to 400 meters from the sensor, allowing great flexibility in installation. Each 1720D contains two independent recorder outputs which can be attached to an SOM via the AquaTrend Network menu. Up to eight 1720D sensors may be connected to up to eight SOM modules per AquaTrend network. For more information on recorders and analog outputs, see *Section 2.9* on page *35*.

As an example, consider the Hach Aqua View+® data acquisition system, which accepts 4-20mA inputs via IM420 modules. These devices convert two 4-20mA channels to RS485 signals, which are in turn transmitted to Aqua View+.

After an IM420 module is installed in Aqua View+, the span (min/max) value must be set to match the span of the 1720D. Units of NTU may also be entered in the IM420 configure screen. For more information on Aqua View+ and the IM420 input module, see the Aqua View+ manual (Cat. No. 52750-88).

RS232 SCADA Connections

Another popular method for connecting process instrumentation to SCADA systems is via RS232. The 1720D supports this connection scheme with Serial I/O (SIO) modules. The SIO can be mounted up to 400 meters from the sensor, allowing it to be placed in the control room next to the SCADA system.

Once connected to the SCADA computer, the data may be transmitted in one of two ways.

1. To have the 1720D initiate the data transmission, set the print interval of each 1720D to the desired print interval (1, 15, 30, or 60 minutes).
See *Section 2.10.3* on page *40* for more information. If the time/date is required, see *Section* on page *40*. Once set, the output format is:

```
[1]0.035
```

where 1 corresponds to the sensor number (1-8) and 0.035 is the sensor reading. The brackets [ ] may be used as steering characters to ensure the command is correct.

2. To have the SCADA system initiate the data transmission, the SCADA system must send the following command:

```
1RMR?
```

Where `1` is the sensor number and `RMR?` is the RS232 Measurement Reading command. The response is the same as in part A above. Note that each sensor must be instructed to return its current value (up to eight sensors).

LonWorks SCADA Connections

The newest method for connecting process instrumentation to SCADA systems is direct connection via LonWorks, the underlying protocol used by the AquaTrend network. A network interface (such as Echelon's Serial LonTalk Adapter) is required to connect the SCADA system's computer to the LonWorks network.

Many SCADA packages provide LonWorks drivers for direct connection to each 1720D. Refer to the respective SCADA package's user manual for specific information on interfacing to LonWorks nodes.

APPENDIX C SIO EXAMPLES

When multiple 1720D instruments are connected on the network, their outputs are combined into a single data stream on the SIO. Each line of the data stream begins with [X], where "X" is the sensor number sending the data. Each line ends with a carriage return.

As an example, consider two sensors with the following settings:

- Print Interval = 1 minute
- Time Stamp = ON
- Alarm 1 = High, 0.4 NTU Setpoint, 5% Hysteresis
- Alarm 2 = High, 0.5 NTU Setpoint, 5% Hysteresis

The resulting SIO output data over 10 minutes is as follows:

```
[2]01/01/97 00:13 0.080 NTU
[1]01/01/97 00:13 0.244 NTU
[2]01/01/97 00:14 0.080 NTU
[1]01/01/97 00:14 0.244 NTU
[2]01/01/97 00:15 0.091 NTU
[1]01/01/97 00:15 0.244 NTU
[1]01/01/97 00:15 AL1 BEGIN
[2]01/01/97 00:16 0.091 NTU
[1]01/01/97 00:16 0.444 NTU A*
[2]01/01/97 00:17 0.085 NTU
[1]01/01/97 00:17 0.469 NTU A*
[2]01/01/97 00:18 0.085 NTU
[1]01/01/97 00:18 0.497 NTU A*
[1]01/01/97 00:18 AL2 BEGIN
[2]01/01/97 00:19 0.122 NTU
[1]01/01/97 00:19 0.572 NTU A*
[2]01/01/97 00:20 0.222 NTU
[1]01/01/97 00:20 0.782 NTU A*
[2]01/01/97 00:21 0.081 NTU
[1]01/01/97 00:21 0.521 NTU A*
[1]01/01/97 00:21 AL2 END
[1]01/01/97 00:21 AL1 END
[2]01/01/97 00:22 0.080 NTU
[1]01/01/97 00:22 0.245 NTU
[2]01/01/97 00:23 0.080 NTU
[1]01/01/97 00:23 0.244 NTU
```

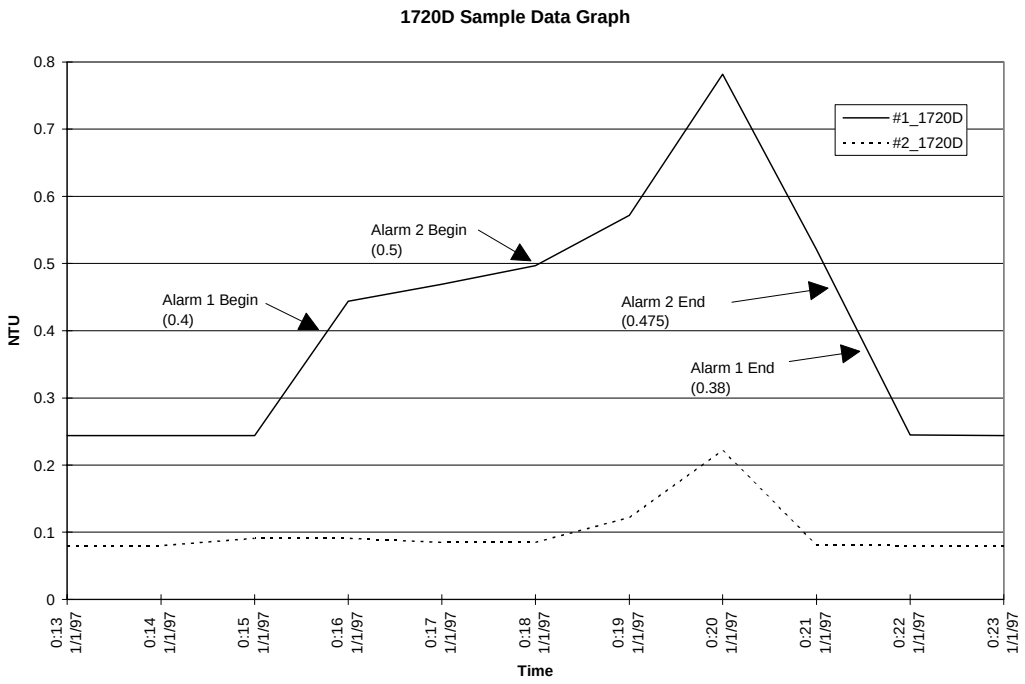
Note that each sensor generates the sensor reading (as opposed to being requested by the SIO), hence the data is not necessarily output in sensor order (i.e., sensor 2 sends before sensor 1 in this example).

Next consider the same data, but with Time Stamp set to OFF:

```
[2]0.080
[1]0.244
[2]0.080
[1]0.244
[2]0.091
[1]0.244
[2]0.091
[1]0.444
[2]0.085
[1]0.469
[2]0.085
[1]0.497
[2]0.122
[1]0.572
[2]0.222
[1]0.782
[2]0.081
[1]0.521
[2]0.080
[1]0.245
[2]0.080
[1]0.244
```

Using Windows Terminal to record the data, a Microsoft Excel graph (such as the one shown in *Figure 9*) can be created.

Figure 9 1720D Sample Data Graph



GLOSSARY

AquaTrend® Network System - A system which provides a digital interface link between sensors and communication devices and can receive data from these devices at a maximum distance of up to 500 m (1640 ft.). The fieldbus communications that makes such configuration possible is provided by Echelon® LonWorks® technology.

The network software may configure up to 35 devices including: one Master AquaTrend, as many as two Serial I/O Modules, and up to eight sensors, eight Signal Output Modules, eight Digital Display Modules, and eight Remote AquaTrends.

channel - Where data is displayed and logged on the AquaTrend. The AquaTrend has eight channels (represented by the letters A through H) to which you can attach measurements from sensors.

configure - Setting up a Hach network device for operation after hardware installation is complete. This involves selecting various software options and establishing communications between devices.

device - Any of the Hach network instruments, including sensors, communications modules, display modules, outputs, and AquaTrends.

Digital Display Module (DDM) - An eight-character display that can be used with sensors or analyzers to display a single measurement. It can be mounted as far away as 400 meters (1310 feet) from the sensor.

Echelon® technology - communications technology used by the AquaTrend Network System and developed by Echelon Corporation, producers of LonWorks® fieldbus technology.

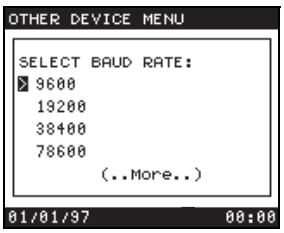
fieldbus - Any of several techniques allowing multiple devices to be connected on a single set of wires.

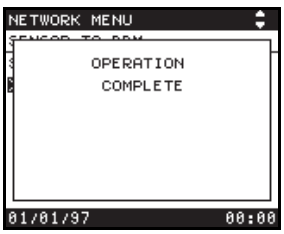
LonWorks - The fieldbus protocol used by the AquaTrend Network System.

Master AquaTrend - Acts as the main network data control center for setup and operation of the network. The network can contain as many as nine AquaTrends but only one can be the Master AquaTrend. Only through the Master AquaTrend can you perform network operations.

network - The connection of one or more devices (of which at least one is a sensor or analyzer) to a Master AquaTrend.

pop-up box - Refers to a selection or message box at the end of a menu chain. This box either provides a choice of options, selectable by moving the cursor and pressing **ENTER**, or allows you to use the arrow keys to enter an alphanumeric response, or it states the status of the current operation. These three possibilities are respectively shown below.





Portable AquaTrend - Mobile device designed to setup and calibrate sensors already setup on the network. Portable AquaTrends can access all menus except the network menu and can not perform network operations.

PS1201 - A power supply that provides 25 watts to AquaTrend network devices.

Remote AquaTrend - Any AquaTrend on a network that is not a Portable or Master AquaTrend. Remote AquaTrends can display all sensor readings and access all sensor menus.

repeater - A device capable of amplifying signals when total cable distance is exceeded in order to extend the network's capabilities.

SCADA - Supervisory Control and Data Acquisition. General term for any automated (and usually PLC or computer-controlled) system for control and data acquisition.

sensor - Any one of the Hach devices designed to take measurements for specific parameters and for use with the AquaTrend Network System (*e.g.* the 1720D Turbidimeter)

Serial I/O Module (SIO) - Communication device for two-way communication with a PC or one-way communication with a printer.

Signal Input Module (SIM) - The Signal Input Module (SIM) provides two 4-20mA analog inputs which can be used to bring measurements from non-networked sensors into the network.

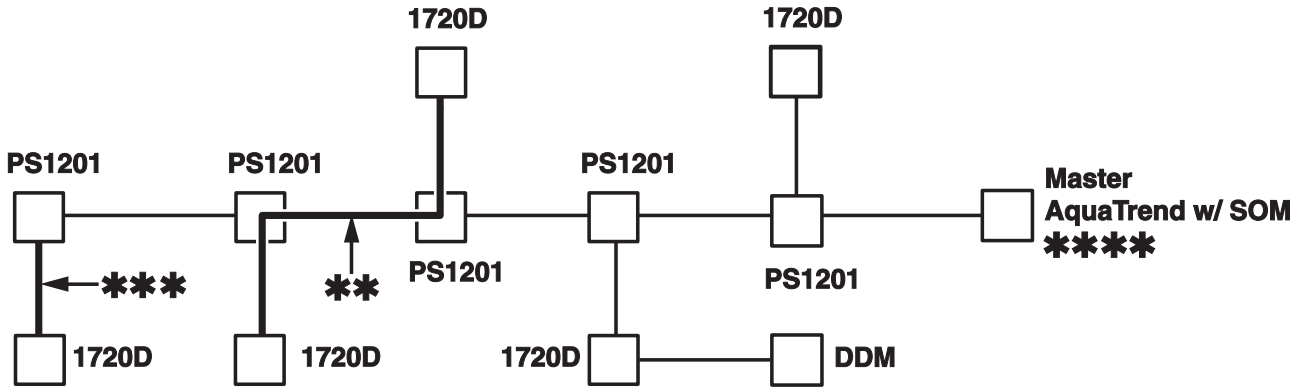
Signal Output Module (SOM) - Network device that provides two relays, each with normally open and normally closed contacts rated at a maximum of 5A/250 VAC, and two analog outputs, selectable through the AquaTrend keypad at either 4-20 or 0-20 mA. Sensor alarms can be configured to trigger one the relays in the SOM and/or a recorder or controller signal from a sensor can be attached to the analog outputs of the SOM.

The SOM can either be a stand-alone device (model 51250) or can be internal to the AquaTrend/SOM (model 51350).

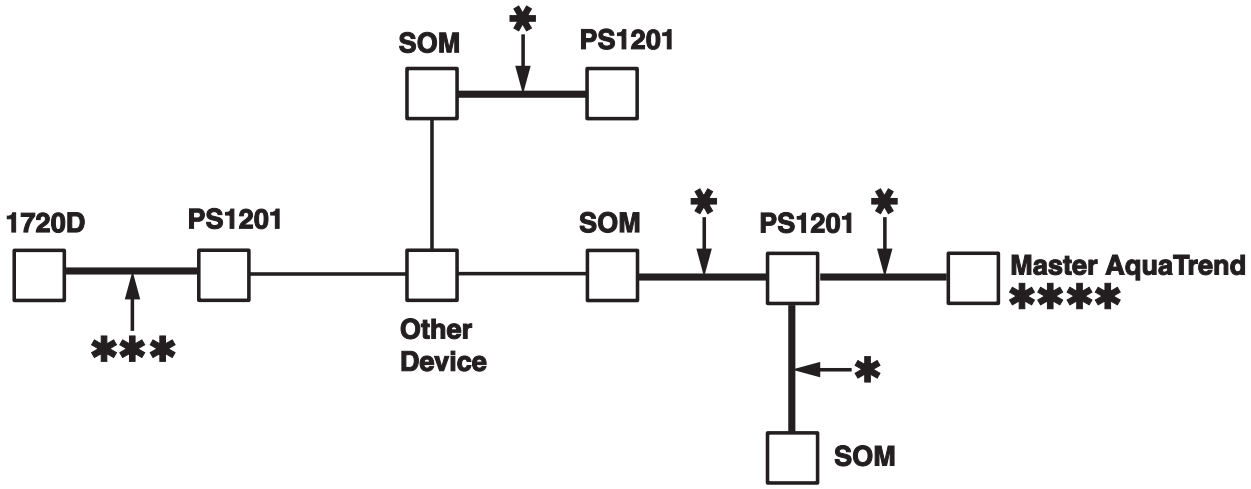
terminator - Impedance stabilizing component that maintains network signal integrity. One terminator is required for proper network operation, either on an AquaTrend (without SOM) or on a stand-alone SOM.

topology - Any wiring configuration. See *Figure 10* for examples.

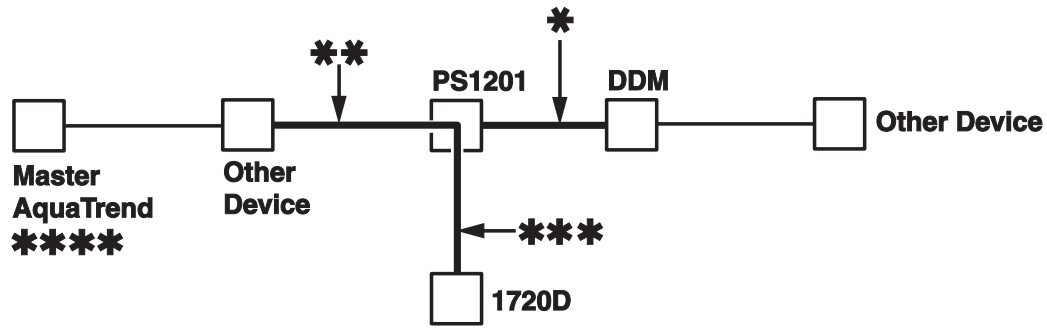
Figure 10 Wiring Topologies



1650 feet (500 meters) Total maximum distance for network communication.



1650 feet (500 meters) Total maximum distance for network communication.



1650 feet (500 meters) Total maximum distance for network communication.
Distances in excess of 1650 feet (500 meters) require a repeater.

* 100 feet (30.3 meters) Maximum distance between the power supply and the device it is powering.

** 1320 feet (400 meters) Maximum distance between two network devices.

*** 20 feet Fixed distance between power supply and 1720D.

**** Only one enabled terminator is allowed for network.
(Terminators are located in SOMs, AquaTrends, and SIOs)

GENERAL INFORMATION

At Hach Company, customer service is an important part of every product we make.

With that in mind, we have compiled the following information for your convenience.

REPLACEMENT PARTS AND REAGENTS

Description	Unit	Cat. No.
1720D Sensor Head Assembly	each	52008-00
Formazin Primary Standard	500 mL	2461-49
Filter, 0.45 µm, to produce ultra-filtered water for cleaning and calibration	each	26705-00
Filter, 0.2 µm, to produce ultra-filtered water for calibration standard preparation	each	23238-10
Lamp Assembly	each	18950-00
PS1201 Power Supply	each	52010-00
Lid, Bubble Trap, 1720D	each	52012-00

OPTIONAL ACCESSORIES

Calibration Cylinder	each	44153-00
Cap, Connector Receptacle	each	52100-00
Communication Cable, 22 gauge, 2-conductor, shielded	per foot	52157-00
Communication Cable, 22 gauge, 2-conductor, shielded	100 ft.	52157-10
Communication Cable, 22 gauge, 2-conductor, shielded	250 ft.	52157-25
Communication Cable, 22 gauge, 2-conductor, shielded	500 ft.	52157-50
Communication Cable, 22 gauge, 2-conductor, shielded	1000 ft.	52157-51
Communication and Power Cable, 20 gauge, 4-conductor, shielded	per foot	52158-00
Communication and Power Cable, 20 gauge, 4-conductor, shielded	100 ft.	52158-10
Communication and Power Cable, 20 gauge, 4-conductor, shielded	250 ft.	52158-25
Communication and Power Cable, 20 gauge, 4-conductor, shielded	500 ft.	52158-50
Communication and Power Cable, 20 gauge, 4-conductor, shielded	1000 ft.	52158-51
Deionized (demineralized) water	1 L	272-56
Digital Display Module (DDM)	each	52400-00
Drain plug for the 1720D body	each	44116-00
Formazin Calibration Kit includes:		
Calibration Cylinder, TenSette Pipet, 4000 NTU Formazin Primary Standard (500 mL)	each	44156-00
Floor Stand for 1720D/PS1201	each	52160-00
Flow meter, 500–700 mL/min	each	40282-00
ICE-PIC Module for Calibration and Calibration Verification		
20 NTU	each	52250-00
1 NTU	each	52215-00
0.5 NTU	each	52225-00
ICE-PIC Module 3-pack (0.5, 1.0, and 20 NTU)	1/each	52003-00
Mounting Kit, pole/wall for Portable AquaTrend	each	51413-00
Photocell Replacement Kit for the 1720D	each	52180-00
Pipet tips for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet tips for 19700-10 TenSette Pipet	50/pkg	21997-96
Portable AquaTrend	each	51400-00
Power Cord Kit, 10A-125V, 1.8 m (6′), UL/CSA listed	each	46306-00
Power Cord Kit, 10A-230V, 1.8 m (6′), European-style plug, VDE approved	each	46308-00
Repeater Board	each	52200-00

OPTIONAL ACCESSORIES, continued

Description	Unit	Cat. No.
Signal Input Module (SIM)	each	51450-00
Signal Output Module (SOM)	each	51250-00
Serial Input/Output Module (SIO), 115 V 50/60 Hz with 120 V power supply	each	52074-00
Serial Input/Output Module (SIO), 230 V 50/60 Hz with 230 V power supply	each	52074-02
StablCal Calibration Set for the 1720C/1720D Turbidimeter		
Includes: StablCal Standards, < 0.1 NTU, 20.0 NTU	1 L/each	26596-00
StablCal Standard, 1.0 NTU	1 L	26598-53
Swabs, Cotton, presterilized for cleaning the photodetector	100/pkg	25543-00
TenSette Pipet, 0.1 to 1.0 mL	each	19700-01
TenSette Pipet Tips, 0.1 to 1.0 mL	200/pkg	25588-00
TenSette Pipet, 1.0 to 10.0 mL	each	19700-10
TenSette Pipet Tips, 0.1 to 1.0 mL	50/pkg	25589-00
Tubing, Inlet, ¼ inch O.D., Polyethylene	per foot	51322-00
Tubing, Outlet, ½ inch I.D., ¾ inch O.D., Tygon R3603	per foot	51263-00
U-Bolts for PS1201/AquaTrend pole mounting	2	51410-00

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Hach Company
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Loveland, Colorado 80539-0389 U.S.A.

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Information Required

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- Your name and phone number
- Purchase order number
- Brief description or model number
- Billing address
- Shipping address
- Catalog number
- Quantity

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