

**MICRO 200 BW TURBIDIMETER  
RANGE OPTION 0 - 1000 NTU**

HF scientific, inc.  
3170 Metro Parkway  
Ft. Myers, FL 33916-7597  
Phone: (239) 337-2116  
Fax: (239) 332-7643



# Field Service Kit

## For the Micro 200 Series Turbidimeter

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Field Service Kit, Catalog No. 19834

- **Clean, Calibrate and Repair Your Instrument in the Field**
- **Avoid Rush Orders for Spare Parts**
- **Virtually No Downtime**

The HF Micro 200 Series Field Service Kit contains the recommended spare parts needed for standard maintenance, repair, and calibration. This kit is designed to allow the operator or technician to service the instrument without a costly service call.

### Field Service Kit Contents:

Qty.	Description	Cat. No.
1	Sensor (Electronics Portion Only)	19807
1	Desiccant Tray Assembly	21555
1	Lamp Module	21541
1	Flow Head Assembly	50125
1	3 pk. cuvettes	50036
1	Secondary Standard Kit (0.02, 4, 10, 40, 100 NTU)	19820
1	O-ring Kit	50136
12 ft.	Tygon Tubing	21201
1	Bulkhead Assembly, 2 pk.	21148
1	Fuse, ½A 5 x 20 mm	20955
1	Fuse, 1A 5 x 20 mm	20956
1	O-ring	50144
1	O-ring	50140
1	Case	13520



## **FOREWORD**

### **HF TURBIDIMETERS**

HF turbidimeters are manufactured to meet design criteria for nephelometers as described in Standard Methods For Examination of Water and Wastewater. HF turbidimeters are approved by the U.S. EPA\* as a means to measure the turbidity of potable water, waste water, and other liquids.

HF turbidimeters provide a linear display of turbidity, throughout all ranges, in Nephelometric Turbidity Units (NTU). HF turbidimeters use solid state electronic components because they resist thermal variation and are not affected by normal line voltage fluctuations.

HF turbidimeters can be calibrated using HF scientific factory certified Secondary Standards or Formazin. Factory calibration is accomplished using HF scientific Secondary Standards, which are factory certified traceable to Formazin, therefore, this instruction manual describes the proper procedures for calibration of HF turbidimeters using Secondary Standards.

HF turbidimeter manuals are designed to assist the user in taking full advantage of the instrument in a majority of its applications. However, in the event that unusual circumstances or problems, not covered by this manual, arise please feel free to contact our local distributor or the manufacturer.

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Fort Myers, Florida 33916-7597  
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Our engineering staff is available to help you with your specific needs.

### **CERTIFICATION**

Congratulations! We at HF scientific are proud to present you with the MICRO 200 BW turbidimeter. This instrument represents the very latest in integrated circuit and display technology. As a result, the product is a rugged and reliable instrument whose performance was tested thoroughly and found to meet its published specifications when it left the factory.

*\*EPA approved means the instrument meets or exceeds the design and performance criteria as specified in the United States Environmental Protection Agency method 180.1.*



# DECLARATION OF CONFORMITY

Application of Council Directive: 73/23/EEC

Standard to which Conformity is Declared:

Product Safety	Immunity	EMI
UL3111-1	EN50082-1	EN55011 Group 1 Class A
CSA-C22.2 No.1010-1-92	IEC801-2	FCC Part 15 Class A
CE EN61010-1	IEC801-3	
	IEC901-4	

Manufacture's Name: HF scientific, inc.

Manufacture's Address: 3170 Metro Parkway, Fort Myers, Florida 33916-7597

Importer's Name:

Importer's Address:

Type of Equipment: Turbidimeter

Model No.: Micro 200/200BW

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standard.

Place: Fort Myers, Florida USA

  
(Signature)

Robert J. Maley, President  
(Full Name)



# DECLARATION OF CONFORMITY

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IEC801-3

IEC901-4

EMI

EN55011 Group 1 Class A

FCC Part 15 Class A

Manufacture's Name: HF scientific, inc.

Manufacture's Address: 3170 Metro Parkway, Fort Myers, Florida 33916-7597

Importer's Name:

Importer's Address:

Type of Equipment: Backwash Sensor and Interface Kit

Model No.: 19276

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standard.

Place: Fort Myers, Florida USA

  
(Signature)

Robert J. Maley, President

(Full Name)



# MICRO 200 BW

## TABLE OF CONTENTS

<b>I. IMPORTANT INFORMATION</b> .....	1
A. HOW TO USE THIS MANUAL .....	1
B. SPECIAL ENVIRONMENTAL CONSIDERATIONS .....	1
C. SPECIFICATIONS .....	2
D. OPTIONS .....	3
E. FIGURES .....	4
F. COMPLIANCE TESTING CERTIFICATION .....	5
<b>II. INSTALLATION</b> .....	6
A. PACKING LIST OF CONTENTS .....	6
B. UNPACKING AND INSPECTION .....	6
C. MOUNTING .....	6
1. Analyzer .....	6
2. Sensor - Turbidity .....	6
a. Installing Desiccant Tray .....	6
D. ANALYZER CONNECTIONS .....	8
1. Cable & Cord .....	8
2. Analyzer Power .....	8
3. D/A Outputs - Voltage & Current .....	9
4. Recorder - Voltage .....	9
5. Recorder - Current .....	9
6. 4 - 20 mA Isolation .....	9
7. Alarm Contacts .....	10
8. Cable Mount Ferrites .....	10
E. TURBIDITY SENSOR .....	10
1. Interconnect Cable .....	10
2. Inserts for Sample and Drain lines .....	10
<b>III. STEP-BY-STEP OPERATION</b> .....	10
A. THEORY & HOW IT WORKS .....	10
1. Menu Guide to the MICRO 200 BW .....	11
2. Turbidity Display .....	12
3. Main Menu .....	13
4. Alarm Menu .....	14
a. Alarm #1 .....	14
5. Display Parameters .....	15
a. Set Upper Limit .....	15
b. Set Average .....	16
6. Utility Menu .....	16
a. Screen Brightness/History .....	17
b. Set Time .....	17
c. Calibrate 0-1000 NTU .....	18
d. Comm Port .....	19
e. Access Code Menu .....	19
f. Security Access Code .....	20
g. Set Access Code .....	20
h. Self Test (4 - 20 mA Cal.) .....	21
i. Self Test (0 - 10 V Cal.) .....	21
7. Wait Messages .....	22
8. Backwash Display .....	23
a. Backwash Calibration .....	24
B. START UP .....	25
1. Indexing .....	25
2. Standardizing .....	25



# MICRO 200 BW

## TABLE OF CONTENTS CONT.

<b>IV. ROUTINE OPERATION</b> .....	25
A. CONTINUOUS MONITORING FLOW THROUGH UNIT .....	25
B. VAPORPURGE .....	26
C. GRAB SAMPLES .....	26
<b>V. ROUTINE MAINTENANCE</b> .....	26
A. CUVETTE CLEANING & CARE .....	26
B. LAMP REPLACEMENT .....	28
C. CALIBRATION PROCEDURES .....	28
1. Calibration Standards .....	28
a. Secondary Standard Set (Optional) Cat. No. 19830 .....	28
b. Standard Formazin Solutions .....	29
2. Calibration Steps for 0-1000 NTU Range .....	29
<b>VI. SECURITY ACCESS CODE</b> .....	30
<b>VII. TROUBLESHOOTING</b> .....	31
A. GENERAL NOTES .....	31
B. SPARE PARTS LIST FOR MICRO 200 BW .....	32
<b>VIII. OPTIONS</b> .....	33
<b>BACKWASH</b> .....	33
A. INSTALLATION .....	33
1. Backwash Interface .....	33
2. Junction Box .....	33
3. Backwash Sensor .....	33
a. Channel Mounting .....	33
b. Extension Handle Mounting .....	33
B. BACKWASH SENSOR CONNECTIONS .....	33
C. BACKWASH SENSOR MAINTENANCE .....	34
1. Backwash Calibration .....	34
D. BACKWASH ALARMS .....	34
E. BACKWASH REMOTE SWITCHING .....	34
1. Electrical Connections .....	34
a. Remote Switch .....	34
b. Alarms .....	34
c. Analog Outputs .....	35
d. Serial Port (optional) .....	35
2. Operation .....	35
<b>SERIAL INTERFACES</b> .....	35
1. RS-232 Voltage Mode Interface .....	36
2. RS-232 Current Loop Mode Interface .....	36
3. RS-485 Interface .....	36
4. Serial Printer .....	36
<b>WARRANTY</b> .....	42
<b>GLOSSARY</b> .....	43



## **I. IMPORTANT INFORMATION**

### **A. HOW TO USE THIS MANUAL**

The equipment has been designed for simple and easy operation. In keeping with that philosophy, this MICRO 200 BW User's Manual has been written to simplify all steps in the procedures that follow.

**THE MOST IMPORTANT ASPECT OF THIS MANUAL IS THAT YOU, THE USER, READ IT IN ITS ENTIRETY AND REFER TO IT OFTEN.** Figures and drawings have been used throughout the manual to show you how and text has been used to enhance and clarify what you have been shown.

Again, please read the manual before attempting to install or operate the MICRO 200 BW. Pay particular attention to the "warning" and "caution" messages throughout. Although the MICRO 200 BW is simple and easy to use, all electrical and safety precautions must be followed. "Notes" have also been added to give further clarification or reminders in certain instances.

### **B. SPECIAL ENVIRONMENTAL CONSIDERATIONS**

The Liquid Crystal Display (LCD) is not recommended for outdoor installation. UV rays are damaging to the display. For more details, see the Installation Section regarding Mounting of the MICRO 200 BW.

### C. SPECIFICATIONS FOR THE MICRO 200 BW

Specification	MICRO 200 BW
Ranges:	0 - 1000.0 NTU
Method:	EPA approved* Nephelometric
Accuracy:	10% 0-1000.0 NTU
Repeatability:	1%
Linearity:	±1%
Resolution:	
0 to 10 NTU	0.0001
1 to 100 NTU	0.01
Digital Display:	LCD 6 digits
Analyzer Graphics:	Built in LCD, Graphics recorder
Clock Graphics:	Date and Time
Response Time:	1 to 8 seconds
Averaging Time (Electronic):	1, 16, 48 & 96 seconds, sliding average
Microprocessor:	Motorola MC68HC11
Keyboard data entry system:	8 interacting membrane switches with tactile feedback
Security Code:	Prevents unauthorized access to analyzer
Built in diagnostics:	Yes
Analog Output, Isolated:	Bracketed to .01 NTU, 4 - 20 mA & .1, 1 & 10 VDC 12 bit resolution D/A
Alarms:	1 system alarm, 2 (NTU or % T) alarms (Hi, Lo and Off)
Alarm Contact rating:	Max. 250 VAC @ 5.0 A
Operating Temperature:	32° to 122°F (0°C to 50°C)
Storage Temperature:	-4°F to 140°F (-20° to 60°C)
Optical Cleaning for NTU Sensor:	Removable cuvette
Flow rate:	0.5 - 1.5 gpm (2000 ml/min - 6.0 L/m)
Positive System Pressure:	60 psi maximum (414 kPa or 4.22 kg/cm <sup>3</sup> )
Wetted surfaces:	Nylon, C.A.B., PVC, Delrin-500, Borosilicate glass, Silicone
Lamp:	External, pre-focused module
Standard Cable Length:	6 feet (1.83 m)
Sensor to analyzer distance:	250 feet (76.25 m) max. Over 50' lengths contact factory.
Dimensions	
Analyzer:	13" x 11½" x 8" (330 x 290 x 200 mm)
NTU Sensor:	8¾" x 9¾" x 8" (225 x 250 x 200 mm)
NTU Sensor Case:	NEMA 4X
CE Rating:	Pollution Degree 2, Overvoltage Category III
Supply Voltage:	120 VAC ± 10% 50/60 Hz 240 VAC ± 10% 50/60 Hz
Power Consumption:	40 VA

\*EPA approved means that the instrument meets or exceeds the design and performance criteria as specified in the United States Environmental Protection Agency Method 180.1.

**C. SPECIFICATIONS FOR THE MICRO 200 BW CONTINUED**

<b>Specifications</b>	<b>Micro 200 BW</b>
Shipping Weight:	Approximately 15 lbs. (6.8 kg)
Warranty:	One year from date of shipment

<b>Backwash Sensor - Optional:</b>	
Backwash Sensor:	IR sensor measures 0 - 100% Transmittance
Sensor operating depth:	16 psi (32 ft.: 9.8 m) maximum depth
Standard cable length Sensor to Analyzer/Interface:	30 feet (9.2 m)
Sensor to Analyzer distance:	1000 feet (305 m) max.
Backwash Sensor Dimensions:	3" Dia. x 7" H (75 x 175 mm)
Backwash Sensor Case:	NEMA 4X
Repeatability:	± 1% Transmittance
Sensitivity:	± 1% Transmittance
Linearity:	± 1% Transmittance
Response time:	Less than 10 seconds for a full scale change
Sensor operating temperature:	32 to 86°F (0°C to 30°C)

**D. OPTIONS:**

<b>Specifications</b>	<b>Micro 200 BW</b>
Printer:	120/240V, 32 column, provides a 4 or 24 hour data printout of station, date, time, high, low, average NEMA 4X enclosure. Includes 10 feet of interconnect cable, paper printer roll, operating manual.
Computer Interface Serial Port:	RS-232 or RS-485/RS-422 or current loop
Display Languages:	English, French, German, Spanish, Italian or Swedish

## E. FIGURES

<b>Figure No.</b>	<b>Title</b>	<b>Page No.</b>
1	Desiccant Tray Installation .....	6
2	Analyzer Outline Dimensions .....	7
3	Turbidity Sensor Outline Dimensions .....	7
4	Access Cover Removal .....	8
5	Cable Routing .....	8
6	Changing Analyzer Voltage/Fuse .....	9
7	Analyzer Rear Cover Removal .....	9
8	4 - 20 mA Isolation Jumper (Removal) .....	9
9	Reference Standard Indexing .....	25
10	Flow Through Cuvette Indexing .....	26
11	Vaporpurge .....	27
12	Critical Measurement Area .....	28
13	Lamp Replacement .....	28
14	Analyzer BNC Connection .....	33
15	Serial Interface Installation .....	35
16	Backwash Interface Outline Dimensions .....	37
17	Backwash Interface Voltage Selection .....	37
18	Junction Box Outline Dimensions .....	38
19	Junction Box Wiring Diagram .....	38
20	Backwash Sensor Outline Dimensions .....	39
21	Backwash Channel Mounting .....	39
22	Backwash Extension Handle Mounting .....	40
23	RS-232 Voltage Connection .....	41
24	RS-232 Current Connection .....	41
25	RS-485 Connection .....	41

## **F. COMPLIANCE TESTING CERTIFICATION**

The Micro 200 BW has undergone extensive testing, therefore, HF scientific, inc certifies that this instrument has met the following standards.

### **Product Safety**

US standard tested by ETL testing labs to UL 3111  
Canadian Standard tested by ETL to CSA 1010.

CE tested by ETL testing labs to EN61010-1

Pollution Degree 2, Installation Category (Overvoltage Category) III

### **Immunity**

Immunity testing by ETL testing labs to EN50082-1 including:

- ESD Immunity to IEC 801-2
- RF Immunity to IEC 801-3
- Transient Burst Immunity to IEC 801-4

### **EMI**

EMI tested by ETL testing labs to EN55011 Group 1 Class A.

RF Emissions to FCC Part 15 Class A by ETL testing labs

## II. INSTALLATION

### A. PACKING LIST FOR THE MICRO 200 BW

<u>CONTENTS</u>	<u>QUANTITY</u>
Instruction Manual	1
MICRO 200 BW	1
Desiccant Tray Assembly	1
Accessory kit - includes:	
0.02 NTU reference standard	1
Flow control clamp (stainless steel)	1
Spare flow through cuvette	1
Light Shield Cap	1

A listing of recommended spare parts appears on page 32 of this manual.

### B. UNPACKING AND INSPECTION

Use extreme care when unpacking your MICRO 200 BW and note that all of the contents are included. Check for any damage that may have occurred during shipping. If there are any omissions, report this immediately to the your local distributor or the Quality Assurance Dept. at HF scientific, inc. If there is **any** shipping damage; notify the shipping company immediately and arrange for a prompt inspection.

### C. MOUNTING

**CAUTION: Instrument is not designed for outdoor installation. The LCD screen will be damaged by UV rays. Contact factory for available enclosures.**

The maximum allowable ambient temperature is 122°F (50°C).

**NOTE: Be careful during installation not to violate the moisture integrity of the sensor, interface or analyzer housings. The analyzer requires approximately two hours to reach it's final operating temperature. Further adjustment of the LCD brightness may be required during this period.**

#### 1. Analyzer

The location of the analyzer should be given careful consideration. As an example, if the MICRO 200 BW is to be used for performing backwash, the analyzer

must be mounted where it can be viewed at the backwash control station. In this example, for convenience of maintenance, the turbidity sensor should be mounted at the backwash station and have the water plumbed to it. The analyzer must be mounted in a location that avoids direct water contact. Refer to figure 2 on page 7 for outline dimensions. Allow enough room for the analyzer to pivot on the mounting bracket upside down, to make connections.

After mounting, the angle of analyzer may be adjusted for best visibility.

#### 2. Sensor - Turbidity

For the outline drawing of the turbidity sensor refer to figure 3 on page 7. Allow enough room for easy access to both the flow through unit and the lamp module. Avoid mounting the sensor in a location that will put the sensor housing in contact with dripping water, as this will present problems when performing periodic maintenance.

The sensor is equipped with a float valve, that opens in case the flow through cuvette ruptures, to prevent damage to the sensor. The float valve drain tube can be connected to a 5/8" (15.9 mm) tube (not supplied) to direct the flow of water to a convenient drain. Keep the length of this external tube to a minimum.

#### a. Installing & Replacing Pack Desiccant Tray

Before operating the Micro 200BW for the first time the replaceable desiccant pouch must be installed. Please refer to Figure 1 while installing for the first time. To initially install unscrew the four thumbscrews and remove the electronics half of the sensor. Open the foil bag and remove the desiccant pouch and the indicator card. Install these items and replace the top portion of the sensor.

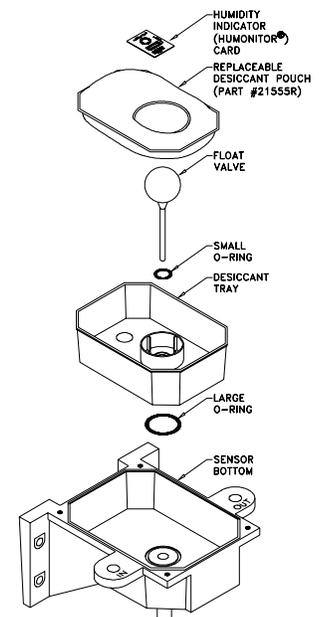


Figure 1  
Desiccant Tray Installation

Proper use of the supplied desiccant is essential in maintaining the performance of the

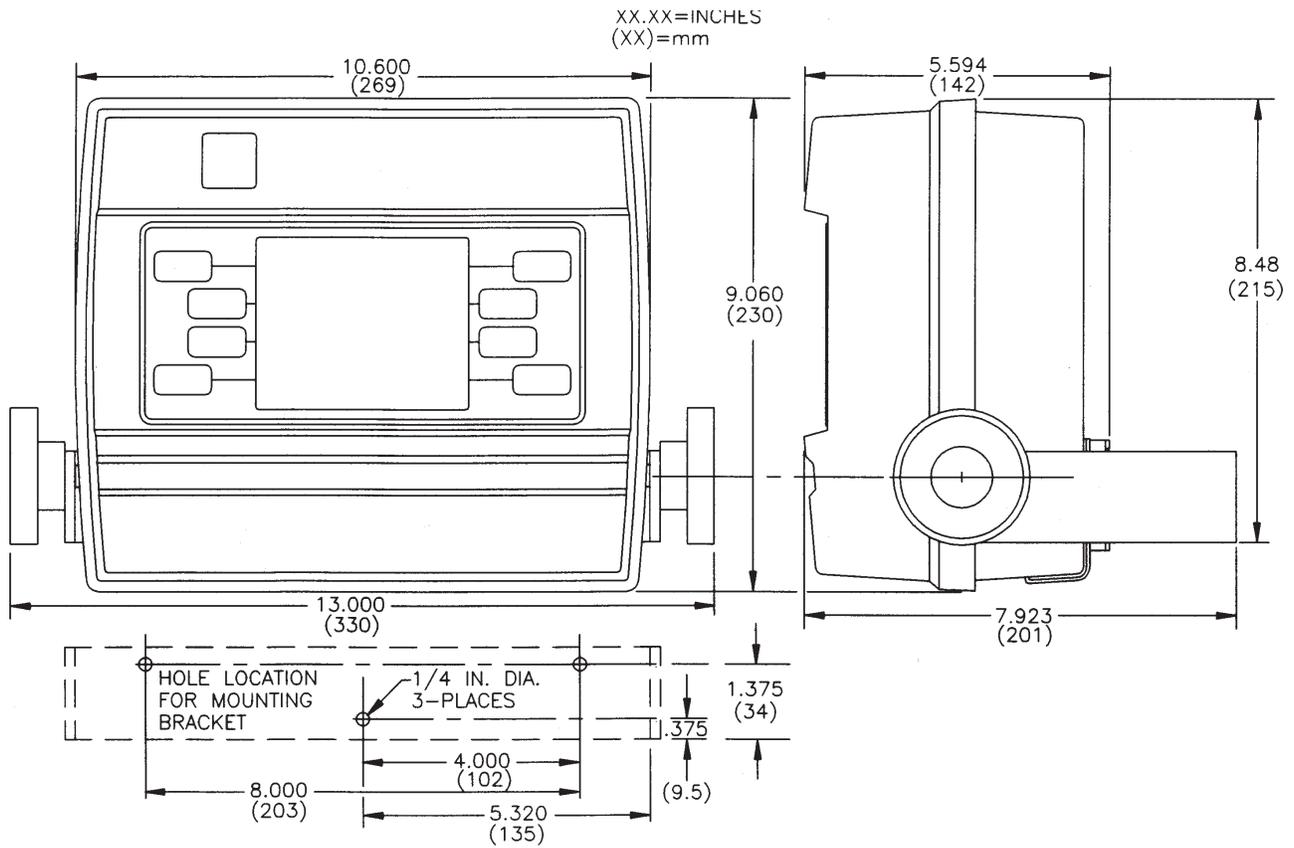


Figure 2  
Analyzer Outline Dimensions

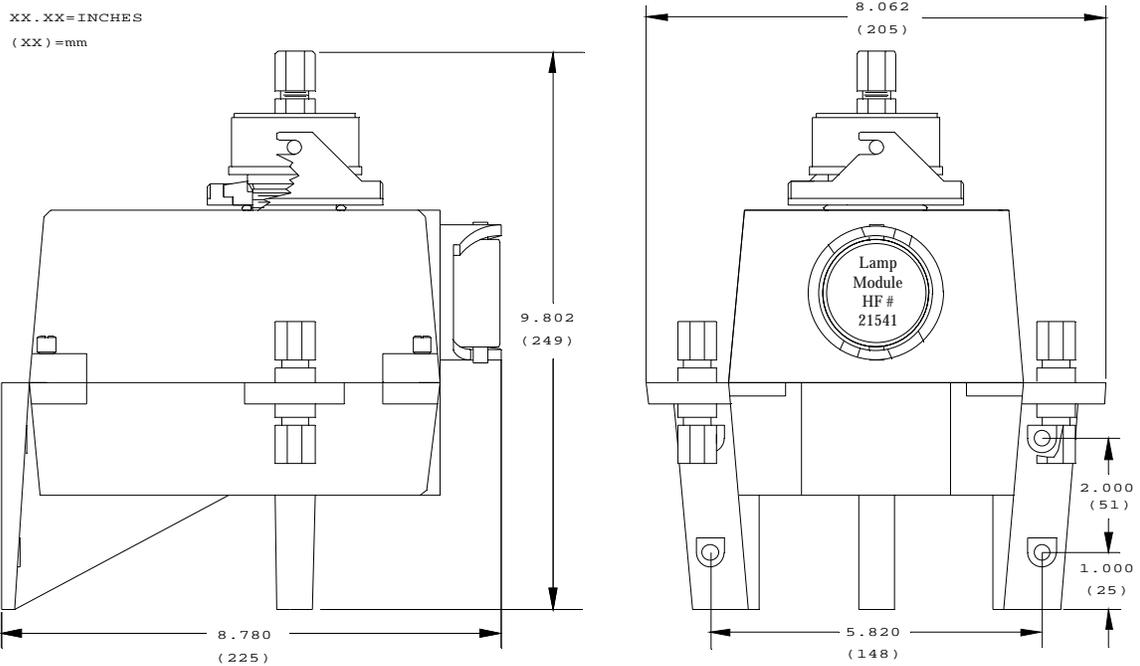


Figure 3  
Turbidity Sensor Outline Dimensions

instrument. The desiccant pouch is designed to have a long life; however, replacement of the desiccant pack will be required from time to time. To determine the condition of the desiccant, check the included humidity indicator card. If required, a new foil sealed desiccant pouch and indicator card are available from HF scientific inc. part #21555R.

It is essential that all enclosure seals be maintained. The emergency drain and o-rings that are supplied with each new instrument form part of the instrument humidity seal. Inspect these items each time the desiccant pouch is replaced. Replace any parts found to be defective.

#### D. ANALYZER CONNECTIONS

All connections are reached by removing the access cover. Heed all warnings and precautions prior to removal.

**WARNING: Before removing access cover disconnect all power from the MICRO 200 BW analyzer.**

- 1) Unplug the instrument or
- 2) Turn off the power at the circuit breaker.
- 3) Remove power to alarm contacts if greater than 30 VAC is connected for external operations.

**To remove the access cover (refer to figure 4):**

- 1) Loosen the two analyzer clamping knobs.
- 2) Swivel the analyzer top forward, such that the back is now facing you.
- 3) Re-tighten the two analyzer clamping knobs.
- 4) Loosen the 4 captive screws.
- 5) Remove access cover.

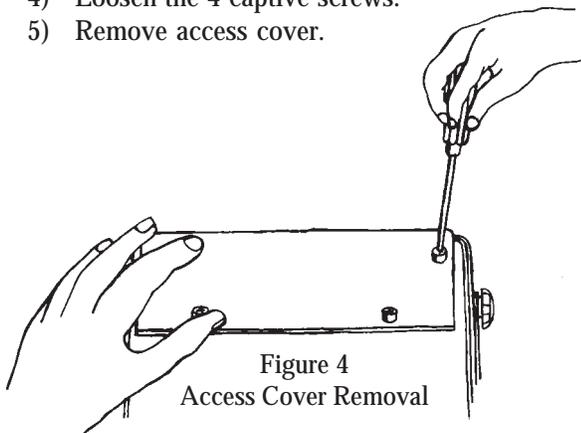
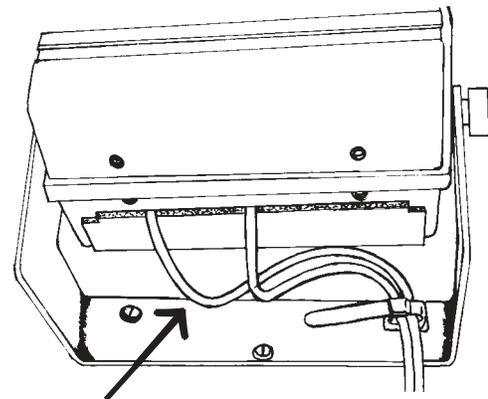


Figure 4  
Access Cover Removal

**WARNING: Do not restore power until the access cover has been replaced and secured. When routing the cabling for the following sections, allow enough excess cable length to swivel the analyzer upside down. Note that a cable strap is provided on the mounting bracket. Refer to figure 5 for suggested cable routing. Do not overtighten the four captive screws when replacing cover.**



Extra Cable  
Figure 5  
Cable Routing

#### 1. Cable & Cord

**Interconnecting Cable:** The standard interconnecting cable between the analyzer and the turbidity sensor is 6 feet (1.83 meters) in length (Catalog No. 20853). This length may be decreased without affecting instrument performance. For longer cable lengths consult HF scientific, inc.

**WARNING: Ensure that power to the analyzer is removed prior to connecting or disconnecting the sensor.**

#### 2. Analyzer Power

The power cord (120V) provided is 6 feet (1.83 meters) long. The analyzer power requirement is 40 VA at either 120 VAC or 240 VAC. The voltage setting of the analyzer can be determined by removing the access cover and looking at the fuse cartridge, just to the left of the power cord receptacle. The voltage printed next to the two triangles that point toward each other indicate the selected voltage. To change the input voltage first remove the power cord. The fuse cartridge can be removed by prying upwards using a flat blade screwdriver in the slot provided. Pull the cartridge out, invert and then reinsert. Refer to figure 6 on page 9. To replace a blown fuse remove the fuse cartridge as in figure 6 on page 9. Replace only the fuse for your selected voltage. The triangle on the fuse cartridge points to the fuse for

the voltage. The correct fuse ratings are 5 x 20 mm 1A fast acting for 120 VAC and 5 x 20 mm ½A fast acting for 240 VAC.

A power switch is located to the right of the power cord.

**WARNING: If power connection is to be hardwired, place each analyzer on a separate circuit breaker or switch to allow for service. Observe all local wiring codes.**

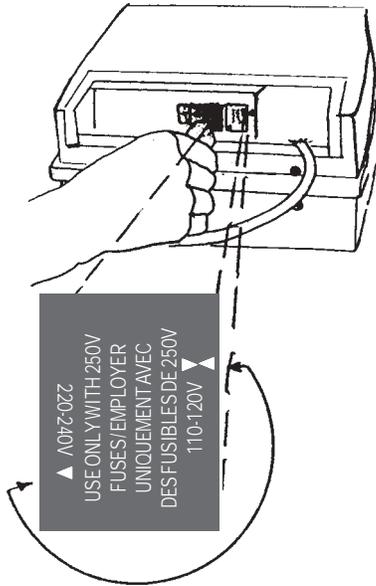


Figure 6  
Changing Analyzer Voltage/Fuse

### 3. D/A Outputs - Voltage & Current

The full scale range of the recorder outputs, both voltage and 4 - 20 mA, is determined by the upper and lower limits selected by the user in the display parameters menu. Please note that either 4- 20 mA **OR** voltage may be selected in the DISPLAY PARAMETERS menu, but not both.

### 4. Recorder - Voltage

Recorder output voltage is selected at the terminal block labeled ANALOG VOLTAGE (J6). Only one of these voltages is to be selected at any time.

Recorder load for each voltage:

Terminal 1	0 - 10V	50000 ohms or greater
Terminal 2	0 - 1V	5000 ohms or greater
Terminal 3	0 - 100mV	500 ohms or greater
Terminal 4	Common	

Twisted pair shielded cable, 22 AWG - 14 AWG, is recommended. Tie the shield to the ground terminal the recorder end (**Do not connect shield to MICRO 200**

**BW analyzer**).

### 5. Recorder - Current

A 4-20 mA current output is available. The connections are made at the terminal block labeled Analog 4-20 mA (J5). Use twisted pair shielded cable, 22 AWG - 14 AWG, with the shield tied to earth ground at the recorder end. (**Do not tie shield to ground at the analyzer**). The recorder load may be rated from 0-1000 ohms maximum. Terminal #1 is positive, terminal #2 is negative.

### 6. 4 - 20 mA Isolation

Isolation of the 4-20 mA recorder output may be achieved by removing the jumper at J13. This procedure requires removal of the rear cover assembly. Refer to figure 7 to remove the rear cover and figure 8 for location of jumper.

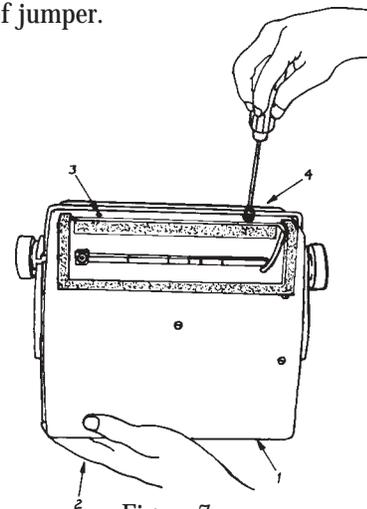


Figure 7  
Analyzer Rear Cover Removal

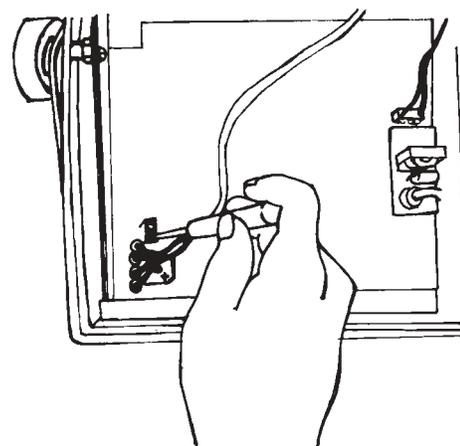


Figure 8  
Remove jumper J-13 to establish isolation of the 4-20mA signal.

**WARNING:** While the chance is slight, there are fault conditions under which a hazardous voltage could be exposed on the analog output wires when the jumper J13 is removed. To preclude this possibility HF scientific strongly recommends, for personal protection, that a Ground Fault Circuit Interrupter (GFCI), such as LEVITON part number 6599 or 5299, be used at the power connection.

### 7. Alarm Contacts

Connections are provided to the alarm relay contacts on the terminal block labeled ALARMS.

**NOTE:** These are “failsafe” and will revert to an “alarm” condition should the power be disconnected, for any reason.

Refer to the Specifications to ensure that alarm contact ratings are not exceeded.

**NOTE:**    **ALARM 1:**       **Terminal Block J1**  
              **ALARM 2:**       **Terminal Block J2**  
**SENSOR ALARM:**       **Terminal Block J3**

The following are the connections for each of the relay contacts:

Terminal 1: Normally Closed (N.C.) (open on alarm)  
Terminal 2: Normally Open (N.O.) (closed on alarm)  
Terminal 3: Common (C)

**WARNING:** Ensure that all external voltages in excess of 30 volts are disconnected before attempting to make connections or disconnections from alarm terminal blocks.

The SENSOR ALARM contacts are provided to indicate that the source lamp in the sensor module has failed or that the MICRO 200 BW requires routine standardization.

**NOTE:** For external analyzer connection, other than power, #14 AWG is the largest wire the connecting terminals will accept.

### 8. Cable Mounted Ferrites

The interconnect cable has a cable mounted ferrite on it, located near the analyzer. To maintain the CE rating for EMI this ferrite HF #21140 must be in place when operating the instrument.

Some input/output connections that are made to the Micro 200BW will also require the addition of a ferrite to maintain the CE rating for EMI. The following connections require the addition of HF# 21138: Serial Ports, Recorder Output - Current (4-20mA), Recorder Output - Voltage.

## E. TURBIDITY SENSOR

### 1. Interconnect Cable

The interconnecting cable from the analyzer is plug connected at the sensor. If the interconnecting cable is removed at the analyzer end, it should be reconnected to terminal block labeled SENSOR INTERFACE (J8). The cable wire colors are labeled in front of this terminal block.

### 2. Inserts for Sample & Drain Lines

Plastic inserts (not needed with rigid tubing) are provided with the turbidity sensor and are intended for use with 5/16" OD x 3/16" ID (7.94 mm OD x 4.76 mm ID) flexible plastic tubing as sample and drain lines.

## III. STEP-BY-STEP OPERATION

### A. THEORY & HOW IT WORKS

The HF scientific, inc., MICRO 200 BW Turbidimeter is specifically designed to monitor turbidity and backwash water in water filtration plants. This is done by providing a linear display of turbidity in Nephelometric Turbidity Units (NTU). The units, FTU and NTU, are compatible. Optional backwash function is displayed in Percent Transmission (% T).

The MICRO 200 BW is a continuous reading Nephelometric instrument that measures scattered light from particles in suspension (turbidity). The optical signal from the photodiodes is amplified and then converted to a frequency. This frequency is dependent upon the NTU level of the sample in the sample well. The resultant signal is sent to the analyzer where it is linearized for presentation on the display.

All operator controls are located on the front panel of the MICRO 200 BW. Complete displays include LCD indicators which blink in the event of an alarm of the two user set alarms and a sensor alarm.

Each feature is clearly labeled and you will be taken, step-by-step, through each one later in this section. This approach ensures **EASY** use of the HF scientific, inc., MICRO 200 BW.

One of the most important features of the MICRO 200 BW is the ease of operation. You simply press the Function Key, <F1-F5> for the selection you want to access on the LCD screen.

The information contained in this manual will help users take full advantage of the MICRO 200 BW's capabilities. In the event that unusual circumstances arise that are not addressed in the manual, contact your local distributor. Our engineering staff is also available to help you with your specific needs.

The ROM program used in the MICRO 200 BW contains confidential information which is the property of HF scientific, inc. Unauthorized disclosure, distribution or copying is prohibited. COPYRIGHT © HF SCIENTIFIC, INC. All rights reserved.

### 1. Menu Guide to the MICRO 200 BW

The following pages guide you through the menus in MICRO 200 BW and provide insight on how to use each of them. Probably the best way to learn the system is by "hands on training". After reading this section in its entirety the user should follow through each of the menus on the MICRO 200 BW. The user will find that each of the menus is arranged in a logical manner. After going through each of the menus once he will gain a familiarity with the structure. Each function is clearly labeled. A menu flow chart figure 26 is provided on page 44 for further clarity.

The functions of F1-F5 will vary according to the menu. The function will be shown beside each button. The absence of a function beside a button indicates that the button is not used in that menu.

The following buttons always retain the function described below:

**ALARM:** Turns alarm contacts to "OFF". Once an alarm condition is met, the display will continue to flash until the alarm condition is removed. Once the alarm level has been exceeded, either Hi or Lo, the alarms will reset when the alarm condition has returned to non-alarm value, including the dead band value.

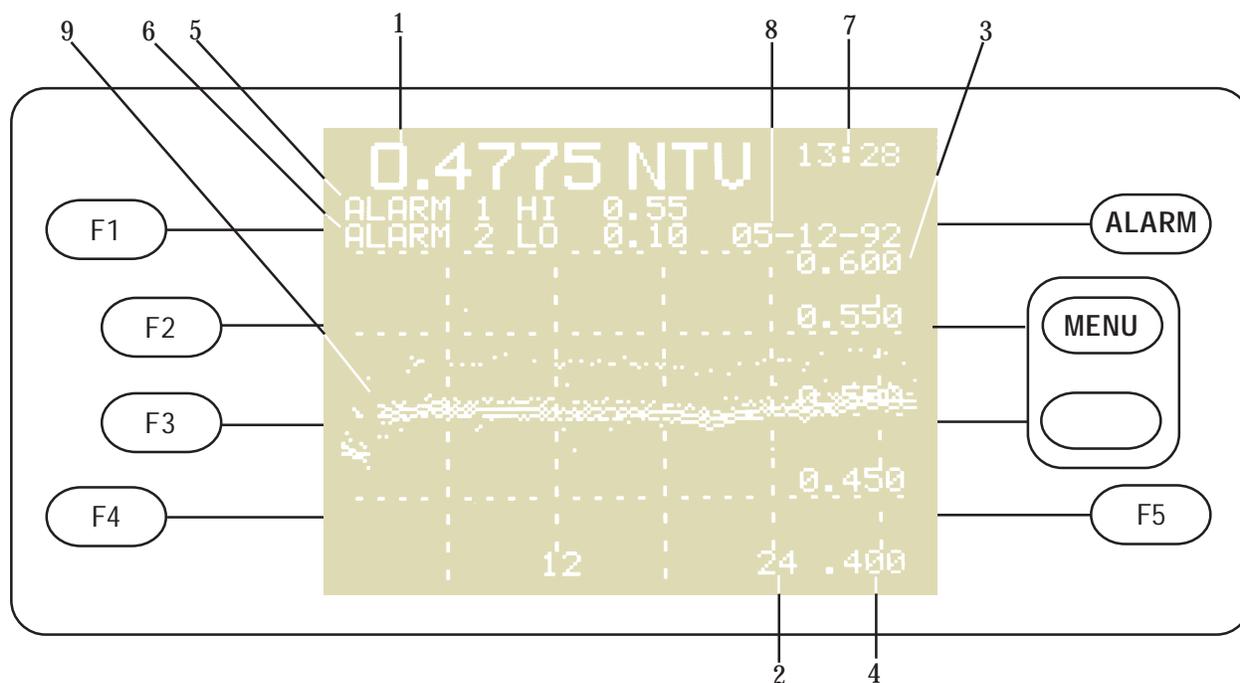
Once the alarm button is pushed the alarm relay is inactive until the reading has once again reached a non-alarm value (keep in mind the dead band value). After this the alarm level must be once again exceeded

before the alarm contacts can again close.

**MENU:** Display will change to the next highest level or previous menu. If this button is pushed several times you will always return to the MAIN MENU. This button is also used to return to the turbidity display once the range has been selected.

**NOTE: There are places of selection, for instance, alarm limits, graphic limits and time set where it is possible to set a parameter which is not viable. An example is the 13th month of the year in Time Set, or the Hi Alarm limit set lower than the Low Alarm limit. When this happens you will be disallowed from leaving that menu and the effect will be that the menu button will not work. Examine and correct the parameters to proceed.**

## 2. Turbidity Display

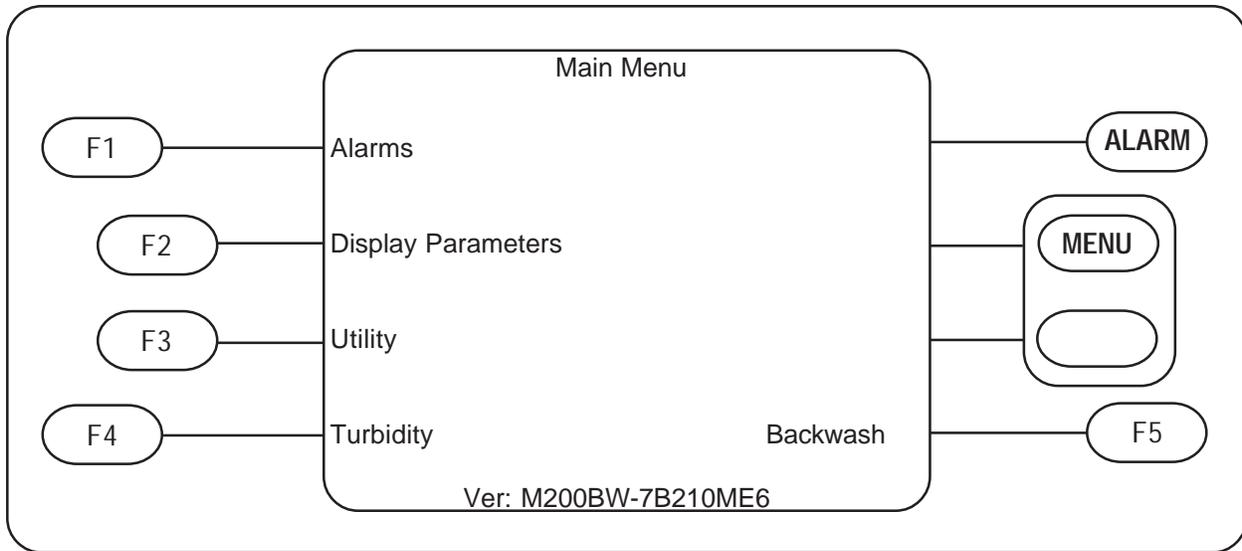


This is the turbidity display. The display shown above is fairly typical. The display has the following parameters:

- 1 - CURRENT TURBIDITY READING: 477.5 NTU
- 2 - GRAPH TIME BASE: 24 HOURS
- 3 - GRAPH UPPER LIMIT: 600 NTU
- 4 - GRAPH LOWER LIMIT: 400 NTU
- 5 - ALARM 1 SETTING: ALARM ON HIGHER THAN 550 NTU
- 6 - ALARM 2 SETTING: ALARM ON LOWER THAN 100 NTU
- 7 - TIME: 1:28 PM (SHOWN IN 24 HOUR CLOCK MODE)
- 8 - DATE: MAY 12 1992
- 9 - GRAPH OF TURBIDITY HISTORY (High, Ave. & Low)

To leave the turbidity display and get to the Main Menu push **MENU**. F1 - F5 are nonfunctional in this display. Please note that the graph history shows the highest readings, the lowest readings and the average readings taken within the sample period.

### 3. Main Menu

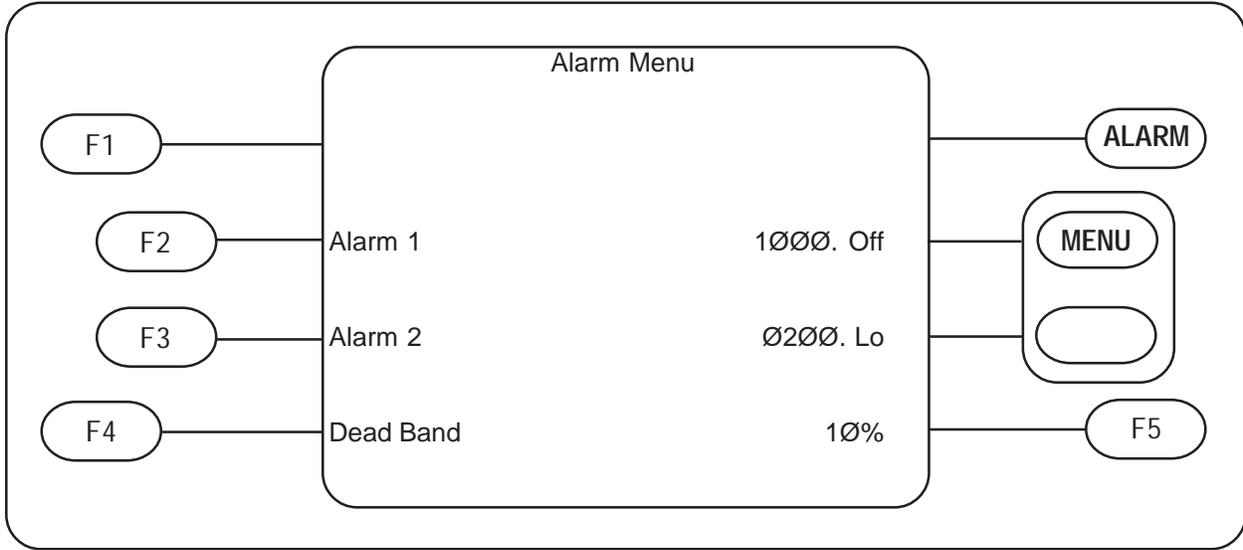


This is the main menu. It is the starting point for all sub-menu selections. Shown below are all function key selections and their purpose.

#### Selection Options:

- F1: Changes screen to ALARM MENU  
Select this option to set the value at which the alarm contacts will change for Alarm #1 & Alarm #2.
- F2: Changes screen to DISPLAY PARAMETERS MENU  
Select this option to:  
Set upper limit  
Set lower limit  
Select time base  
Set average  
Select D to A  
Set digit suppression
- F3: Changes screen to UTILITY MENU  
Select this option to:  
Set screen brightness  
Clear graph history  
Set time & date  
Calibrate & Adjust offset  
Set up serial port parameters  
Disable/Enable & Set access code  
Run self test diagnostics
- F4: Changes screen to TURBIDITY DISPLAY  
Select this option to display current turbidity and graph turbidity history.
- F5: Changes screen to BACKWASH DISPLAY  
Select this option to display and graph a backwash cycle if backwash option is connected.

#### 4. Alarm Menu



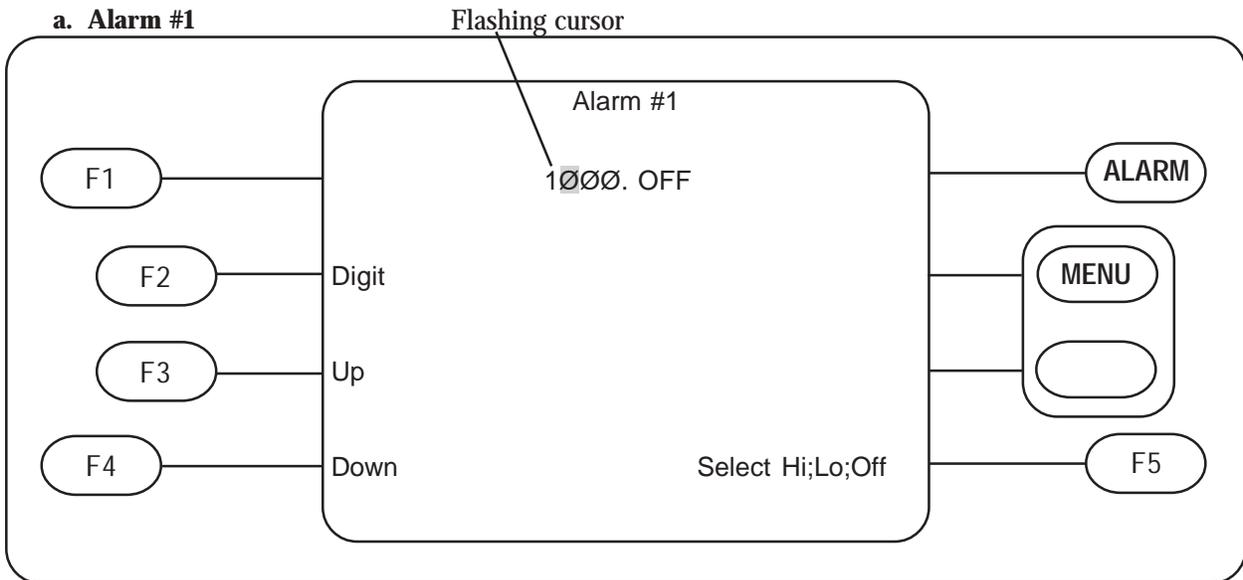
This is the ALARM MENU. The left side of the screen shows the selections as described below. The right side shows the current settings. In the example above:

- Alarm 1 is set to 1000 NTU and is off
- Alarm 2 is set to 200 NTU and will alarm below 200 NTU
- The Dead Band is set to 10%

##### Selection Options:

- F1: Not Used
- F2: Selects ALARM 1 setpoint MENU
- F3: Selects ALARM 2 setpoint MENU
- F4: Selects the DEAD BAND for the alarms to 2.5%, 5%, or 10%
- F5: Not Used

##### a. Alarm #1

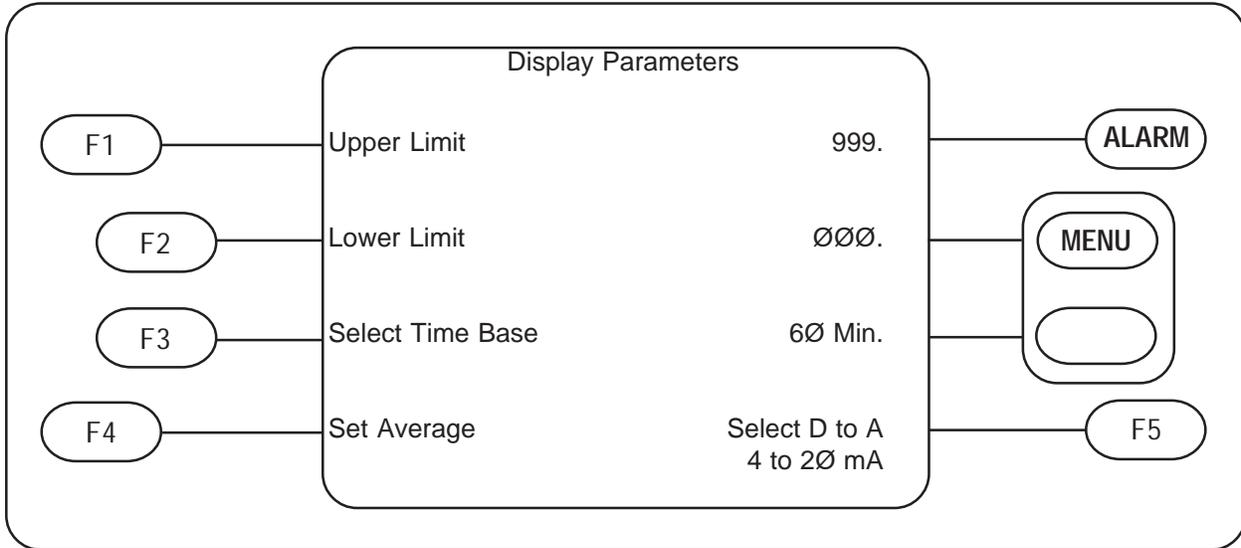


This is the Alarm #1 Menu. In this menu you can set the value at which the alarm contacts for Alarm #1 will change. The purpose of the function buttons are shown below. The current setting is displayed in the center top of the screen. Alarm #2 is displayed and used exactly the same as this menu.

##### Selection Options:

- F1: Not Used
- F2: Selects the digit to change as indicated by the flashing cursor
- F3: Increments the selected digit (increases it)
- F4: Decrements the selected digit (decreases it)
- F5: Selects Alarm #1 to High, Low or Off

## 5. Display Parameters

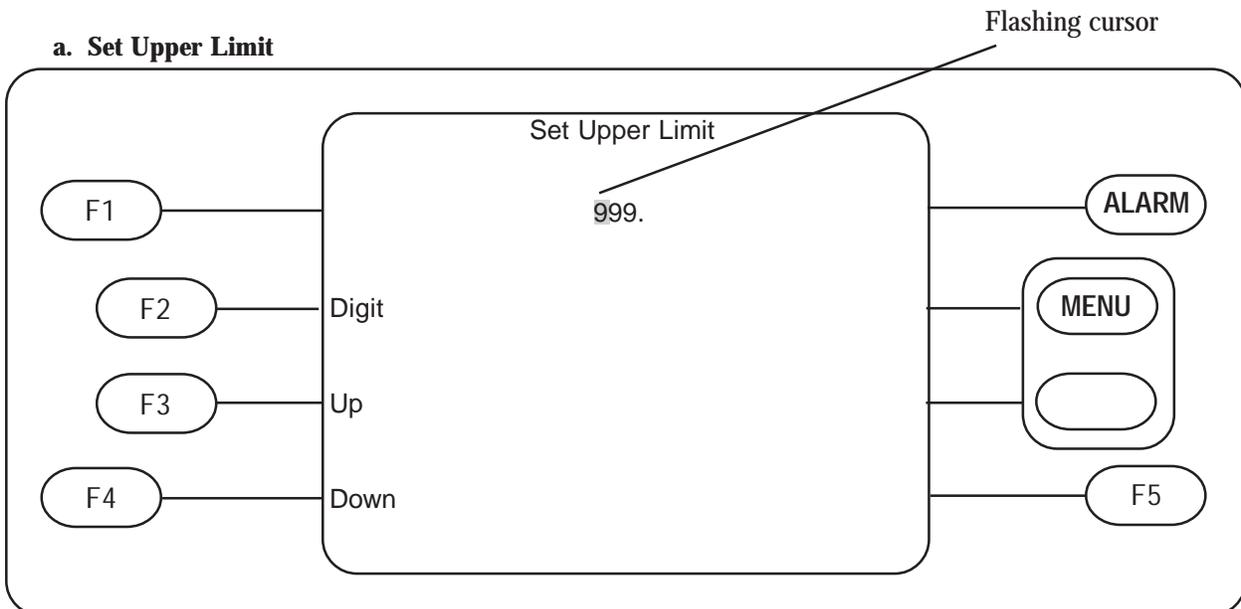


This is the Display parameters Menu. The sub-menu selections are described below. In the example above:  
 Upper Limit is set to 999 NTU      Lower Limit is set to zero NTU  
 Time Base is set to 60 minutes      D to A is set for 4 to 20 mA  
 Note: The D to A automatically calibrates to upper & lower (for our example you will get 4mA at 0 NTU & 20 mA @ 999 NTU)

### Selection Options:

- F1:      Selects UPPER LIMIT MENU
- F2:      Selects LOWER LIMIT MENU
- F3:      Selects Time Base between 60 minutes and 24 hours
- F4:      Selects Set Average Menu
- F5:      Selects D to A between 4-20 mA or 0 to 10 volts

### a. Set Upper Limit

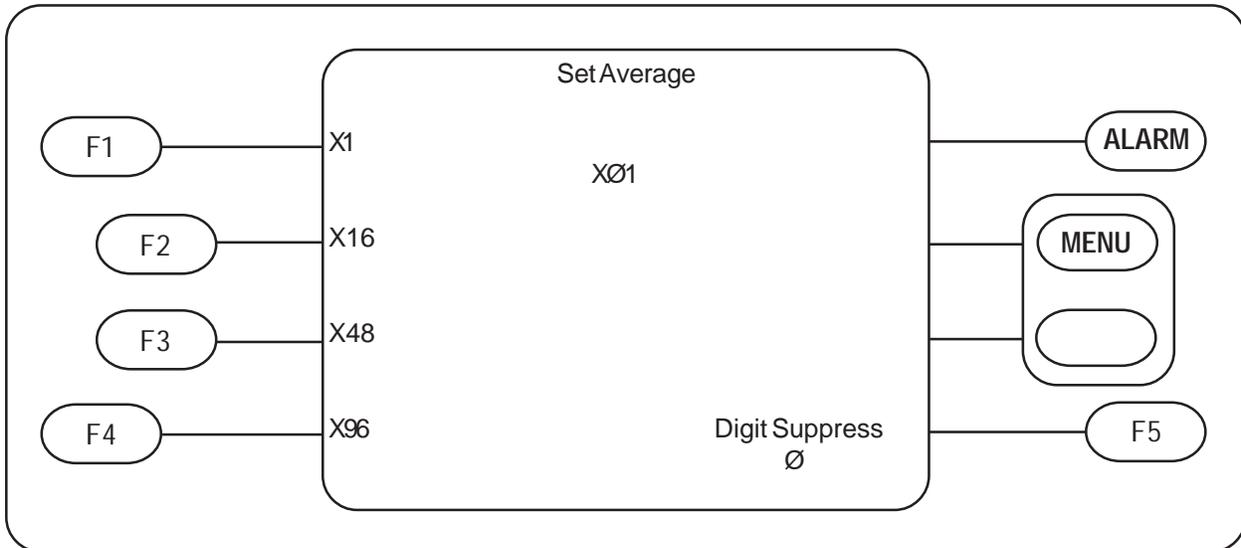


This is the Set Upper Limit Menu. This is where you can change the upper limit for both the graphical display and the high setting to which the D to A output is calibrated. The set lower limit menu is identical to this and is not shown.

### Selection Options:

- F1:      Not Used
- F2:      Selects the Digit to change as indicated by a flashing cursor
- F3:      Increments the selected Digit (increases it)
- F4:      Decrements the selected digit (decreases it)
- F5:      Not Used

## b. Set Average

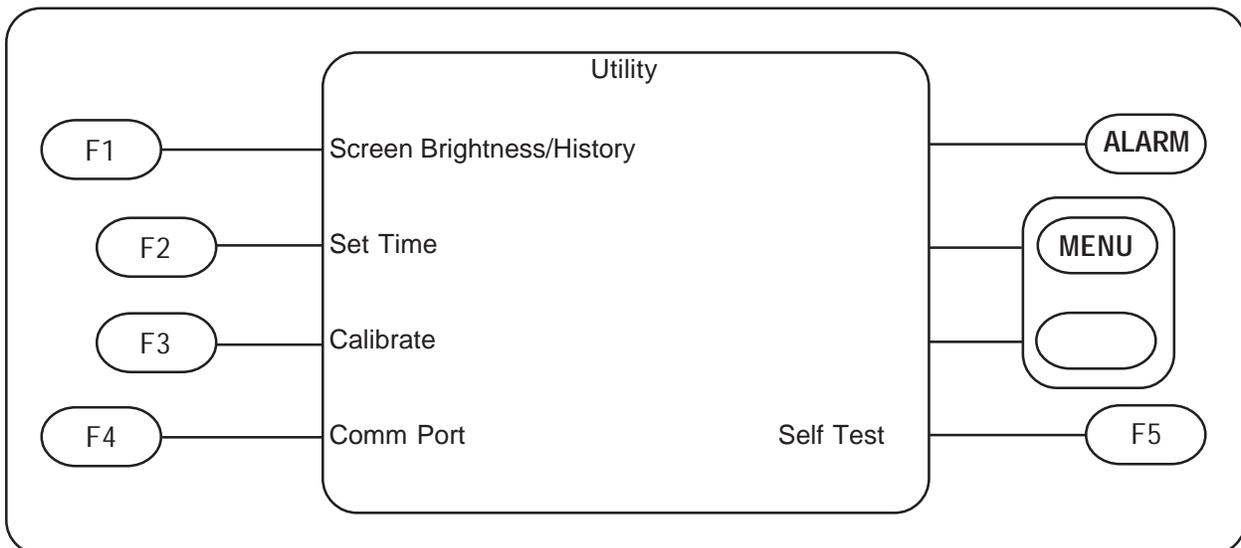


This is the Set Average Menu. This is where you can make changes to the averaging period. Readings are updated at a rate of one per second. A higher averaging time will give smoother curves to the graphical display and to recording devices and helps “wash out” anomalies. Always use the X1 setting when taking grab sample readings. Suppression or “Holding” the least significant digits to zero may be set here. The X1 setting is automatically selected while in the calibration menu.

### Selection Options:

- F1: Selects each reading (one second)
- F2: Selects Averaging of the last sixteen readings (16 seconds)
- F3: Selects Averaging of the last forty-eight readings (48 seconds)
- F4: Selects Averaging of the last ninety-six readings (96 seconds)
- F5: Selects between 1 digit, 2 digits & none of the least significant digit suppression

## 6. Utility Menu

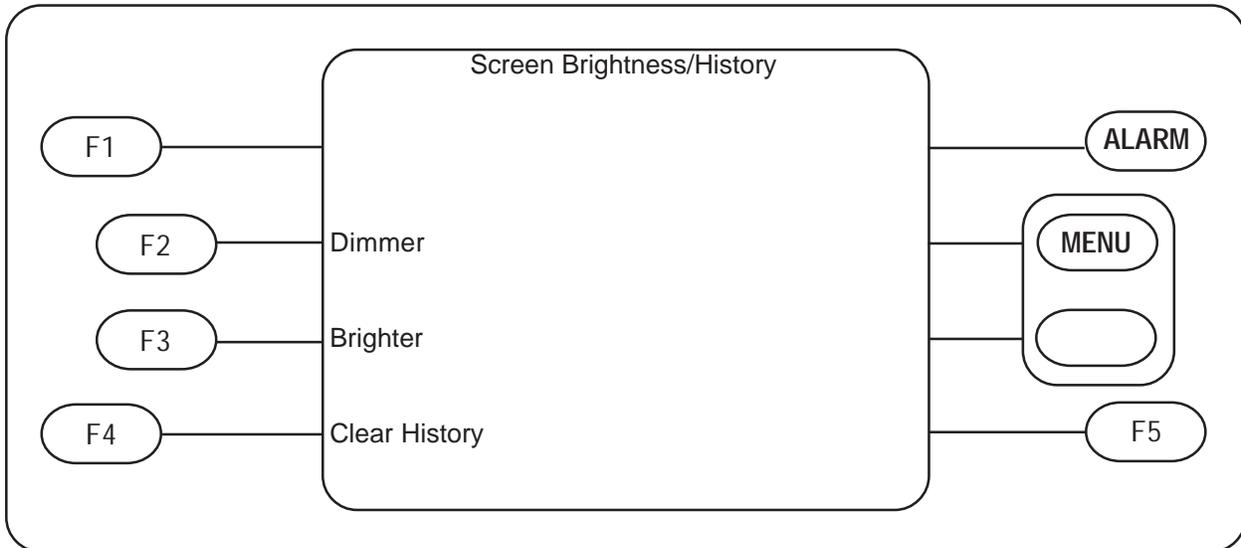


This is the Utility Menu. The available sub-menu selections are listed below.

### Selection Options:

- F1: Selects Screen Brightness & Clear History Menu (from graphs)
- F2: Selects Set Time & Date Menu
- F3: Selects Calibration Menu
- F4: Selects serial port & Access code set-up menu
- F5: Performs a check of internal critical voltages

**a. Screen Brightness/History**



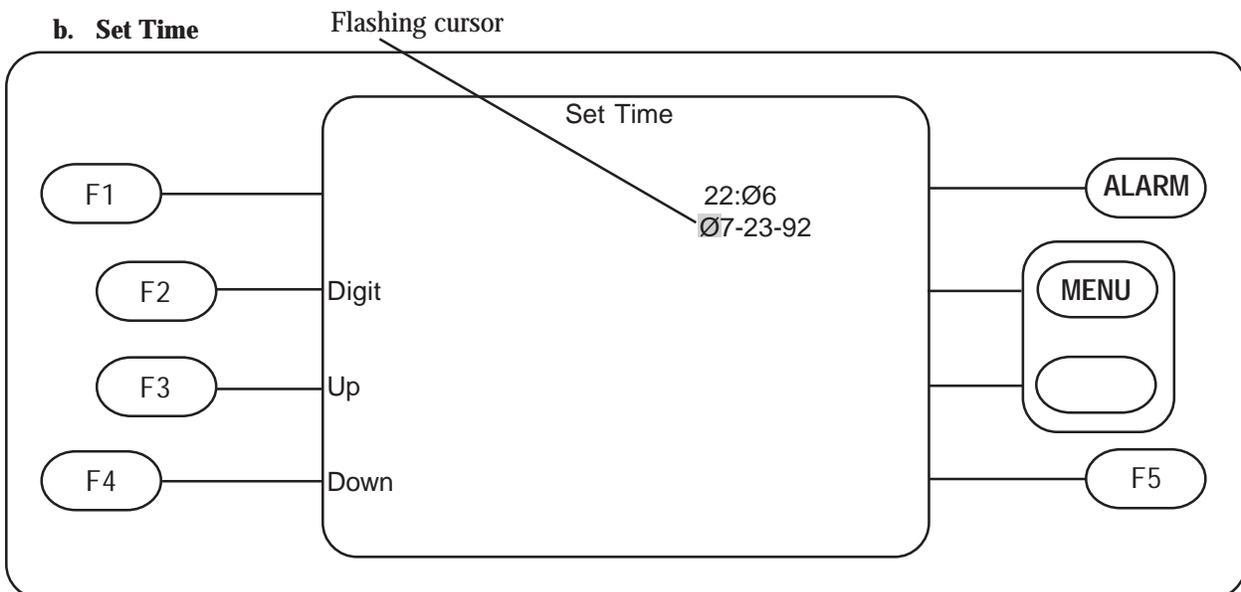
This is the screen brightness and clear history menu. In this menu you can adjust the screen intensity in increments by successively pressing F2 or F3. The intensity level will be stored when you leave this menu. Variations in ambient temperature will cause shifts in the brightness level.

F4 allows you to clear the graph history from both the turbidity and backwash screens.

**Selection Options:**

- F1: Not Used
- F2: Adjusts the screen intensity brighter a step each time pushed
- F3: Adjusts the screen intensity dimmer a step each time pushed
- F4: Clears the graph history from screens
- F5: Not Used

**b. Set Time**

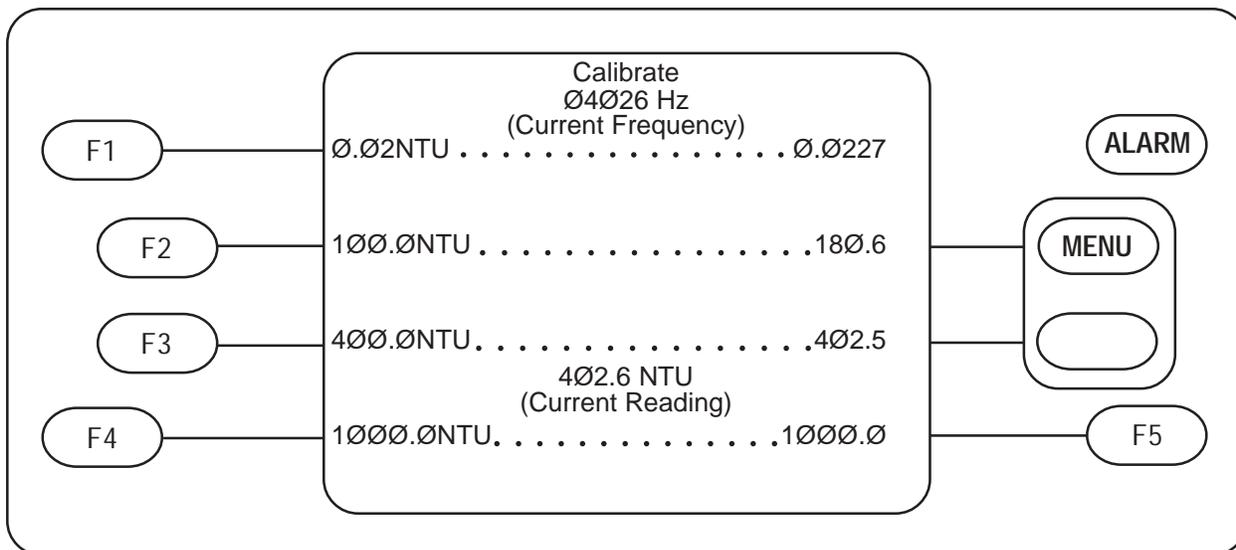


This is the set time and date menu. From this menu you can set the time and date to local time. Time and date are presented on the turbidity and backwash displays and printer reports.. The clock accepts the new time and date when you push **MENU**. Invalid statements will disallow leaving this menu (see Section VII. Troubleshooting).

**Selection Options:**

- F1: Not Used
- F2: Selects digit to change as indicated by flashing cursor.
- F3: Increments the selected digit (increases digit)
- F4: Decrements the selected digit (decreases digit)
- F5: Not used

**c. Calibrate 0 - 1000 NTU**



This is the turbidity calibration menu.

**Sensor Calibrate** is provided to adjust the sensor output for variations in lamp intensity. **WHEN YOU PERFORM A SENSOR CALIBRATE YOU MUST HAVE A 1000 NTU STANDARD IN THE WELL OR YOU MAY GET A SENSOR FAIL MESSAGE.**

F1, F2, F3 & F4 are selected calibration points which are used to calibrate the analyzer to the sensor. Any combination may be used, however, the stated accuracy will not be achieved without using all four points. The analyzer uses the calibration values to linearize the readings in this range. The recommended step-by-step procedure is on page 29.

**Caution: Do not press F1-F4 unless the indicated standard is in the optical well.**

The calibration points are shown on the left side of the screen and are selection options. The right side of the screen shows the stored real frequency for each calibration point.

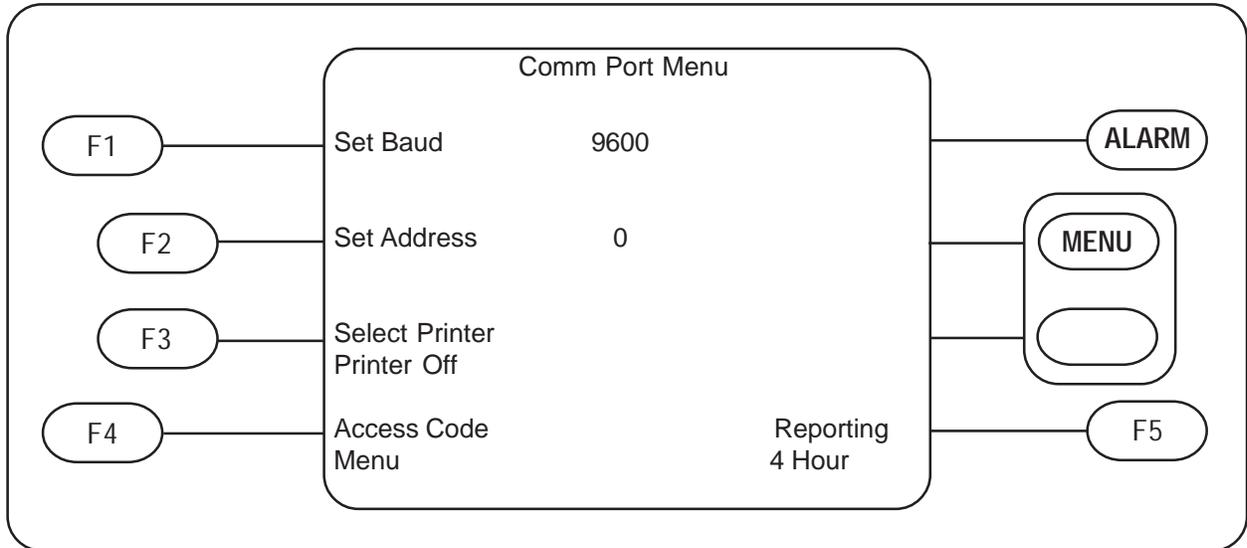
In the center of the screen are two numbers. The top number shows the current real frequency reading (decimal adjusted). The lower number shows the corrected or linearized frequency. In most instances the numbers on this screen can be ignored. They do, however, serve as a useful diagnostic tool.

See page 28 for complete step-by-step instructions.

**Selection Options:**

- F1: Stores the standardize frequency
- F2: Stores the 100 NTU frequency
- F3: Stores the 400 NTU frequency
- F4: Stores the 1000 NTU frequency
- F5: Performs a sensor calibration with 1000 NTU in well

#### d. CommPort

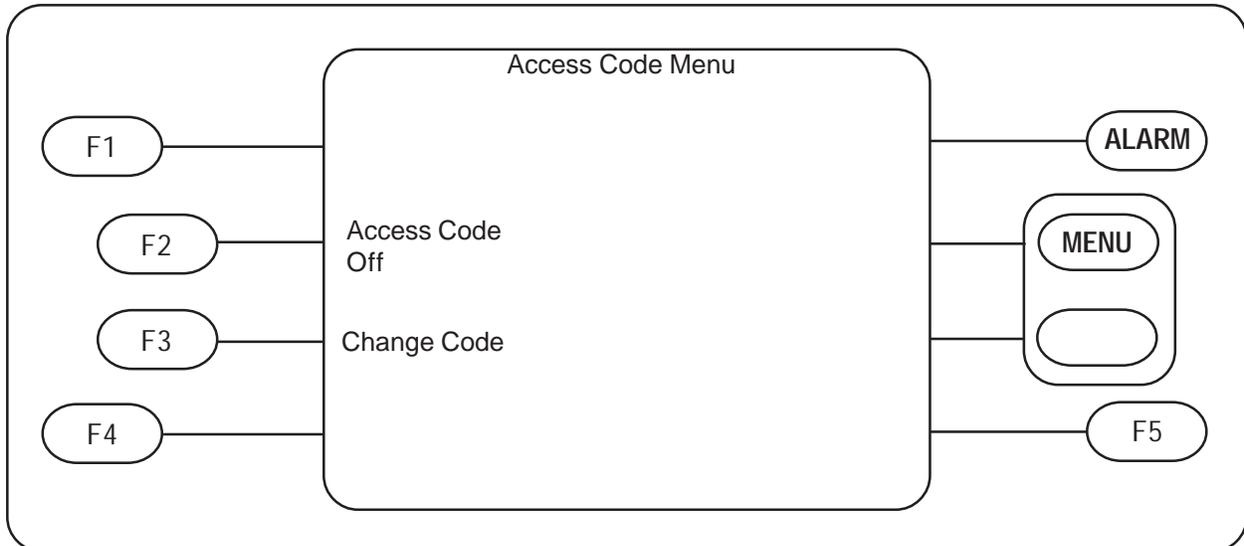


This is the communications or serial port menu. This menu will have no purpose unless you have one of the optional serial ports installed. See page 35 for more details.

#### Selection Options:

- F1: Selects the baud rate between 300, 600, 1200, 2400, 4800 & 9600
- F2: Selects the address from 0 to F, HEXADECIMAL
- F3: Selects serial printer mode on & serial printer mode off
- F4: Used to change access code
- F5: Not Used

#### e. Access Code Menu

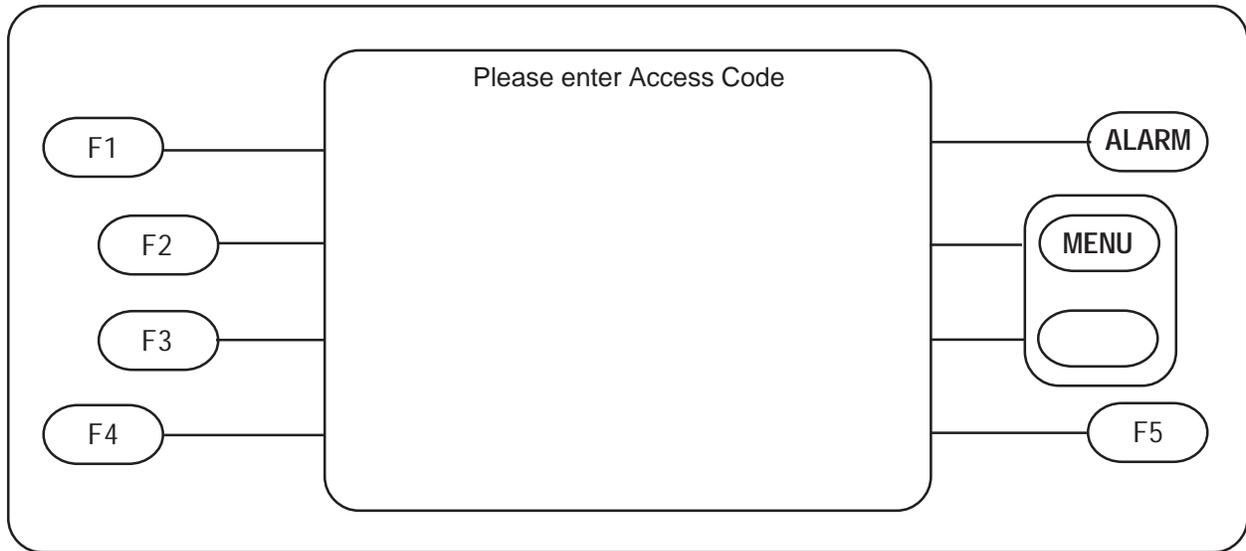


To enter to this menu, you first need to enter an access code. If no previous code has been entered, the master code F1, F4, F3, F5 may be used.

#### Selection Options:

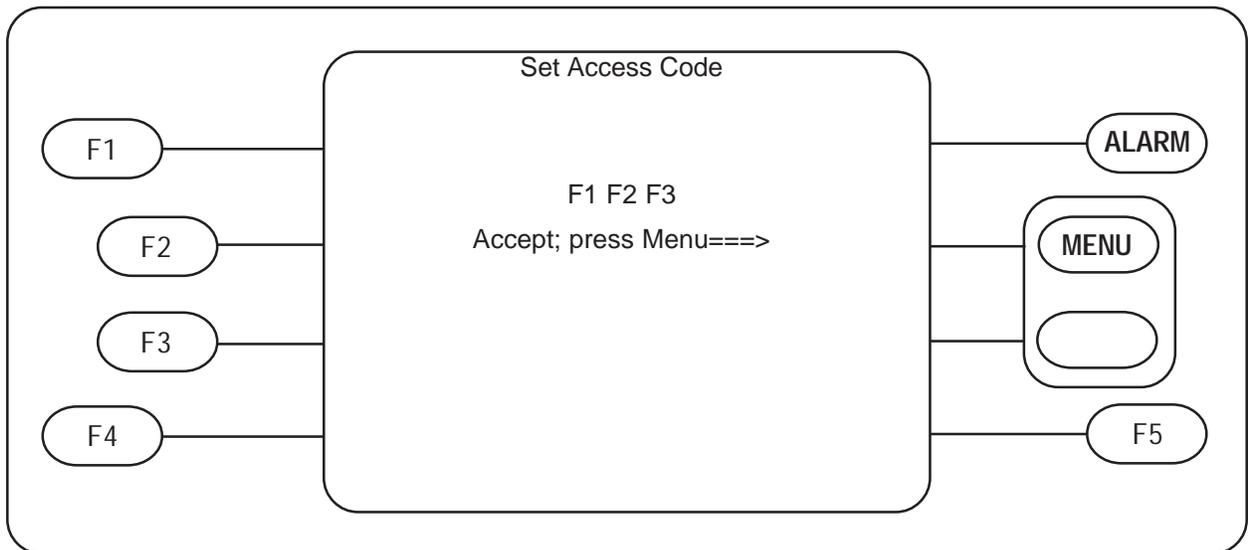
- F1: Not Used
- F2: Toggles between Access code off and Access code on
- F3: Used to select a new Access Code
- F4: Not Used
- F5: Not Used

**f. Security Access Code**



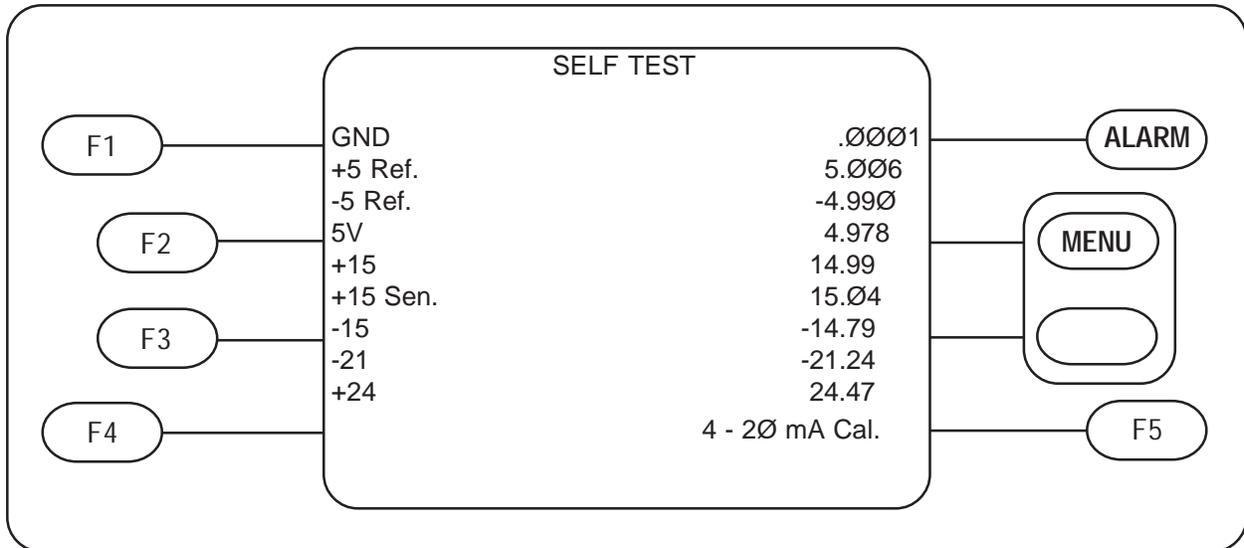
This screen is encountered when leaving the turbidity or backwash displays and when changing the Access Code. Use only the F1, F2, F3, F4 or F5 buttons to enter the Access Code. Refer to page 30 for complete instructions.

**g. Set Access Code**



This screen is encountered after the previous screen when changing the Access Code. Enter the new Access Code using the F1, F2, F3, F4 or F5 buttons. Refer to page 30 for complete instructions.

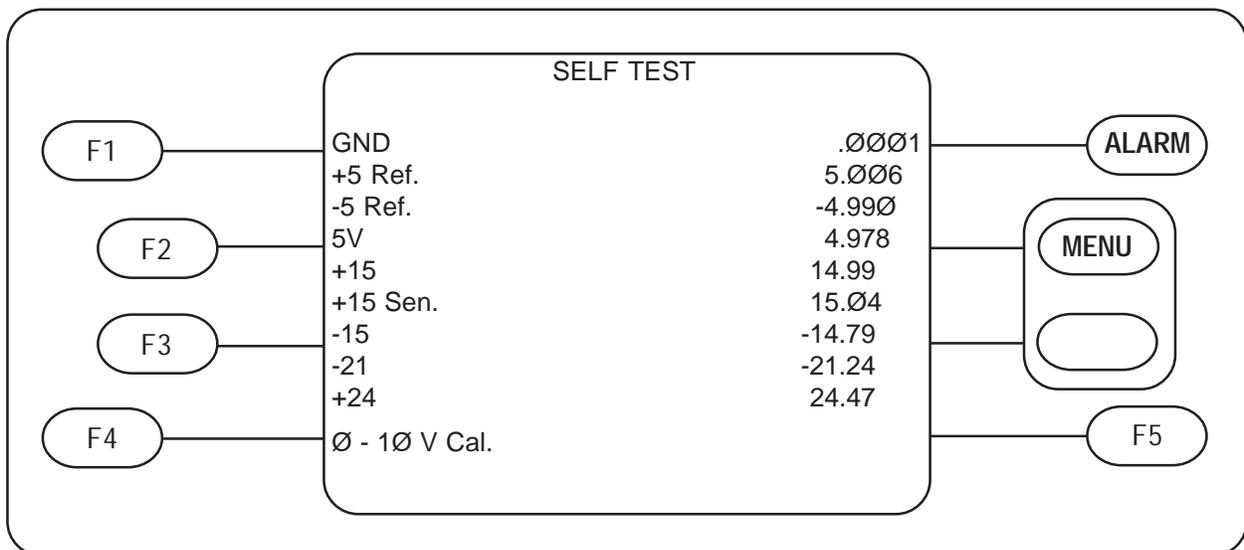
### h. Self Test (4 - 20 mA Cal.)



This is the self test menu. Upon entering this menu all internal critical power supplies are checked and displayed. You may also calibrate the 4-20 mA D to A output while in this menu. **NOTE:** You should have some load (up to 1000 Ohms) connected to the 4 - 20 mA terminals when it is calibrated or it will give you a message indicating a defective 4 - 20 mA line. The display shows only 0 - 10V Cal or 4 - 20 mA Cal as previously selected in the display parameters menu.

#### Selection Options:

- F1: Not Used
  - F2: Not Used
  - F3: Not Used
  - F4: Not Used
  - F5: Performs a 4-20 mA calibration
- i. Self Test (0 - 10 V Cal.)**

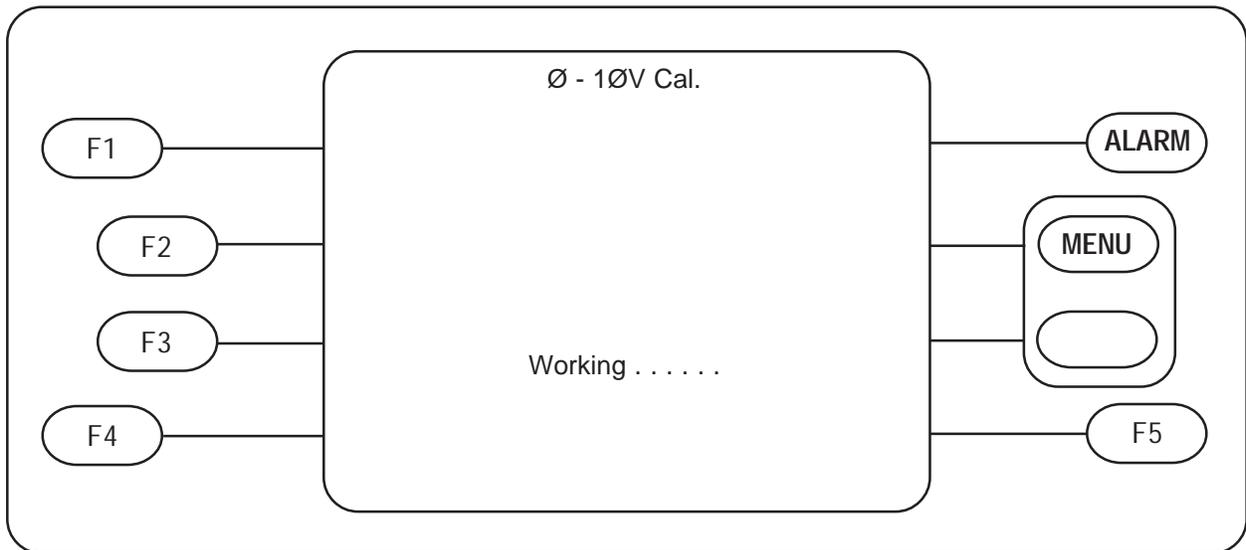
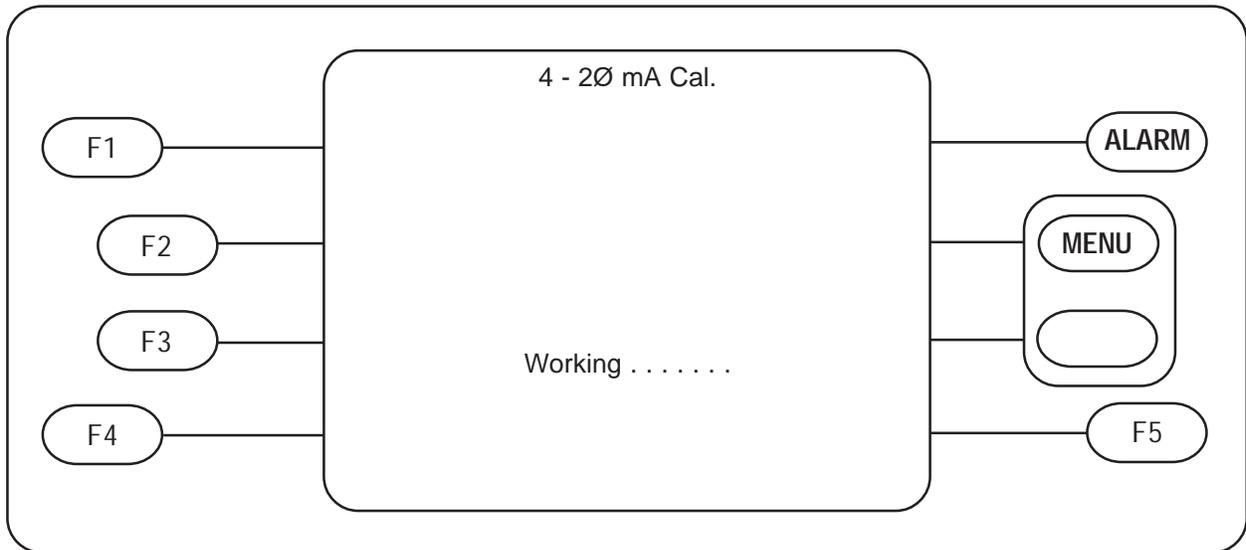
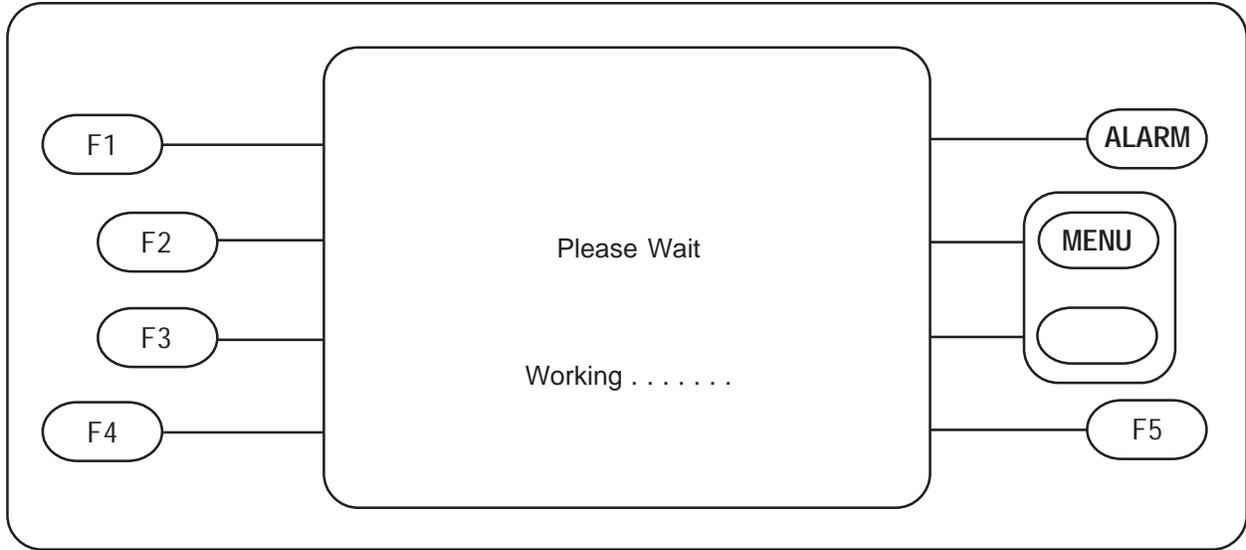


This is the self test menu. Upon entering this menu all internal critical power supplies are checked and displayed. You may also calibrate the 0-10 volt output while in this menu. The display shows only 0 - 10V Cal or 4 - 20 mA Cal as previously selected in the display parameters menu.

#### Selection Options:

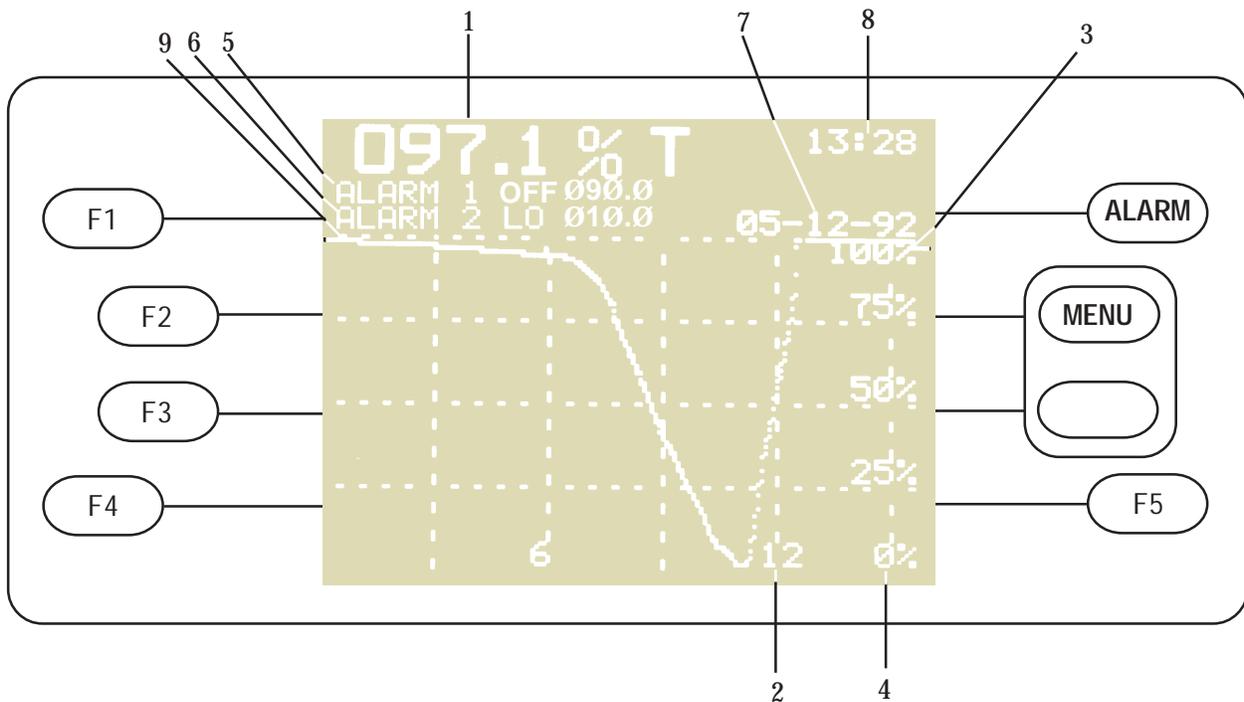
- F1: Not Used
- F2: Not Used
- F3: Not Used
- F4: Performs a 0-10 volt calibration
- F5: Not Used

## 7. Wait Messages



These screens indicate that the analyzer is performing some calculations or storing information. This typically occurs when the analyzer is powered up or when a change in display parameters has been made.

## 8. Backwash Display

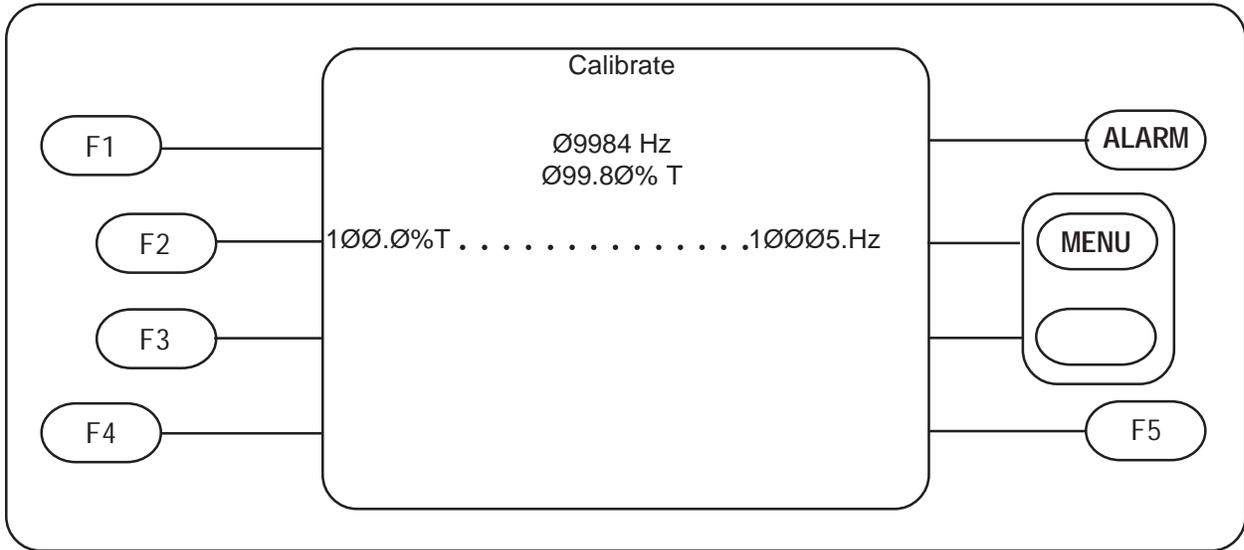


This is the backwash display. It is only meaningful if Backwash option is connected. The screen above shows a typical backwash cycle. In this mode, updates are made to the screen every 6 seconds. The reading is updated every second. The display shows the following parameters:

- 1 - CURRENT %T READING: 97.1 %T
- 2 - GRAPH TIME BASE: 12 MINUTES
- 3 - GRAPH UPPER LIMIT: 0 %T
- 4 - GRAPH LOWER LIMIT: 100 %T
- 5 - ALARM 1 SETTING: ALARM TURNED OFF
- 6 - ALARM 2 SETTING: ALARM ON LOWER THAN 10.0 % T
- 7 - TIME: 1:28 PM (SHOWN IN 24 HOUR CLOCK MODE)
- 8 - DATE: MAY 12 1992
- 9 - GRAPH OF BACKWASH HISTORY (with optional Backwash connected)

To leave the backwash display and get to the Main Menu push **MENU**. F1 - F5 are nonfictional in this display.

### a. Backwash Calibration



This is the backwash calibration menu and usable only with Backwash Sensor connected. To get to it you must first enter backwash from the main menu. You will be asked if you wish to calibrate. If you respond with yes (F2) you will reach the calibration screen above. If you respond with no (F3) you will go directly to the backwash display menu. After the calibration procedures have been completed, press the menu button to reach the backwash display screen.

There is only one point of calibration for backwash, 100% T. The sensor must be placed in what is to be considered 100% T water (preferably the same water as used in the backwash process). Pressing F2 will then calibrate the analyzer to the 100% T frequency of the sensor. The right hand side of the screen shows the stored real frequency number.

In the center of the screen are two numbers. The top number shows the current real frequency reading (decimal adjusted). The lower number shows the corrected or linearized frequency. In most instances the numbers on this screen can be ignored. They do, however, serve as a useful diagnostic tool.

The function keys F1, F3, F4 & F5 are not used in this menu.

See page 34 for complete maintenance procedures.

## B. START UP

Before placing the MICRO 200 BW on line we recommend that you standardize the instrument. The following sections describe the required procedures.

### 1. Indexing

The United States Environmental Protection Agency (U.S. EPA) recommends that cuvettes used for instrument calibration or sample measurement be indexed.

To comply with U.S. EPA standards, the MICRO 200 BW includes an Indexing Ring for quick and repeatable indexing of the reference standard.

To index the calibration standard you must be in the calibration menu. Observe the top center (current frequency) reading while performing the following steps:

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

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

Figure 9 shows a calibration standard being indexed.

**NOTE: This Calibration Standard is only Indexed to the Turbidimeter for which it was aligned.**

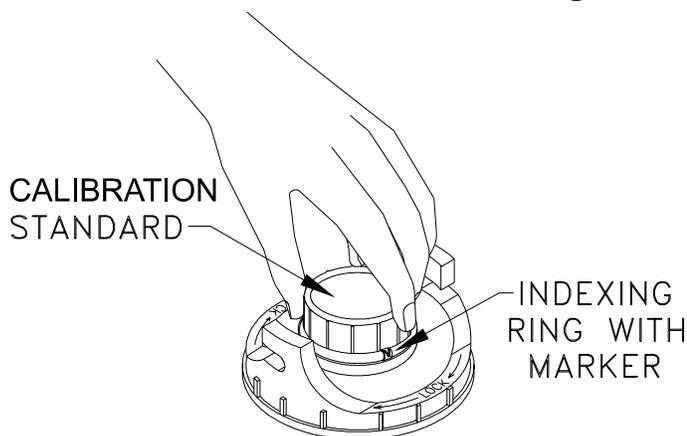


Figure 9  
Reference Standard Indexing

### 2. Standardizing

The reference standard (cuvette) supplied with the MICRO 200 BW is a pure liquid sealed in glass. It has a value of 0.02 NTU.

Standardization is performed in the calibration menu see page 18 for more details. While in the calibration menu perform the following operations:

- Place the Reference Standard in the Optical Well.
- Index the Reference Standard as previously described.
- Allow a few seconds for the standard to stabilize.
- Press the F1 button to accept the frequency.

**NOTE: This operation “calibrates” the .02 NTU reference standard in the range of interest. If both ranges maybe used this operation should be performed on both ranges.**

**CAUTION: Avoid scratching the surface of the cuvette. Keep the cuvette surface clean and free of dust. A scratched or dirty and dusty cuvette will cause analysis error. For instructions (See: V. ROUTINE MAINTENANCE).**

## IV. ROUTINE OPERATION

### A. CONTINUOUS MONITORING FLOW THROUGH UNIT

The standard flow through unit supplied with the instrument is designed to operate at pressures up to a maximum of 60 p.s.i. (414 kPa or 4.22 kg/cm<sup>3</sup>) and temperatures to a maximum of 122° F (50° C) fluid temperature. Flow rates through the unit can be adjusted from 0.5 gpm (200 ml/min) to a maximum of approximately 1.5 gpm (5.7 liters/minute). The speed of sensing turbidity changes will depend on the length of the take-off line, the diameter of the take-off line, and the flow rate or velocity through the take-off line. By using a high flow rate and keeping the lines small, approximately 3/16 inch (4.8 mm) I.D. and relatively short length, the response time is kept to a minimum. Consult HF scientific, inc. when unusually long connections are required.

Depending on the type of fluid being monitored, a pressure drop through the line can cause gas or air to come out of solution and form bubbles which will create errors in the turbidity measurements. This can be prevented by creating a slight back pressure on the

discharge side of the flow through unit using the stainless steel flow control valve (Catalog #50004) supplied. Increasing the size of the incoming line will also help this condition.

**NOTE: Since each application is different, the amount of back pressure required to eliminate bubbles must be determined and modified on site during operation by the customer.**

A plastic shut-off clamp is provided on the inlet side of the flow through unit in order to completely stop flow to facilitate changing the cuvette. See the section on cuvette cleaning and care for more information.

The U.S. EPA recommends that cuvettes used for instrument calibration, standardization, or sample measurement be indexed. For quick indexing of the flow through cuvette, a rotational flow through assembly with locking collar is supplied.

To index your flow through cuvette, slowly rotate the flow through at least one revolution, while observing the reading, to locate the position of the lowest reading. Without moving the flow through, press down on it and turn the locking collar until the flow through assembly is securely locked in place. See figure 10.

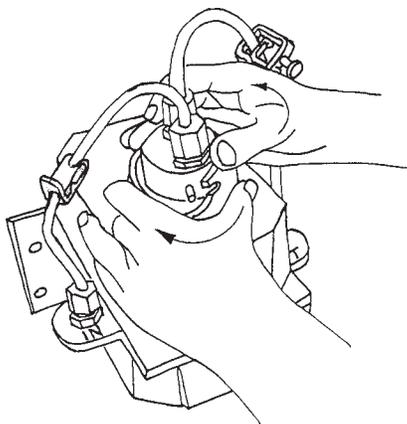


Figure 10  
Flow Through Cuvette Indexing

## B. VAPORPURGE

The MICRO 200 BW is equipped with a continuous vaporpurge system. A fan inside the sensor continuously circulates heated, dry air around the optical well and the flow through cuvette. This feature eliminates the need for connection of a dry purge line. See Figure 11.

The desiccant beads are dark blue when dry and turn to a light pink when expended. Check the desiccant on a quarterly basis or if after cleaning the cuvette readings appear erroneously high to ensure proper operation of the vaporpurge feature. **It is important to keep a cover on the sample well if the flow through head is out for more than a few minutes, to avoid saturating the desiccant uselessly.** A replacement desiccant tray complete with foot valve is available from HF scientific or your local representative HF part# 21555. See figure 1 on page 6 when replacing the desiccant.

**Remember to dry the flow through cuvette of excess moisture before inserting it into the optical well. This will speed up the evaporation time.**

**NOTE: If it should become necessary to return the sensor to the factory, you need only return the upper sensor assembly and not the base. IF RETURNING THE BASE, THE DESICCANT TRAY MUST BE REMOVED BEFORE SHIPPING.**

## C. GRAB SAMPLES

Take extreme care when handling any sample cuvettes. Surface scratches, dust or finger smudges will cause analysis error. Examine each cuvette carefully before the sample is drawn and placed in the Optical Well. We recommend that the cuvette be wiped clean with a lint-free laboratory tissue before the sample is drawn. Handle Reference Standard and cuvettes by the top portion only.

To take a reading of a grab sample:

1. Set Averaging to 1 second (see page 16).
2. Remove the flow through unit and insert grab sample cuvette in Optical Well.
3. The turbidity value of the grab sample will now be displayed on the readout. Allow at least two updates (five to ten seconds) for best accuracy before noting the reading.

**NOTE: Settling particles or air in the sample may cause the digital reading to “hunt”. For best results take readings before turbid particles settle but after air bubbles have been allowed to escape.**

## V. ROUTINE MAINTENANCE

### A. CUVETTE CLEANING & CARE

Cuvettes must be clean and free of marks or scratches in the critical area (see figure 12 on page 28). Cleaning

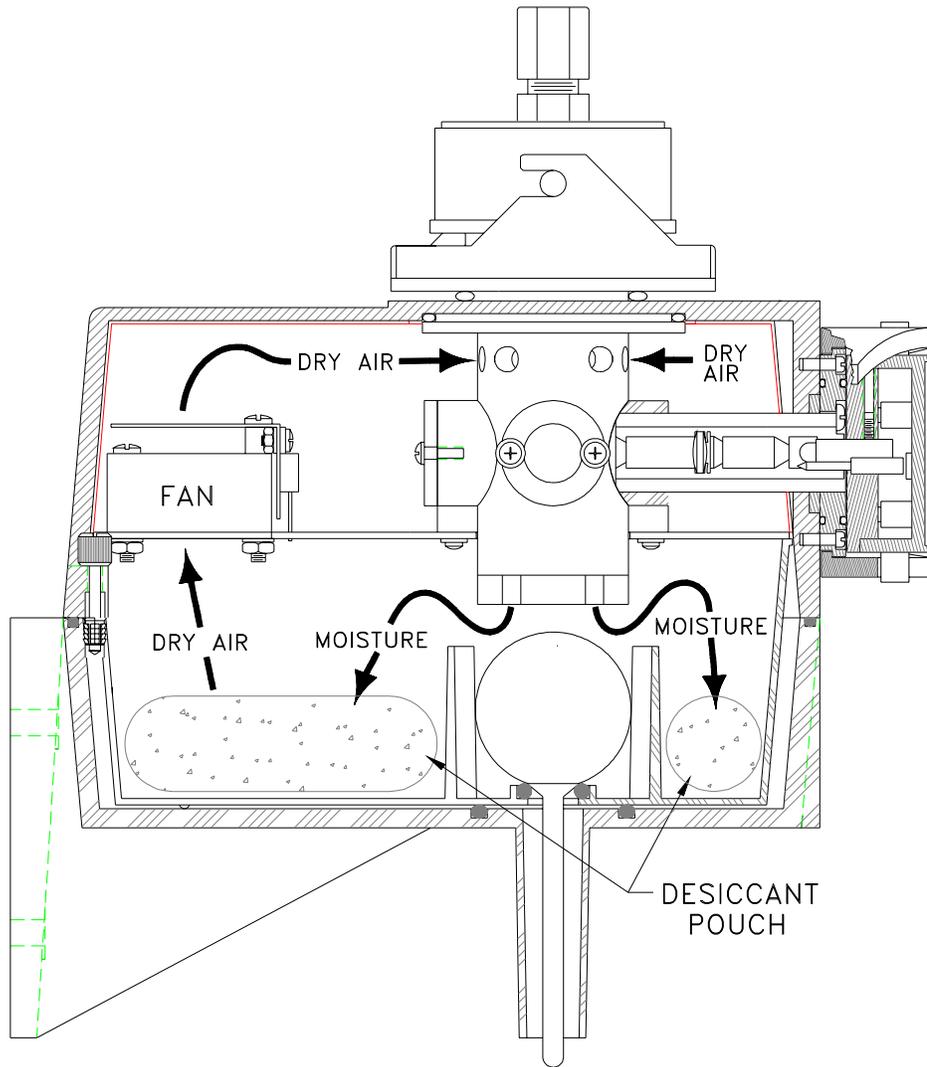


Figure 11  
Vaporpurge

is accomplished by washing the interior and exterior of the cuvette in a detergent solution, then rinsing thoroughly 8 to 10 rinses in clean, distilled water, to remove all streaks.

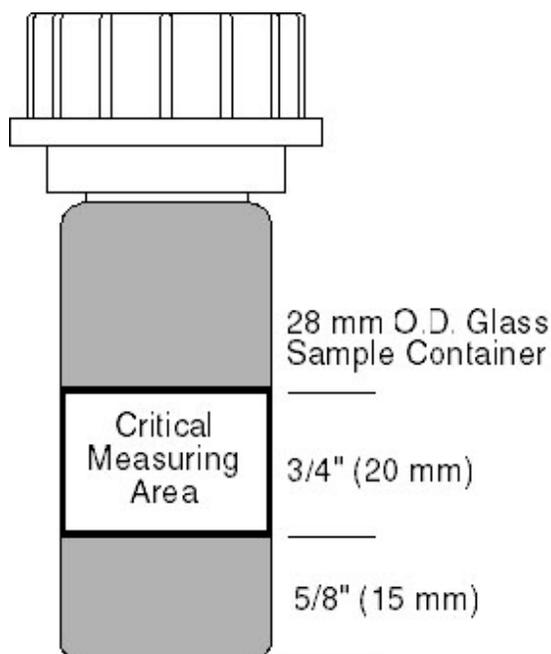


Figure 12  
Critical Measurement Area

The sample flow must be shut off, with the flow shut-off clamp on the inlet flexible tubing, when the cuvette in the flow through unit is to be cleaned or changed (see figure 13).

Replace the cuvette if scratches or marks in the critical area affect readings.

Store reusable cuvettes (Catalog No. 50036, pkg of 3) in a clean dust-free environment.

## B. LAMP REPLACEMENT

Periodically the LAMP MODULE, Cat. #21541, in the sensor will require replacement. It is recommended that one spare lamp for each MICRO 200 BW be kept on hand at all times. A burned out lamp is indicated by a flashing SENSOR AL indicator on the analyzer display. **TO CHANGE THE LAMP MODULE SIMPLY TURN THE OUTSIDE LOCKING RING COUNTER CLOCKWISE, AND PULL THE MODULE STRAIGHT OUT.** Reverse the procedure to install the replacement module. For accurate operation a complete calibration is recommended after a lamp module replacement. See page 29 for calibration instructions. Refer to figure 13.

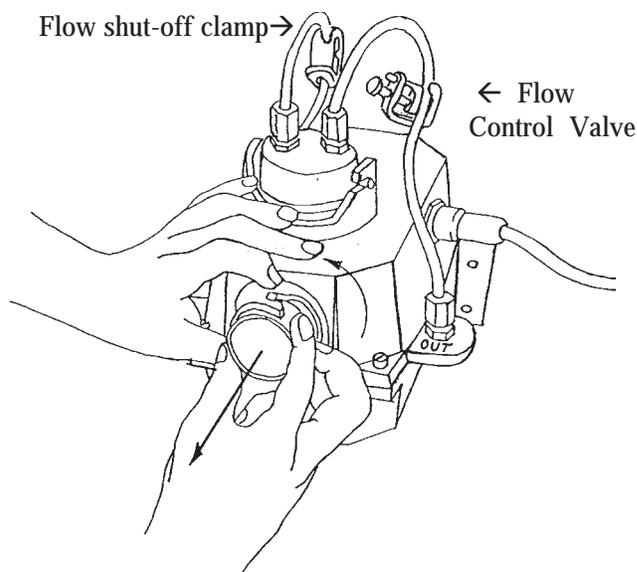


Figure 13  
Lamp Replacement

## C. CALIBRATION PROCEDURES

### 1. Calibration Standards

#### a. Secondary Standard Set (optional) Catalog No. 19830

HF Secondary Standards are recommended and certified by HF scientific. They are traceable to freshly prepared formazin primary standards. These standards are very easy to use off the shelf anytime without preparation making them an ideal turbidity standard. A Certificate of Traceability is available on request to HF scientific Customer Service Department. HF Secondary Standards may be used for calibration of HF turbidimeters. Order from HF scientific, inc.

**NOTE: Do not freeze standards. Do not leave standards in the measuring well for extended periods. Do not shake standards.**

Specific instructions for using certified Secondary Standards are included with the kit.

Each Secondary Standard Kit contains:

- Instructions
- 0.02 Reference Standard
- Certified Secondary Standards 100.0, 400.0, 1000 NTU Standards are contained in preselected cuvettes with light shield caps.
- A sturdy storage case

## b. Standard Formazin Solutions

Calibration of this instrument is based on Formazin, a material which is made by polymerization.

Calibration samples may be obtained by diluting Formazin stock suspension using "Turbidity-Free" water. Formazin stock suspension can be prepared by the user (Reference Standard Methods For Examination of Water and Wastewater) or a kit can be purchased from, HF scientific, inc., Catalog No. 50040.

Each kit contains:

- Instruction manual
- 1 liter of 4000 NTU Stock Suspension
- 1 Gallon (3.79 liters) turbidity-free water
- 4 Sample cuvettes (28 mm)
- 4 Light Shield Caps
- Graduated Pipettes 1 ea. in 1 ml, 10 ml, & 25 ml
- 1 Reference Standard

**NOTE: When the prepared samples start to flocculate, they are unreliable and fresh ones must be made. This will occur more rapidly for the lower value diluted suspensions.**

## 2. Calibration Steps 0-1000 NTU Range (Also See Section IV)

To meet stated accuracy it is advisable to allow both the analyzer and sensor to come to its optimum operating temperature, which can take approximately two hours. After this point you can proceed with the following procedure.

Standardization should be performed after after 1000 NTU (Full Scale) Calibration, although it is possible to standardize at any time without performing a complete calibration.

Although it is possible to calibrate at any combination of the calibration points, to achieve the stated accuracy use the following procedure.

Read these instructions in entirety prior to calibration. Select calibration menu then:

1. Insert 1000 NTU Standard
2. Rotate the standard while observing the frequency until the lowest reading is noted.

**NOTE: Be prepared for the two least significant digits to move about, this is normal.**

3. Calibrate the analyzer with the 1000 NTU Standard by pressing the F4 key.

4. A sensor calibration is first performed which adjusts the sensor for lamp variations. Then the frequency at the time of this selection is saved as the calibration frequency for the 1000 NTU standard. The frequency is displayed in the right hand column.
5. Insert the 400 NTU standard.
6. Rotate the standard while observing the frequency until the lowest reading is noted.
7. Press the F3 key.
8. The frequency at the time of this selection is saved as the calibration frequency for the 400 NTU standard. This frequency is displayed in the right hand column.
9. Insert the 100 NTU standard.
10. Rotate the standard while observing the frequency until the lowest reading is noted.
11. Press the F2 key.
12. The frequency at the time of this selection is saved as the calibration frequency for the 100 NTU standard. This frequency is displayed in the right hand column.
13. Insert the Reference Standard.
14. Rotate the Reference Standard to its index point.
15. Press the F1 key.
16. The frequency for the 0.02 NTU standard is saved. This frequency is displayed in the right hand column.

## VI. SECURITY ACCESS CODE

The security access code for the MICRO 200 BW provides a degree of protection against an unauthorized change to the instrument's settings or parameters. The security code feature may be turned off if desired.

The first requirement for the security access code after "power-up" is when you wish to exit the current display screen (turbidity or backwash). Upon pushing the MENU button to leave the display screen, a request will be made for the security access code. If the wrong code is entered, the screen will indicate this and the screen will return to the previous display. About ten seconds are allowed to enter the correct security access code. After this time the screen will return to the previous display. **Security access codes may be entered using the F1, F2, F3, F4 or F5 keys, only.**

The master security access code of 1435 must be used for initial use. **This master security access code may always be used.** Another code may be recorded and used for general maintenance. This code may be changed at any time. To record another code, go to the COMM PORT MENU. Select F4 button to change the access code. The MICRO 200 BW will now ask for the security access code. This may be the master security access code or the previous code (if any). The next menu will allow turning the access code off or for entering a new security access code. To use the access code feature, toggle the access code to on. Push F3 "Change code" to enter a new code. Note that the security access code must be any combination of three function buttons, F1 through F5. See page 20. Push the menu button to accept this code.

## VII. TROUBLESHOOTING

### A. GENERAL NOTES

Service and technical support are available from the manufacturer, HF scientific inc. from 8:00 AM to 4:00 PM Eastern Standard Time.

The following Table will supply fundamental troubleshooting information. The Guide assumes that the controls and functions of the instrument are used correctly. The intention of the guide is to eliminate common faults, not to troubleshoot down to component level.

#### GUIDE TO FUNDAMENTAL TROUBLESHOOTING

SYMPTOM	SOLUTION
Display not lit.	<ol style="list-style-type: none"> <li>1. Make sure that the unit is plugged in and turned on. Make certain that your power source is providing the correct voltage.</li> <li>2. Check analyzer fuse. Refer to page 8 for correct fuse size and instructions for changing.</li> <li>3. Shut off power for about five seconds and then turn it back on. This will initiate a power on reset.</li> <li>4. If none of the above steps correct the problem, contact HF scientific, inc. service dept. for additional support.</li> </ol>
Instrument not functioning correctly.	<ol style="list-style-type: none"> <li>1. If sensor cable was removed from the analyzer, check wiring connections.</li> </ol>
Cannot leave. menu.	<ol style="list-style-type: none"> <li>1. Invalid parameters may have been inadvertently set. Examples of this are a bad time or date or the lower limit set higher than the upper limit. Check the screen and change any invalid numbers.</li> </ol>
Display response slow.	<ol style="list-style-type: none"> <li>1. Select a lower averaging time.</li> </ol>
Sensor alarm on.	<ol style="list-style-type: none"> <li>1. Replace the lamp module.</li> <li>2. Check the connection at the sensor.</li> <li>3. The turbidity may be too high.</li> <li>4. Replace the sensor. If you have a spare sensor or another MICRO 200 BW you may use the alternate sensor to determine if the sensor in question is defective.</li> </ol>
Readings lower than expected.	<ol style="list-style-type: none"> <li>1. Recalibrate with known good standards.</li> </ol>
Readings higher than expected.	<ol style="list-style-type: none"> <li>1. Check the flow through cuvette. If it has dirt on either the inside or outside or is scratched, clean the cuvette or replace it.</li> <li>2. Check for condensation on the outside of the cuvette. If condensation is present either the desiccant tray needs replacement or the vaporpurge system of the sensor is defective. Replace the desiccant or the sensor.</li> <li>3. Recalibrate the sensor with known good standards.</li> </ol>
Readings erratic.	<p>To check if the erratic readings are due to sample measurement or a problem with the instrument, remove the flow through unit and place a light shield over the sample well. This may be left for a period of time and the graphic history observed later. If the graph shows instability the MICRO 200 BW has a problem. Call HF scientific service dept. If the graph is stable there is a problem with the sample being measured. See the following for suggested corrections.</p> <ol style="list-style-type: none"> <li>1. Check for debris in flow through cuvette. Clean out as required.</li> <li>2. Increase back pressure with flow control valve. This will keep air in solution.</li> </ol>
Analyzer Displays "Sensor Fail"	<ol style="list-style-type: none"> <li>1. Reset by turning analyzer power off and then on again. "0-1000 range 1000 NTU calibrate" should only be performed with a 1000 NTU standard in sensor well.</li> </ol>

## **B. SPARE PARTS LIST FOR MICRO 200 BW**

<b><u>CATALOGNO.</u></b>	<b><u>DESCRIPTION</u></b>
20892	BNC Connector
50036	Cuvette (3 pk) 28 mm x 70 mm (pressure checked)
21555	Desiccant Tray Assembly
50004	Flow control valve
50125	Flow through assembly
21512	Foot Valve Assembly
50040	Formazin Stock Solution Kit (4000 NTU)
21541	Lamp Module
50092	Light Shield Cap
20853	NTU Sensor Cable (per foot)
19808	NTU Sensor Module, 0 - 1000 NTU, Electronics portion only
21148	Nylon Bulkhead Assembly
50136	O-ring kit for flow through unit.
21640	Operating & Maintenance Manual
21870	PC Board Micro 200 BW Analyzer (Universal)
60002	Standard 0.02 NTU
20106	Stilling Chamber

### **OPTIONS - BACKWASH**

19275	Backwash Interface
20849	Backwash Interface to Analyzer Cable
50321	Backwash Sensor
20853	Backwash Sensor to Interface Cable

HF scientific, inc.  
3170 Metro Parkway  
Fort Myers, Florida 33916-7597  
Phone: (239) 337-2116  
Fax: 239-332-7643

## VIII. OPTIONS

### BACKWASH

#### A. INSTALLATION

##### 1. Backwash Interface

To monitor backwash using the MICRO 200 BW, one backwash interface and one backwash sensor is required for each analyzer. Refer to figure 16 for the outline of the backwash interface. Power requirements are 12 VA at 110 - 120 VAC or 220 - 240 VAC. The voltage may be changed using the selector switch located inside the interface housing. See figure 17 for details. The interface may be mounted up to 320 feet (91.4 m) away from the backwash sensor. The signal is sent to the MICRO 200 BW analyzer via BNC connectors through up to 1000 feet (304.8 meters) of coaxial cable (Catalog No. 20849). Refer to figure 14 for the analyzer BNC cable connection.

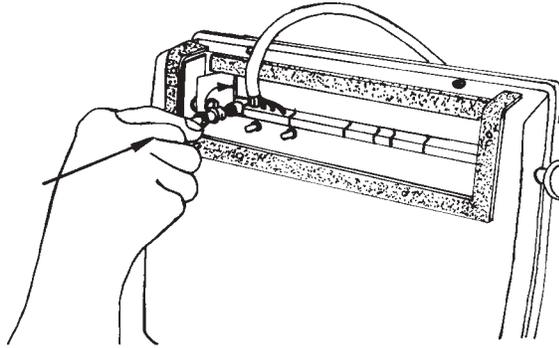


Figure 14  
Analyzer BNC Connection

##### 2. Junction Box

This option, HF Catalog No. 19805, may be used to extend the backwash sensor cable to a total length of 350 feet (106.7 meters), as measured from the sensor to the backwash interface. The junction box is weather tight and may be mounted outside. Refer to figure 18 for outline dimensions. For wire connections refer to figure 19. Extension cable may be ordered using HF Catalog No. 20848.

##### 3. Backwash Sensor

There are two standard methods of installing this sensor, **channel mounting** and **extension handle mounting**. Both of these will be described below. If alternate methods of mounting are required, please consult HF scientific inc.

When choosing an installation site for the sensor there are several things to consider. Since filters rarely will backwash consistently or uniformly, a site should be

chosen that best averages the backwash water over the cycle. The sensor should also be located as close to the backwash filter as possible to reduce the time delay of the water sample. This will give the operator a correct picture as to how the backwash is proceeding and when it is complete. Refer to figure 20 for sensor outline dimensions.

##### a. Channel Mounting

This method can be used when the area above the end of the channel is easily accessible. This allows cleaning of the sensor or calibrating by lifting the sensor up by its cable and lowering it back into place when you are finished. Since the sensor is not affected by sunlight, a lightshield is not required. An installation kit is available from HF scientific, HF Catalog No. 50345 which includes the sensor chamber, a stainless steel bracket, and mounting clamps. The user must supply PVC piping, bolts and anchors. Refer to Figure 21.

##### b. Extension Handle Mounting

This method allows the user to adjust the sensor positioning to optimize the sampled water. An installation kit is available from HF scientific, HF Catalog No. 50356 which includes sensor end baffles, hose clamps, and a pipe adapter. The user must supply the extension pipe such as galvanized steel 1/2" to 1 1/2" in diameter (12.7 mm - 38.1 mm) and any additional mounting deemed necessary for upper end.

1. The slot for the outlet baffle must be positioned in a vertical axis at the top.
2. Remove all rough edges from the pipe to prevent cable damage.
3. Attach the sensor to the pipe adapter with hose clamps.
4. Sensor cable can be wrapped around the pipe. If the pipe diameter permits, the cable can be threaded through the pipe.
5. Don't pull the cable too sharply through the pipe, use a large radius bend instead.

In operation, some experimentation will be needed during backwash to achieve optimal results. Note that the adapter has a pivot to allow the sensor to lay parallel to the bottom. Refer to figure 22.

#### B. BACKWASH SENSOR CONNECTIONS

The Backwash sensor is supplied with a 30 foot (9.1 meters) cable. This cable connects at TB2 of the Backwash Interface. The cable should first be inserted through the strain relief fitting of the case. At this point the outer jacket of the cable should be stripped back

about three inches. Care must be used to not nick the wires under the jacket. Note that the sensor cable is composed of two pairs of wires. Each pair consists of two insulated wires and an uninsulated shield wire, wrapped individually in a foil shield. The wire pairs are RED & BLACK and WHITE & BLACK. The foil can be unwrapped and removed, while keeping the pairs together. The two shield wires should be wrapped together. The remaining wires need to have the insulation stripped back about ¼". The sensor cable can now be wired to the appropriate terminal block, using care not to transpose the black wires in opposite pairs. Make the following connections:

- Terminal 1 White wire - white/black pair
- Terminal 2 Black wire
- Terminal 3 Uninsulated shields
- Terminal 4 Red wire
- Terminal 5 Black wire - red/black pair

### C. BACKWASH SENSOR MAINTENANCE

Over a period of time contaminants may build up on the flow through glass surface of the sensor. This may affect the operation of the sensor. The sensor should be cleaned periodically. A soft bottle brush can be used with a mild solution of water and detergent followed by a thorough rinsing with water. For optimal results, clean the sensor each time before calibrating.

An indicating type desiccant can be seen through the glass of the sensor. If no leaks are present, these beads will be blue. If the beads are not blue, the sensor must be returned to HF scientific for service.

#### 1. Backwash Calibration

This procedure takes place through the Calibration selection from the Utilities Menu. Numbers will be displayed on the LCD (screen). These numbers represent frequencies adjusted so that 10KHz is represented as 100%T. The numbers in the top center of the screen show real time frequency and percent transmittance as it is output from the sensor. The number to the right of the 100%T is the frequency that was saved from the previous backwash calibration. See page 24.

Follow this procedure:

1. Inspect the glass tube in the backwash sensor. Clean the sensor in mild detergent and a soft bottle brush, if required.
2. Insert the backwash sensor in a container of 100% T water, preferably the same water which will be used for backwash.

3. Press the 100% selection. (This is the only operation necessary for backwash calibration.)

### D. BACKWASH ALARMS

To use the backwash alarms you must first enter the backwash display, and then exit to the main menu. Select F1 for alarms. The alarms may be set as shown on page 14. Note that the alarms are set in percent transmittance and that these alarm settings are unique to the backwash function. These settings do not affect previous turbidity alarm settings.

**CAUTION: If either of these alarm contacts are wired to a turbidity control function, set that alarm to "off" to prevent accidental operation during a backwash. Likewise, if alarm contacts are wired to a backwash control function, set that alarm to "off" to prevent accidental operation during turbidity measurement.**

### E. BACKWASH REMOTE SWITCHING

**NOTE: This feature adds two attributes to the MICRO 200 analyzer:**

- 1) **The addition of an analog output either 4-20mA or 0-10V while operating in the backwash mode.**
- 2) **The ability to switch, at a remote location, between turbidity and backwash.**

#### 1. ELECTRICAL CONNECTIONS

##### a. Remote Switch

Connections are made at the analyzer terminal block J7 labeled MISC. INPUTS (SIGNAL). A dry (not powered) "A" contact connection between terminals 1 & 2 is required. With an open circuit between these contacts, the MICRO 200 will operate normally. Closing this circuit, while in the turbidity display, will cause the instrument to change to the backwash mode.

##### b. Alarms

Two sets of user settable alarm contacts are provided plus an additional sensor alarm. Separate Alarm set points may be made in either turbidity and backwash modes. Keep in mind that when you change modes these contacts are still connected and active unless set to OFF in either of the modes.

### c. Analog Outputs

Analog outputs of either 4-20 mA or voltage are available. If you select voltage you may choose 0-10V, 0-1V or 0-100mV. This analog output will be shared by both modes and will automatically recalibrate to the selected mode.

### d. Serial Port (Optional)

If a serial port is connected the readings will report in NTU while in the turbidity mode and will report in %T while in the backwash mode.

## 2. OPERATION

With the remote switch set to the normal position (open), the instrument should be calibrated in both turbidity and backwash. All parameters such as alarm set points and display limits should be set as described in the O&M Manual. From the main menu, press F4 to enter turbidity, and select the range. At any time, from this point on, you may set the remote switch to the backwash position (closed) and change over to the backwash display.

While in either mode any operating parameter may be changed by pressing MENU and entering the access code. Keep in mind that even while in the menus, all outputs are still active in which ever mode you were last in.

**CAUTION: Keep in mind that when changing modes, the alarms, the analog output and the serial port (if connected) will also change modes.**

### SERIAL INTERFACES

Each of these options maybe installed by removing the rear cover of the analyzer as shown in figure 4 on page 8 and plugging in the interface as shown in figure 21.

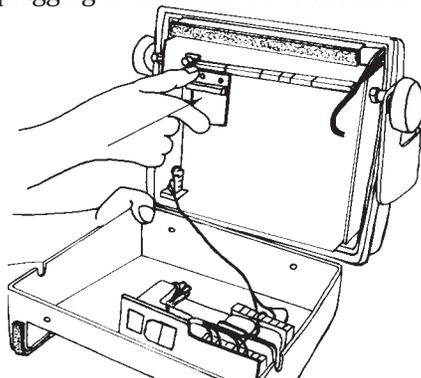


Figure 15  
Serial Interface Installation

These options may be used to connect to a serial printer, a data logger or as a direct interface to a computer. The serial port will report each reading that is seen on the analyzer digital display. The report is in ASCII format and is concluded with a carriage return and line feed.

As an example, if the display of the MICRO 200 BW reads 0.1234 NTU, the serial port decimal string would be:

```
Decimal
48 46 49 50 51 52 78 84 85 13 12
0 . 1 2 3 4 N T U (CR) (LF)
ASCII
```

(SP) = Space; (CR) = Carriage Return; (LF) = Line Feed

If the display reads 098.7 % T, the serial port decimal string would be:

```
Decimal
48 57 56 46 55 0 37 84 13 12
0 9 8 . 7 (SP) % T (CR) (LF)
ASCII
```

By selecting "Printer on" via the Main Menu, Utility Menu and the COMM Port menu, the MICRO 200 BW will transmit each reading, in real time. This mode is used to drive a printer for raw data collection.

By selecting "Printer Off" the MICRO 200 BW will only transmit its reading by command. Up to 16 MICRO 200 BW units may be simultaneously connected to one serial port of a host computer. An address may be assigned to a particular unit by operating F2 in the Comm Port Menu. It will serially cycle through addresses 0 through F (Hexadecimal). Obviously, no two units, which are on the same host computer port, should have the same address.

If the host computer transmits the ASCII character "@" (decimal 64) followed by the ASCII character address, for instance, 64, F, only the unit assigned address "F" will respond with its reading. This allows data logging for a non-dedicated host computer for up to 16 MICRO 200 BW units on only one of its serial ports. Both the MICRO 200 BW and the host computer must be set at the same baud rate. The host computer requires software to handle the data storage.

#### 1. RS-232C Standard Voltage Mode Interface (Catalog # 19861)

This configuration is the standard serial port format (RS-232C). It is suitable where the cable length

between the most remote MICRO 200 BW analyzer and the host computer does not exceed 50 feet (16.4 m.). Due to its "tri-state transmitter" design, the companion MICRO 200 BW units, which are on the same serial port at the host computer, may be "hubbed" or connected each one to the next as long as the total cable length from each MICRO 200 BW to the host computer does not exceed 50 feet (16.4 m.). See figure 23 on page 41.

TXD = Pin #1; Transmitted data out; Data to computer or printer

GRD = Pin #5; ground; digital common

RXD = Pin #8; received data in; data from computer to MICRO 200 BW

SHIELD = PIN #4

Please consult HF scientific, inc. for more detailed instructions.

## **2. RS-232 Current Mode Interface (Catalog # 19862)**

This configuration is used where the cable length between the most remote MICRO 200 BW analyzer and the host computer exceeds 50 feet (16.4 m.). Because it is sensitive to the resistance of the interconnecting cable, and because each interface used causes the total loop resistance to increase, its use is limited to only a few stations. It is difficult to determine how many stations may be used until all of the geographic site locations are determined. Please consult HF scientific, inc. if this option is under consideration. A more prudent choice might be the RS-485 option, the description of which follows this. See figure 24 on page 41.

## **3. RS-485 Half Duplex Interface (Catalog # 19851)**

This option may be used where the distance from the host computer to the most remote MICRO 200 BW analyzer is, in extreme cases, up to 10,000 feet (3.28 km), depending on the site noise conditions. It is similar to the RS-232 Standard Voltage Mode Interface except that it transmits in a "Balanced" mode, in one direction, at one time (half-duplex). This balanced mode makes it less susceptible to noise. It also may be "hubbed" or connected each one to the next. It is important the most remote interface, and only it, should have its switch "closed" to properly terminate the network. Please consult HF scientific, inc. for more specific information. See figure 25 on page 41.

## **4. Serial Printer (Catalog # 19860)**

This option provides a printout every 4 hours, or every 24 hours at midnight, of: date, time of period, minimum NTU, average NTU, and maximum NTU readings during the selected period. The printer option is supplied in a NEMA 4x enclosure intended for wall mounting. This option is shipped with an instruction manual addendum giving more detailed information on installation and operation. Please consult HF scientific, inc. for more specific information.

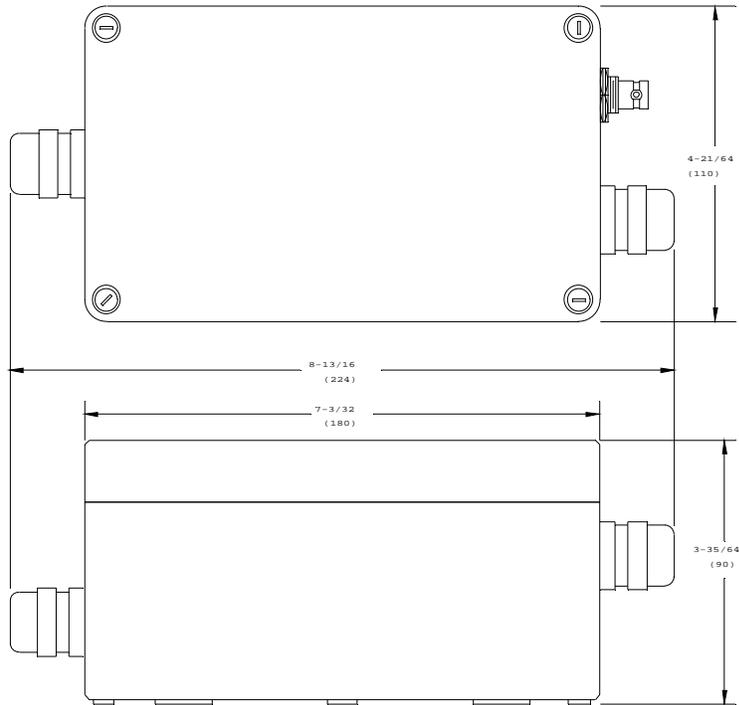


Figure 16  
Backwash Interface Outline Dimensions

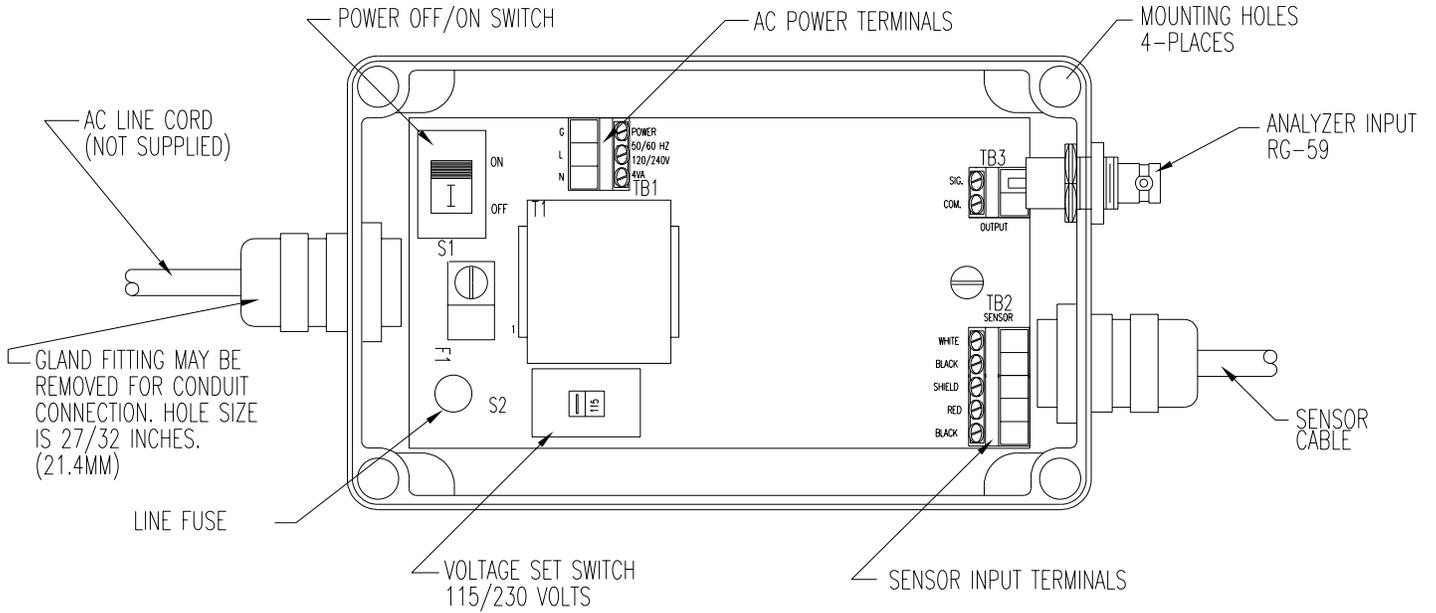


Figure 17  
Backwash Interface Voltage Selection

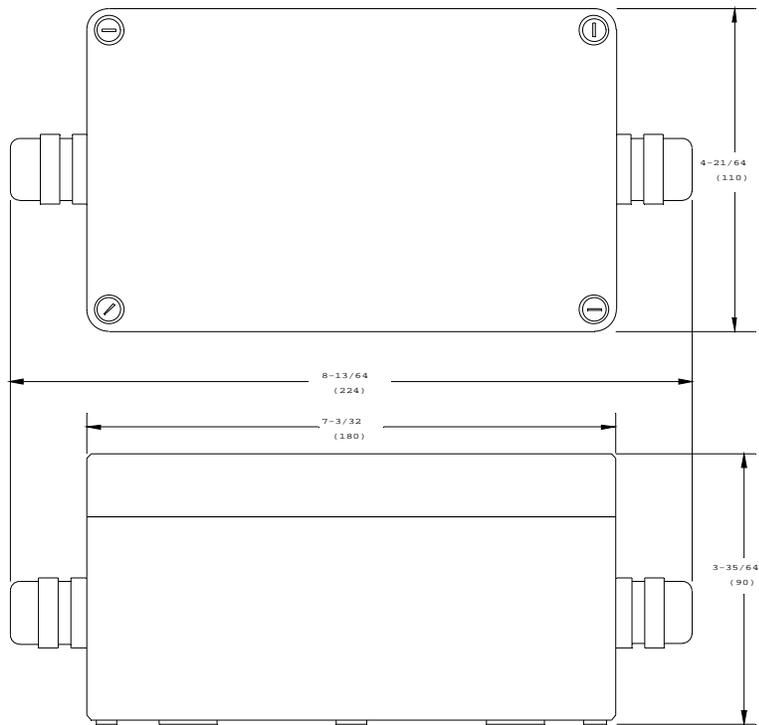


Figure 18  
Junction Box Outline

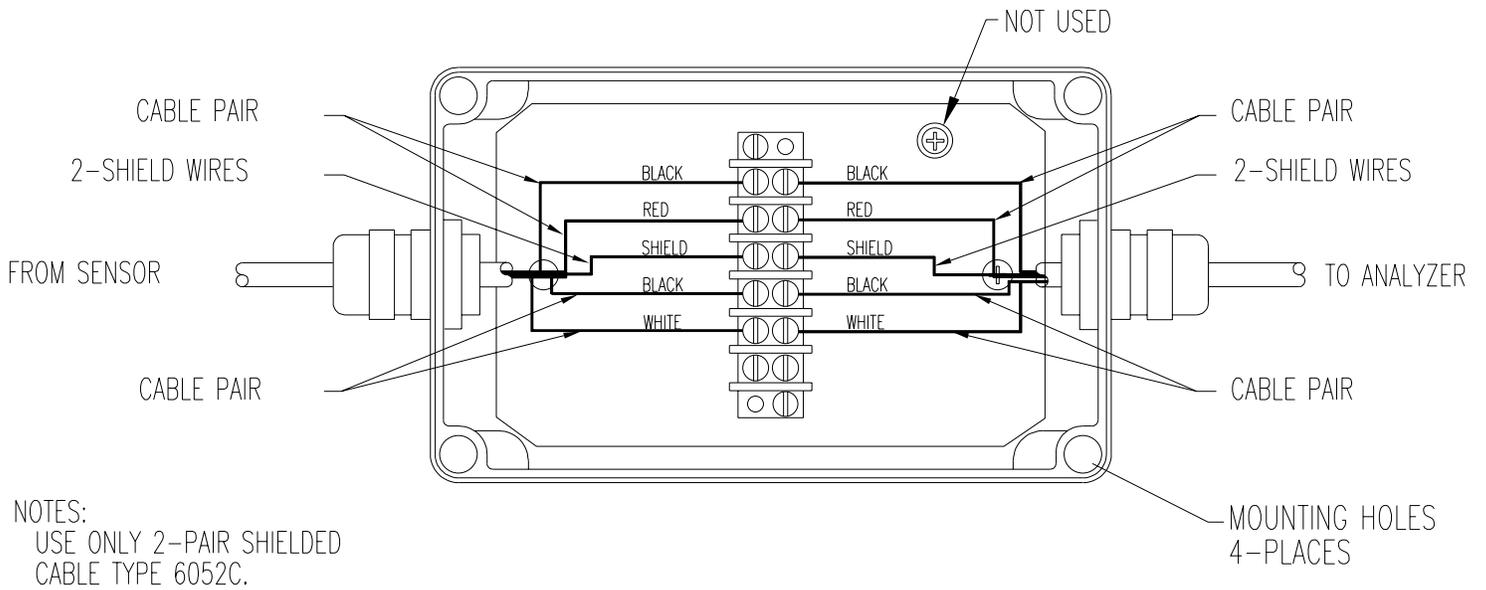


Figure 19  
Junction Box Wiring Diagram

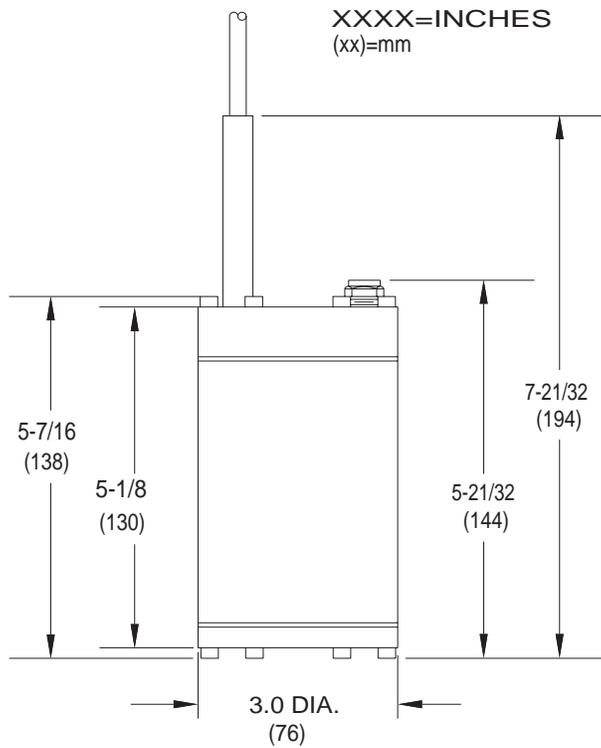


Figure 20  
Backwash Sensor Outline Dimensions

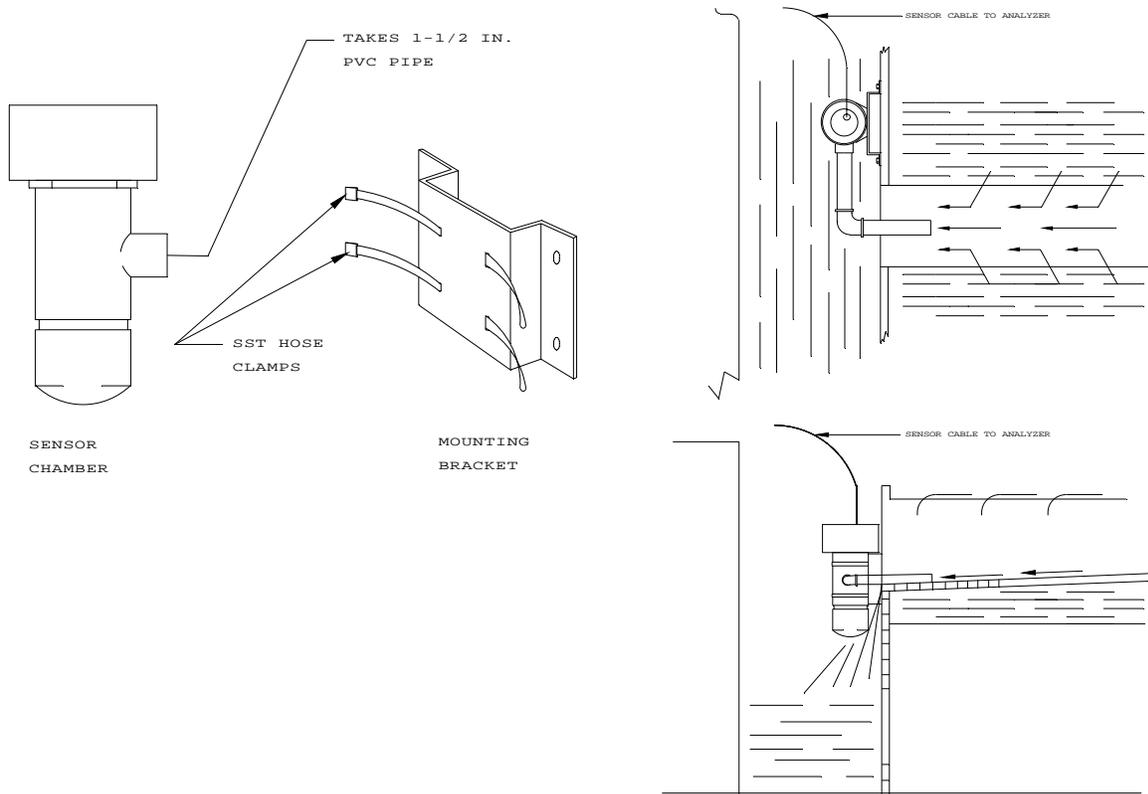
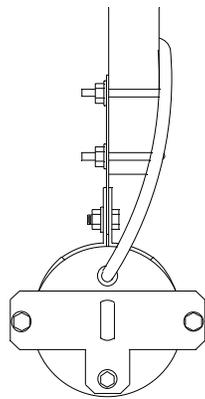
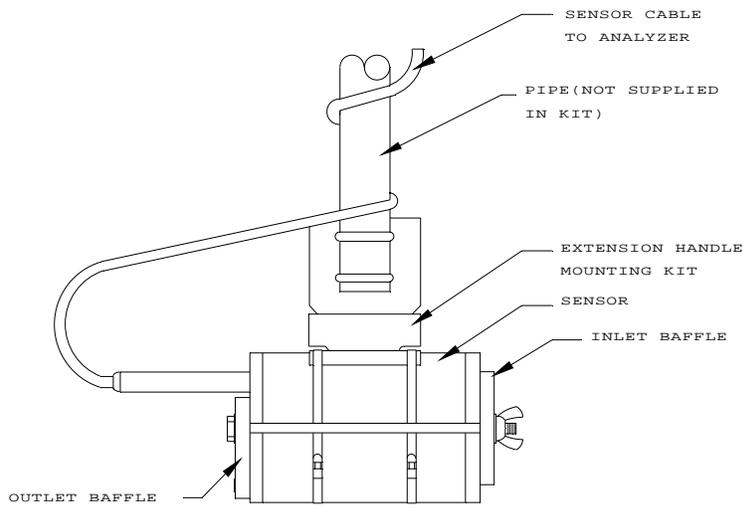
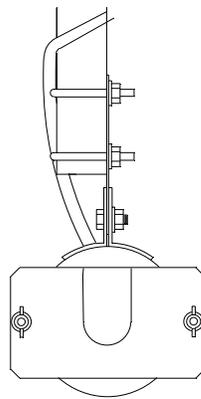


Figure 21  
Backwash Channel Mounting



OUTLET BAFFLE



INLET BAFFLE

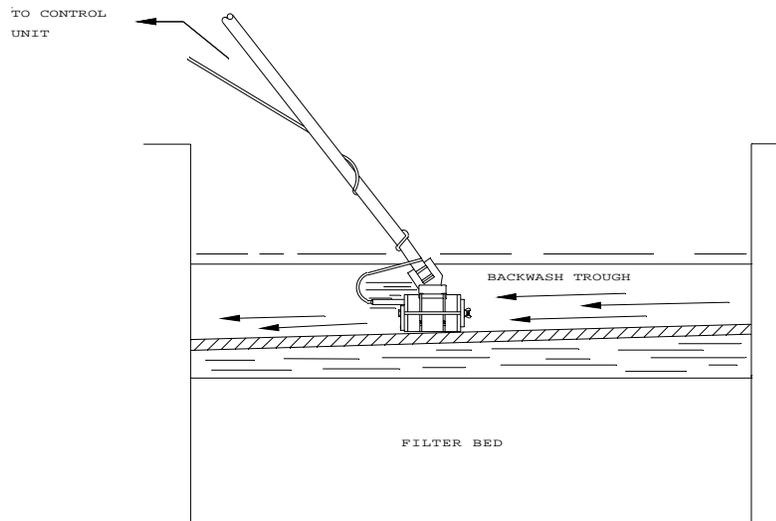


Figure 22  
Backwash Extension Handle Mounting

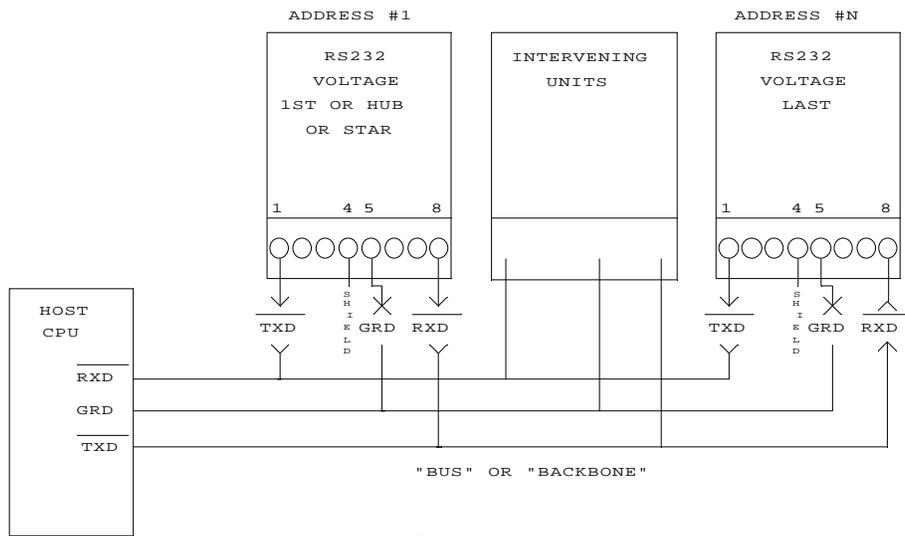


Figure 23  
RS-232 Voltage Connection

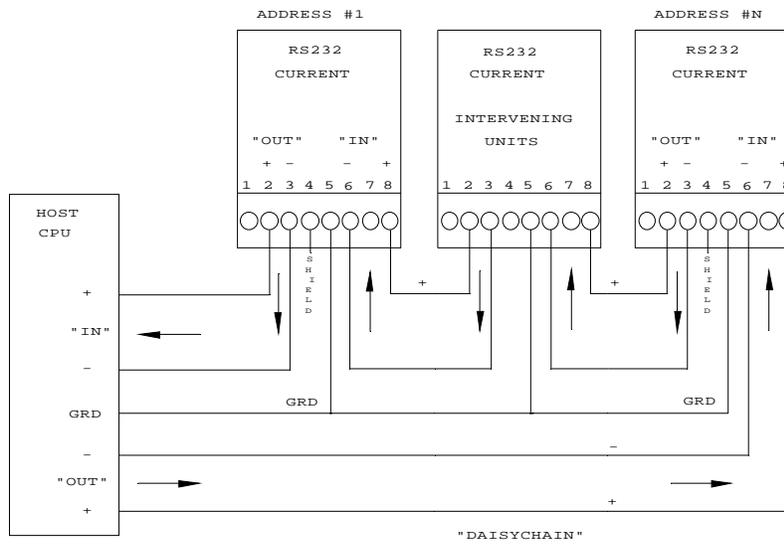


Figure 24  
RS-232 Current Connection

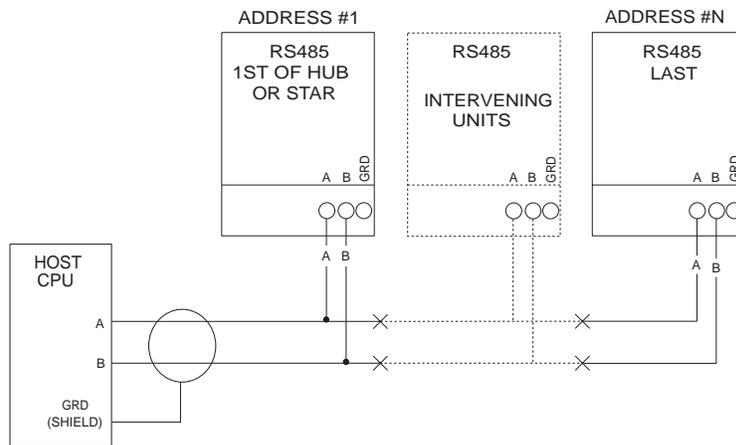


Figure 25  
RS-485 Connection

## WARRANTY

HF scientific, inc., as vendor, warrants to the original purchaser of the instruments to be free of defects in material and workmanship, in normal use and service, for a period of one year from date of delivery to the original purchaser. HF scientific, inc.'s, obligation under this warranty is limited to replacing, at its factory, the instrument or any part thereof. Parts which by their nature are normally required to be replaced periodically, consistent with normal maintenance, specifically lamps including fluorescent backlight, reagent, desiccant, sensors, electrodes and fuses are excluded. Also excluded are accessories and supply type items.

Original purchaser is responsible for return of the instruments, or parts thereof, to HF scientific, inc.'s factory. This includes all freight charges incurred in shipping to and from HF scientific, inc.'s factory.

HF scientific, inc. is not responsible for damage to the instrument, or parts thereof, resulting from misuse, negligence or accident, or defects resulting from repairs, alterations or installation made by any person or company not authorized by HF scientific, inc.

HF scientific, inc. assumes no liability for consequential damage of any kind, and the original purchaser, by placement of any order for the instrument, or parts thereof, shall be deemed liable for any and all damages incurred by the use or misuse of the instruments, or parts thereof, by the purchaser, its employees, or others, following receipt thereof.

Carefully inspect this product for shipping damage, if damaged, immediately notify the shipping company and arrange an on-site inspection. HF scientific, inc. cannot be responsible for damage in shipment and cannot assist with claims without an on-site inspection of the damage.

This warranty is given expressly and in lieu of all other warranties, expressed or implied. Purchaser agrees that there is no warranty on merchantability and that there are no other warranties, expressed or implied. No agent is authorized to assume for HF scientific, inc. any liability except as above set forth.

HF scientific, inc.  
3170 Metro Parkway  
Fort Myers, Florida 33916-7597  
Phone: (239) 337-2116  
Fax: (239) 332-7643

## GLOSSARY

Alarms:	Relay outputs that change when an alarm setpoint has been exceeded.	JTU:	Jackson Turbidity Units
Backwash:	A method of measuring the transmission of filter backwash water.	LCD Display:	Liquid Crystal Display (screen) used to view the information available on the MICRO 200 BW.
Baud:	Rate of transfer of serial information.		
Calibrate:	Electronic adjustment of the instrument to known standards.	Main Menu:	The major options for each of the functions accessed by the "FUNCTION" keys.
Cursor:	The LCD pointer indicating which digit or figure will change.	NTU:	Nephelometric Turbidity Units
Cuvette:	Glass container used to hold the sample to be measured. It is placed in the optical well of the turbidimeter.	Self Test:	A function that the MICRO 200 BW performs to check the internal analyzer voltages.
Comm Port:	Serial RS-232 or RS-485 communications port used for connecting a serial printer to generate hard copies of measurements or to datalogging equipment.	Set Alarm Point:	Setting the value at which an alarm will occur.
		Set Average:	Selection of the time period used to average the display. Used to mitigate rapidly changing readings.
D to A:	Digital to analog conversion. Used to provide 4-20 mA and 0 - 10 V output signals.	Set Time:	Function used to Set the internal clock of the MICRO 200 BW
Digit Up:	Command indicating an increment or increase of the digit selection.	Set Baud Rate:	Set the RS-232 information transfer rate.
Digit Down:	Command indicating a decrement or decrease of the digit selection.	Standardize:	Calibration of the lowest value of water.
Display Parameters	The set up of information to be displayed on the LCD display.	Sub Menu:	Menu selections offered after selecting an option from the main menu.
Display:	LCD display screen on the Analyzer.	Select:	A function that alternates among features or selections.
Frequency:	The number of cycles per second (hertz), of an alternating current signal.	Turbidity:	The measurement of light reflected by particles suspended in a fluid.
FTU:	Formazin Turbidity Units (see NTU)		
Host Computer:	A computer that is used to acquire and collect information from the serial port of one or more MICRO 200 BW analyzers (up to 16, Ø through F, Hexametadecimal).		



Date: August 3, 2004

Revision: 10

## MATERIAL SAFETY DATA SHEET

HF scientific, inc.  
3170 Metro Parkway  
Fort Myers, FL 33916-7597  
(239) 337-2116  
Mon-Fri 8:00 am - 4:30 pm

24 Hour Emergency  
Telephone Number  
CHEMTREC  
1-800-424-9300

### SECTION 1 PRODUCT IDENTIFICATION

**PRODUCT NAME:** 100 %T STANDARD SOLUTION, 0.02 NTU PRIME TIME STANDARD, REFERENCE STANDARD, 0.02 NTU 250 ML PRIMARY STANDARD, and 0.02 NTU 1GALLON PRIMARY STANDARD, WATER - INCLUDING H2O PRIME TIME STANDARD.

**CATALOG NUMBER:**

HF scientific, inc.  
14246/19199/19323/50047/60002/70908

U. S. Filter/Wallace & Tiernan:  
AAC1556/AAC6608

**CHEMICAL FAMILY:** Not applicable

**SYNONYMS:** None

**FORMULA:** Turbidity free water (CAS # 7732-18-5), Preservative

### SECTION 2 HAZARDOUS INGREDIENTS

No hazardous ingredients greater than or equal to 1%  
No carcinogen greater than or equal to 0.1%

### SECTION 3 PHYSICAL DATA

**Boiling Point(F):** Approximately 212 deg F (100 deg C)

**Solubility in Water:** Miscible

**Vapor Pressure (mm Hg):** Not determined

**Appearance and Odor:** Clear and colorless; no odor.

**pH :** 1.1 - 2.0 at 25 deg C

**Vapor Density(AIR=1):** Not determined

**Specific Gravity (H<sub>2</sub>O=1):** Approximately 1

**Melting Point:** Approximately 32 deg C (0 deg C)

**Evaporation Rate:** Not determined

**Percent Volatile by Volume:** Not determined

### SECTION 4 FIRE AND EXPLOSION HAZARD DATA

**Flash Point:** Not Flammable

**Flammable Limits:** Not determined

**Fire Extinguishing Media:** Suitable to cause of fire

**Fire Fighting Procedures:** Suitable to cause of fire

**Unusual Fire And Explosive Hazards:** None

### SECTION 5 HEALTH EFFECTS AND FIRST AID

**Route(s) of Entry:** Inhalation? No Skin? Yes Ingestion? Yes

**Effects of Overexposure:** Irritation of the eyes, mucous membranes and skin could occur.

**Carcinogenicity:** NTP? IARC MONOGRAPHS? OSHA REGULATED?  
Not a carcinogen.

**Signs and Symptoms of Exposure:** Burning or irritation of the exposed area.

**Medical Conditions Generally Aggravated by Exposure:** None found

**Emergency First Aid Procedures:**

**Skin:** Wash with plenty of water for 15 minutes. Call physician if irritation occurs.

**Eyes:** Flush eyes with plenty of water for 15 minutes. Call physician.

**Ingestion:** Give large quantities of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Call physician.

**Inhalation:** Remove to fresh air. If breathing has stopped, give artificial respiration. Call physician immediately.

### SECTION 6 REACTIVITY DATA

**Stability:** Stable

**Conditions to Avoid:** Organic matter, chlorates, active metals

**Incompatibilities (Materials to Avoid):** Organic matter, chlorates, active metals

**Hazardous Decomposition Products:** Toxic SO<sub>x</sub> fumes

**Hazardous Polymerization:** Will not occur

### SECTION 7 SAFE HANDLING AND USE

**Steps to be Taken in Case Material is Released or Spilled:** Neutralize with soda ash. Absorb with paper.

**Waste Disposal Method:** DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

**Precautions to be Taken in Handling and Storage:** Avoid contact with skin, eyes and clothing. Store tightly closed in a cool, dry place.

**Other Precautions:** Do not open vial to preserve low turbidity of standard.

### SECTION 8 CONTROL MEASURES

**Respiratory Protection:** None required in normal use.

**Ventilation:** General mechanical ventilation satisfactory in normal use.

**Skin Protection:** Rubber gloves

**Eye Protection:** Safety goggles

**Other Protective Measures:** None

**Work/Hygenic Practices:** Wash well if contact occurs

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