MICRO PURGE basics QED

FLOW CELL

MODELS

MP20
MP20D
MP20DT

User's Guide

Part No. 95179 REV. 12-20-02

The World Leader in Air Powered Pumps *For Remediation, Landfills and Ground Water Sampling*

Ground Water Sampling • Remediation, Leachate and Condensation Pumps • Floating Layer Recovery Systems • Air Strippers

SEVERN TRENT

QED Environmental Systems

QED ENVIRONMENTAL SYSTEMS
P.O. Box 3726 • Ann Arbor, MI 48106-3726 USA • 1-800-624-2026 • FAX (734) 995-1170 • info@qedenv.com • www.qedenv.com
1133 Seventh Street Oakland CA 94607-2601 • 1-800-537-1767 • FAX (510) 444-6789

CONTENTS

1.1 Foreword

The QED MicroPurge basics MP20 Flow Cell (including models MP20, MP20D and MP20DT) is an advanced purge water quality monitoring system specifically intended for use in ground water sampling, especially related to low-flow sampling methods. The sonde is optimized for flow cell use and is not intended for submersion; submerging the cable fitting will cause water damage to the electronics. The MP20 Flow Cell includes the following key features:

- Exclusive PurgeScan parameter stabilization monitoring function, which signals when selected stabilization criteria have been met and stores key readings.
- Waterproof, light weight meter with simplified, 5 key controls, and large display that shows all parameters automatically.
- Compact sonde with high reliability sensor design and built-in stirrer for fast response and stable readings.
- One-piece, molded transparent flow-through cell with minimized internal volume and designed flow path for quick, accurate response to water quality changes.
- Rugged, waterproof case that also serves as a convenient operating platform.
  3 year warranty on meter, sonde and flow-through cell.
- Model MP20D includes the capability to download data to a PC.
- Model MP20DT includes turbidity measurement and the capability to download data to a PC.

The QED MicroPurge basics MP20 Flow Cell includes a sensor package (the Sonde), a data display unit (the Meter), a flow-through cell, accessory items and a waterproof case which also serves as an operating platform. For this manual, MP20 Flow Cell will refer to the combination of all of these elements.
The MP20 Sonde includes sensors for temperature, pH, dissolved oxygen (DO), specific conductance (SpC), oxidation-reduction potential, (ORP), salinity, and total dissolved solids (TDS). The MP20DT Sonde includes a turbidity sensor. The sonde should not be submerged.
The MP20 Meter includes battery power and a liquid-crystal screen for viewing up to five parameters at one time. The Meter is also used for configuring and calibrating the sensors and can store up to 200 data frames. The MP20D includes the cables required for data download to a PC.
The MP20 flow-through cell includes connecting fittings and a check valve.
The provided MP20 accessories include a calibration cup, storage cup, connecting tubing for the flow cell, and service kits for the DO and pH sensors.
The MP20 waterproof case is designed to serve both as transport protection and a usage platform.

1.2 Specifications

Performance Specifications

	Range	Accuracy	Resolution
Temperature	5ºC to 50ºC	±0.2ºC	0.01ºC
Dissolved Oxygen	0 to 50 mg/L	±0.2 mg/L ≤20 mg/L ±0.6 mg/L >20 mg/L	0.01 mg/L
Specific Conductance	0 to 100 mS/cm	±1% of reading±1 count	4 digits
pH	2 to 12 units	±0.2 units	0.01 units
ORP	-999 to 999 mV	±25 mV	1 mV
Depth (100 m)	0 to 100 m	± 3 m	0.1 m
Turbidity	0 to 1000 NTU	±5% of reading ±1 NTU	0.1 NTU<100 NTU 1 NTU≥100 NTU
Salinity	0 to 70 PSS	±1% of reading ±1 count	0.01 PSS

MP20 Sonde

Width:	7.6 cm (3 in)
Length:	22.9 cm (9 in)
Weight:	2.9 kg (1.3 lbs)
Operating Temperature (non-freezing):	-5°C to 50°C
Operating Voltage Range:	7 to 14 VDC

MP20 Meter

Screen Size (diagonal):	8.9 cm (3.5 in)
Width (screen section):	12.7 cm (5 in)
Width (handle section):	6.4 cm (2.5 in)
Length:	26.9 cm (10.6 in)
Weight (with batteries):	0.95 kg (2.1 lbs)
Operating Temperature (non-freezing):	-5°C to 50 C
Batteries:	3 C Alkaline
Battery Life (Circulator On, Without Turbidity):	>20 Hours
Battery Life (Circulator On, With Turbidity):	>13 Hours
Memory (1 frame stores all parameter values):	200 Data Frames (non-volatile FLASH)
Waterproof Rating:	NEMA 6 (IP67)
Real-Time Clock Life:	>10 Years
Real-Time Clock Accuracy:	± 2 Minutes Per Month

1.3 Components

The following picture identifies the main components of an MP20 System.

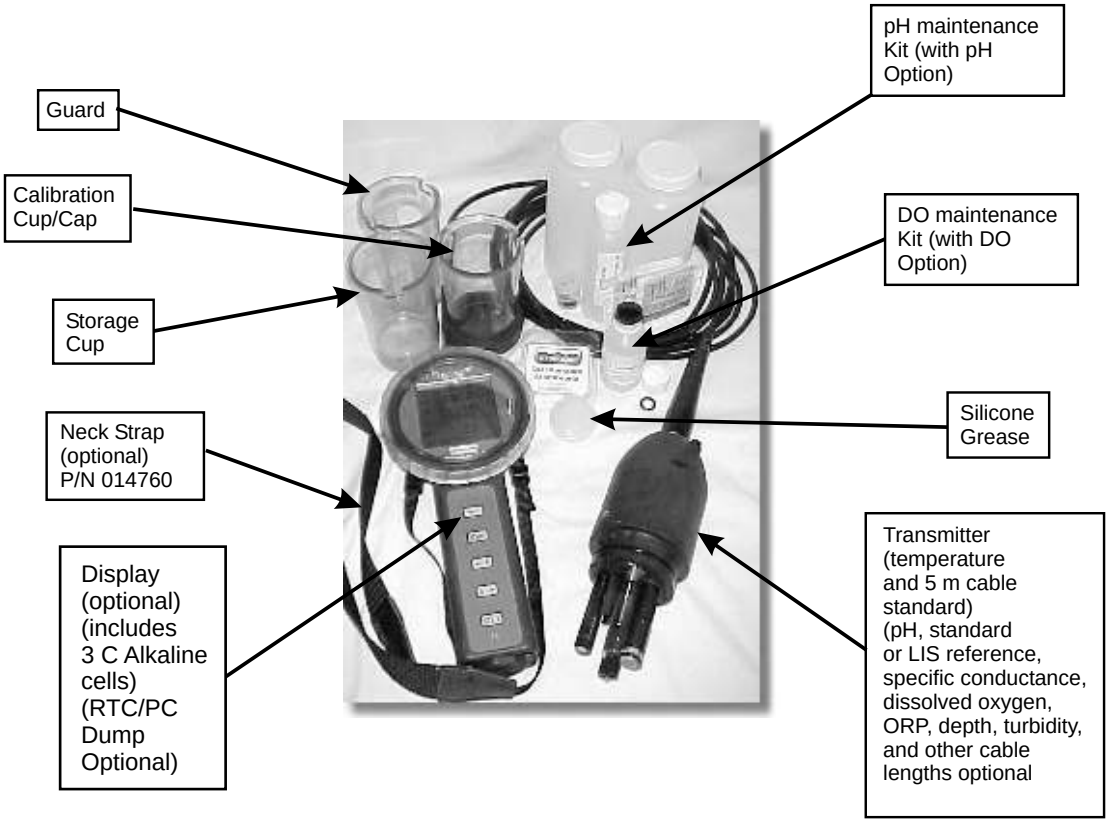


Figure 1

1.3.1 MP20 System Assembly

To assemble your MP20 System, simply uncap the Meter connector and connect the Sonde cable connector to the Meter connector. These connectors are keyed (don't force them) and the retaining ring will make a 'click' when rotated to the correct position to capture the connectors. Have the Sonde attached to the storage cup, calibration cup or flow-through cell with water contacting the sensors. Do not submerge the sonde cable connector.
Now press the Meter's ⏻ key (on/off). The Meter's LCD will show the Meter and Sonde software revisions and, after a few seconds, begin showing current Sonde data. If not, please refer to Section 7.

Notes:
The Meter and Sonde software revisions show as 'd A.B', 'S C.D', and 'U E.F' where 'd' is the Meter's software revision, 'S' is the Sonde's software revision for non-turbidity measurements, and 'U' is the Sonde's software revison for turbidity measurements.

1.3.2 MP20 Flow Cell Operation Overview

The MP20's keypad control generally operates by using the arrow keys to move the blinking highlight to different items on the display, and the 8 key to select the item. The Esc ESC key is used to back out of an operation. See Section 2.1.3 Keypad, below for complete information.

Typical MP20 usage sequence: Calibrate meter, remove calibration cup from sonde, twist flow cell onto sonde, put flow cell/sonde into vertical or horizontal position in front of case, connect flow cell to sampling pump discharge with tubing and fittings provided, begin well purging. When the desired purge flow rate is achieved from the pump in the well, initiate the PurgeScan feature to automatically indicate when water quality parameter readings have stabilized according to the established criteria. When stabilization is attained, disconnect flow cell from pump discharge tube and begin filling sample containers directly from pump discharge tube. See System Connection Diagram, below.

System Connection Diagram

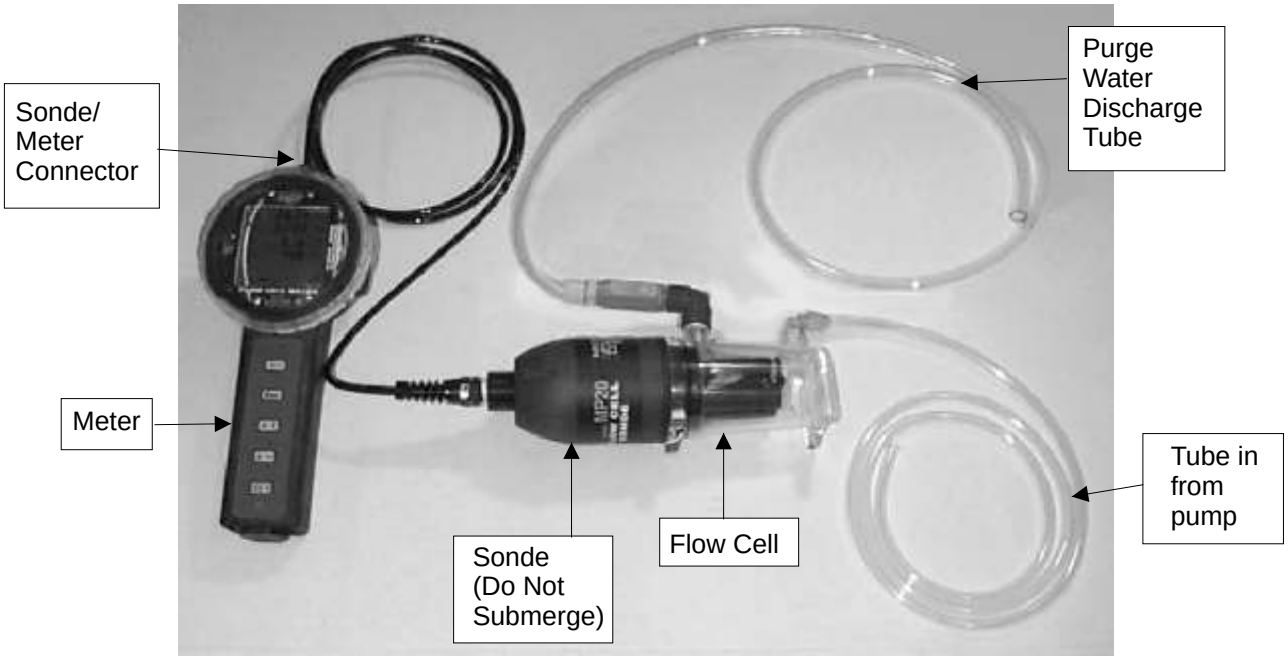


Figure 2

1.4 Introductory Exercise - Calibrating Specific Conductance

Assemble the MP20 System as described in Section 1.3.1. Turn on the System by pressing the Meter's (on/off) key. If the circulator is on, press the Esc **Esc** (escape/circulator) key (or **Esc** on early production models) to toggle the circulator off, so that it doesn't splash your calibration standard.
Next, install the Calibration Cup on the Sonde with the Sonde sensors pointing up (towards the ceiling). The MP20 case liner has a recess in the front left corner that can hold the Sonde in this position. Fill the Calibration Cup with a specific conductance calibration standard. Wait for the specific conductance readings to stabilize in the calibration solution, which may require one or two minutes.
After power-up, the Meter's **Screen** icon, in the lower center of the screen, is blinking. Press either of the or (arrow) keys to cause **Calib** (calibrate) to blink instead of **Screen**. Press the (enter) key to select calibration. Use the or keys to cause **SpC** (specific conductance) to blink, and press the key.
Next, use the or keys to raise or lower the specific conductance reading to match the calibration standard in mS/cm. Press the key to finish calibration of specific conductance. If the Sonde accepts the calibration, the Meter returns to the **Calib** screen. If the Sonde rejects the calibration, the Meter LCD shows 'FAIL' before returning to the **Calib** screen. Press Esc to return to the real-time data screen.
Now, check the specific conductance value to confirm calibration.

2 MP20 METER

2.1 Components

The following picture identifies the main components of a MP20 Meter.

Figure 3

2.1.1 Contrast Control

The Contrast Control is accessed by pressing the Lens down slightly and twisting counterclockwise to disengage the bayonet. Adjust the Contrast Control to suit lighting conditions, thermal conditions, and personal preference. Reattach the Lens by first insuring the o-ring is in the groove around the outside of the Lens. Then align the bayonet, press down slightly, and twist clockwise until you feel the bayonet engage.

Warning: *If the o-ring is on the main housing when the Lens is installed, the Meter will not properly seal. Severe damage to the Meter can occur if water leaks into the main housing.*

2.1.2 LCD

The Meter's LCD provides all the visual information for the MP20 System. The following picture shows all the segments used in operating the MP20 Meter.

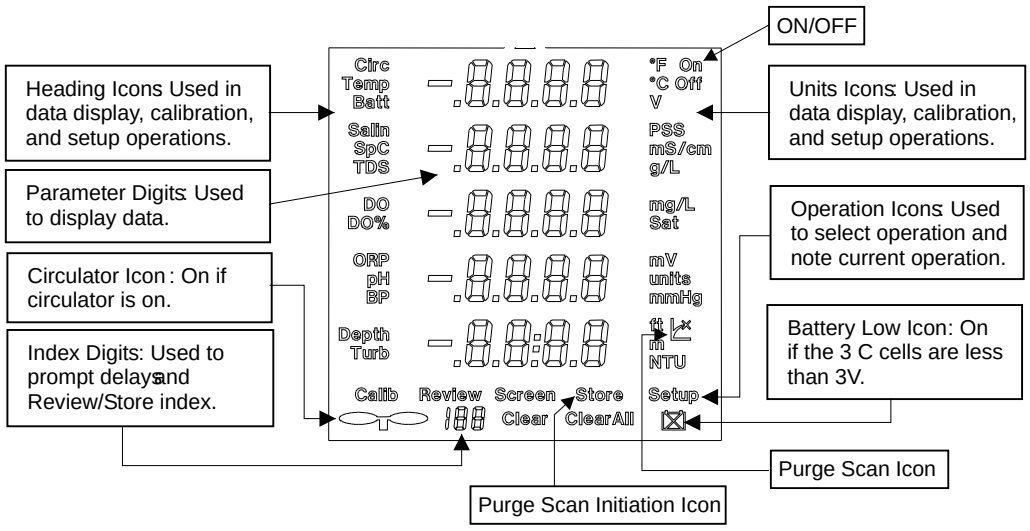


Figure 4

2.1.3 Keypad

The MP20 Meter only uses five keys and their functions are defined as follows:

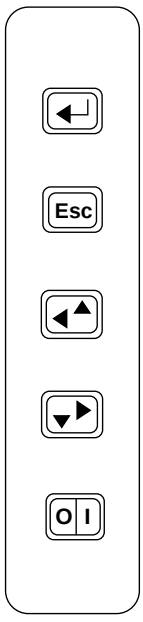


Figure 5

Enter: Pressing executes the action of the blinking icon.

Esc 8 Escape/Circulator: Pressing **Esc 8** returns to the previous operation without executing anything. At the top level, pressing **Esc 8** toggles the circulator on or off.

Left/Up: For menu operations, moves the blinking icon left or up as required by the current menu. For numeric operations, increments the number based on an acceleration algorithm.

Down/Right: For menu operations, moves the blinking icon down or right as required by the current menu. For numeric operations, decrements the number based on an acceleration algorithm

O|I On/Off: O|I will turn the Meter on if currently off. If currently on, pressing and holding **O|I** until the index digits count down to zero, will turn the Meter off. If turning off, the current operation is aborted.

Note: Each key press and release produces an audible tone for user feedback.

2.1.4 Batteries

To access the batteries, remove the Battery Cap using a coin. Tilt the Meter and the three spent C cells will easily slide out. Dispose of spent cells properly. Inspect the o-ring and o-ring surface and clean if necessary. Insert three brand-new alkaline C cells, positive terminal first and reattach the Battery Cap using a coin. The Meter may turn on as a result of battery installation, but this is normal. The MP20 System provides at least 12 hours of continuous operation at 20C on one set of brand-new Duracell brand alkaline C cells. (See specifications, section 1.2).

Note:
- Changing batteries will not affect stored data frames. Data frames are stored in non-volatile FLASH memory and do not require batteries for data retention. The MP20D with data download includes a lithium battery for maintaining the real-time clock.
- QED recommends high-quality alkaline batteries to provide the maximum operating time. Other C cells can be used (NiCad, NiMH, etc.), but shorter operating time may result. All three cells must be of the same type and battery voltage must not exceed 5V.
- Derate 25% for operation at 0C.

2.1.5 RTC/PC-Dump- Models MP20D and MP20DT

The optional RTC/PC-Dump is factory installed in the Meter. If installed, the bottom row in the Parameters Digits shows "CL:PC" during display of the software revisions at power-up. The RTC/PC-Dump option stamps each data frame with date-time and dumps all data frames in a comma-separated value (CSV) format for easy import into spreadsheet or database programs.

Note:
- The real-time clock maintains date-time through 31-Dec 2099 23:59:59, including leap years.
- Daylight Savings Time is not supported.

When the RTC/PC-Dump option is purchased, the PC interface cable is also provided. During PC-Dump, the 4-pin male connector attaches to the connector on the Meter and the 9-pin female "D" connector plugs into PC RS232 port with a 9-pin male "D" connector.

2.2 Operations

After power-up, the Heading Icons, Parameter Digits, and Units Icons display real-time data provided a Sonde is connected. If no Sonde, the Parameter Digits will show dashes. Also, the top row of Operation Icons is all on with the **Screen** icon blinking. The Circulator and Battery Low icons will show the circulator and battery status on this and all other operation screens.
Exception: During data review, the Circulator icon will show the circulator state at the time the data was stored.
By pressing the ◄▲ or ▼► keys, the blinking will move to a different icon. If you press ↵, you select the operation associated with the blinking icon. Using the ◄▲ and ▼► keys, to move to and select an operation is called selecting the operation. If you accidentally select an undesired operation, press Esc to return to the previous operation.

Note:
- If no Sonde is connected, the Parameter Digits show flashes.
- See the inside front cover of this manual for a graphical Operations Tree.
- The Meter automatically powers off if no keys are pressed for 60 minutes.

2.2.1 Screen

After power-up, the Heading Icons, Parameter Digits, and Units Icons display real-time data containing temperature, specific conductance, DO (mg/L), and pH. This screen is called **Screen 1**

Selecting the **Screen** icon, toggles the real-time display to show battery voltage, salinity or TDS, DO (%Saturation), ORP and turbidity. This screen is called **Screen 2**.

Selecting the **Screen** icon again toggles the real-time display to show day, month, year, hours, and minutes. This screen is called **Screen 3**. Selecting the **Screen** icon again toggles the real-time display to

Screen 1 can be configured to display temperature in C or F. **Screen 2** can be configured to display salinity or TDS. Section 2.2.2 describes these Setup operations.

Note:

- If a Sonde is not connected, the Parameter Digits are dashed.
- Also, if the Sonde was purchased without one or more parameters, then the missing parameters' heading, digits, and units are blank.
- If the Meter was purchased without the RTC/PC-Dump option, **Screen 3** is not not displayed and selecting the **Screen** icon from **Screen 2** toggles the real-time display back to **Screen 1**.
- **Screen 3** displays real-time clock data day, month, year, hour and minute. Seconds are not displayed, but are included with PC-Dump data. The hours and minutes are in 24-hour format. The months are represented as:

Month	Display	Month	Display
January	JAN	July	JUL
February	FEb	August	AUG
March	MAr	September	SEP
April	APr	October	OCt
May	MAY	November	NOU
June	JUN	December	dEC

Figure 6

2.2.2 To Start After Cleaning and Calibration Are Completed

Setup

Selecting the **Setup** icon allows setup, or configuration, of the PurgeScan feature, circulator state, temperature units, and salinity or TDS display. The sonde cable must be connected to the meter during **"Setup"**.

To Enter Setup

1. Upon startup "**Screen**" will flash

2. Press ▶ key twice to move flashing highlight to the right to "**Setup**"

3. Press ↵ "**Enter**" key to select "**Setup**".

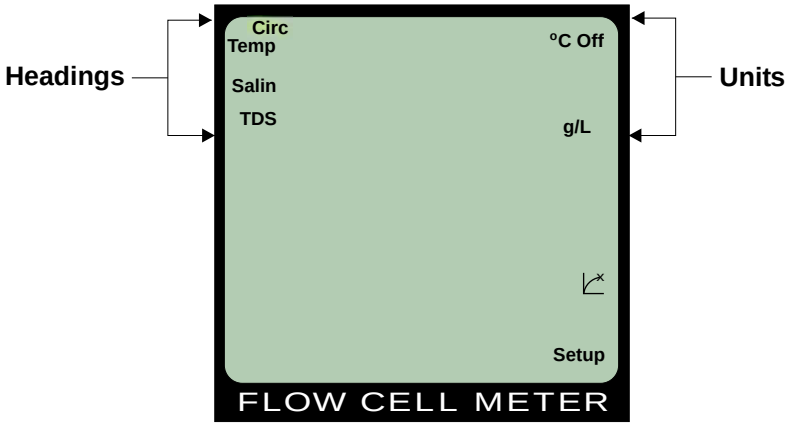


Figure 7

From the displayed Headings Icons, select the item to be changed by using the arrow keys ◄▲▼►, then the ↵ Enter key . Now, all Headings and Units Icons except the selected one will be blank. The Units icons show the configuration options available. Use the arrow keys ◄▲▼► to toggle between the "Setup" choices, press the ↵ Enter key when the desired condition is in flashing mode. After selecting the configuration desired, the display returns to the Setup screen. The following configurations are available, in addition to PurgeScan, which is addressed below:

Setup	Default	Alternate
Circulator	On	Off
Temperature	C	F
Salinity/TDS	Salinity in PSS	TDS in g/l

2.2.3 PurgeScan Setup

PurgeScan automatically monitors selected water quality parameters at selected time intervals, then signals achievement of stabilization when three consecutive readings fall within the stabilization limits. The PurgeScan setup allows user setting of the criteria that define water quality parameter stabilization within the PurgeScan Function:

- Selection of the water quality parameters which will be included.
- Stabilization range values (how much each of the selected parameter readings can vary).
- Stabilization interval (the time interval to be used between PurgeScan data evaluations).

Setup	Default	Alternate	Range Value Default
PurgeScan			
SpC	On (mS/cm)	Off (blank)	.020 mS/cm
DO	On (mg/l)	Off (blank)	.20 mg/l
ORP	On (mV)	Off (blank)	20 mV
pH	On (units)	Off (blank)	.2 units
Turbidity	On (NTU)	Off (blank)	1 unit
Time Interval (00:00)	1:00 min.	2-9 min.	

After reaching "**Setup**" as described above, enter PurgeScan setup by Pressing the ▼► key3 times to move the flashing highlight to the Purge-Scan symbol ⌐, then press ↵ to select.

Once PurgeScan setup has been entered, then one or more of the following parameters can be selected, as described below, specific conductance, dissolved oxygen, pH, ORP (redox), turbidity and time interval. Parameters selected for stabilization determination are indicated by the display of respective units in this Setup screen; parameters not selected for use in PurgeScan will show no units in this screen, but will be measured and displayed normally in all other screens. ***Warning***: Units without a turbidity sensor must not have turbidity included as a PurgeScan parameter, or stabilization will not be possible.

When PurgeScan setup is entered, the screen will display the symbols for all five water quality parameters, the units for currently selected parameters, the current stabilization range value for the flashing, selected parameter, and the current stabilization time interval value, (as shown in Figure 8).

1. If the flashing selected parameter has a blank display for stabilization range value and units, that parameter is currently not included in PurgeScan stabilization evaluations. If no change from that status is desired, use the ◄▲►▼ keys to select another parameter for change, or exit PurgeScan setup by pressing Esc. If a change is desired for the selected parameter, go to step 3 below.

2. If the stabilization range value and units displayed for the flashing, selected parameter are as desired and require no change, use the ◄▲►▼ keys to select another parameter for change, or exit PurgeScan setup by pressing Esc. If a change in settings is desired for the flashing, selected parameter, press the ↵ key once. This first step will show a blank display for stabilization range value and units, indicating that the parameter has been eliminated from the stabilization criteria; if this elimination of the parameter is desired, use the ◄▲►▼ keys to select another parameter for change, or exit PurgeScan setup by pressing Esc. If it is desired that the parameter be retained as a stabilization criteria, got to step 3 below.

3. Press ↵. The stabilization range default value will be shown in a flashing display status. To change the value, use the ◄▲►▼ keys. (***Warning:*** Do not adjust the stabilization range too low with respect to meter sensitivity, because this will make PurgeScan stabilization difficult to attain.) When the desired value is shown, select it with the ↵ key. The stabilization value will be shown in a steady status, and the parameter symbol will be flashing. If no further change is desired, use the ◄▲►▼ keys to select another parameter for change, or exit PurgeScan setup by pressing Esc.

Notes: All parameter readings are displayed during normal meter operation, regardless of their setup status within PurgeScan.

The time interval between PurgeScan evaluation readings can also be changed. One minute intervals are the default value; 2-9 minutes can also be selected, in one-minute increments. The PurgeScan time interval value affects only the internal calculations the MP20 uses to determine stabilization; during normal usage in Screen and PurgeScan modes, the MP20 will always display real-time values for all measured parameters. The time interval can be changed by selecting the 00:00 elapsed time indicator near the bottom of the display with the arrow ◄▲►▼ keys, then the Enter ↵ key. Then using the arrow ◄▲►▼ keys to increase or decrease the value. Press ↵ after selections have been made.

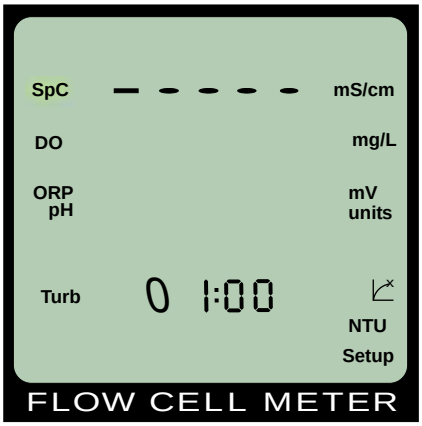


Figure 8

Notes:

- All configurations are stored in the Sonde and retrieved by the Meter during power-up.
- Pressing Esc while displaying **Screen 1, Screen 2 or Screen 3** will toggle the circulator state without accessing **Setup**.

2.2.4 Calib

Selecting the **Calib** icon allows calibration of salinity, specific conductance, TDS scale factor, DO, ORP, pH, barometric pressure (BP), turbidity and date-time.. Depth will also appear but is non-functional. After selecting **Calib**, only the **Calib** icon will remain lit from the Operation Icons and the Parameter Digits and the Units Icons will blank. The Headings Icons will display the items that can be calibrated. From the displayed Headings Icons, select the item to be calibrated. Now, all Headings and Units Icons except the selected one will be blank. The Parameter Digits show the current value for the item selected. Press the ◄▲ or ►▼ keys to change the numeric value to match the calibration standard. Once the value is correct, press the ↵ key to send the updated calibration value to the Sonde. If the Sonde accepts the calibration, the Meter returns to the **Calib** screen. If the Sonde rejects the calibration, the Meter LCD shows 'FAIL' before returning to the **Calib** screen. Press Esc to return to **Screen 1**. Now, review **Screen 1, Screen 2** and/or **Screen 3** to confirm calibration.
Some calibrations require two values. After updating the first value and pressing Esc, the second value starts blinking. Update it and press to complete calibration.
The following calibrations are available:

Calibration	First Value	Second Value	Third Value	Fourth Value	Fifth Value
Salinity/	PSS	-	-	-	-
Specific Conductance	mS/cm	-	-	-	-
TDS	Scale Factor (0.64 default)	-	-	-	-
DO/BP	mg/L	mmHg	-	-	-
DO%/BP	100% (fixed)	mmHg	-	-	-
ORP	mV	-	-	-	-
pH	units	-	-	-	-
Barometric Pressure (BP)	mmHg	-	-	-	-
Turbidity	NTU	-	-	-	-
Date-Time	Year	Month	Day	Hour	Minute

Notes:
- Holding the ◄▲ or ►▼ keys causes the numeric rate of change to accelerate.
- Calibrating salinity or specific conductance causes calibration of salinity, specific conductance, and TDS.
- Calibrating TDS only changes the TDS scale factor.
- Calibrating DO mg/L or DO %Saturation causes calibration of DO mg/L, DO %Saturation, and barometric pressure.
- Calibrating barometric pressure updates the barometric pressure used in calculating DO % Saturation without changing the DO calibration.
  pH is a two-point calibration. A pH standard between 6.8 and 7.2 is treated as the "zero" and all other values are treated as the "slope". First calibrate "zero", then calibrate "slope".
- Turbidity is a two point calibration. A turbidity standard of 0.0 is treated as the "zero" and all the other values are treated as the "slope". First calibrate "zero", then "slope".
- With RTC/PC-Dump option, date-time calibration sets the real-time clock inside the Meter and seconds are set to "00".

2.2.5 Store/PurgeScan

Selecting the Store icon causes the Meter to initiate the exclusive PurgeScan mode, which:

- Automatically tracks purge water quality parameter stabilization for selected parameters and time intervals
- Provides audio and visual alert of achievement of the stabilization criteria
- Automatically stores key data frames, including elapsed time since start of PurgeScan initiation

PurgeScan monitors the selected water quality parameters for stability within a given range, with observations based on selected time intervals. One or more of five parameters can be selected for stabilization determination: specific conductivity, DO, ORP, pH and turbidity.. The time interval between evaluation readings is also selectable, from 1 to 9 minutes. See section 2.2.2 Setup above for selection procedures for parameters and time interval. The stabilization range values for each parameter are adjustable, but start with the default values given below:

Stabilization Parameter	Stabilization Range
pH	± .2 units
DO	± 0.2 mg/l
Conductivity	± 0.020 mS/cm
ORP (Redox)	± 20 millivolts
Turbidity	1 NTU

For units without a turbidity sensor, make sure turbidity is not activated as a PurgeScan parameter; otherwise purge stabilization will not be detected.

When stabilization criteria have been met, the Meter beeps and the PurgeScan symbol, begins flashing. Real-time data values continue to be displayed, but no additional data frames are stored and stabilization evaluation ceases. Pressing Esc returns the Meter to the startup Screen display. Selecting Store again initiates another, new PurgeScan stabilization cycle.
Data frames are automatically stored at time 0 (when Store/PurgeScan is initiated), every 5 minutes, and for each of the three consecutive readings that result in satisfaction of the stabilization criteria. A data frame includes all current data values (not just selected stabilization parameters), elapsed time since PurgeScan was initiated by selecting Store, circulator state, and the identifying Index Digit for each data frame.

By selecting Store, the PurgeScan cycle is initiated, and only the Store icon will remain lit from the Operation Icons. The Headings Icons, Parameter Digits, and the Units Icons will automatically toggle between Screen 1, Screen 2 and Screen 3, which automatically alternate for 7.5 seconds each so that all data points can be displayed without pressing any keys. The Index Digits at the bottom left edge of the display will show the index of the location of the first data frame of each PurgeScan stabilization event. The Index Digit value will remain fixed at the starting value throughout the stabilization cycle, even though additional data frames are automatically being stored and assigned consecutive Index Digits. The Index Digit value displayed after each initiation of PurgeScan at a well can be written down so that the data set for that well can be positively identified during later data review.

.

Note:

- The Meter can store up to 200 data frames ranging from index '00' to '199'.
- An index of '' is displayed in the Index Digits if the memory is full.
- **"FAIL"** will be momentarily displayed in the Parameter Digits if the data frame could not be stored, most likely due to a full memory.

2.2.6 Review

Selecting the Review icon causes the Meter to display data frames previously stored using the Store/PurgeScan operation. After selecting Review, only the Review icon will remain lit from the Operation Icons. The Headings Icons, Parameter Digits, and the Units Icons will toggle between Screen 1, Screen 2 and Screen 3 for the first data frame in memory. The blinking Index Digits show the index of the displayed data frame. Each full set of stored data frames from a PurgeScan stabilization evaluation cycle can be identified by the initial Index Digit assigned and displayed by the Meter after PurgeScan was initiated by selecting Store.
Press the ◄▲ or ►▼ keys to review other data frames. Press Esc to return to Screen 1.
Pressing ↵ selects the indexed data frame for erasure using the Clear operation. All data frames can be erased using the ClearAll operation.

Note:
- If no data frames are stored when Review is selected, " will appear in the Index Digits and the Parameter Digits will be blank.

2.2.6.1 Clear and ClearAll

From the Review operation, pressing Esc causes the Index Digits to stop blinking and the **Clear** and **ClearAll** icons to appear. Selecting the **Clear** icon causes the Meter to erase the indexed data frame and return to the **Review** operation indexed to the next data frame. If the erased indexed data frame was the last data frame, the Meter will return to **Screen 1**.
Selecting the **ClearAll** icon causes the Meter to erase all data frames and return to **Screen 1**.

Warning: *Exercise extreme caution when accessing the* **ClearAll** *operation. There is no undo operation and up to 200 valuable data frames could be lost!*

2.2.7 PC-Dump

The PC-Dump feature dumps all data frames in a CSV, format for easy import into spreadsheet or database programs. A PC is required with an available 9-pin 'D' male RS232 COM port and must be loaded with serial communications software (e.g., HyperTerminal ® included with MicroSoft Windows ®).

Note:
- The PC-Dump feature is only available if the RTC-PC-Dump option was purchased.

To set up PC-Dump, turn the PC on and launch the communications software. Configure the communications software to use the available COM port and configure the COM properties to:

Port Settings	Value
Bits per second	1200
Data bits	7
Parity	Even
Stop bits	1
Flow Control	None

Connect the 9-pin "D' female PS232 connector on the meter/PC Interface cable to the available 9-pin 'D' male RS232 COM port. With the meter off, connect the 4-pin male connector on the PC Interface cable to the 4-pin female connectors on the meter. To enter PC-Dump mode, make sure the meter is off. Press and hold the Esc key, then press the O|I key. When all segments on the LCD are on, release the Esc key. The Parameter Digits display **"OPEN CSV FILE PUSH ESC"** confirming PC-Dump mode.

Start capture text in the serial communications software. To easily import into spreadsheets (e.g., Excel ®), give the capture text file a **".CSV"** extension.
Press the Esc key to start the data transfer. The Parameter7 Digits display "DISP -- PC" to confirm transfer in progress. The meter transmits a header line containing column labels for all possible data values. Next, the meter transmits a data line for each data frame stored. If a data frame is empty, no data line is transmitted. During transmission, the Index Digits update to reflect the index of the data frame currently being transmitted. The Parameter Digits display "SAVE CSV FILE PUSH ESC" after all data has been transmitted.
Stop capture text in the serial communications software. Press the Esc key and the meter powers down.
From the file manager, double-click the captured text file with the **".CSV"** extension to launch your spread sheet program and open the file. Alternately within the spreadsheet's file open operation, select file type of test files (i.e., ".csv) and open the captured text file with the **".CSV"** extension. The resulting worksheet contains a copy of the meter's memory and is ready for analysis.

- If using Microsoft Windows® and HyperTerminal®
  Microsoft Windows® includes serial communications software called HyperTerminal®. The Hyper Terminal® folder can be opened from the Desktop via *Start:Programs:Accessories:HyperTerminal*. Double-click on the *Hypertrm.exe* icon to launch HyperTerminal®.
- The available COM port is selected under the *File:Properties* menus and choosing the *Connect using* option. The port settings are accessed via the *Configure* button under the *Connect using* option.
- If you change COM port settings, you generally have to *Disconnect* and *Connect* for the new settings to take affect.
- The COM port selection and settings can be saved and opended under *File* menu.
- The text capture function is started and stopped under the *Transfer: Capture Test*… menu.

2.3 Meter Care

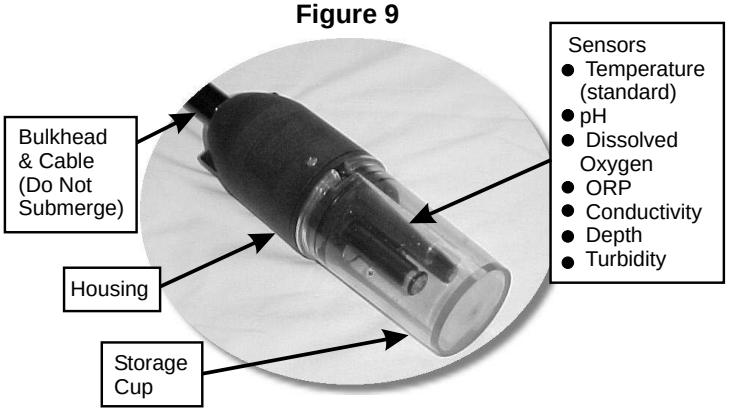
The meter should be kept as clean as possible, especially of grit and grease. Wash the meter with soap and water as needed. The meter should be stored between -5° C and 50° C.

3 MP20 SONDE

3.1 Components

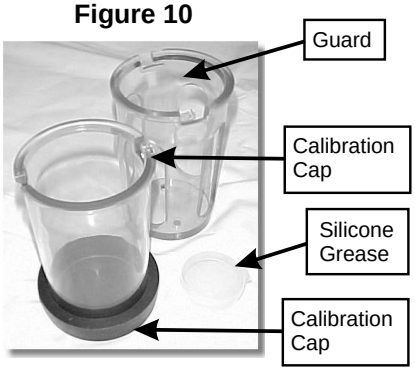
The following pictures identify the main components of a MP20 Sonde and maintenance items supplied with each MP20 Sonde.

Figure 9



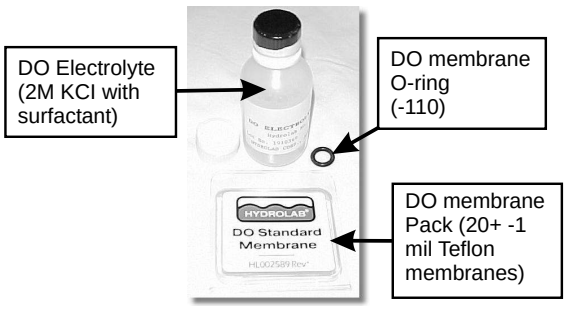
MP20 Sonde

Figure 10



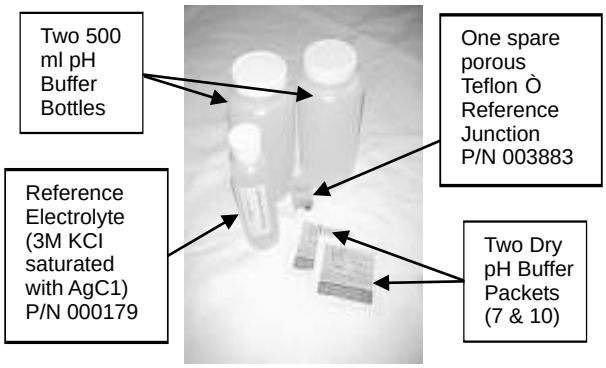
Standard Maintenance Items

Figure 11



Dissolved Oxygen Maintenance Items

Figure 12



pH Maintenance Items

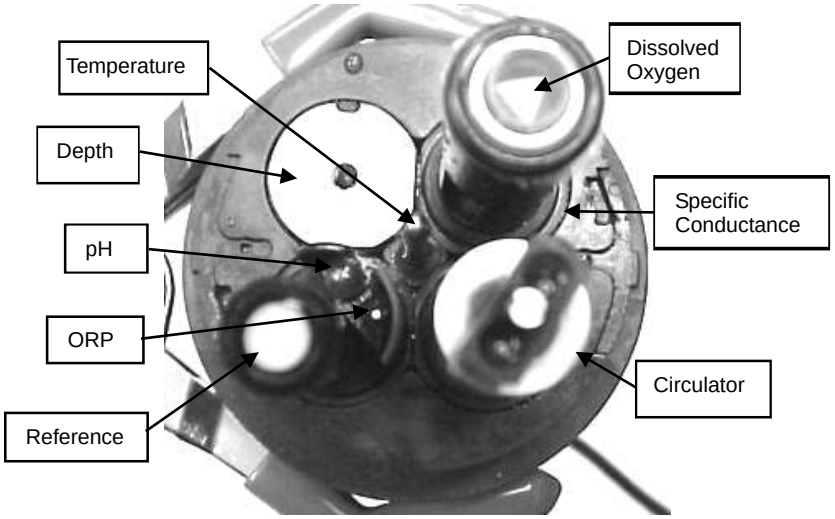


Figure 13

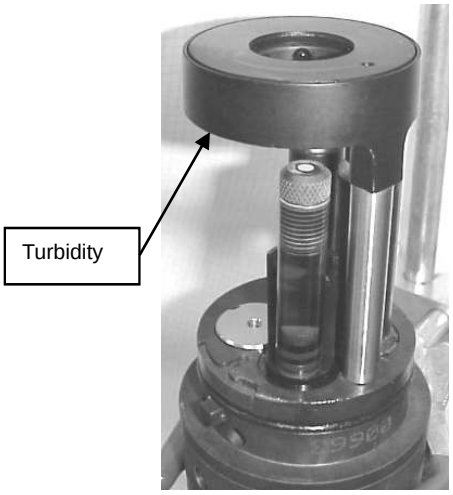


Figure 14

3.2 Setup

The Sonde can be setup, or configured, for circulator state, temperature units, salinity or TDS output. The setup can be changed via the Meter.

3.2.1 Setup with Meter

See Section 2.2.2 for setup of the Sonde with the Meter.

3.3 Circulator

The Sondes are equipped with a circulator to assist with reliable dissolved oxygen measurements. The circulator also continuously supplies fresh sample to all sensors, and tends to keep the sensors clean by sweeping debris away. The circulator also speeds sensor response by ensuring rapid temperature equilibration.
From **Screen 1** or **Screen 2** on the Meter, press Esc to toggle the circulator state. Alternately, select **Setup**, **Circ**, and **On** or **Off** to set the circulator state.
Generally, the circulator should be on except during calibration.

Note:

- The circulator's impeller (part # 005306), impeller screw (part # 005307) and impeller bearing (part # 003594) are non-warranty consumables which require regular replacement.

3.4 Calibration

Fundamentally, the Sonde is calibrated by pouring a calibration standard into the calibration cup then watching the readings for the parameter to be calibrated. When the readings stabilize, send the calibration information to the Sonde via the Meter. Then confirm the data calibration.

Note:

- You may notice that the Sonde has built-in checks for calibration acceptance. If for any reason you cannot complete calibration for any parameter, the Sonde will continue to use the calibration from the last time that particular parameter was calibrated successfully. However, you should try to determine why the Sonde did not accept the new calibration (faulty sensor, bad standard, low battery, mistyped standard value, etc.).

3.4.1 Calibration with the Meter

If the circulator is on, press the Esc (escape/circulator) key (or **Esc** on early production models) to toggle the circulator off, so that it doesn't splash your calibration standard. Place the sensors in the appropriate calibration standard for the parameter being calibrated. Monitor the parameter's stability on **Screen 1** and/or **Screen 2**, select **Calib**, then the item to calibrate. Finally, enter the one or two values as required to complete calibration. Return to **Screen 1** and/or **Screen 2** to confirm calibration. See Section 2.2.3 for details on using the Meter to perform calibrations. The following table details what can be calibrated with the Meter.

Calibration	First Value	Second Value
Salinity/	PSS	-
Specific Conductance	mS/cm	-
TDS	Scale Factor (0.64 default)	-
DO/BP	mg/L	mmHg
DO%/BP	100% (fixed)	mmHg
ORP	mV	-
pH	units	-
Barometric Pressure (BP)	mmHg	-
Turbidity	NTU	-

3.4.2 Calibration Preparation

The following is a general outline of the steps required to calibrate all the sensors:

- **Select a calibration standard whose value is near that of your field samples**.
- Remove the Storage Cup from the Sonde.
- **Clean and prepare the sensors** as detailed in Sections 3.4.4 through 3.4.8.
- Attach the Calibration Cup.

- Using the Calibration Cap, thoroughly **rinse the sensors several times** by half-filling the calibration cup with deionized water and shaking the Sonde to make sure each sensor is free from contaminants that might alter your calibration standard.
- In a similar manner, **rinse the sensors twice with a small portion of the calibration standard**, each time discarding the rinse.
- With the Sonde sensors pointing up (toward the ceiling), **fill the Calibration Cup with the calibration standard**. See Sections 3.4.4 through 3.4.8 for sensor specific details.
- Complete the calibration as per Sections 3.4.1 and/or 3.4.2.
- Finally, **discard used calibration standards appropriately**. Do not attempt to reuse calibration standards.

Figure 15

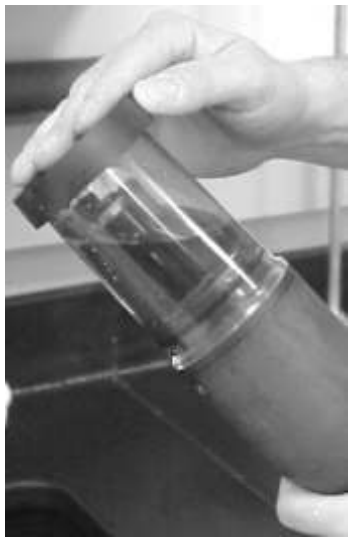


Figure 16

Figure 17

Warning: Sensor preparation is probably the most important action you can take to maintain or improve the quality of your field measurements. *A contaminated, worn-out, or damaged sensor simply will not produce a reliable reading. It is well worth your time to set up a routine in which all sensors are serviced frequently and then allowed to rest in tap water overnight before calibration. Generally, you should calibrate all MP20 parameters as often as your accuracy requirements dictate. If you want exceptionally accurate data, you must calibrate frequently. Calibration requirements also vary with deployment conditions in very turbid or biologically-active waters, for instance, generally require more frequent calibrations than do cleaner waters.*

Note:

- The optional turbidity sensor has a rotating sealed shaft to make maintenance of the other sensors easier. With the storage cup and calibration cup removed, the turbidity sensor rotates ~135 degrees in each direction before engaging the internal stop. After rotating the turbidity sensor to access other sensors, ensure that the turbidity sensor is rotated back to the normal position before reinstalling the storage cup or calibration cup. **Do not use excessive force or the sensor will break!**

3.4.3 Temperature

Cleaning and Preparation

- Soap or rubbing alcohol may be used to remove grease, oil, or biological material.
- Rinse with water.

Calibration Standard

- Factory-set and no recalibration required.

3.4.4 Specific Conductance, Salinity, and TDS

Cleaning and Preparation

- Clean the oval measurement cell on the specific conductance sensor with a small, non-abrasive brush or cotton swab.
- Soap or rubbing alcohol may be used to remove grease, oil, or biological material.
- Rinse with water.

Calibration Standard

- Pour the specific conductance or salinity standard to within a centimeter of the top of the cup.
- Make sure there are no bubbles in the measurement cell of the specific conductance sensor.

Notes:
- TDS measurements are based on specific conductance and a user defined scale factor. For TDS calibrations, first calibrate specific conductance, then calibrate the Sonde with a site-specific scale factor. The factory default scale factor is 0.64 g/L / mS/cm.

3.4.5 Dissolved Oxygen %Saturation and mg/L

Cleaning and Preparation

- Remove the o-ring securing the DO membrane.
- Shake out the old electrolyte.
- Rinse with fresh DO electrolyte.
- Refill with fresh DO electrolyte until there is a perceptible meniscus of electrolyte rising above the entire electrode surface of the sensor.
- Make sure there are no bubbles in the electrolyte.
- Hold one end of a new membrane against the body of the DO sensor with your thumb and with a smooth, firm motion, stretch the other end of the membrane over the sensor surface and hold it in place with your index finger.
- Secure the membrane with the o-ring.
- Make sure there are no wrinkles in the membrane or bubbles in the electrolyte.
- Trim away the excess membrane extending below the o-ring.
  Ideally, let the sensor soak overnight to allow the membrane to relax to its final shape.

DO %Saturation Calibration Standard (Saturated-Air Method)

- Fill the Calibration Cup with deionized or tap water (specific conductance less than 0.5 mS/cm) until the water is just level with the o-ring used to secure the membrane.
- Carefully remove any water droplets from the membrane with the corner of a tissue.

- Turn the black calibration cup cover upside down (concave upward) and lay it over the top of the Calibration Cup.
- Determine the barometric pressure for entry as the calibration standard. See Section 5.1.3 for computation details on barometric pressure.

Notes:
- Calibration of DO %Saturation also calibrates DO mg/L.

DO mg/L Calibration Standard (Known Concentration Method)

- Immerse the sensor in a water bath for which the DO concentration in mg/L is known (for instance by Winkler titration). This calibration method is more difficult to perform than the saturated-air method.
- Make sure the circulator is turned on.
- Determine the barometric pressure for entry as the calibration standard. See Section 5.1.3 for computation details on barometric pressure.

Notes:
- Calibration of DO mg/L also calibrates DO% Saturation.
- Note that if there is a change in barometric pressure after calibration (for instance, if barometric pressure drops as you move the calibrated Sonde to a higher elevation for deployment), the readings for DO %Saturation will not be correct. You must enter a new barometric pressure. However, the readings for DO mg/L will be correct regardless of changes in barometric pressure.

3.4.6 pH and ORP (Redox)

Cleaning and Preparation of pH

- If the pH sensor is obviously coated with oil, sediment, or biological growth, clean the glass with a very clean, soft, non-scratching cloth wet with rubbing alcohol (a cotton ball will do).
- Rinse with tap water.

Cleaning and Preparation of ORP

- If the platinum band at the tip of the ORP sensor gets dirty and/or discolored, polish it with a clean cloth and a very mild abrasive, such as toothpaste; or use a fine polishing strip.
- Rinse with water.
- Soak the sensor overnight in tap water to allow the platinum surface to restabilize.

Cleaning and Preparation of Reference

- Gently pull the entire reference sleeve away from the Sonde. The reference sleeve is the clear blue tube with a Teflon Reference Junction attached.
- Discard the old electrolyte from the reference sleeve.
- Drop two KCl salt pellets (#0053756) or two KCl salt rings (#005309) into the reference sleeve.
- Refill the sleeve to the top with reference electrolyte.

.

- With the Sonde sensors pointed toward the floor, push the full reference sleeve back onto its mount until the sleeve has just covered the first o-ring located on the mount (just behind the silver electrode).
- Turn the Sonde so that the sensors point toward the ceiling and push the sleeve the rest of the way onto its mount.
- Rinse with tap water

Notes:

- **The Porous Teflon Reference Junction is the most important part of the pH and ORP performance**. Make sure it is clean and passes electrolyte readily. If not, replace it with the spare provided with the pH option. Replacement Reference Junctions are part #003883.
- When seating the reference sleeve, **trapped air and excess electrolyte is purged. This purging flushes and cleans the Porous Teflon Reference Junction.**
- **The standard reference is designed for waters with specific conductances >0.2 mS/cm. For measurements in very low ionic strength waters, below 0.2 mS/cm, a factory installed option is available.**

Calibration Standard

- Pour the pH or ORP standard to within a centimeter of the top of the cup.

Notes:

- pH is a two-point calibration. A pH standard between 6.8 and 7.2 is treated as the "zero" and all other values are treated as the "slope". First calibrate "zero", then calibrate "slope".

3.4.7 Turbidity

Cleaning and Preparation

- Soap or rubbing alcohol may be used to remove grease, oil, or biological material.
- Use a **non-abrasive, lint-free cloth** to clean the quartz glass tube. **Scratched glass reduces the sensor's accuracy**.
- Rinse with water.

Calibration Standards

- Calibrate turbidity with primary standards ("turbid-free water, Formazin, and/or polystyrene beads) and check with a secondary standard (Quick-Cal Cube™).
- Use 'turbid-free' water to calibrate the "zero".
- Use Formazin and/or polystyene beads to calibrate the "slope".
- Primary standards must completely fill the optical area of the turbidity sensor plus ¼" (6mm) of the standard on both sides of the PVC body by filling the calibration cup to the top. Alternately, pour ≃ 1-1/4" (32mm) of standard into the storage cup and place the inverted sensors into the standard with bayonets disengaged.
- After calibration with the primary standards, the value of the optional Quick-Cal Cube™ secondary standard, if used must be determined and recorded for each individual instrument. The Quick-Cal Cube™ value is determined by removing the storage/calibration cups, wiping the optical areas, both sensor and cube, clean and dry with a non-abrasive, lint free cloth, and placing the ceramic glass cube into the turbidity sensor's optical area. Align the Quick-Cal Cube™'s pin with the turbidity sensor's recessed hole and, for optimum repeatability, rotate the Quick-cal Cube™ clockwise to remove mechanical play in the pin/hole.
- To test for drift between primary calibrations, reinstall the Quick-Cal Cube™.

Figure 18

Figure 19

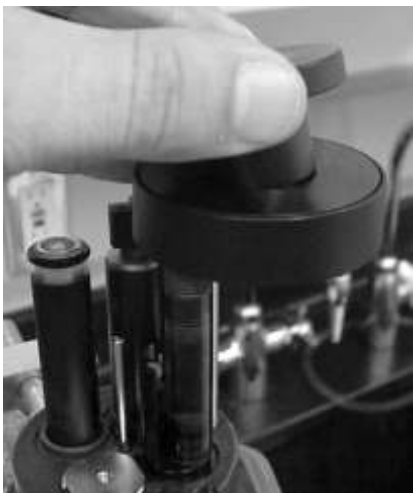


Figure 20

Notes:

- 'Turbid-free' water is available for purchase from chemical supply houses. However, it is far less expensive to make by passing reagent-grade water through a 0.1 mμ or smaller filter.
- *Formazin and polystyrene beads are primary standa*rds as defined by EPA. Quick-Cal Cubes™ are secondary standards, which must be rechecked, and value recorded, after each primary standard calibration with each instrument. However, Quick-Cal Cubes™ save resources , both time and money, by allowing inexpensive and frequent calibration checks between permit and/or standard operating procedure required primary calibrations.
- Formazin requires daily preparation.
- Polystyrene beads are instrumentation specific and beads formulated for one instrument design often read differently on a different instrument design. QED has polystyrene beads formulated for the MP20DT Turbidity sensor. Please contact Customer Service for ordering information.
- When using liquid standards, insure no bubbles in the optical area. The optical properties of bubbles affect the turbidity calibration. Gentle agitation easily dislodges bubbles.
- When using Quick-Cal Cube™ standards, insure no water droplets in the optical area. The optical properties of water droplets affect the calibration check. Remove droplets with a non-abrasive, lint-free cloth.
- Turbidity is a two-point calibration. A turbidity standard of 0.0 is treated as "zero" and all other values are treated as the "slope". First calibrate "zero", then calibrate "slope".

3.5 Care of the Sonde

In addition to normal sensor maintenance, clean the Sonde with soap and water. **During storage or transportation, always use the calibration cup/cap or the storage cup filled with a ¼" of tap water to protect the sensors from damage and drying out**. Never immerse the sonde's cable connector; doing so could cause water damage to the electronics.

3.6 Care of the Cable

Protect the cable from abrasion, unnecessary tension, and repetitive flexure. When not in use, the cables should be clean, dry, and coiled at a 12" or greater diameter.

3.7 FlowCell

For monitoring purge water quality during ground water sampling without exposing the water to the atmosphere, the FlowCell is used. **Note that models equipped with a turbidity sensor use a different, slightly larger FlowCell; DO NOT attempt to use the smaller, non-turbidity FlowCell with turbidity-equipped Sondes.**
To install, remove the storage cup and attach the FlowCell to the Sonde. Connect ¼" ID-3/8" OD tubing to the inlet at the end of the FlowCell and 3/8"ID-1/2"OD tubing to the outlet on the side of the FlowCell. Then connect the inlet to the sampling pump discharge and the outlet to the purge water collection point. Don't exceed a pumping rate of about 1.5 liters per minute, which flushes the contents of the FlowCell about eight times per minute. If possible, lay the Sonde on its side. Bubbles will tend to float away from the sensors and out the outlet on the side of the FlowCell.

Warning:
Do not over-tighten the tubing fittings on the FlowCell, or the FlowCell may be damaged. Clean the FlowCell with a damp cloth or sponge, using an Alconox solution or mild detergent if necessary. Rinse well before use. Do not use abrasives or solvents to clean the FlowCell!

Warning:
Do not pressurize the FlowCell or its feed line above 15 PSIG! Higher pressures could result in serious and/or fatal injury and/or damage the FlowCell! If pressures greater than 15 PSIG are possible, use an appropriate pressure regulator installed by qualified personnel.

Warning:
Remove pressure before disconnecting the Sonde from the FlowCell! Failure to do so could result in serious or fatal injury and/or damage the Sonde and/or FlowCell!

3.8 Pressure Extremes

The Sonde's maximum depth is 100 meters.The Meter has a NEMA 6/IP 67 rating. Except during maintenance, keep the Lens and Battery Cap installed.

3.9 Temperature Extremes

The MP20 System's operating temperature range is -5°C to 50°C (23°F to 113°F) non-freezing. Exposure of the Sonde or Meter to temperatures outside of this range might result in mechanical damage or faulty electronic performance. The latter may be very subtle.

4.0 PC Interface cable

The PC interface cable is intended for indoor use only. The 4-pin male conductor is Conxall P/N 3282-4PG-528 and the 9-pin "D" female connector is compatible with RS232 industry standard 9-pin "D" male connectors. The Quanta display/PC interface cable pin-out is as follows:

4-pin Male	9-pin Female	Function
Pin 1	–	Transmitted Power
Pin 2	Pin 5	Ground
Pin 3	Pin 2	RXD-
Pin 4	Shell	Shield
–	Pin 3	TXD-
–	Pin 1, 4, & 6 (Tied Together)	CD, DTR, & DSR
–	Pin 7, & 8 (Tied Together)	RTS & CTS
–	Pin 9	RI

4 TECHNICAL NOTES

4.1 Dissolved Oxygen

4.1.1 Oxygen Solubility in Water

The function used to calculate oxygen solubility is based on the oxygen solubility vs. temperature data from Table 4500-O found in the 19th Edition of *Standard Methods for the Examination of Water and Wastewater*.

4.1.2 Salinity Correction of DO mg/L

The function used to calculate oxygen solubility is based on the oxygen solubility vs. chlorinity data from Table 4500-O found in the 19th Edition of *Standard Methods for the Examination of Water and Wastewater*.

Note:

- DO %Saturation is not a function of solubility, and has no salinity or temperature correction.

4.1.3 Barometric Pressure Functions

Local barometric pressure, *BP*, in mmHg can be estimated using:
BP = 760- 2.5(*A*/100)
where '*A*' is the local altitude above sea level in feet.
If using the local weather bureau BP, remember these numbers are corrected to sea level. To calculate the uncorrected atmospheric pressure *BP'*, use the following function:

BP' = BP-2.5(A/l00)

4.2 Specific Conductance, Salinity, and TDS

4.2.1 Specific Conductance Temperature Correction

Temperature correction of conductivity to produce specific conductance is based on the temperature correction formulas and factors of Table 3 in *ISO 7888-1985 Water Quality Determination of Electrical Conductivity*. This temperature correction is normalized to 25C
Because total dissolved solids (TDS) is calculated from the specific conductance reading, it also has the above correction.

4.2.2 Salinity Calculation

The method used to calculate salinity from conductivity is found in 2520B the 19th Edition of *Standard Methods for the Examination of Water and Wastewater*. This method is also commonly referred to at the Practical Salinity Scale or UNESCO method. This method uses conductivity, not specific conductance, and includes its own temperature correction normalized to 15C.

4.2.3 Total Dissolved Solids (TDS) Calculation

TDS is calculated from specific conductance as:
TDS = C x Scale Factor
whereTDS is total dissolved solids in g/L,

.

,
C is specific conductance in mS/cm,
andScale Factor is a user defined.
The default scale factor is 0.64 from Water Chemistry, by Snoeyink and Jenkins. If more site-specific information is available, then enter the site-specific TDS scale factor as per Section 3.4.

4.3 CE Testing

The MP20 System has been tested and complies with CE requirements in effect at time of manufacture. A copy of the MP20's current Certificate of Compliance is available on request.

4.4 Turbidity

QED's MP20DT Turbidity option is compliant with GLI method 2, EPA approved method, and ISO 7027:1999(E). GLI Method 2 is recognized by EPA as an approved method in Section 141.74 of the Federal register Vol. 59 No. 232 (December 5, 1994). Reprints of both the GLI Method 2 documentation and the Federal Register reference are available on request.

The MPs0DT's turbidity sensor, circuitry, software, and Quick-Cal Cubes™ were developed as a joint venture between Hydrolab Corporation and GLI International, Inc. and are protected by U.S. Patents #5,059,811 and #5,140,168. Other patents pending.

5 TROUBLESHOOTING

5.1 The Meter will not turn on.

- Are the batteries installed correctly? (See Section 2.1.4)
- Are the batteries good?

5.2 The Meter will not show readings.

- Is the Sonde connected?
- Are all connectors mated properly?

5.3 Measurements seem wrong.

- Are the sensors maintained and calibrated properly? (See Section 3.4.)
- Are the units (C or F, m or ft, Salinity or TDS) displayed correct? (See Section 3.2)

5.4 Water in the Sonde

- Disassemble the Sonde at an ESD workstation by removing the two flat blade retaining screws. As you remove the two retaining screws, be sure that the Bottom Cap is not pointed at anyone, since the internal pressure caused by the water leakage may blow the Bottom Cap out of the Sonde body. Rinse the circuit board with distilled water and blow dry with a hair dryer.
- Please contact QED Customer Service if you ever have a leakage problem, even if you are sure you have repaired the Sonde.

5.5 Water in the Meter

- Disassemble the Meter at an ESD workstation by removing the Lens, Battery Cap, batteries, and four Phillips retaining screws above and below the LCD. Rinse the circuit board with distilled water and blow dry with a hair dryer.
- Please contact QED Customer Service if you ever have a leakage problem, even if you are sure you have repaired the Meter.

5.6 Purge Scan stabilization not signaled as expected

- Purge Scan parameters selected may not be appropriate; check Purge Scan Setup to verify that all activated parameters are as set as intended
- Purge Scan parameter stabilization ranges may be set too tightly; check Purge Scan Setup to verify that all parameter stabilization ranges are set as intended, using the default values if unsure
- MP20 without turbidity sensor (only model MP20DT has turbidity sensor) may have turbidity selected as a stabilization parameter; if so, deselect turbidity under Purge Scan Setup.

QED Monitoring System WARRANTY

QED ENVIRONMENTAL SYSTEMS, INC. ("QED") warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by QED in the manner provided herein.

This warranty shall be limited to the duration and the conditions set forth below. Warranty duration is calculated from the original date of purchase.

1. Dedicated-Use System Products 10-year warranty on dedicated bladder pumps equipped with QED inlet screens, and purge pumps used in periodic, non-continuous groundwater sampling (up to 52 samples events per year.) All other components, equipment and accessories are warranted for one year.

2. Portable-Use Systems - Controllers and Water Level Meters, and the Sample Pro pump are warranted for one year. Hose reels, pumps and caps are warranted for ninety (90) days. Tubing and Purge Mizers are covered by a ninety-(90) day material and workmanship warranty. There will be no warranty for application on tubing and Purge Mizers when used as part of a Portable System.

3. Separately Sold Parts and Spare Parts Kit - Separately sold parts and spare parts are warranted for ninety (90) days. Repairs performed by QED are warranted for ninety (90) days from date of repair or for the full term of the original warranty, whichever is longer.

4. The MP20 - Sonde, Meter and Sensors are warranted for 3 years from date of invoice. This warranty does not apply to batteries of any type or any other items that carry shelf lives (i.e. calibration solutions). Also the warranty does not cover products damaged by improper installation, or application, misuse, abuse, neglect or accident. NOTE: THE MP20 WARRANTY EXCLUDES COVERAGE OF COMPONENTS CONSUMED THROUGH NORMAL USE, SUCH AS CONSUMPTION OF THE DISSOLVED OXYGEN SENSOR'S SILVER ANODE.

Buyers' exclusive remedy for breach of said warranty shall be as follows: if, and only if, QED is notified in writing within the applicable warranty period of the existence of any such defect in the said products, and QED upon examination of any such defects, shall find the same to be within the term of and covered by the warranty running from QED to Buyer, QED will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Buyer. If QED for any reason, cannot repair a product covered hereby within four (4) weeks after receipt of the original Purchaser's/Buyer's notification of a warranty claim, then QED's sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Buyer, or to refund the full purchase price. In no event shall such allegedly defective products be returned to QED without its consent, and QED's obligations of repair, replacement or refund are conditioned upon the Buyer's return of the defective product to QED.

IN NO EVENT SHALL QED ENVIRONMENTAL SYSTEMS, INC. BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.

The foregoing warranty does not apply to major sub-assemblies and other equipment, accessories, and parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties, if any, supplied by the respective manufacturers. QED makes no warranty concerning products or accessories not manufactured by QED. In the event of failure of any such product accessory, QED will give reasonable assistance to Buyer in obtaining from the respective manufacturer whatever adjustments is reasonable in light of the manufacturer's own warranty.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY (INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE). WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of QED, and QED neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the said products, materials and/or workmanship.

QED Monitoring System WARRANTY (cont.)

It is understood and agreed that QED shall in no_event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, not for special damages, nor for improper selection of any product described or referred to for a particular application

.This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environmental beyond the designated limits of materials and construction will also void this warranty. QED shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED's service personnel unless such repair by others is made with the written consent of QED.

If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact QED for determination of warranty coverage. If the return of a component is determined to be necessary, QED will authorize the return of the component, at owner's expense. If the product proves not be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the Purchaser.

RESPONSIBILITY OF THE PURCHASER

The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of QED and:

1. Identifying the product involved (by model or serial number or other sufficient description that will allow QED to determine which product is defective).

2. Specifying where, when, and from whom the product was purchased.

3. Describing the nature of the defect or malfunction covered by this warranty.

4. Sending the malfunction component, after authorization by QED to:

QED Environmental Systems Inc.
6155 Jackson Road
Ann Arbor, MI 48103
(800) 624-2026
(734) 995-2547
www.qedenv.com
info@qedenv.com

The World Leader in Air Powered Pumps
For Remediation, Landfills and Ground Water Sampling

SEVERN TRENT

QED Environmental Systems