User Manual DOCUMENT #606035REF



EcoSense[®] DO200A EcoSense[®] DO200M Dissolved oxygen & temperature instruments

USER MANUAL

The EcoSense® DO200A/DO200M Instrument is warranted for one year from date of purchase by the end user against defects in materials and workmanship. DO200A/DO200M probes and cables are warranted for one year from date of purchase by the end user against defects in material and workmanship. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, write or call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

Limitation of Warranty

This Warranty does not apply to any YSI product damage or failure caused by: (i) failure to install, operate or use the product in accordance with YSI's written instructions; (ii) abuse or misuse of the product; (iii) failure to maintain the product in accordance with YSI's written instructions or standard industry procedure; (iv) any improper repairs to the product; (v) use by you of defective or improper components or parts in servicing or repairing the product; or (vi) modification of the product in any way not expressly authorized by YSI.

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Please follow the guidelines below, and read this manual in its entirety to ensure safe operation of the unit.

Avoiding Damage to the Instrument - Precautions

The Instrument Case

Though the instrument is housed in a water-proof IP67 case, DO NOT use it underwater. The cable connector is not waterproof unless the cap is installed. In case of submersion without the cap connected, follow these steps immediately:

- 1. Remove the battery and reinstall the battery cover.
- 2. Dry the connector if necessary, and replace the DO probe. Rinse unit carefully with distilled water. After rinsing and drying, inspect and clean connectors to remove all contaminants that may affect probe connections.
- 3. Wait for unit and all connections to dry before reinstalling the battery and resuming operation.
- 4. If the unit does not function correctly after step 3, contact YSI for possible repair or replacement.

The Probe

- Membranes last longer if properly installed and regularly maintained. Erratic readings can result from damaged or fouled membranes or from large bubbles in the electrolyte reservoir. If unstable readings or membrane damage occurs, replace both the membrane cap and Oxygen Probe solution (also known as "O2 Probe Electrolyte", potassium chloride, or KCl solution). The average replacement interval is 4 to 8 weeks, although they may last longer if kept clean. Harsh environments, such as wastewater, may require membrane replacement every 2 to 4 weeks. Unstable readings may occur if membrane cap is coated with oxygen consuming or oxygen evolving organisms such as bacteria or algae.
- 2. Chlorine, sulfur dioxide, nitric oxide and nitrous oxide can affect readings by behaving like oxygen at the probe.
- 3. Avoid substances that may damage probe materials such as concentrated acid, caustics and strong solvents. Probe materials include Stainless steel, epoxy and ABS Plastic.
- 4. Keep the probe's gold cathode clean and textured (when properly maintained it has a matte finish). If it is tarnished (from contact with

certain gases), or plated with silver (from extended use with a loose or wrinkled membrane), then clean it, following the instructions in the <u>Maintenance</u> section.

5. To prevent the membrane and electrolyte from drying out, store the field probe in the calibration bottle with the moistened sponge. If using the self-stirring 200-BOD probe for the lab, store it in a clean BOD bottle with 1 inch of water to keep the probe in a saturated air environment.

ltem #	Contents
606077	DO200A meter, manual, and 9V battery
606071	DO200A meter, manual, 9V battery, transport case, polarographic probe with 1 meter cable, 6 screw-on cap membranes and electrolyte solution
606072	DO200A meter, manual, 9V battery, transport case, polarographic probe with 4 meter cable, 6 screw-on cap membranes and electrolyte solution
606040	DO200A meter, manual, 9V battery, transport case, polarographic probe with 10 meter cable, 6 screw-on cap membranes and electrolyte solution
601027	DO200M meter, manual, USB cable, and 9V battery
601028	DO200M meter, manual, USB cable, 9V battery, transport case, polarographic probe with 1 meter cable, 6 screw-on cap membranes and electrolyte solution
601029	DO200M meter, manual, USB cable, 9V battery, transport case, polarographic probe with 4 meter cable, 6 screw-on cap membranes and electrolyte solution
601030	DO200M meter, manual, USB cable, 9V battery, transport case, polarographic probe with 10 meter cable, 6 screw-on cap membranes and electrolyte solution

PACKAGE CONTENTS

UNPACKING

Carefully unpack the unit and accessories, and inspect for shipping damages. Compare received parts with materials listed in the <u>Package</u> <u>Contents</u> section. Notify YSI immediately of any damage or missing parts. Save all packing materials until satisfactory operation is confirmed.

Probe Preparation

The DO probe ships with a dry, protective membrane. To install a new membrane cap on the probe:

- 1. Unscrew probe membrane cap and discard.
- 2. Fill a new cap with Oxygen Probe Solution. Prepare according to directions on the solution bottle.
- 3. Thread filled membrane cap onto sensor. The sensor can be placed in a 100% water-saturated air environment (see <u>Dissolved Oxygen</u> <u>Calibration</u> section).
- Allow sufficient warm-up time for initial use (10-15 min). During this time an "ovEr" message may appear on the display. This is normal. After the warm up is complete the message will disappear.

Battery Installation

An initial display of "BAT" on the LCD indicates approximately one hour of battery life for unit operation within specifications. Replace battery when "BAT" appears on the LCD.

To replace battery, remove the two battery cover screws and the battery cover and o-ring (Figure 1). Replace the 9V battery. Replace the battery cover and o-ring (be sure to align the o-ring correctly to prevent a bad seal) and fasten the two battery cover screws for the splash-resistant feature.

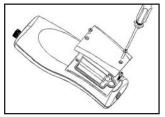


Figure 1

Battery Disposal

This instrument is powered by a 9 volt battery, which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

INTENDED USE AND GENERAL OVERVIEW

The YSI DO200A and YSI DO200M are precise water quality instruments that measure dissolved oxygen (DO) in addition to temperature. A builtin microprocessor stores, calculates, and compensates for all parameters related to DO determinations including DO electrode temperature characteristics.

The DO200A and DO200M have a waterproof IP67 case when the connector cap is installed. The keys are highly reliable with tactile and audio feedback. These instruments use one 9V battery. Recalibration is not required when power is restored.

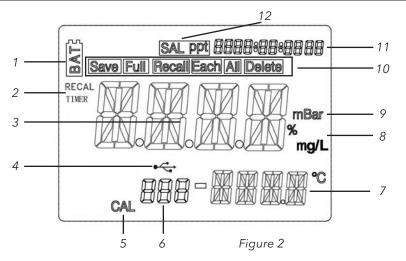
The front of the instrument has a large LCD that displays temperature and either DO % or DO mg/L (ppm). The instrument also displays user prompts and mode indicators. The unit prompts the user through calibration and measurement procedures.

The model DO200A/DO200M field and lab probes use a polarographic electrode with convenient screw-on cap membranes. Field probes feature a built-in temperature probe for automatic temperature compensation, as well as a stainless steel body for added weight. The self stirring 200-BOD lab probe (item # 609200) is also available.

Key differences between the YSI DO200A and DO200M include:

- DO200A can store 50 data sets, while the DO200M can store 250 data sets.
- A real-time clock is included on the DO200M for date/time stamp of saved data.
- The DO200M features a waterproof USB port with cover that will allow customers to download stored measurement data to a PC.
- A recal prompt on the DO200M allows users to select a recalibration interval.

DISPLAY DESCRIPTION



Number	Description	
1	Low battery indicator	
2	Recal Timer indicator (DO200M only)	
3	Main display for dissolved oxygen values	
4	USB/PC connection indicator (DO200M only)	
5	Calibration mode indicator	
6	Data set number	
7	Temperature display	
8	Dissolved oxygen units (% or mg/L)	
9	mbar: Displays during calibration to prompt user for true barometric pressure.	
10	Save, Full, Recall, Each, All, Delete: Instrument's data storage indicators.	
11	Date/Time display (DO200M only)	
12	SAL ppt: Displays during calibration when user is prompted for the approximate salinity (in ppt) of the sample to be tested.	

OPERATIONAL KEYS DESCRIPTION

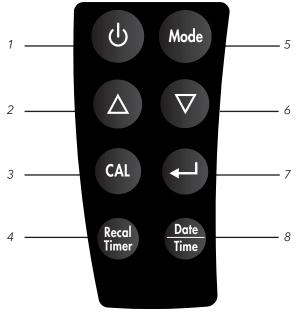


Figure 3

Number	Кеу	Description
1	С U	Power key. Turns the unit on or off.
2, 6		Up and down arrow keys. Used to scroll through saved data in Recall mode, select the data deletion option in Delete mode, and adjust input values for barometric pressure and salinity during calibration. On the DO200M, these keys adjust recal time and select/adjust date time format and information.
3	CAL	Calibration key. Press to enter the calibration mode.
4	Recal Timer	Recal Timer key (DO200M only). Press to enter the Recal Timer input display.

5	Mode	Mode key. Adjusts between measurement modes (%, mg/L), recalling saved data and deleting saved data.
7		Enter key. Pressing Enter saves the current measurement into memory, confirms mode selection (recall/ delete), confirms calibration steps, and confirms data deletion. On the DO200M, this key confirms recal timer entry and date/time selections.
8	Date Time	Date/Time key (DO200M only). A short press (i.e. key is not held) of the Date/Time key changes the display in the upper right corner to be either Date or Time. Pressing and holding for 3 seconds will allow date and time information to be updated. Pressing and holding for 6 seconds will allow for the date (e.g. MM/ DD/YYYY) and time format (12 or 24 hour) settings to be changed.

OPERATIONAL PROCEDURES

Press the Power key to turn the unit on or off. The instrument will perform a self-diagnostic test, during which an "ovEr" message may appear on the display. This is normal. After the warm up is complete the message will disappear. After the self-diagnostic test completes, the temperature displays in the lower right of the display, and the unit is ready for operation. Immerse the probe halfway into the sample solution. If possible, do not allow probe to touch any solid object in the solution. Allow no air bubbles around the probe. When the unit is not in use, turn it off to save battery life. The instrument has a 30 minute auto shut off feature when not in use.

Note: During an oxygen measurement, the probe must be moved approximately 1/2 ft per second to overcome the inherent consumption of oxygen by the sensor. When using the 200-BOD lab probe, however, simply use the probe's self-stirring feature.

Measurement Modes - % or mg/L

This unit provides three distinct measurements: Temperature, Dissolved Oxygen in % saturation, and Dissolved Oxygen in mg/L (ppm). The dissolved oxygen measurement unit is indicated on the right side of the display. Press Mode to switch between % and mg/L.

Calibration

Temperature

All probe and cable assemblies have a built-in thermistor. Temperature calibration is not available or required. To verify the temperature sensor, compare it to a NIST traceable thermistor by touching the thermistors together and observing the measurements.

Dissolved Oxygen

Calibration Requirements:

• The approximate true barometric pressure (in millibars [mbars]) of the location at the time of calibration.

True <u>B</u>arometric <u>P</u>ressure (mmHg) =

[Corrected <u>BP</u> mmHg] - [2.5 * (Local Altitude in ft. above sea level/100)] mBar = mmHg *1.333

- The approximate salinity of the water to be analyzed. Fresh water's salinity value is approximately zero parts per thousand (ppt). Seawater has an approximate salinity of 35 ppt.
- For highest accuracy, complete all calibrations at a temperature as close as possible to the sample temperature.
- For the field probe, place 5-6 drops of clean water (tap, distilled, or deionized) into the sponge inside the calibration bottle. Turn the bottle over and allow any excess water to drain out of the bottle. The wet sponge creates a 100% water-saturated air environment for the probe, which is ideal for calibration, transport, and storage of the DO probe. For calibration, the probe remains in a water-saturated air and is not submersed.

For the lab BOD probe, simply use the same bottle the probe is stored in with approximately 1 inch of water in the bottom. This creates a 100% water-saturated air environment for the probe, which is ideal for calibration and storage of the Model 200-BOD probe. For calibration, the probe remains in a water saturated air atmosphere and is not submersed.

- 2. For the field probe, slide it into the calibration bottle. Be sure the membrane does not touch the sponge.
- 3. Turn on the unit by pressing the Power bkey. Wait 10 to 15 minutes for the dissolved oxygen and temperature readings to stabilize.
- 4. Press CAL.
- 5. The LCD prompts for the local pressure in mBar. Use Up and Down keys to increase or decrease the pressure value respectively. See <u>Appendix A</u> to convert barometric pressure units to mBars.

- 6. When the proper pressure displays, press Enter 🛀 once to view the calibration value in the lower right of the display. Once the value in the main display stabilizes, press Enter 🛁 again to move to the salinity compensation procedure.
- 7. The display prompts for the approximate salinity of the water to be analyzed. Use the Up and Down keys to increase or decrease the salinity compensation value to the value of your sample (between 0 to 40 parts per thousand [ppt]). When the correct salinity displays, press Enter .
- 8. The unit holds calibration even if it is powered off. However, it is recommended to check calibration with each use and recalibrate as necessary to prevent drift. Dissolved oxygen readings are only as good as the calibration.

Saving, Viewing and Deleting Data

The DO200A can save 50 data records, while the DO200M can save 250 data records. When in measurement mode, press Enter \checkmark to save a record. The instrument will confirm saving the data by displaying "Save" and the data record number for one second. "Full" is displayed when trying to save data and memory is full.

To view saved data, press Mode until "Recall" is displayed and then press Enter . Use the Up or Down arrow keys to review different saved records. Press Mode to escape back to measurement mode.

To delete data records, press Mode while in measurement mode until "Delete" is displayed. Press Enter . "All" will be displayed and blinking. Press the Up or Down arrow key to switch between delete 'All' or 'Each' options. Select either 'All' or 'Each' by pressing Enter - while that option is displayed.

If 'All' is selected, all records will be deleted from memory and 'None' will be displayed. Press Mode twice to return to the measurement mode.

If 'Each' is selected, the Up and Down arrow keys will allow you to scroll through the saved data records. Press Enter to delete the selected record. All records after the deleted record will shift up to keep the records in sequential order. For example, if record 3 is deleted, record 4 will become record 3 and record 5 will become record 4. Press Mode twice to return to the measurement mode.

Downloading Data to a Computer - DO200M Only

The DO200M features a micro USB connection that allows the instrument to be connected to a computer with Windows 7 or Windows 10 as the operating system. Once connected, data saved to the meter can be downloaded to the computer.

- 1. A USB cable is included with all DO200M instruments. Plug the micro USB connector into the DO200M instrument and the USB connector into a computer.
- 2. Turn the DO200M instrument on. A driver will install from the instrument to the computer.
- 3. Open Windows Explorer. The PC will recognize the instrument as a removable drive.



Windows Explorer Icon

4. <u>Copy and paste the .csv file from the instrument to a</u> <u>location on the computer.</u> This file can be opened in Excel[®].

Note: The original .csv file should be left on the DO200M instrument. Do not try to modify this file.

Note: If the .csv file is opened with Excel[®] and the data is not formatted correctly (e.g. a temperature reading is interpreted as a date), please refer to the <u>Troubleshooting</u> section.

5. The instrument can be disconnected from the computer. The original .csv file should still be located on the DO200M instrument.

Recal Timer - DO200M Only

The Recal Timer feature provides a reminder to recalibrate the DO probe. If enabled, 'Recal' will be displayed when the user-defined interval has elapsed.

After pressing the Recal Timer key, use the Up and Down arrow keys to adjust the value for the recal prompt in number of days. Press Enter to confirm. The instrument will return to the run screen.

Any value between 0 and 60 days can be selected. Set the value to 0 to disable the Recal Timer.

Date/Time Settings - DO200M Only

A short press (i.e. key is not held) of the Date and Time key changes the display in the upper right corner to be either Date or Time.

Press and hold the Date and Time key for 3 seconds to set date and time information. Use the up and down arrow keys to adjust Hour, Minute (Min) and Second (Sec). Press Enter 🕶 to confirm each selection. After adjusting time, adjust date information by using the up and down arrow

key to adjust the MM (month), DD (Day) and YYYY (Year) information. Press Enter 🕶 to confirm each selection.

Press and hold the Date and Time key for 6 seconds to set the date/time format. Use the Up and Down arrow keys to display the desired Date format (MM/DD/YYYY, DD/MM/YYYY, or YYYY/MM/DD), followed by Enter to confirm the selection. Next, use the Up and Down arrow keys to display the desired Time format (12-hour or 24-hour), followed by Enter to confirm the selection.

Sensor Storage

Short-term Storage

When the DO sensor is not in use, store it in a moist environment. For shortterm storage (less than 30 days), moisten the sponge in the calibration/ storage sleeve with a small amount of clean water and place this over the probe with the membrane cap and sensor guard installed. This will provide a 100% saturated air environment.

If using the Model 200-BOD probe for the lab, store the probe in a BOD bottle containing at least 1 inch of clean water.

Long-term Storage

For long-term storage (>30 days), remove the battery from the instrument. Moisten the sponge in the calibration/storage sleeve with a small amount of clean water and place this over the probe with the membrane cap and sensor guard installed. Inspect the sponge every 30 days to make sure it is still moist.

Alternatively, you can place the probe with membrane cap directly in a beaker or other container of water, making sure that the water does not evaporate over time.

For long term storage of the Model 200-BOD probe, remove the membrane cap, rinse the probe tip with deionized water, and install a dry membrane cap (without electrolyte solution).

TROUBLESHOOTING

Error Messages on Display

Main Display	Possible Solutions	
"ovEr" or "undr"	Check membrane and electrolyte solution.Clean anode and cathode.Return product for service.	

Secondary Display	Possible Solutions	
"undr"	 Heat the sample to above -6.0 °C Return product for service. 	
"ovEr"	Cool sample to below 46.0 °CReturn product for service.	

Opening the Data File with Excel®

Depending on the region and language setting of your PC, measurement data might be formatted incorrectly by Excel® when the data file is opened.

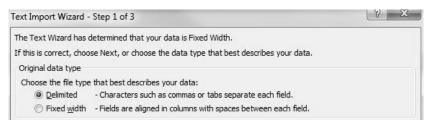
This is sometimes encountered with German set as the PC language, as a German date format typically utilizes a decimal (DD.MM.YYYY). The DO200M utilizes a decimal as the radix, so a temperature of **31.1** is sometimes interpreted by Excel[®] as **31. Jan** when German is set as the PC language.

If a data file is opened in Excel[®] and measurement data is incorrectly interpreted as something other than a number, please follow these steps:

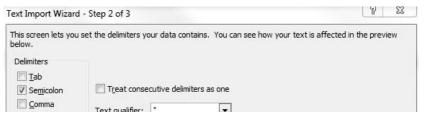
- 1. Open a <u>blank</u> Excel[®] spreadsheet.
- 2. Go to the **Data** tab and select **From Text**.



- 3. Choose to **Import** the data file you have copied to your PC. Don't select the original data file that is still on the instrument.
- 4. Under Step 1 of the Text Import Wizard, choose **Delimited**.



5. Under Step 2 of the Text Import Wizard, choose **Semicolon**.



 Under Step 3, click on the column with the incorrectly formatted data. This column should be highlighted in black. Choose **Text** under **Column data format**. Do this for each column with incorrectly formatted data.

		eral' converts ining values t		s to numbers, date values to da	ites, and all
YMC	•		ĺ	Advanced	
port column	ı (skip)		L.		
			-		
eral	General	General	General	Text	Genera
0.5.100.005	12.6	1 100 100 100 100 100 100 100 100 100 1			Genera 🔺
e	Time	DO %	DO mg/L	Temp degree Celsius	Genera ^
e 7/07/10	12.6	1 100 100 100 100 100 100 100 100 100 1			Genera ^
e 7/07/10 7/07/10	Time 14:10:23	DO % 97.1	DO mg/L 7.20	Temp degree Celsius 31.1	Genera ^ -
			YMY	MY	MY Advanced

7. Select **Finish**, then choose where you want the data to be placed on your opened spreadsheet.

MAINTENANCE

Dissolved Oxygen Sensor

Clean the probe whenever it won't calibrate or the readings are unstable and changing the membrane does not solve either issue. On average, the probe should only be cleaned about once or twice per year. To clean the probe, sand the electrodes according the directions below. In addition to sanding, a chemical soak may be necessary (direction below). Always sand the electrodes after performing a chemical soak.

- 1. Remove membrane cap and rinse the probe with clean water (tap, distilled, or deionized).
- 2. Turn unit off, or disconnect probe.
- 3. Obtain either:
 - 14% lab strength ammonium hydroxide and soak for 2-3 minutes
 - 3% household cleaning strength ammonia and soak overnight (8-12 hours)
- 4. Rinse ammonium hydroxide/ammonia from probe.
- 5. Use sandpaper (400 grit wet/dry, supplied with YSI membrane kit 605306) to buff (wet sand) excess deposits from probe.
- 6. Install a new membrane cap.

Never use chemicals or abrasives not recommended by YSI.

Temperature Sensor

You must keep the temperature portion of the sensor free of build up. Other than that, the sensor requires no maintenance. A soft bristle brush, like a tooth brush can be used to scrub the temperature sensor if needed.

ACCESSORIES / PART NUMBERS

Part Number	Description	
606037	1 meter DO and Temp probe and cable assembly	
605352	4 meter DO and Temp probe and cable assembly	
605353	10 meter DO and Temp probe and cable assembly	
609200	Self-stirring BOD lab probe and cable assembly with power supply	
605139	DO carrying case, soft sided	
606036	DO carrying case, hard sided	
605306	Membrane kit, 1.25 mil PE, six cap membranes and KCI solution	

All cables include a polarographic dissolved oxygen sensor and temperature sensor.

TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)

+1 937 767 2762 (Globally) Monday through Friday, 8 AM to 5 PM ET Email: info@ysi.com

Mail: YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA Internet: <u>ysi.com</u>.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at ysi.com or contact YSI Tech Support.

Parameter	Range	Resolution	Accuracy	
Temperature	-6.0 to 46.0 °C	0.1 °C	± 0.3 °C	
Dissolved Oxygen	0.0 to 200% air saturation	0.1% air saturation	±2% of the reading or ±2% air saturation, whichever is greater	
	0.00 to 20.0 mg/L	0.01 mg/L	±2% of the reading or ±0.2 mg/L, whichever is greater	
Pressure Compensation (Input during calibration)		600 to 1100 mBar (450 to 825 mmHg)		
Salinity Compensation (Input during calibration)		From 0.0 to	From 0.0 to 40.0 ppt	
ATC Probe		Thermistor, 10KΩ, at 25 °C		
Calibration Backup		Yes		
Audio Feedbac	:k	Yes, on all keys		
Power Source, I	Battery Life	One 9V battery (included with meter)		
			Approximately 500 hour (DO200A) or 150 hour (DO200M) battery life	
		Real time clock (RTC) on the DO200M also powered by CR2032 coin battery (3V)		
Operating Range - Temperature		0 to 50 °C	0 to 50 °C	
Operating Range - Relative Humidity		Up to 95%		

Instrument Casing	Waterproof IP-67 with cable connector cap installed
Weight (with battery)	281 grams (.62 lbs)
Dimensions (L x W x H)	18.9 cm x 7.9 cm x 3.8 cm (7.45 in x 3.10 in x 1.50 in)
Memory	50 data sets on the DO200A 250 data sets on the DO200M
Auto Shutoff	Automatically powers off after 30 minutes of inactivity
Recal Timer	DO200M only - Customer selects recalibration interval; from 0 to 60 days
Real-Time Clock (RTC) for Date/Time Stamp of Saved Data	DO200M only
Waterproof USB for Downloading Data to PC	DO200M only
Conforms to the following:	
Directives:	EMC 2014/30/EU RoHS 2011/65/EU WEEE 2012/19/EU
Harmonized Standards:	EN61326-1:2013 (IEC 61326-1:2012) IEC 61000-3-2:2005 IEC 61000-3-3:2008 IEC 61000-4-2:2008 IEC 61000-4-3:2006 IEC 61000-4-3:2004 IEC 61000-4-6:2008 IEC 61000-4-8:2009

APPENDIX A - CONVERSIONS

To Convert:	Multiply by:
Inches of Hg to mBar	33.864
Inches of Hg to mmHg	25.4
mmHg to mBar	1.333

Item #606035REF Revision B; December 2017 For the latest version of this manual, visit <u>ysi.com</u>