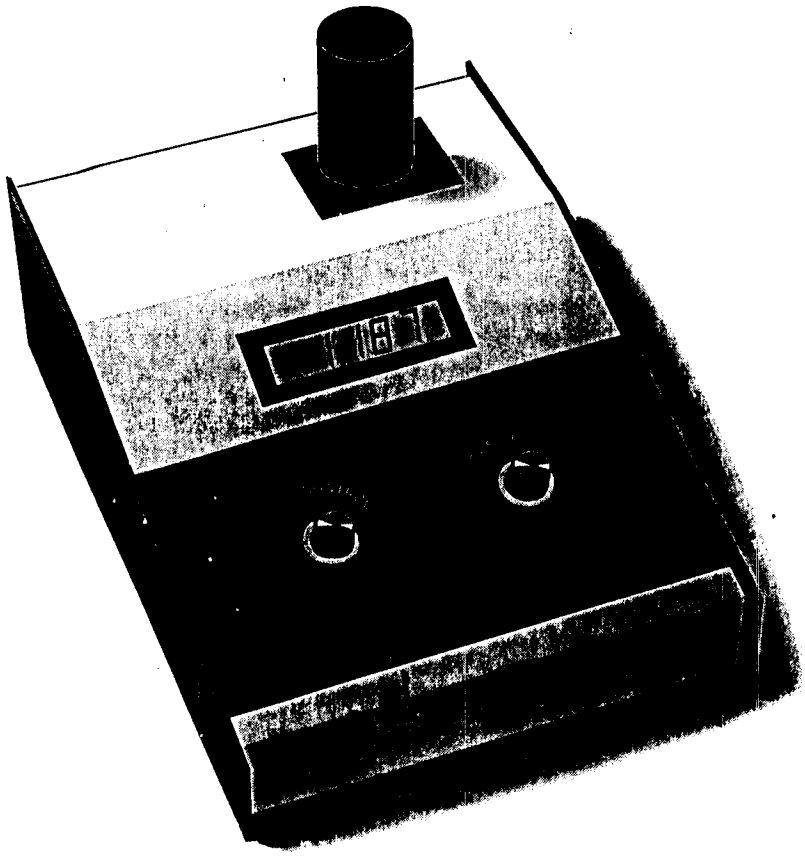
TRB-800

Dual Range Turbidity Meter



OMEGA®

An OMEGA Technologies Company

Operator's Manual
M1657/0593

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TRB-800

Introduction

The Omega Model TRB-800 meets EPA specifications for measurement of turbidity in drinking water. Its drift-free, accurate readings make this instrument suitable for testing municipal water, food and beverage processing water, and any aqueous solutions in which control of clarity is critical.

The Model TRB-800 is a true nephelometer, measuring the amount of light scattered at a right angle from a beam of light passing through the test sample. Test results are read directly in NTUs on an LCD digital read-out. The turbidimeter is pre-calibrated and a simple "zero adjustment" is the only step required prior to testing.

Cover the sample tube and chamber when a reading is taken. To prevent dust accumulation, leave the light shield in place on the instrument when it is not in use. Do not store sample tubes in chamber.

A function control switch turns the instrument ON and also serves as the range selector for the two ranges: 0-20 and 0-200 NTU. The Model TRB-800 is designed to remain on permanently. However, during long periods of non- use, it is recommended the unit be switched off to prolong lamp life. If the unit is switched off it will require approximately 30 minutes for warm-up.

Handle the sample tubes with extreme care. Discard any tube with scratches. It is important that the tube, especially the bottom, be wiped clean with lint-free tissues before inserting it into the reading chamber. To avoid smudges, handle all tubes by the top of the tube only.

On the side of each sample tube is a vertical white index line. Make sure this index line faces the exact same position every time you insert the sample tube into the test chamber. If the index line is not in the same position, the reading on the meter will change; not because of a change in the test solution, but because of the varying optical characteristics of the sample tube. You can verify this glassware effect by rotating the sample tube in the test chamber. You will notice the meter readings change.

Caps for the sample tubes are provided. These caps should be placed on the sample tubes before the tubes are put into the reading chamber to prevent any accidental spillage of the contents into the chamber. The chamber should be kept dry and clean at all times to ensure accurate readings.

Turbidity samples and standards should be thoroughly mixed before inserting either into the reading chamber. All bubbles should be removed, either by allowing the tube to stand for a few minutes or by gently tapping and swirling the contents.

Particulate matter, such as dust or lint in the sample, will cause considerable fluctuation in the meter reading as the particle comes into the path of the light beam. In most cases, the meter readings will waver between a steady reading and a higher reading. The reading will eventually fluctuate back down to a lower reading as the particle settles. When this type of reading is evident, it is best to remove the light shield and examine the sample.

Available Models

TRB-800	Dual range turbidity meter

Accessories

TRB-800-BATT	Rechargeable battery pack and vinyl carrying case
TRB-800-0	0 NTU permanent standard
TRB-800-10	10 NTU permanent standard

Unpacking

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, plese call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE:

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

The TRB-800 is supplied with Formazin, filter/syringe assembly, six sample vials, sample cap, and rechargeable battery pack, all housed in a rigid vinyl carrying case.

Preparation of Turbidity-Free Water Reference Standard

The filter holder and syringe must be conditioned, by forcing at least two syringe loads of deionized water through the filtering mechanism, to remove foreign matter from the filtering apparatus. The first and second rinses are discarded. Turbidity-free water, as prepared below, may be stored in the dark, at room temperature, in a clear glass bottle with a screw cap, or in a turbidity tube and used as required. The storage vessels should be rinsed thoroughly with filtered-deionized water. Periodically inspect the water for foreign matter in a bright light.

Procedure for Making Triple Filtered Distilled Water

1. Remove the plunger from the syringe and attach the filter holder to the bottom of the syringe.

2. Pour approximately 50 mL of deionized water into the barrel of the syringe, replace the plunger into barrel and exert pressure on the plunger to slowly force the water through the filter. Collect the water in a suitably clean container.

3. Remove filter holder from syringe then remove plunger from barrel. This procedure is required to prevent rupturing the membrane filter, by the vacuum created as the plunger is removed from the barrel.

4. Replace filter holder and repeat Steps 3 and 4 until the desired amount of turbidity free water is collected. Periodically examine the membrane filter to insure no holes or cracks are evident.

5. Repeat Steps 1 through 4 using the 1X filtered water obtained in Step 4. This will give you 2X filtered water.

6. Repeat Steps 1 through 4 using the 2X filtered water of Step 5. This gives you a X or triple-filtered water.

7. Depending upon the nature of the unfiltered water, it is possible to prepare a liter or more of turbidity-free water using a single filter. The membrane filter may be stored in the holder for an indefinite period of time and used as required.

Preparation of Formazin Standards

Calibration of the Model TRB-800 is based upon Formazin, a suspension which is more reproducible in its light-scattering properties than any other suspension.

The Model TRB-800 has been calibrated to Formazin solutions by the factory and the calibration should not change with time. However, should the instrument indicate a need for calibration, it may be accomplished in the laboratory by using carefully prepared Formazin solutions as follows:

The standard Formazin solution has a value of 4000 NTU. This solution is used as the stock solution and is stable for 6 months in the undiluted form. Dilutions of the stock solution are made with turbidity-free water as prepared on page 4.

A working standard is prepared by pipetting exactly 10 mL of the stock solution into a clean, volumetric flask and diluting to 100 mL. The working standard has a value of 400 NTU and is stable for one month. Dilutions of the stock solution, resulting in values below 400 NTU, should be prepared daily for reliable results.

The following table gives the relationship between dilutions of the 400 NTU solution and the resulting values as NTU. When diluting the suspension, use only turbidity-free, triple-filtered, deionized water.

NTU	**mL of 400 NTU solution** (diluted to 100 mL with turbidity-free water:)
400	0
200	50
50	12.5
20	5.0
10	2.5
1	0.25
0.5	0.125
0.1	0.025

Dilution of Sample

If the sample has a turbidity reading greater than 200 NTUs, it is necessary to dilute the sample with turbidity-free, deionized water to bring the reading within range of the instrument. Turbidity-free, deionized water may be prepared as described above. The following calculation is required if the sample is diluted:

$$\frac{A\,(B+C)}{C} = D$$

Where A = NTU found in diluted sample
B = Volume of deionized water used, mL
C = Sample volume taken for dilution, mL
D = NTU of original, undiluted sample

For example: If 10 mL of sample water is diluted with 90 mL of turbidity-free water to a total volume of 100 mL and the resulting solution measures 40 NTU, the turbidity of the original undiluted sample is:

$$\frac{40\,(90+10)}{10} = 400 \text{ NTU}$$

General Operating Instructions

1. First attach the AC wall adapter's 3.5mm plug into the instrument's jack located on the rear panel of the instrument. The AC wall adapter converts 120 volts AC to 9 volts DC, 500 milliamps. Allow the Model TRB-800 to warm-up for 30 minutes.

2. Insert a sample tube containing a turbidity-free zero (0) reference of either triple filtered water or a 0 NTU polymer standard into the chamber, and replace the light shield. Ensure cap is on tube. Permanently sealed polymer standards of 0 NTU and 10 NTU values are available. Please refer to the Replacement Parts section on page 7.

3. Rotate the range switch to the "20" position, and with the zero adjustment knob adjust meter to read "0". For multiple samples, it is not necessary to reset the zero for each sample.

4. Remove the zero standard from the chamber and insert the test sample. Ensure cap is on tube.

5. Replace light shield.

6. Rotate switch until appropriate range is selected for reading the sample. If the meter shows a 1—, it is over ranged. Change the range switch to the 200 range. If the reading is greater than 200 NTU, dilute the sample by 1/2 to obtain reading and multiply results by 2 . See page 4 for dilution instructions.

7. Remove sample from chamber and replace light shield. Samples should never be allowed to remain in the chamber for extended periods of time.

Calibration Procedure Using Standardized Solutions

Although each instrument is pre-calibrated before it leaves the factory, it may be necessary to check the calibration to determine if the instrument is responding according to the specifications. The instrument should be allowed to warm up for 30 minutes. Please read the instructions thoroughly before starting.

Procedure

1A. Insert a sample tube with turbidity-free, triple-filtered, deionized water or a 0 NTU polymer standard into the chamber and cover. Set the range switch to "20" NTU. Set the "Zero Control" potentiometer on the instrument panel so that the meter reads "0". If the meter cannot be made to read zero (0), then go to Step 1B. If the meter does read zero, then go to Step 2.

1B. Set the panel "Zero Control" knob at mid-range, so the arrow on the knob points at the letter "o" of the word "Control". Locate the coarse zero potentiometer. It can be found on the right side of the instrument and is marked "0". With a small screwdriver, set the coarse zero pot so that the meter reads as close to zero (0) as possible. An exact zero can now be set with the "Zero Control" knob.

2. Insert a 10 NTU standard solution into the chamber and cover. Set the range switch to "20". If the meter does not read 10.00, adjust the potentiometer marked "20", found on the right side of the instrument, with a screwdriver until the meter reads 10.00. The digit "1" will appear in the display when the instrument is over range, that is over 19.99.

3. With the 10 NTU standard solution in the chamber and covered, set the range switch to "200". If the meter does not read 10.00, adjust the potentiometer marked "200", found on the right side of the instrument, with a screwdriver until the meter reads 10.00. The digit "1—" will appear in the display when the instrument is over range, that is over 199.9.

4. Repeat Steps 1-4 if necessary. The instrument is now calibrated in both ranges.

Battery Operation

CAUTION

The enclosed battery pack stores a large amount of energy.
DO NOT ALLOW ANYTHING TO SHORT-OUT THE BATTERY'S PLUG!

Treat this battery with the same respect and caution given to a car battery. Failure to do so may result in damage or injury to you or the instrument.

The Model TRB-800 Turbidity Meter has an optional battery pack. The battery pack is a sealed, gel-filled, 12-volt DC , 1.9 amp hour battery. The battery is permanently mounted in the carrying case and is connected to the Model TRB-800 Turbidity Meter via a six-inch long double-ended plug. The Model TRB-800 can be used in the laboratory with the AC wall adapter supplied with the meter, or in the field with the battery pack.

Battery Pack Operation:

To use the battery pack, insert the double-ended plug between the battery jack and the 3.5 mm AC adapter jack found on the back of the meter. A fully charged battery should provide 90 minutes of continuous operation, approximately 180 samples. To conserve battery power, we recommend the meter be turned on for a test and then turned off immediately afterwards.

Charging the Battery:

To charge the battery, take the plug of the AC wall adapter and insert it into the battery jack. It will take 24 hours to fully charge the battery. The battery is fully charged at the factory before shipping.

Maintenance

Replacing Light Bulb

Unplug instrument from receptacle. Remove the 4 screws from the bottom of the turbidity meter and one on each side. Lift the instrument housing from the base. The top part of the instrument housing contains the light box from which the bulb and lead wires can be removed. Carefully remove the wire leads from the light box by unscrewing the wire nuts. Attach the new bulb leads by the wire nuts, and place the bulb back into position in the light box. Place the instrument housing over the base and replace the 6 screws. Plug instrument into receptacle. The optical characteristics of each bulb are carefully controlled, but to insure accurate results it may be necessary to calibrate the instrument according to instructions on page 5.

Cleaning the Light Box

Periodically clean the light box chamber with a lint-free cloth or tissue, to remove foreign matter which may interfere with turbidity readings. If any solution is spilled into the chamber, remove the spilled fluid immediately with an absorbent towel. Wipe clean with a lint-free cloth or tissue.

Replacement Parts

The following is a list of replacement parts available for the Model TRB-800:

TRB-800-CAP	
TRB-800-FTR	Filter, .2 micron disposable
TRB-800-FMZ	Value of 4000 NTUs
TRB-800-SYG	50 cc syringe
TRB-800-VIAL	21x70 mm, flat bottom, with cap
TRB-800-0NTU	0 NTU permanently sealed polymer standard
TRB-800-10NTU	10 NTU permanently sealed polymer standard
TRB-800-LAMP	Lamp 3.5 volt
TRB-800-AC	AC adapter, 9 volts at 500 milliamps

Specifications

Meter

Range: 0-19.99 and 0-199.9 NTU
Accuracy: + /- 2% or 0.05 NTU
Display: 0.5" LCD

Photometric Data

Photodetector: 2 Photo voltaic cells, centered at 90 degrees to the incident light path, spectral peak response between 400 and 600 nm.

Lamp: Tungsten, lens-end 3.5 volt, operating at a color temperature of 2230 degrees K. Distance traversed by incident light and scattered light within the sample tube is 2.5 cm.

Control Panel

Range Selector: 3 Positions: Off/ 0-20 NTU/ 0-200 NTU
Zero Control: For calibration to 0 NTU

Power Requirements

Line Operated: 120 volts, 50/60 Hz, 220 VAC optional
Battery: 12-volt sealed battery with battery pack

Meter Housing

Material: Aluminum
Dimensions: 9.25"L x 6.66"W x 3.20"H (235 x 169 x 81 mm)
Weight: 3 lbs (meter); 9 lbs (meter, battery, case)