

Eco-celli Barometer Model E038 Users Guide

How It Works

The Eco-celli is a new concept in liquid barometers with the precision of a mercury barometer without the mercury hazard. The Eco-celli looks similar to a traditional mercury barometer but the basic principle is completely different, based on the compressibility of gasses instead of the weight of liquid mercury. Looking at your Eco-celli, on the upper left-hand side of the barometer you can see the gas reservoir above the red fluid tube. The gas provides a constant counter-pressure against the atmospheric pressure. (Boyle's Law)

High Pressure or Increasing Pressure:

Air pressure pushes down on the open side of the barometer tube onto the surface of the red fluid. The gas in the barometer will be compressed and you will notice the red fluid level in the right hand portion of the barometer tube falling. High pressure or increasing pressure indicates fair or improving weather

Low Pressure or Decreasing Pressure:

When the air pressure decreases on the surface of the red fluid, the gas in the barometer will expand and the red fluid will rise in the right-hand portion of the barometer tube. Low pressure or decreasing pressure indicates foul weather or deteriorating weather conditions.

A very important factor in measuring air pressure is the temperature. High temperatures will cause fluids and gases to expand causing an error in the readout of the barometer scale. The Eco-celli has solved that problem. On the right side of the Eco-celli is mounted a high precision thermometer parallel to the barometer tube. This thermometer has the same thermal expansion/compression rate as the barometer. With the help of a movable scale attached to both the barometer and thermometer tubes, you set the scale to the actual temperature (top of blue fluid level). The error caused by the temperature is automatically corrected and you can now read the correct air pressure. On the barometer scale, there is a slider. This is the tendency pointer. As you read the air pressure (top of red fluid) place the slider at that point. When air pressure fluctuations occur, the red fluid level will differ from the last position of your pointer. The difference is the indication of the coming weather. The amount and speed of the changes in air pressure give a good indication of when to expect weather changes. The weather forecast distributed on television and radio are only for a broad area and do not take into account factors such as forests, lakes, rivers, etc. These effects in meteorology are called "the micro-climate". With the help of your Eco-celli barometer, you will be able to make forecasts for your own "micro-climate" for a time interval of 6 to 12 hours in advance.

The Eco-celli remarkable and important advantages

1. The barometer system does not contain any mercury. The thermometer is filled with blue colored alcohol.
2. The scale is 4 times larger than a standard mercury barometer and with the highly colored fluid, much easier to read.
3. The barometer tubes are handcrafted out of high quality capillary glass. All glass tension is removed during production. This, together with the low specific gravity of the colored oil, insures safe movement and shipment of the barometer.
4. Due to the unique construction of the Eco-celli, there are no problems moving the unit from place to place or even placing it vertically. The rising or falling of the red fluid will be reduced by the construction in order to prevent mixture of oil and gas.

Initial Setup

When you receive your Eco-celli barometer you will notice that the upper right-hand tube has a rubber plug attached to its end. Remove this plug

- Hang the barometer on a wall. If you notice gaps in the red fluid column, install the rubber hose and blue plug found in the calibration kit. Pinch the rubber tube between your thumb and pointing finger. You will see the gaps disappear. A separate paper with the barometer explains the procedure in more detail.
- Now remove carefully the rubber plug and rubber hose. Insert the hollow glass plug found in the calibration kit into the end of the red fluid tube. This plug prevents dust or bugs from mixing with the fluid but allows air pressure to enter the tube.
- The barometer is now fully functional. Please wait at least one hour before taking pressure readings. This allows the instrument to reach the same temperature as its surroundings.

Taking a reading

Located between the barometer (red fluid) and thermometer (blue fluid) is the barometer scale. Once the unit has acclimatized with its surroundings, you may begin taking air pressure readings.

- Slide the entire scale up or down until the temperature pointer is even with the top of the blue fluid level of the thermometer. By doing this, temperature correction is completed and pressure readings may be taken.
- Set the tendency pointer on the barometer tube to the top of the red fluid level and take your reading off of the scale. The reading will be in inches and hPa (millibars) or millimeters, depending on model. The next time you take a reading, you should see a difference between the location of the tendency pointer and the level of the red fluid. Unless there is severe weather approaching, air pressure does not change rapidly so allow several hours between readings.

Calibration of the barometer

The Eco-celli barometer is calibrated to sea level (0 feet). When you install the barometer in an area that has a different height above or below sea level of more than about 150 feet, you will have to calibrate your barometer. A calibration set comprised of gloves, a syringe, needle stub, and capillary tube was included with your barometer. Have paper towels available to catch any spills as the colored oil will stain anything it comes in contact. Wear gloves and eye protection to prevent any fluids from reaching the skin or eyes. See caution at the bottom of this page.

There are two methods of calibration. Method One - Recommended: the first thing you will need is the current local air pressure. Contact a local airport, television station, National Weather Service office, or visit a weather web site such as www.weather.com. Once you have the correct local air pressure, remove fluid from the red tube using the calibration set until the fluid level matches the correct air pressure.

This second calibration method should only be used if local pressure cannot be obtained via another method. This method calculates the air pressure difference from sea level. To find your height above sea level, contact your local city/town hall. Each 25 feet above sea level is equal to 0.03 inches on the scale. Remove the calculated amount of fluid until the correct fluid level is reached. Please save the removed fluid in the syringe so it may be added if the barometer is moved to a different location. Example: if you are located 1200 feet above sea level, $1200 / 25 = 48$. $48 \times .03 = 1.44$. If the barometer were reading 30.89 inches, you would subtract $30.89 - 1.44 = 29.45$. Remove red fluid until the barometer reads 29.45. It is calibrated.

Important Notes:

SPILLING OF THE COLORED FLUID: Caution: The thermometer and barometers tubes contain chemicals that may cause skin irritation. Wear protective gloves when handling the liquid. If skin is exposed, wash with warm water and soap. The chemicals may cause eye irritation if splashed into the eye. Always wear eye protection when handling the liquid. If the eye is exposed to the fluids, flush the eye with warm water to remove. The dyes used in the fluids are very strong colorants and will stain anything they come in contact with. If they get on clothes, wash immediately in soap and water.

Disposal: In case of a spill of the fluids, absorb the fluid with paper towels or inert absorbent material such as sand or kitty litter. Place in a sealed plastic bag and dispose of as chemical waste. Do not flush down the drain, as the chemicals are hazardous to marine life.

CAUTION WITH HIGH TEMPERATURES: The barometer is very heat sensitive. Do not place this barometer on places that will be overheated by the sun. The barometer will not function properly and the thermometer will be damaged if the temperature is above 120 degrees F.

TRANSPORTATION: If the barometer is to be transported, you should close the end of the barometer tube with the rubber hose and rubber stopper.

MAINTENANCE: Use a dry lint free cloth. Use of abrasive cleaning products is prohibited. Use standard window cleaner on the glass/acrylic pieces. DO NOT spray directly onto the instrument. Spray a bit of product onto a cloth and gently rub the glass/acrylic parts.

Eco-celli® Barometer Model E038 Assembly Instructions

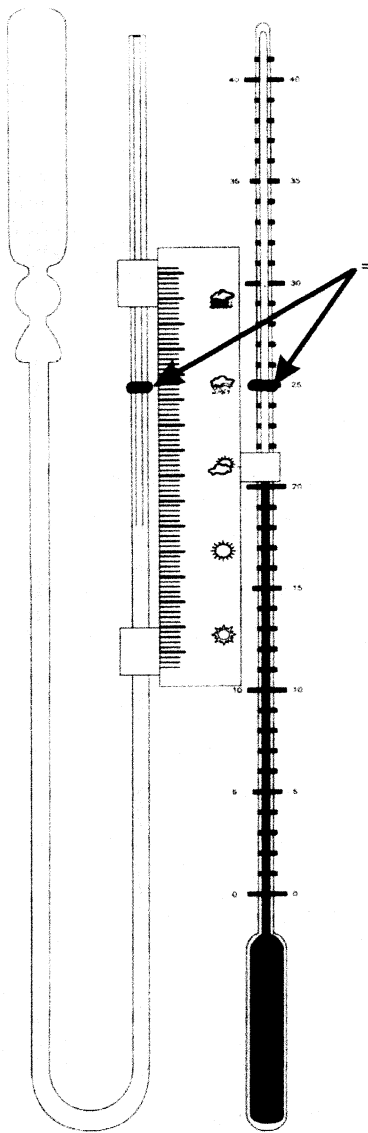
The Parts

The Eco-celli is usually delivered in two boxes.

Box 1 is the outer shipping box.

Box 2 contains the frame, a glass thermometer tube with blue fluid, and a U-shaped barometer tube with red fluid. It also contains the barometer scale, calibration set with small glass plug and wall mounting screw.

Fig. A



Assembly

Step 1 Place the acrylic frame on a flat surface.

Step 2 Remove the blue rubber-shipping plug from the end of the U-shaped barometer tube.

IF your glass tubes are already assembled to the sliding scale, skip to step 5.

Step 3 Slide the left hand side of the scale with the holders over the free end of the barometer tube.

Step 4 Slide the thermometer tube into the right hand side of the scale through two holders.

Step 5 Place the rubber hose and blue rubber plug (in calibration kit) on the end of the barometer tube.

Step 6 Place the barometer/thermometer tubes over the clips on the frame. The U-shaped tube goes on the left side of the frame.

Step 7 Using your thumb, press the tubes into the clips in the following order:

- 1) Lower left hand barometer tube (red fluid)
- 2) Upper left hand barometer tube
- 3) Lower inside barometer tube
- 4) Upper inside barometer tube
- 5) Lower thermometer tube (blue fluid)
- 6) Upper thermometer tube

Step 8 There are black line marks on both the barometer and thermometer tubes. Slide the tubes in their mounting clips until these marks line up with the 77 degrees Fahrenheit (25 C) level on the thermometer scale printed on the frame. See Fig A.

Step 9. When you are ready to hang your Eco-celli, hold it upright and remove the rubber hose and rubber plug. Install the glass plug into the end of the open barometer tube. This prevents any dust or bugs from getting into the barometer tube but it has small holes that allow air to pass through. Hang the barometer away from direct heat or sunlight. Unless you are at sea level, you will need to calibrate your barometer. Let it hang for at least an hour

before performing the calibration procedure on the reverse page.

Be sure to read the User Information on the reverse page, as well as the calibration and care procedures for your Eco-celli barometer. If you have Air Gaps in the red fluid, this is normal. Please read the enclosed paper on removing Air Gaps from the red or blue fluid.

Removing Air Gaps From Your Eco-celli

The Eco-celli barometer often develops air gaps in the fluids during shipping. These gaps can form in either the red fluid in the U-shaped barometer tube or in the blue fluid in the thermometer tube. Each tube has a unique method of removing the air gaps. If any air gaps are present upon receipt of your new Eco-celli just follow the procedure(s) below. Before beginning, place several layers of paper towels on whatever surface you will be working on, in the event you break one of the tubes. The fluid will stain anything it comes in contact with.

1. Procedure for air gaps in the red barometer fluid of the U-shaped tube.

Locate the *short* length of plastic tubing in the calibration kit. This section of tubing is roughly the diameter of the barometer glass tube. Slide one end of this plastic tubing over open end of the barometer tube (it might be helpful to moisten the end of the glass tube a bit before proceeding). Next, place the blue rubber plug in the open end of this short plastic tube. Stand the barometer upright (the tubes should already be installed to the barometer frame). Now simply squeeze the plastic tube. This will force the red fluid down one side of the tube and up the other towards the reservoir on the other side of the U-shaped glass barometer tube. Notice a small bulge in the glass tube near the bottom of the side of the U-tube that you attached the rubber tubing. If the air gap is between the plastic tube and this bulge in the glass, keep squeezing the plastic tube until the air gap reaches this bulge. Once the fluid reaches this bulge, the air gap will naturally escape and the fluid will rejoin. Note that you might have to remove and re-install the blue plug (while pinching the plastic tube together with your fingers to prevent the air already forced down the glass tube from escaping) in order to introduce more air into the plastic tube. If the air gap is beyond the bulge in the glass, keep squeezing the plastic tube until the air gap reaches the reservoir chamber at the top of the closed end of the barometer tube. It may take several squeezes of the plastic tube but the air gaps will disappear.

2. Procedure for air gaps in the blue thermometer tube.

To remove air gaps from the blue thermometer fluid, you will be dropping it vertically onto a firm surface from a distance of *no more than three (3) inches*. **BEFORE** doing this, place down several folded paper towels to act as a cushion for the drop and to prevent staining in the event the tube breaks. Locate a firm but not hard surface (*not* concrete!). A rubber doormat is a perfect surface. If one is not available, place about five (5) paper towels on a hardwood floor. Finally, hold the thermometer upright and about three (3) inches above the floor. Release the thermometer through your fingers allowing it to land onto the rubber mat or paper towels. You are trying to create enough shock to cause the blue fluid above the air gap to become unstuck (break the friction) from the inside of the glass tube and slide through the air gap. Try this a few times. If it doesn't work, go to the next step.

If the shock treatment did not work, a hair dryer can be used to *slowly and gently* heat and expand the fluid. Turn the hair dryer to its *lowest* setting. Hold it at least 12 inches from the bottom of the thermometer tube. Heat *only* the bottom of the thermometer tube for *only* a few seconds (2 – 3 seconds) then remove the hair dryer. Allow the fluid in the thermometer to react to the heat before heating again for a few more seconds. Again, remove the dryer and allow the thermometer to react. It takes a little time for the fluid to absorb the heat and for the fluid to begin moving. **CAUTION! Heating the bottom of the thermometer too fast or too long will cause the blue fluid to expand too much and it will break!** Repeat the heating sequence slowly, heating the thermometer tube until the blue fluid moves up and closes the gaps. The Eco-celli thermometer is only designed to reach 110 degrees F. A hair dryer can cause it to reach this maximum threshold very quickly, so heat in a few second increments to **avoid overheating and breakage!**

Caution: The thermometer and barometers tubes contain chemicals that may cause skin irritation. Wear protective gloves when handling the liquid. If skin is exposed, wash with warm water and soap. The chemicals may cause eye irritation if splashed into the eye. Always wear eye protection when handling the liquid. If the eye is exposed to the fluids, flush the eye with warm water to remove. The dyes used in the fluids are very strong colorants and will stain anything they come in contact with. If they get on clothes, wash immediately in soap and water.

Disposal: In case of a spill of the fluids, absorb the fluid with paper towels or inert absorbent material such as sand or kitty litter. Place in a sealed plastic bag and dispose of as chemical waste. Do not flush down the drain, as the chemicals are hazardous to marine life.

Pressure Conversion Table

For use with the mercury-free Eco-celli barometer

Millibars or hPa	Inches	mm	Millibars or hPa	Inches	mm	Millibars or hPa	Inches	mm
945	27.91	708.81	980	28.94	735.06	1015	29.97	761.31
946	27.94	709.56	981	28.97	735.81	1016	30.00	762.06
947	27.96	710.31	982	29.00	736.56	1017	30.03	762.81
948	27.99	711.06	983	29.03	737.31	1018	30.06	763.56
949	28.02	711.81	984	29.06	738.06	1019	30.09	764.31
950	28.05	712.56	985	29.09	738.81	1020	30.12	765.06
951	28.08	713.31	986	29.12	739.56	1021	30.15	765.81
952	28.11	714.06	987	29.15	740.31	1022	30.18	766.56
953	28.14	714.81	988	29.18	741.06	1023	30.21	767.31
954	28.17	715.56	989	29.21	741.81	1024	30.24	768.06
955	28.20	716.31	990	29.23	742.56	1025	30.27	768.81
956	28.23	717.06	991	29.26	743.31	1026	30.30	769.56
957	28.26	717.81	992	29.29	744.06	1027	30.33	770.31
958	28.29	718.56	993	29.32	744.81	1028	30.36	771.06
959	28.32	719.31	994	29.35	745.56	1029	30.39	771.81
960	28.35	720.06	995	29.38	746.31	1030	30.42	772.56
961	28.38	720.81	996	29.41	747.06	1031	30.45	773.31
962	28.41	721.56	997	29.44	747.81	1032	30.47	774.06
963	28.44	722.31	998	29.47	748.56	1033	30.50	774.81
964	28.47	723.06	999	29.50	749.31	1034	30.53	775.56
965	28.50	723.81	1000	29.53	750.06	1035	30.56	776.31
966	28.53	724.56	1001	29.56	750.81	1036	30.59	777.06
967	28.56	725.31	1002	29.59	751.56	1037	30.62	777.81
968	28.58	726.06	1003	29.62	752.31	1038	30.65	778.56
969	28.61	726.81	1004	29.65	753.06	1039	30.68	779.31
970	28.64	727.56	1005	29.68	753.81	1040	30.71	780.06
971	28.67	728.31	1006	29.71	754.56	1041	30.74	780.81
972	28.70	729.06	1007	29.74	755.31	1042	30.77	781.56
973	28.73	729.81	1008	29.77	756.06	1043	30.80	782.31
974	28.76	730.56	1009	29.80	756.81	1044	30.83	783.06
975	28.79	731.31	1010	29.83	757.56	1045	30.86	783.81
976	28.82	732.06	1011	29.85	758.31	1046	30.89	784.56
977	28.85	732.81	1012	29.88	759.06	1047	30.92	785.31
978	28.88	733.56	1013	29.91	759.81	1048	30.95	786.06
979	28.91	734.31	1014	29.94	760.56	1049	30.98	786.81

Note that Millibars and hPa are equivalent and interchangeable units of barometric pressure.

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Allivan Marketing, LLC

PO Box 320, Tyngsboro, MA 01879

978-649-8547

<http://www.allivanmktg.com>