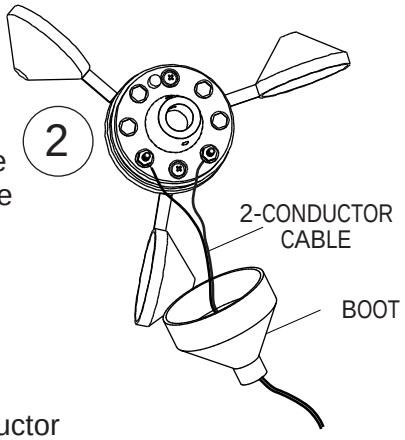
MAESTRO

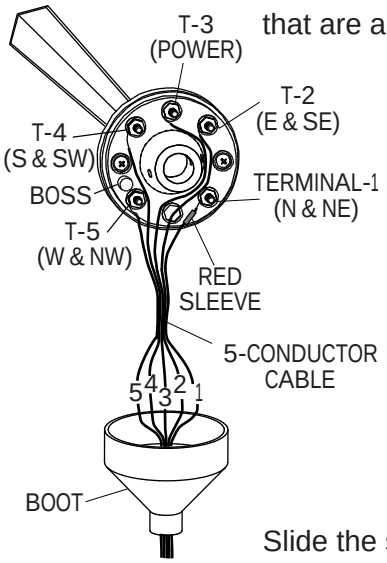
INSTALLATION

PROPER INSTALLATION IS IMPORTANT. IF YOU NEED ASSISTANCE, CONSULT A CONTRACTOR, ELECTRICIAN OR TELEVISION ANTENNA INSTALLER (CHECK WITH YOUR LOCAL BUILDING SUPPLY, OR HARDWARE STORE FOR REFERRALS). TO PROMOTE CONFIDENCE, PERFORM A TRIAL WIRING BEFORE INSTALLATION.

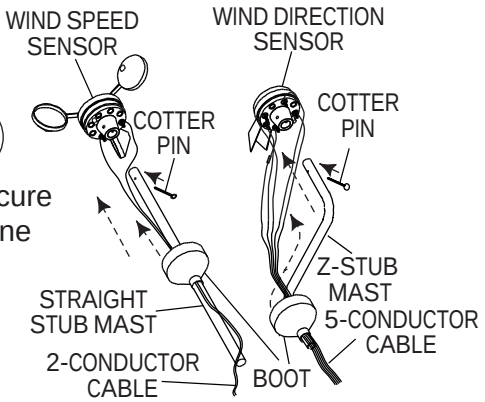
1 Determine where you are going to locate both the rooftop sensors and the read-out.



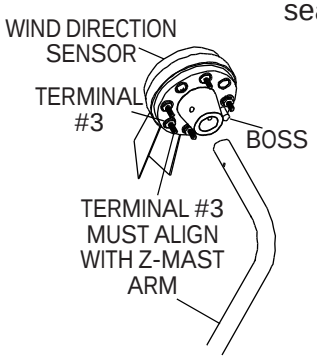
Feed the teminal lug end of the 2-conductor cable through one of the rubber boots and connect the lugs to the terminals on the bottom of the wind speed sensor. (Do NOT adjust the nuts that are already on the sensor). The polarity does not matter.



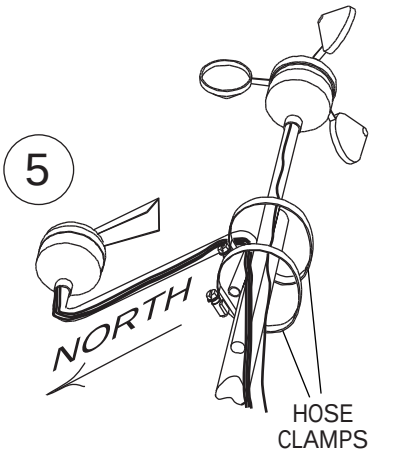
3 Feed the terminal lug end of the five-conductor cable through the other rubber boot and connect the lugs to the terminals on the bottom of the wind-direction sensor. (Do NOT adjust the nuts that are already on the sensor). The red sleeve indicates wire #1.



Slide the stub masts through the rubber boots and insert the stub masts into the bottom of the sensors. Secure with the cotter pins. Coat all wire connections with silicone sealant and slip the boots over the sensors.



4A **When assembling the wind direction sensor to the Z-mast, make certain that terminal #3 is aligned with the Z-mast arm.**



Secure the sensors and stub masts to your antenna mast (not supplied) with the two hose clamps. **Align the wind-direction Z-mast arm to true North**. Radio Shack and similar stores have a selection of tall masts and roof mounting brackets. Choose a mount that best suits your location and provides at least eight feet of vertical clearance above objects on the roof.

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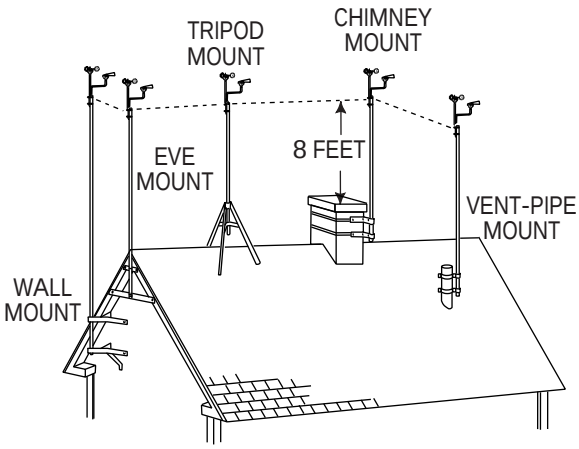
MAESTRO

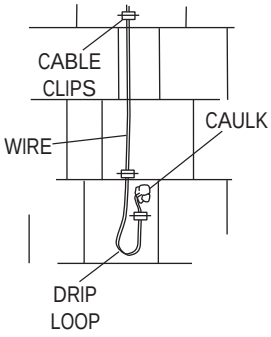
INSTALLATION

(continued)

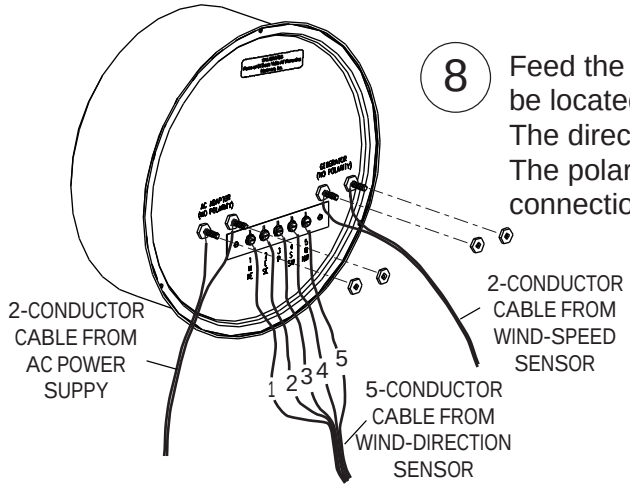


6 Follow the instructions supplied with the antenna mount and secure the mast to the mount.

7

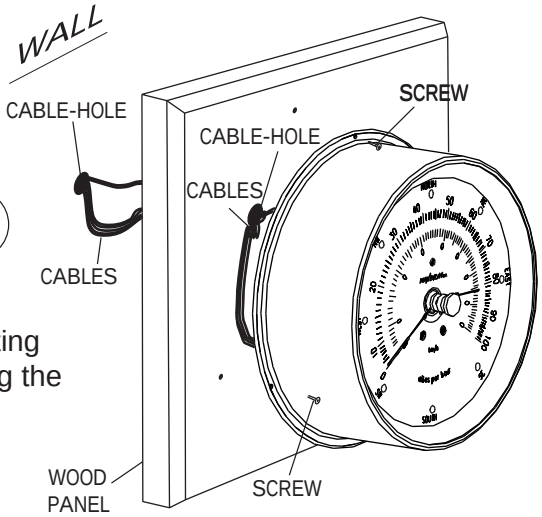


Secure the wire to the building using cable clips (do not use regular staples). Form a drip loop where the wires enter the hole drilled through the exterior wall. Caulk the hole when done.



8 Feed the cables through the wall to where the read-out is going to be located. Attach the wires to the rear of the read-out as shown. The direction wires must follow in sequence for the direction sensor. The polarity does not matter for the wind speed or power supply connections. (Do NOT adjust the nuts that are already on the meter).

9



Mount the brass read-out directly over the cable feed-thru-hole to avoid crimping the wire under the lip. We recommend mounting the read-out on one of our pre-drilled and centered panels. Plug the power supply into a 110 VAC power outlet.

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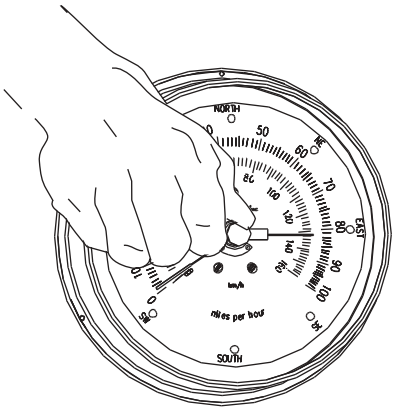
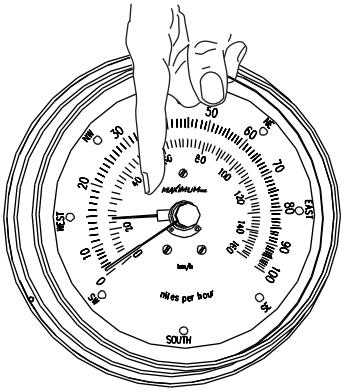
MAESTRO

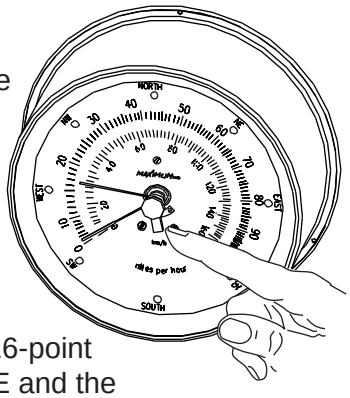
OPERATION



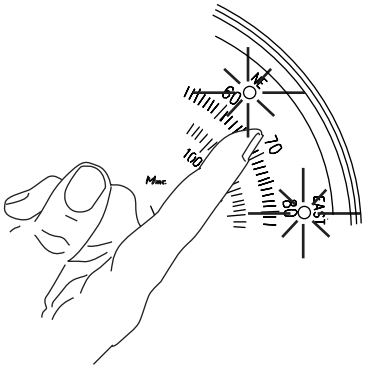
To reset the gust register needle, turn the knob counter-clockwise.



Turning the knob counter-clockwise will eventually contact the gust register. The Gust Register should not be set under 15 MPH - this gives the needle room to operate at low speeds. If the Gust Register is set below 15 MPH turn the knob clockwise until the needle registers greater than 15 MPH.



After setting the Gust Register turn the knob clockwise until the reset arm is parked near the six o'clock position. Failure to do so may damage your meter.



The wind direction may be read with 16-point accuracy. In this example both the NE and the E indicator lamps are illumitated. This would be read as East-Northeast.

ADDITIONAL INFORMATION

Cables can be shortened or lengthened without affecting accuracy

WIRE GAUGE	MAXIMUM FEET WITHOUT RECALIBRATION
24	300'
22 (supplied with instrument)	500'
20	750'
19	1000'
18	1250'

WIRE GAUGE	MAXIMUM FEET WITHOUT RECALIBRATION
16	2000'
14	3200'
12	5000'
10	8000'

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MAESTRO

TROUBLE SHOOTING

Maximum Instruments are accurate and reliable. Most problems that occure are due to loose or corroded connections. If, after checking the connections, there is still a problem, determine if the problem is with the sensor or the brass read-out.

WIND SPEED

1. Disconnect the two wind-speed wires from the back of the brass read-out.
2. Attach a low range *AC Analog Voltmeter* to the wires. If the speed sensor is operating properly, you will achieve these approximate readings: 8-9 MPH = 0.28 VAC rms, 17 MPH = 0.56 VAC rms, 51 MPH = 1.78 VAC rms, 102 MPH 3.67 VAC rms
3. If the speed sensor delivers these approximate readings, then the brass read-out is faulty. If the speed sensor does not produce these readings, then either the speed sensor or the wire is faulty.

WIND DIRECTION

1. Unplug the AC Power Adaptor.
2. Disconnect the AC Adaptor wires and the 5-conductor cable wires from the back of the brass read-out.
3. Connect an AC Voltmeter to the two wires coming from the AC Power Adaptor.
4. Plug in the AC Power Adaptor to a 110 VAC outlet. When functioning properly, the adaptor will deliver 11.5-18 VAC. If the adaptor checks out fine, proceed further with the test. If not, send both the adaptor and the instrument to Maximum.
5. If the AC Adaptor checks okay, unplug the Adapter and re-connect the two wires to the back of the brass read-out.
6. Plug in the AC Power Adapter.
7. Using a small piece of wire or a paper clip as a jumper, touch one end to terminal #3 (the middle one of the five). Touch the other end to terminal #1, then #2, then #4 and lastly #5 (keeping one end of the jumper on terminal #3). At each termial, two adjacent lights should light up simultaneously. If any light fails to function properly, the fault lies within the brass read-out.
8. If all the lights function properly, then the problem lies with either the wiring or with the outdoor wind direction sensor. Disconnect the wires at the sensor and bring it down to the brass read-out.
9. Use a short piece of the 5-wire cable and reconnect the sensor to the brass readout as shown in the installation instructions.
10. Rotate the vane slowly by hand and observe the lights on the brass read-out. If they operate properly, then the installed wiring is at fault; if not, then the outdoor wind direction sensor is faulty.

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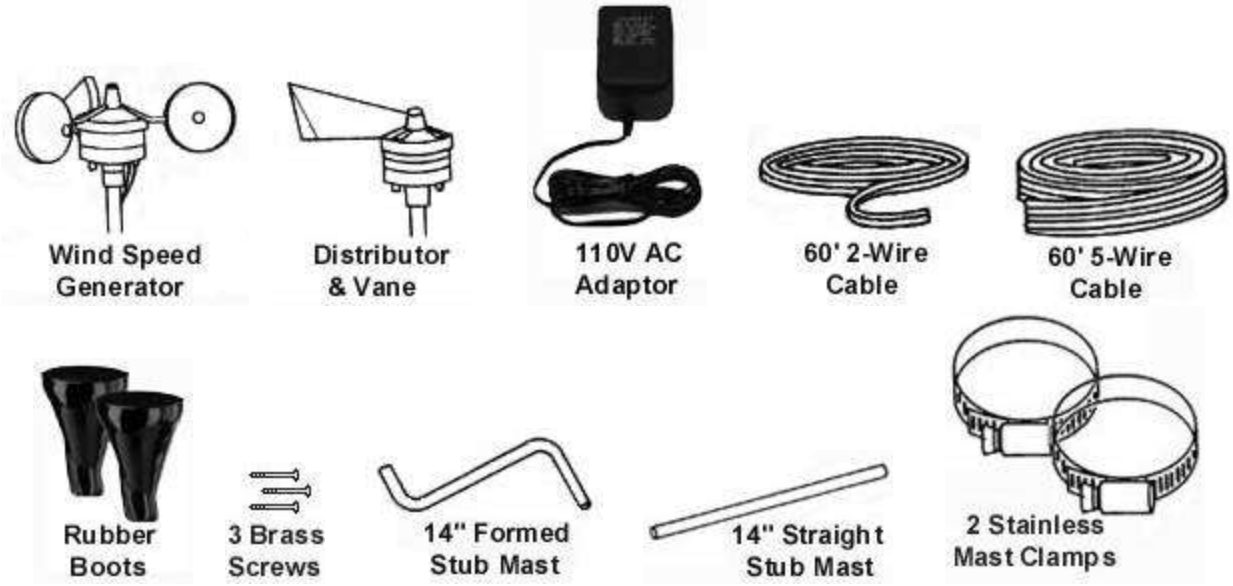
IMPORTANT ADDITIONAL INFORMATION

Components: Along with the indicator, the following components are included with this instrument:



Rooftop sensors: To insure a clear unobstructed path for the wind to the sensors, they should be mounted on some type of antenna mast at least 8-10' above the highest object on your roof. Remember, your roof is also an obstruction and it usually requires at least 8' of height to avoid the turbulence it creates.

AC Adaptor: This instrument requires its own AC Adaptor. Due to the various power requirements of each Maximum instrument, attempting to run more than one instrument on a single adaptor could cause improper operation and/or damage to the instrument(s) thereby voiding your 5-year warranty.

Sensors: Properly installed, your sensors will require virtually no maintenance at all. Our sensors do not utilize brushes or wiping contacts. All bearings are Rulon-J self lubricating type and will perform for many years in the harshest environments.

Brass Case: Your brass case is solid brass A70-30 Holloware quality, with a durable lacquer finish. It is in fact a piece of jewelry and should be treated as such. It should be cleaned at least once a week to keep airborne pollutants (dust, etc…) and any moisture from collecting on the case thereby attacking the lacquer. At no time should you use an abrasive cleaner or cloth on the brass case. Simply use a soft cloth or soft paper towel with a mild glass cleaner to wipe the case clean. If your instruments are in a summer home, and you are not able to clean them regularly, simply lay a small cloth or towel across the top two-thirds so that dust cannot settle on the finish.

Specifications: All instrumentation or measuring devices have accuracy tolerances and specifications. Making comparisons between different pieces of equipment is appropriate provided the specified accuracies of both are known.

	Measurement Range	**Guaranteed Accuracy**
Wind Speed	0-100 MPH	±3% Full Scale & Mid Scale
Wind Direction (Indicator)	16 Compass Points	Zero Error (Digital Display System)
Wind Direction (Sensor)		±11.25 Degrees

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MAXIMUM®
WEATHER INSTRUMENTS

Electrical Damage – Common Causes & Recommended Prevention

Electrical damage can be caused by many different factors. Below are some of the more common causes and some suggested methods of minimizing potential problems.

Common Causes:

- **Storm Activity –** lightening in your area can do damage to your instruments in different ways. The obvious way is due to a direct or nearby strike. In addition, lightening storms, dust storms, dry snowstorms and strong dry winds can all cause static electricity to build up on and around your external sensors. Regardless of the cause this built up electricity can discharge itself through the cable connecting the external sensors to the instrument.

- **Power Surges –** A surge may come from the electric company's switching generators or power grids, from local industries or after power interruption when accumulated power suddenly surges back through AC lines. Even the on-and-off switching of large electrical appliances, such as refrigerators or clothes dryers can create damaging fluctuations. This is especially true with sensitive weather recording devices.

- **Yourself –** Are you constantly giving and/or receiving a shock every time you touch a doorknob or another person? If so you have a great deal of static electricity in your environment. Depending on where you live, static electricity may be a year round problem or only a seasonal problem. In either case, it is possible for a person to carry enough of a charge to damage an instrument.

Recommended Prevention:

Ground Your Mounting Mast – *IMPORTANT*: PVC and fiberglass are not recommended mast materials as they can store high amounts of static electricity within themselves. It is recommended that you follow the grounding instructions that came with your mounting mast, while also maintaining accordance to your local Electric Code. In the absence of instructions for your mast system, the following generic guidelines from the **National Electric Code** may be helpful.

1) The NEC requires that the antenna mast and mount be grounded directly. No splices or connections are allowed in the ground wire between the mast and the ground rod.
2) Attach one end of a No. 8 (or thicker) copper or aluminum ground wire to the antenna mast. **Note:** As static electricity issues are more common for weather sensors than direct lightening strikes, consider installing the ground wire as physically close to the wind sensors as possible to best combat static electricity issues. For multi-piece (or telescoping) masts, consider connecting the ground to each separate section of the mast.
3) For painted or coated masts, scrape off the coating around the area where the contact will be made. This will ensure a good, solid connection. (Once the ground is attached to the mast, any scraped off portion that is exposed should be recoated with paint or other sealant.)
4) Next, run the ground wire to ground as directly as possible. Standard wire staples can be used to secure the ground wire against the side of the house. Avoid making 90° or sharper turns with the ground wire. A lightning charge has difficulty making such a turn and therefore may discharge into the house. Make ground wire bends as smooth and as gradual as possible.
5) The ground wire must be connected to a ground rod. Water pipes or plumbing fixtures are not acceptable. A good copper-coated steel ground rod driven at least 3 feet into the ground is required. Special clamps that provide a solid connection between the ground wire and ground rod should be used

- **Use Surge Protectors –** For the AC adapter, a UL 1449 rated surge protector with EMI/RFI filtering is recommended. This rating will be clearly listed on the packaging of any good quality surge protector.

- **Discharge Yourself –** If the instruments are located in an environment where static electricity is a problem, make sure that you discharge yourself before touching the instrument(s). The shock that you get from touching a doorknob or another person can often be sufficient to damage an instrument.

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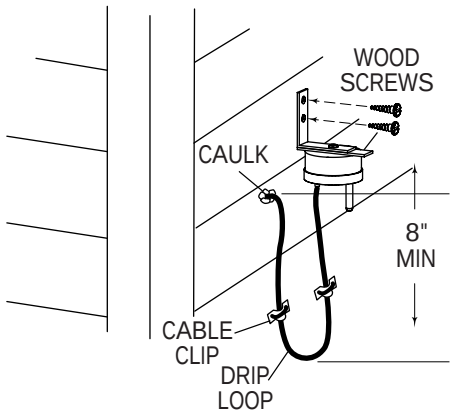
MINI-MAX

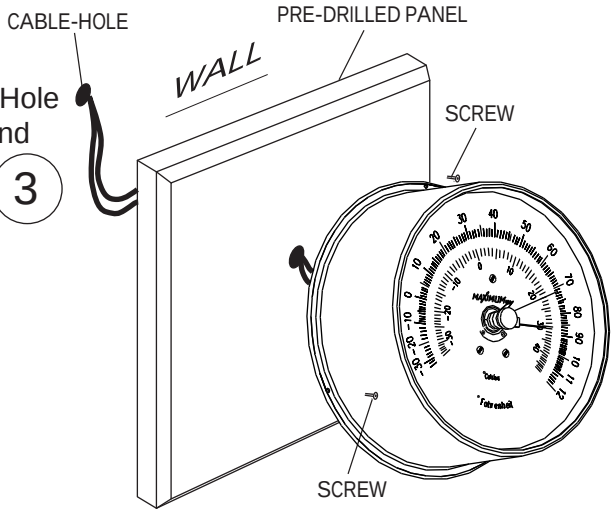
INSTALLATION

PROPER INSTALLATION IS IMPORTANT. IF YOU NEED ASSISTANCE, CONSULT A CONTRACTOR, ELECTRICIAN OR TELEVISION ANTENNA INSTALLER (CHECK WITH YOUR LOCAL BUILDING SUPPLY, OR HARDWARE STORE FOR REFERRALS). TO PROMOTE CONFIDENCE, PERFORM A TRIAL WIRING BEFORE INSTALLATION.

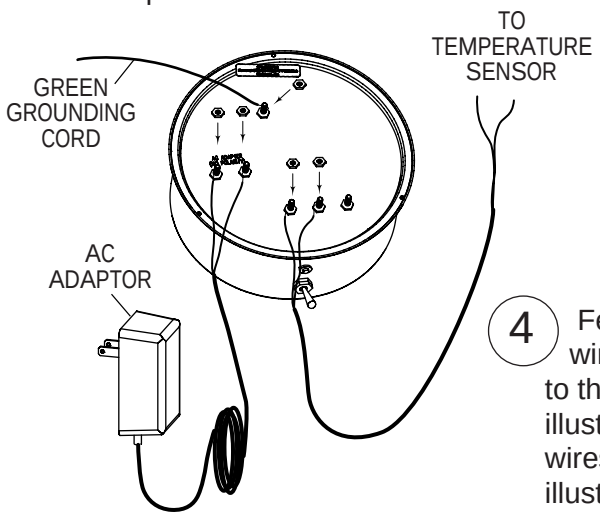


1 Mount the temperature sensor assembly with the two large wood screws. Select a location that is protected from direct sunlight and sheltered. (A north exposure, six feet above the ground will give the best results.)

2 Form a drip loop with the wire at least eight inches below the exit from the sensor and at least eight inches below the point of entry into the building. Anchor any exposed wire with insulated cable clips. Run the wire through the building to the location where the indicator will be located. Caulk any holes when done.



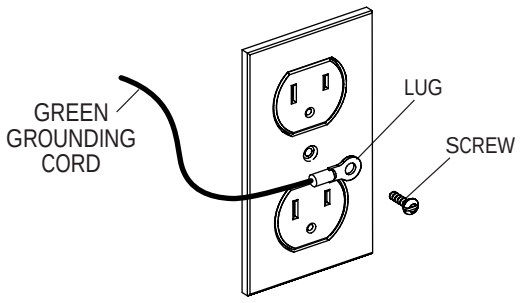
3 Mount the Brass Readout directly over the Feed-Thru-Hole to avoid crimping the wire under the lip. We recommend mounting the Readout on one of our pre-drilled and centered panels.



4 Feed the AC Adaptor Cord, Green Grounding Cord and Sensor wire to the Indicator. Connect the two temperature sensor wires to the appropriate terminals (HEX NUTS) as shown in the illustration. The polarity does not matter. Connect the AC adaptor wires to their appropriate terminals (HEX NUTS) as shown in the illustration. The polarity does not matter for these.

5 To prevent static from causing bad readings it is necessary to "EARTH GROUND" you Mini-Max. Proceed as follows:

- -Turn off the circuit-breaker to the outlet where the ground cord is attached.
- -Remove the outlet cover screw.
- -Insert the outlet cover screw through the lug on the green grounding cord and reinsert the outlet cover screw.
- -Turn on the circuit-breaker to the outlet.
- -Plug in the AC Adaptor.
- -Reset the memories as described in the operating instructions (next page).



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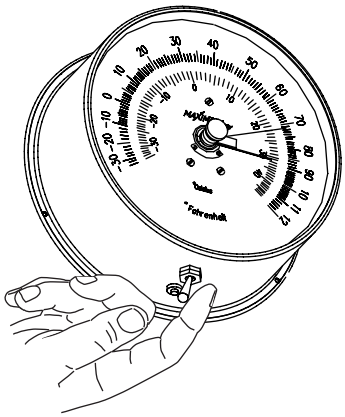
MINI-MAX

OPERATION

Your Mini-Max II has two switches. The toggle switch is for selecting the function. The small push button switch behind the toggle is for resetting the memories.

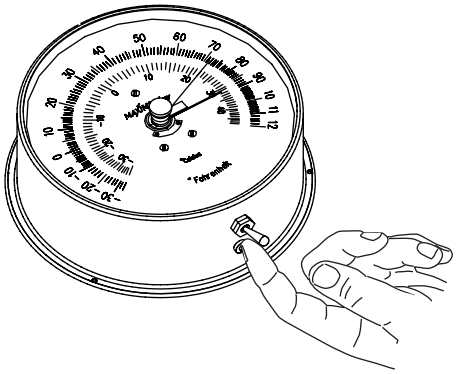


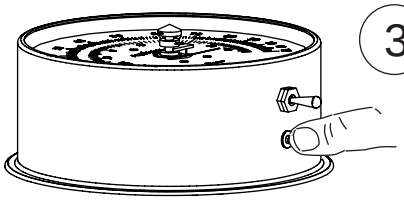
1

Lightly holding the toggle switch to the left will display the recorded low temperature since the last reset.

Lightly holding the toggle switch to the right will display the recorded high temperature since the last reset.

2



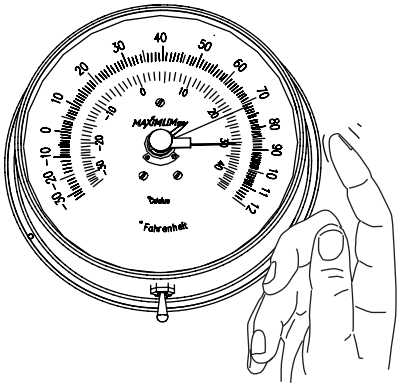


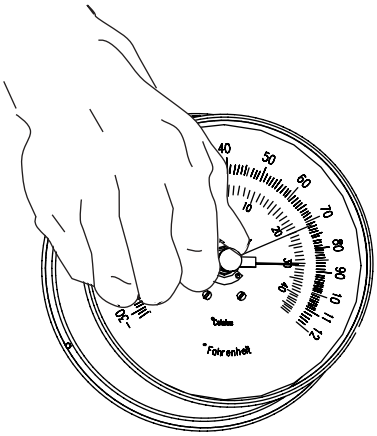
3

Fully depressing the small push button switch for five seconds resets both memories. The instrument will now display current temperature and the memories once again begin storing the new high and low temperatures.

(After resetting wait 10 seconds before activating the toggle switch.)

NOTE: Before reading your thermometer, you should lightly tap the case with your finger. A TAP change of 1-2 degrees is a common occurance with any slow moving precision meter movement.





4

The trend register needle can be set by turning the center knob on the indicator dial.

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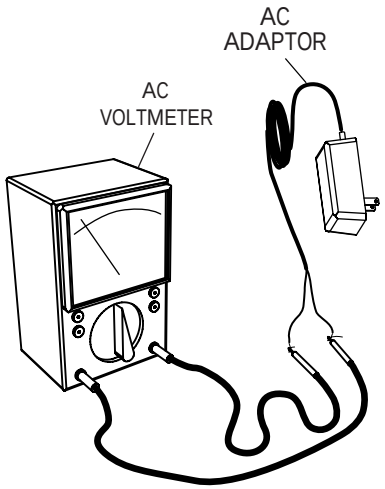
MINI-MAX

TROUBLE SHOOTING

1 Unplug the AC adaptor and remove the instrument from the wall.

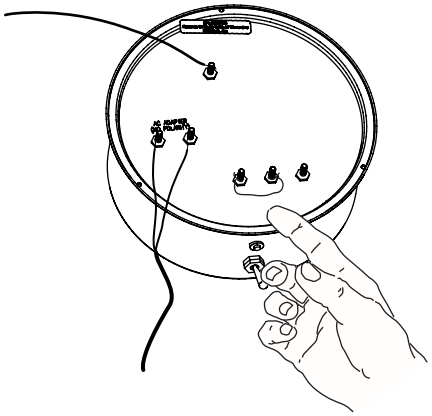
Disconnect the AC adaptor from the indicator and connect it to an AC Voltmeter. Plug the AC adaptor back in. 2



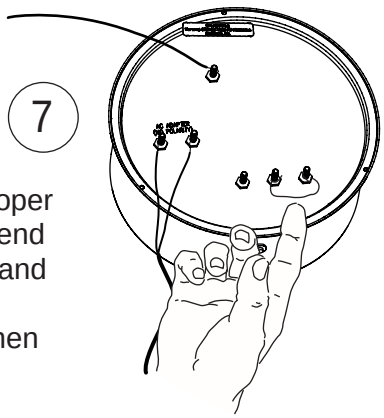
3 If working properly the AC adaptor will deliver 11.5 to 18VAC. If not working properly please contact the factory. If the AC adaptor is working properly, continue with the next steps.

4 Unplug the AC adaptor and reconnect it to the indicator. Plug the AC adaptor back into a 110V outlet.

5 Disconnect the sensor wires from terminals #1 and #2 on the back of the indicator. The indicator pointer should drop to -35˚F or below.



6 Use a jumper wire (a paper clip will do) to connect across the sensor terminals #1 and #2. The indicator should read 120 F. If so, disconnect this jumper and proceed to the next step.



7 Use a jumper wire to connect across terminals #2 and #3. The calibration test point has been hand-written on the back of the indicator just above terminals #2 and #3. If the indicator is in proper working order it will read within 2˚F of this number. We recommend that you re-mount the instrument in this mode for several hours and observe it periodically. This will help to detect most intermittent problems. If the indicator registers within 2˚F of the test point, then the problem is in the sensor or wire.

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IMPORTANT ADDITIONAL INFORMATION

Components: Along with the indicator, the following components are included with this instrument:

Air Temperature Sensor w/60' Cable

110V AC Adaptor

3 Brass Screws

AC Adaptor: This instrument requires its own AC Adaptor. Due to the various power requirements of each Maximum instrument, attempting to run more than one instrument on a single adaptor could cause improper operation and/or damage to the instrument(s) thereby voiding your 5-year warranty.

Brass Case: Your brass case is solid brass A70-30 Holloware quality, with a durable lacquer finish. It is in fact a piece of jewelry and should be treated as such. It should be cleaned at least once a week to keep airborne pollutants (dust, etc…) and any moisture from collecting on the case thereby attacking the lacquer. At no time should you use an abrasive cleaner or cloth on the brass case. Simply use a soft cloth or soft paper towel with a mild glass cleaner to wipe the case clean. If your instruments are in a summer home, and you are not able to clean them regularly, simply lay a small cloth or towel across the top two-thirds so that dust cannot settle on the finish.

Specifications: All instrumentation or measuring devices have accuracy tolerances and specifications. Making comparisons between different pieces of equipment is appropriate provided the specified accuracies of both are known.

	Measurement Range	**Guaranteed Accuracy**
Temperature (Indicator)	-35 to 120°F	±.5°C., 1°F
Temperature (Sensor)		±.5°C., 1°F

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WEATHER INSTRUMENTS

Electrical Damage – Common Causes & Recommended Prevention

Electrical damage can be caused by many different factors. Below are some of the more common causes and some suggested methods of minimizing potential problems.

Common Causes:

- **Storm Activity –** lightening in your area can do damage to your instruments in different ways. The obvious way is due to a direct or nearby strike. In addition, lightening storms, dust storms, dry snowstorms and strong dry winds can all cause static electricity to build up on and around your external sensors. Regardless of the cause, this built up electricity can discharge itself through the cable connecting the external sensors to the instrument.

- **Power Surges –** A surge may come from the electric company's switching generators or power grids, from local industries or after power interruption when accumulated power suddenly surges back through AC lines. Even the on-and-off switching of large electrical appliances, such as refrigerators or clothes dryers can create damaging fluctuations. This is especially true with sensitive weather recording devices.

- **Yourself –** Are you constantly giving and/or receiving a shock every time you touch a doorknob or another person? If so, you have a great deal of static electricity in your environment. Depending on where you live, static electricity may be a year round problem or only a seasonal problem. In either case, it is possible for a person to carry enough of a charge to damage an instrument.

Recommended Prevention:

- **Use Surge Protectors –** For the AC adapter, a UL 1449 rated surge protector with EMI/RFI filtering is recommended. This rating will be clearly listed on the packaging of all good quality surge protector.

- **Discharge Yourself –** If the instruments are located in an environment where static electricity is a problem, make sure that you discharge yourself before touching the instrument(s). The shock that you get from touching a doorknob or another person can often be sufficient to damage an instrument.

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INSTALLATION/OPERATION

COMFORTMINDER

INSTRUCTIONS

INTRODUCTION:

Please read these instructions carefully before installing your COMFORTMINDER indicator. We have prepared them carefully, knowing that some owners will use this instrument in a variety of areas for a variety of purposes – greenhouse control, central air conditioning and heat monitoring, furniture protection, general comfort conditions etc.

INITIAL ACTIVATION (HUMIDITY):

Before installation, place your indicator with its face down on a soft surface so as not to scratch the finish. Locate a cloth, such as a dish towel or face cloth, wet it and wring it out so it is not dripping wet and lay it over the back of the indicator for at least one half hour. Do not be concerned with the relative humidity reading at the end of this time. Wipe any residual moisture off the back of the indicator when removing the cloth.

This procedure should only have to be done once, unless the COMFORTMINDER is to be used in areas of persistently low humidities – that is, long periods where humidity is less than 40-45% RH. Once this activation procedure is completed it may be several hours before COMFORTMINDER settles out to actual room conditions.

We include this initial "activation process" in our instructions because we often do not know where your instrument has been and for how long, prior to your purchase. This procedure is for the humidity portion of COMFORTMINDER only, and will not affect the temperature element or damage it.

INSTALLATION:

Your COMFORTMINDER indicator is easy to install. It is the actual location of the indicator that should take some consideration. Simply put, the humidity sensing element of COMFORTMINDER is an absorption rather than an evaporative device. Therefore actual air circulation is not vital to accuracy, but it will enhance response rate.

The temperature element is a durable high quality Bi-metallic spring which is thermally coupled to the instrument housing to attain as closely as possible, the average temperature in the area being monitored. Keeping this information in mind, try to locate the indicator on a wall that will demonstrate, as closely as possible, the average temperature and humidity in the area that is to be monitored – not on a cold outside wall or a wall with a heating pipe or vent behind it or under it.

COMFORTMINDER can be mounted outdoors if it does not come in direct contact with moisture – spray, rain, etc. Nor should it be used in direct sunlight, which could cause erroneous temperature readings. Place indicator on the wall you have chosen and using the supplied brass screws, fasten to surface but do not snug down tightly. Your indicator is designed to be spaced slightly off the wall. This space is controlled by the three spacers mounted on the back of the indicator. These spacers, not the lip of the indicator, will make contact with the wall. Once mounted, this space will hardly be noticeable.

HELPFUL COMMENTS & INFORMATION

* Lightly tap the instrument when reading.

* COMFORTMINDER should net need any maintenance (regeneration) unless as

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stated earlier, it is to be used in areas of persistent low relative humidities. If COMFORTMINDER is subjected to such conditions, periodically follow initial activation instructions. This procedure does not apply to nor will it affect the temperature portion of COMFORTMINDER.

* COMFORTMINDER is measuring the relative humidity and temperature at the location of the indicator, not at the local weather forecasting station. Relative humidity and temperature, like many other elements, can be drastically different with the smallest change of location.

* Your COMFORTMINDER case is jewelry quality brass with a durable finish. Do Not clean with abrasives.

* Attempts to alter calibration will only destroy the elements and void your 5-year warranty.

Because humidity is the least understood and most difficult function of our environment to measure accurately, the following essay should be carefully read to help you use and understand your COMFORTMINDER.

UNDERSTANDING HUMIDITY MEASUREMENT

A commonly asked question is, "why does my COMFORTMINDER read a different humidity than the weather service, or another hygrometer in my home?" To adequately answer this question we must first explain a little about humidity measurement.

Humidity is defined as the amount of water vapor present in the atmosphere. The simplest way of expressing humidity is as the absolute humidity. Absolute humidity is the density of water vapor, or the mass of the vapor divided by the volume. The problem with this form of measurement is that it can vary as much as five orders of magnitude (i.e. 1 to 100,000) over the surface of the earth at any point in time. Because of this large variation, absolute humidity is not a useful form of measurement to most people.

A number of other measurements of humidity have been defined to correlate natural phenomenon with humidity. Specific humidity is the ratio of the mass of water vapor to the mass of natural air. This form of measurement is useful because it has less variation and is independent of temperature and barometric pressure (altitude). Specific humidity is often used to relate the different forms of humidity measurement.

Relative humidity is by far the most popular form of humidity measurement. By definition, relative humidity is the ratio of the measured vapor pressure to the maximum possible vapor pressure at the measured temperature. In simpler terms, if the relative humidity is 50% then the air is holding 50% of the maximum amount of water vapor possible at that temperature. Relative humidity is the measurement of humidity that most closely relates to natural phenomenon. Some examples are, the changes in organic substances (i.e., the shrinking and swelling of wood), the performance of electronic devices, and the level of comfort that we feel.

It was stated previously that specific humidity is independent of temperature and pressure. Relative humidity, however, is dependent on temperature and pressure. Therefore, the relationship between specific and relative humidities is governed by temperature and pressure. In general, barometric pressure doesn't vary over small areas. Also, of the two variables, pressure and temperature can vary greatly in a small area. Therefore, we will only consider the effect of temperature on the specific versus relative humidity relationship.

You can convert one version of humidity measurement to another by using complex mathematical formulae, a table or a chart. A typical chart, known as a psychrometric chart, relates all of the basic humidity measurements. We have included a simplified chart to facilitate comparison of specific and relative humidities.

Generally, the specific humidity in a small area (i.e., inside a building or around a yard) is constant. This is due to the fact that most substances in the atmosphere (i.e., smoke, water vapor) tend to disperse evenly throughout the air mass by a process called diffusion. Additionally, the specific humidity tends to be fairly constant from outside

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to inside a building. Because relative humidity is dependent on temperature, the relative humidity will vary in a small area even though the specific humidity is not varying. A few examples will help illustrate this point.

In a building, we measure the temperature and relative humidity in one location to be 75 degrees F and 50% RH, respectively. Referring to the psychrometric charts, we locate 75 on the bottom scale. We then follow the line vertically up to the intersection with the 50% RH curve. From this point, we move horizontally to the right and read the specific humidity as approximately 64 gr./lb. (grains of moisture per pound of natural air). We then measure the temperature in another location within the building and find it to be 70 degrees. Now, assuming the specific humidity to be constant, we can find the relative humidity at the new location. On the chart, we find the intersection of the 70-degree line and the 64 gr./lb. line. This point is on the 60% RH curve. So, if we were to place a hygrometer in the new location it would read 60% RH. An indoor temperature variation of 5 degrees is not uncommon. In many buildings we have measured 20-degree variations from one area to another. This shows that within a building, 10% RH variations are common and 50% RH variations are possible.

Let us examine some indoor to outdoor variations. The local weather service reports that the temperature is 40 degrees F and the humidity is 60% RH. Using the chart, we find specific humidity to be 25 gr./lb. If the temperature inside is 68 degrees F then, from the chart, the indoor relative humidity will be about 25%. This example illustrates why it feels so dry inside during the cold winter months.

Next, let us assume that the weatherman says it is 90 degrees F and 50% RH outside. And because your home is in the shade, your indoor temperature is 80 degrees F. Referring to the chart, we find the specific humidity to be 106 gr./lb. which, at the indoor temperature of 80 degrees, will yield an indoor humidity of 70% RH.

The previous examples show that if the specific humidity remains constant, then as the air temperature increases, the relative humidity decreases. Conversely, as the air temperature decreases, the relative humidity increases. This phenomenon explains why cellars tend to be wetter and attics tend to be drier than the rest of a building.

In modern buildings there are many factors besides air temperature that can influence humidity readings. One factor is the material used in the construction of the building. Many common building materials (i.e. wood, plaster, concrete) absorb and then release water vapor as the humidity varies. This causes the specific humidity to vary, which in turn causes the relative humidity to vary. Probably the single biggest factor affecting the humidity is heating and air conditioning systems. A heating system can increase or decrease the specific humidity. Air conditioning systems cause a decrease in the specific humidity. This decrease is because the cooling element in an air conditioner is very cold. From the chart, you can see that as air passes by the very cold element, its relative humidity increases rapidly. When the relative humidity reaches 100%, the water vapor condenses to liquid water. The removal of vapor by condensation causes a drop in the specific humidity.

Another factor affecting the indoor humidity is that many newer buildings incorporate humidifiers and/or dehumidifiers into the heating and air conditioning systems. We have had a number of customers who question why their hygrometers never change more than 10% RH. When we check the instrument calibration, we find it accurate. We then contact the customer and find out that their home has climate control. So, as it turns out, their hygrometer is simply indicating that their control system is controlling the relative humidity very well. The hygrometer, then, is a good indicator that all is well with their climate control systems.

With all of the aforementioned variables affecting humidity measurement, one might wonder, “How will I ever know if my hygrometer is reading correctly?” Well, there is an acceptable method of checking hygrometer accuracy that applies to all hygrometers.

First, you should place the instrument on a non-absorbent surface (i.e. glass or plastic, not wood) in the center of a small room. You should leave the unit there at least two hours before proceeding. Next, you must obtain an accurate instrument to compare against. The only commercially available instruments accurate enough to compare against are:

Instrument Type	**Accuracy**	**Approximate Cost**
Sling Psychrometer	+2.3% RH	$40-80
Aspirated Psychrometer	+1-2% RH	$100-200
Chilled Mirror Dewpoint	+0.5% RH	$1,000-5,000

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Because of the high cost of the other two types of instruments, we will consider only the sling psychrometer. If you buy an official US Weather Bureau sling psychrometer, it will contain the proper operating instructions and tables for high accuracy usage. If the unit you obtain does not contain tables for various pressures, then you should obtain the official pamphlet from the Superintendent of Documents at the US Government Printing Office.

The pamphlet's name is *"Psychrometric Tables for Obtaining the Vapor Pressure. Relative Humidity and Temperature of Dewpoint from Readings of the Wet and Dry Bulb Thermometer, No. 235, Reprint 1941"*: by C.E. Marvin.

The calibration check is made by swinging the psychrometer as close as possible to the instrument under test. You should swing the psychrometer at a rate of two revolutions per second for at least one minute. The readings of the wet and dry bulbs should then be recorded and the procedure repeated until at least two consecutive identical readings are obtained. You should then record the hygrometer's reading, making sure the unit is in the vertical position and lightly tapping the instrument. Also record the time of observation. Now following the instructions supplied with the tables, determine the % RH and record it. Because of the relatively slow response of most hygrometers compared to a psychrometer, you need to repeat the checking procedure every 15 to 30 minutes until the psychrometer and hygrometer readings are stable (usually within an hour).

Now that you have your comparative data, you must take into account the specified accuracy of **both** instruments. As an example, we will use our COMFORTMINDER compared to an official weather bureau psychrometer. The COMFORTMINDER has a rated accuracy of ±5% RH from 20 to 80% RH. The psychrometer is accurate to ±2% RH from 0 to 100% RH. So, if the psychrometer reads between 20 and 80% RH, then the two instruments should read within 7% RH of each other. If, however, the humidity is below 20% or above 80%RH, then no comparison can be made because it is outside of the COMFORTMINDER'S accurate range. The seven percent span is derived by adding the ± tolerances together, ±5% and ±2% = 7% (i.e. the COMFORTMINDER reads +5% and the psychrometer reads –2%, then the difference is 7% RH). This shows us that if you were to compare two COMFORTMINDERS they could read as much as 10% RH different and still be within calibration tolerances.

In conclusion, humidity measurement is one of the most difficult and least understood environmental measurements made. We hope that this essay has helped you to understand humidity and its measurement. However, this is far from a complete explanation, in fact, there is a branch of the sciences called Hygrometry that deals with humidity measurement. If you want more detailed information, please refer to the publications listed below:

Introduction to Meteorology
Author – Sverre Petterssen, PHD
Publisher – McGraw Hill, Inc.
New York, NY
Library of Congress #68-15476

A Field Guide to the Atmosphere
Authors – Vincent J. Schaefer and
John A. Day
Publisher – Houghton Mifflin Co.
Boston, MA
Library of Congress #80-25473
ISBN #0-395-33033-5

Climate and Weather
Author – Hermann Flohn
Publisher – McGraw Hill, Inc.
New York, NY
Library of Congress #67-22978

Instruments for Physical Environmental Measurements, Vol. I 2nd Edition
Authors – J.Y. Wang and C.M.M. Felton
Publisher – Kendall/Hunt Publishing
Dubuque, IA
Library of Congress #83-81613
ISBN #0-8403-3098-7

Humidity and Moisture, Vol. I to IV
Publisher – Reinhold Publishing Corp.
New York, NY
Library of Congress #65-13613

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CHART INSTRUCTIONS

To find Specific Humidity (REF. FIG.1) knowing Air Temperature and %RH (ie.80 degrees F and 60% RH)

1. Find Air Temperature (point A ie.80)

2. Follow the vertical line up to the intersection with the %RH curve (point B ie.60)

3. Follow the horizontal line from the intersection to the right and read the Specific Humidity (point C ie.90)

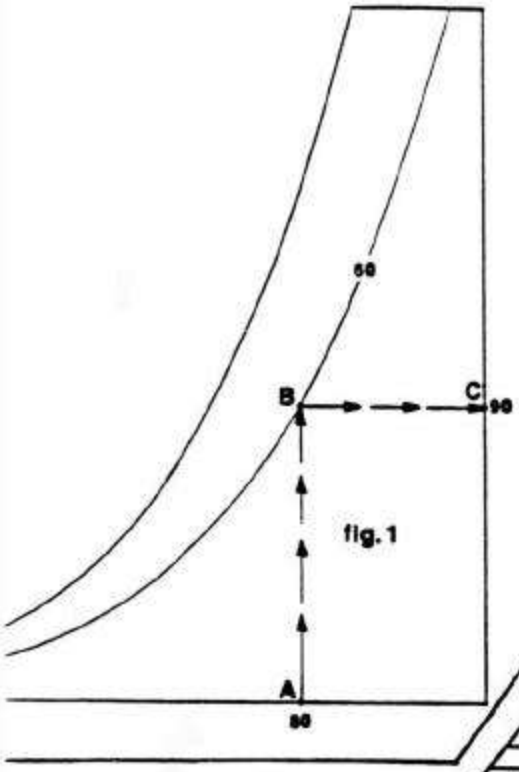
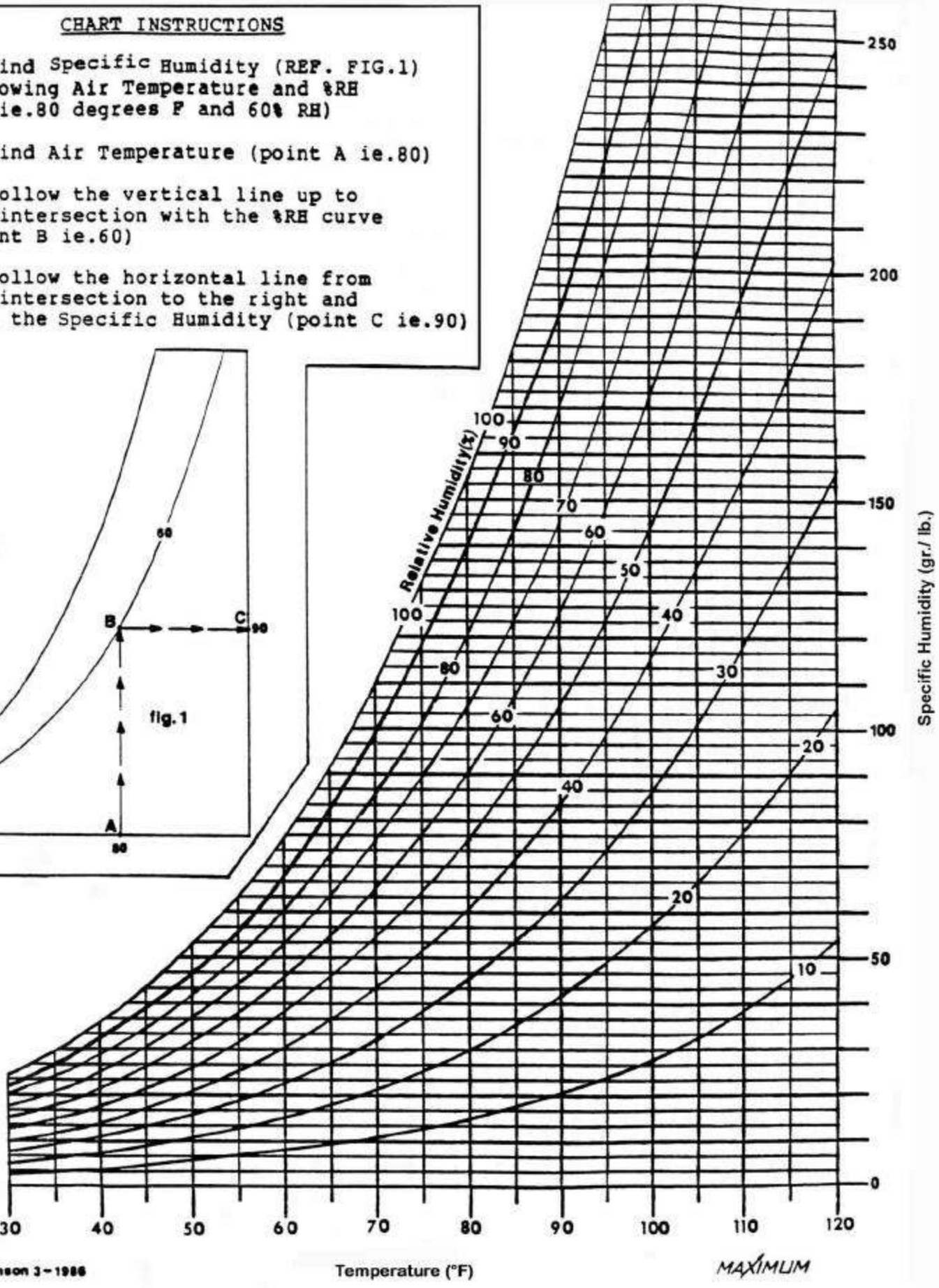


fig. 1



P.Hutchinson 3-1986

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IMPORTANT ADDITIONAL INFORMATION

Components: Along with the indicator, the following components are included with this instrument:

3 Brass Screws

Brass Case: Your brass case is solid brass A70-30 Holloware quality, with a durable lacquer finish. It is in fact a piece of jewelry and should be treated as such. It should be cleaned at least once a week to keep airborne pollutants (dust, etc…) and any moisture from collecting on the case thereby attacking the lacquer. At no time should you use an abrasive cleaner or cloth on the brass case. Simply use a soft cloth or soft paper towel with a mild glass cleaner to wipe the case clean. If your instruments are in a summer home, and you are not able to clean them regularly, simply lay a small cloth or towel across the top two-thirds so that dust cannot settle on the finish.

Specifications: All instrumentation or measuring devices have accuracy tolerances and specifications. Making comparisons between different pieces of equipment is appropriate provided the specified accuracies of both are known.

	Measurement Range	**Guaranteed Accuracy**
Temperature	10 - 110°F	±2°F
Relative Humidity	10 – 100% RH	±5% RH (20-80% RH)

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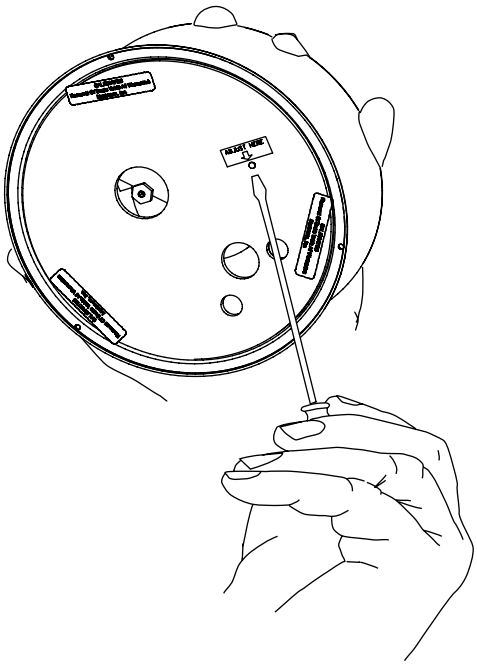
PROTEUS
SETTING AND OPERATION

INTRODUCTION

Inside the brass barometer case is a sealed, flexible metallic drum. As the atmospheric pressures changes, the drum is compressed or expanded. This change is transmitted through linkage to a pointer - thus, change in atmospheric pressure is evidenced by movement of the pointer around the dial. The linkage has a bimetallic element which automatically compensates for changes in temperature which would otherwise introduce an error in barometer readings.

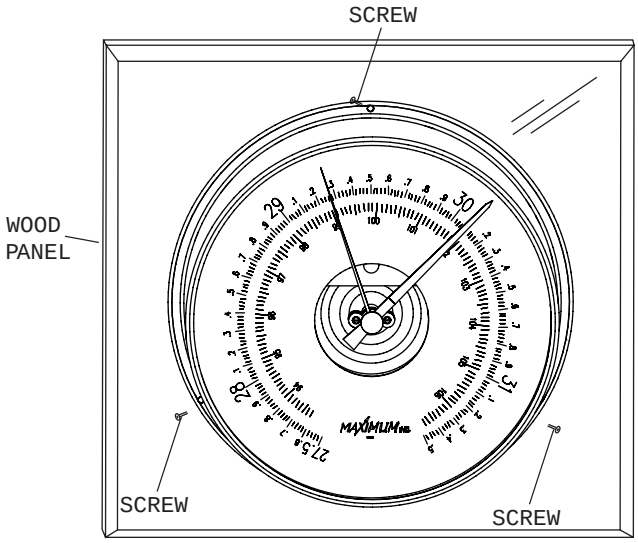


SETTING YOUR BAROMETER

Your barometer has been carefully calibrated and tested at the factory and needs but one simple adjustment before installation at your location. This adjustment is made by inserting a screw driver in the recessed slotted screw at the back of the barometer and turning this screw to the proper setting.

The simplest method of obtaining the correct barometric pressure for your location is to consult the local weather bureau, airport or perhaps a nearby individual with a correctly set barometer.

Due to the nature of aneroid (mechanical) barometers it may be necessary to fine tune the initial setting to accomodate the natural mechanical break-in of the device by simply repeating the setting procedure.



We recommend mounting the read-out on one of our pre-drilled and centered panels.

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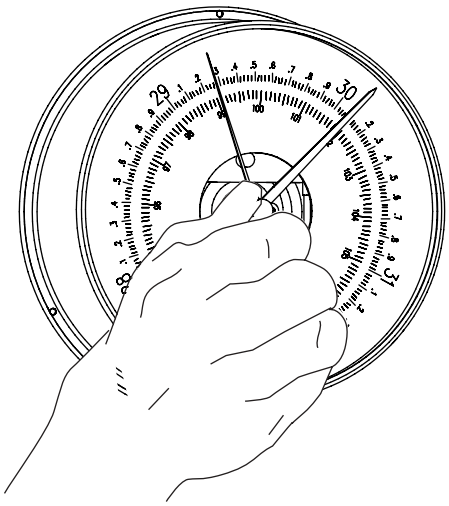
PROTEUS

HELPFUL COMMENTS



Your barometer is a useful instrument for weather prediction. The settable pointer, controlled by the knob in the center of the glass lens, is used to show changes in atmospheric pressure. When reading your barometer, lightly tap the case to take up normal slack in the linkage. Next, move the settable pointer until it rests exactly over the movement pointer. The next time you observe your barometer lightly tap the case again and you will now have a clear indication of rising, falling or steady barometric pressure. Observation of changes in barometric pressure, wind and temperature conditions give the weather watcher a strong basis for forcasting the weather.

WITH A RISING BAROMETER THE FOLLOWING READINGS INDICATE:

28.8 TO 29.2 INCHES	CLEARING, HIGH WINDS AND COOL WAVE
29.2 TO 29.6 INCHES	HIGH WINDS, COOL WAVE, PRECEDED BY SQUALLS
29.6 TO 29.9 INCHES	FAIR WEATHER, FRESH WINDS DURING NEXT 24 HOURS
29.9 TO 30.2 INCHES	FAIR WEATHER AND BRISK WINDS, DIMINISHING
30.2 TO 30.5 INCHES	FAIR WEATHER, COOLER VARIABLE WINDS
30.5 TO 30.8 INCHES	CONTINUED COOL, CLEAR WEATHER, LIGHT WINDS
30.8 TO 31.0 INCHES	HIGH WINDS, SOUTHEAST WITH RAIN

WITH A FALLING BAROMETER THE FOLLOWING READINGS INDICATE:

30.8 TO 30.5 INCHES	FAIR, WEATHER, FOLLOWED BY RAIN
30.5 TO 30.2 INCHES	APPROACHING STORM.
30.2 TO 29.9 INCHES	CLOUDY, WARMER, UNSETTLED WEATHER.
29.9 TO 29.6 INCHES	UNSETTLED WEATHER, WARMER WITH INCREASING WIND.
29.6 TO 29.3 INCHES	SQUALLY, CLEARING, FAIR AND COOLER WEATHER.
29.3 TO 29.0 INCHES	CLEARING, HIGH WINDS WITH SQUALLS AND COOLER WEATHER.
29.0 TO 28.7 INCHES	STORMY WEATHER

Excerpt from "Eldridge Tide & Pilot Book"

NOTE: IF THE BAROMETER IS TO BE USED ABOVE 3000 FOOT ELEVATIONS, THEN THE UNIT MUST BE COURSE ADJUSTED AT THE FACTORY TO THE PROPER ALTITUDE.

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IMPORTANT ADDITIONAL INFORMATION

Components: Along with the indicator, the following components are included with this instrument:

3 Brass Screws

Brass Case: Your brass case is solid brass A70-30 Holloware quality, with a durable lacquer finish. It is in fact a piece of jewelry and should be treated as such. It should be cleaned at least once a week to keep airborne pollutants (dust, etc…) and any moisture from collecting on the case thereby attacking the lacquer. At no time should you use an abrasive cleaner or cloth on the brass case. Simply use a soft cloth or soft paper towel with a mild glass cleaner to wipe the case clean. If your instruments are in a summer home, and you are not able to clean them regularly, simply lay a small cloth or towel across the top two-thirds so that dust cannot settle on the finish.

Specifications: All instrumentation or measuring devices have accuracy tolerances and specifications. Making comparisons between different pieces of equipment is appropriate provided the specified accuracies of both are known.

	Measurement Range	**Guaranteed Accuracy**
Barometric Pressure	27.5 – 31.5 Inches of Hg	±0.08 Inches of Hg

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MERIDIAN

INSTALLATION & OPERATION INSTRUCTIONS

INSTALLATION

Please follow this procedure before setting your clock; if using any of our wall panels, squares or free standing mantle mounts, simply screw into the existing holes the two supplied right angle hangers. These hangers should be screwed in so that there is approximately a 1/2" space left from the panel surface to the top surface of the hanger. On the back of your tide clock you will find two (2) holes that will line up with the mounted right angle hangers.

Align the holes and the hangers and push the clock against the wall. The clock will now be up against the three rubber feet on the back plate and not the rim of the brass case. While still applying pressure against the rubber feet, simply move the clock down so that it seats on the two (2) right angle hangers. If this fit feels too tight, back the hangers off one turn – if too loose, screw the hangers in one turn.

If you are not using one of our panels, use the supplied template to spot the hanger holes on your mounting surface. Using a #50 drill or a 1/16 drill, bore the two hanger holes. Now follow the above instructions for clock mounting.

Note: There is, by design, a small gap between the clock case flange and the mounting surface. Do not mount the clock via the three screw holes located around the outer rim at the back of the clock case. Compressing of the back-plate of the clock may cause improper operation and/or permanent damage.

IMPORTANT ADDITIONAL INFORMATION

Your brass case is solid brass A70-30 Hollowware quality with a durable lacquer finish. It is in fact a piece of jewelry and should be treated as such. It should be cleaned at least once a week to keep airborne pollutants (dust, etc…) and any moisture from collecting on the case thereby attacking the lacquer. At no time should you use an abrasive cleaner or cloth on the brass case. Simply use a soft cloth or soft paper towel with a mild glass cleaner to wipe the case clean. If your instruments are in a summer home, and you are not able to clean them regularly, simply lay a small cloth or towel across the top two-thirds so that dust cannot settle on the finish.

COMPONENTS

Along with the indicator, the following components are included with the instrument:

2 L-shaped Screws

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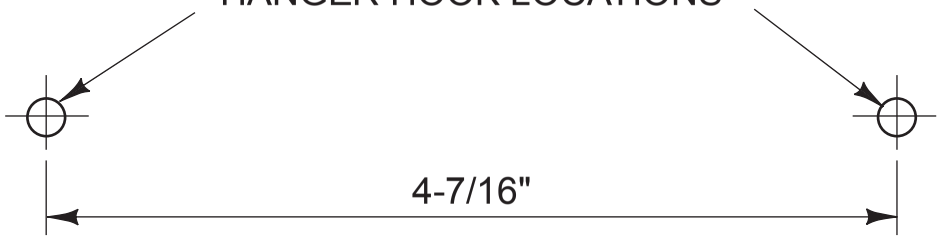
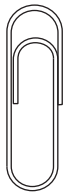
PIN OR TACK

TO USE TEMPLATE USE A LEVEL
TO MAKE LINE LEVEL
OR
USE A PIN OR TACK TO MOUNT
TEMPLATE ON WALL AT POINT SHOWN.
ATTACH A PAPER CLIP WHERE INDICATED.
LET THE TEMPLATE LEVEL ITSELF.
SPOT TWO HANGER HOLES

HANGER HOOK LOCATIONS



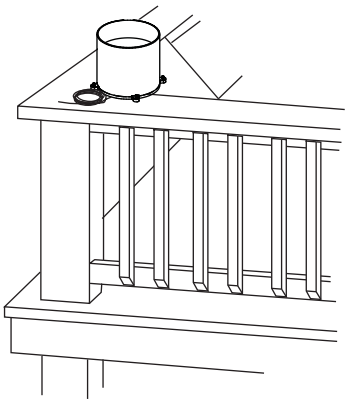
ATTACH PAPER CLIP HERE



RAINWATCH

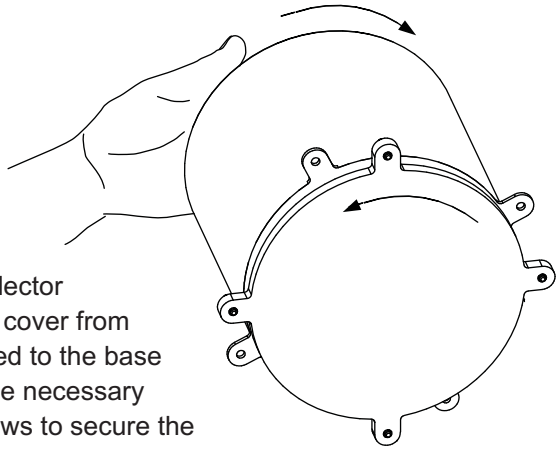
INSTALLATION

PROPER INSTALLATION IS IMPORTANT. IF YOU NEED ASSISTANCE, CONSULT A CONTRACTOR, ELECTRICIAN OR TELEVISION ANTENNA INSTALLER (CHECK WITH YOUR LOCAL BUILDING SUPPLY, OR HARDWARE STORE FOR REFERRALS). TO PROMOTE CONFIDENCE, PERFORM A TRIAL WIRING BEFORE INSTALLATION.



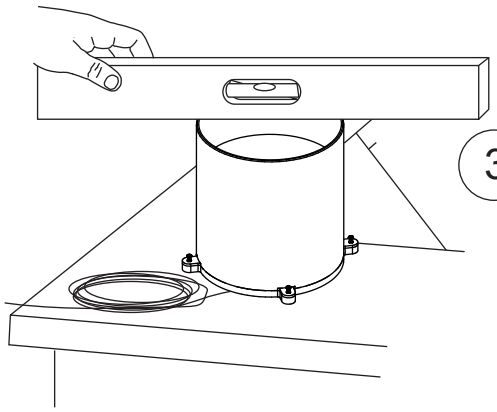
1

Select a level surface in an open area above ground to mount the collector. Some examples would be a deck or tree stump.



2

Rotate the collector to remove the cover from the base. Taped to the base you will find the necessary mounting screws to secure the base to your chosen mounting surface.

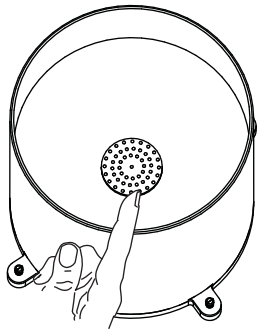


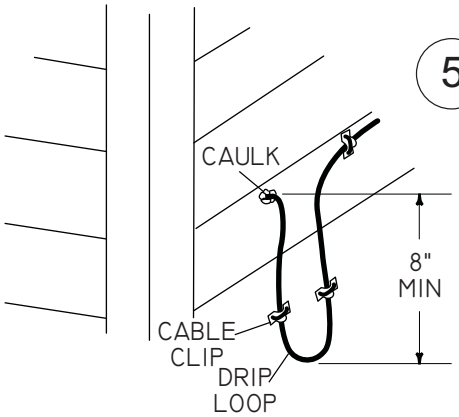
3

If the collector is not mounted absolutely level your readings will be incorrect.

4

Make sure that the plastic screen is in position in the collector.





5

Run the wire into the house using insulated cable clips. Form a drip loop where the wire enters the house and caulk the feed through hole when done.

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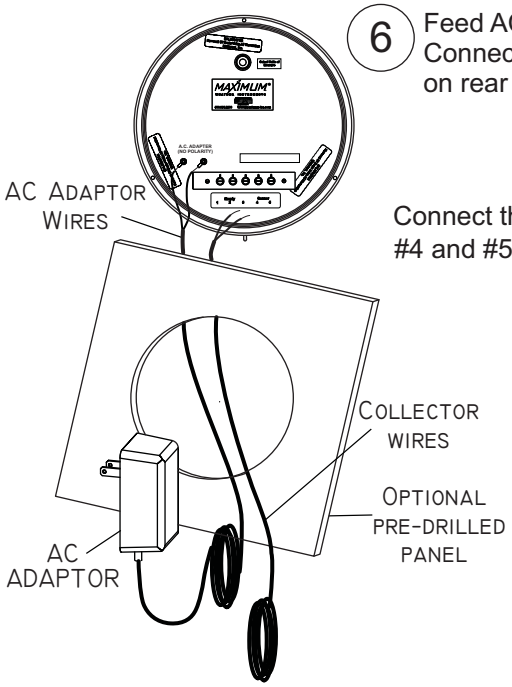
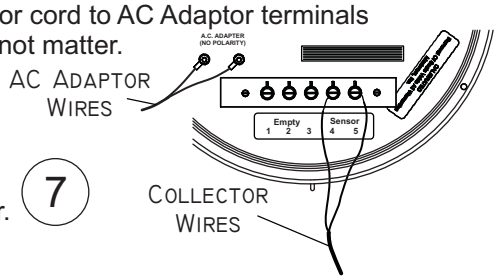
RAINWATCH

INSTALLATION (CONT.)

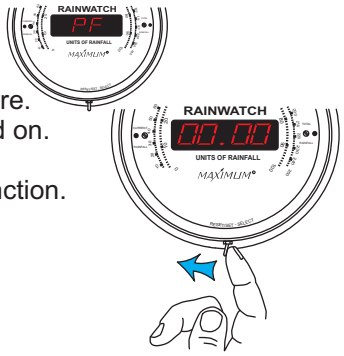


6 Feed AC adapter and collector wires through optional pre-drilled wood panel. Connect the wires from the AC Adaptor cord to AC Adaptor terminals on rear of display. The polarity does not matter.

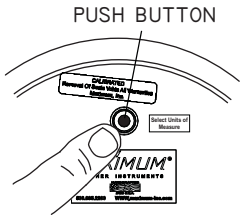


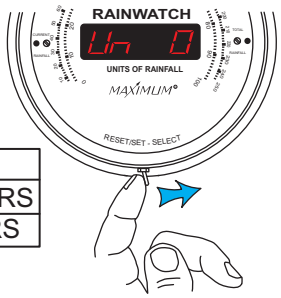
7 Connect the collector wires to terminals #4 and #5. The polarity does not matter.

8 Plug in the AC adaptor. The unit will go through a start up procedure. When done, "PF" will flash off and on. Toggle switch one time to the left (RESET/SET) to enter normal function. Unit will display current rainfall.

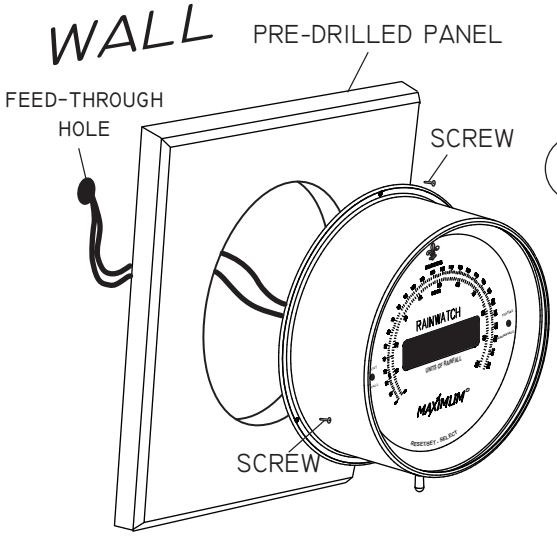


9 Select Unit of Measure. Unit is factory set to display in inches. To change from inches to other available units of measure, press the small push button switch on the back of the indicator. The display will show "Un" and a number. The number indicates the unit of measurement. Press the push button again to advance through the available units. When you have the code showing the unit of measurement you want, operate the toggle switch on bottom of the case to the right, (SELECT). Rainwatch will then return to normal operation with the display using the selected units.





Un 0	INCHES
Un 1	CENTIMETERS
Un 2	MILLIMETERS



10 Mount the Brass Readout directly over the FEED-THROUGH HOLE to avoid crimping the wire. We recommend mounting the Readout on one of our pre-drilled and centered panels.

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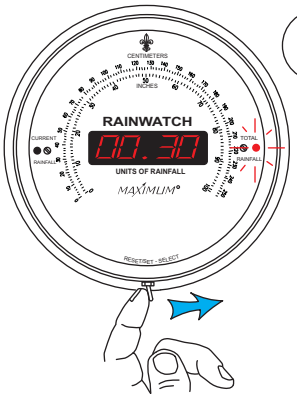
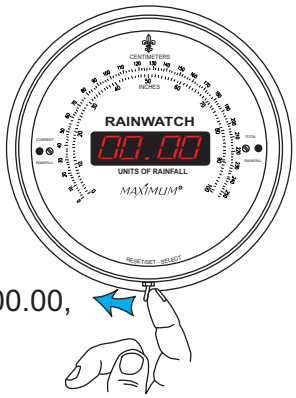
RAINWATCH

OPERATION

RAINWATCH has two "counters". They are shown on the face of the instrument as “CURRENT" and "TOTAL”. The counters are controlled by the switch at the bottom.



1 To switch between the “CURRENT” and “TOTAL” rainfall, toggle the switch to the right (SELECT).

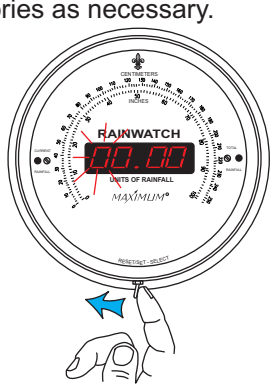


2 To reset the selected Rainfall counter, hold the switch to the left (RESET/SET) for 6 seconds and the count will reset to 00.00, then release.

OPERATION RELATED INFORMATION

Power Outages: During a power outage, Rainwatch will retain the values in it’s counters indefinitely. No further accumulation will be added until power is restored. If continuous operation during power outages is required, plug Rainwatch into an U.P.S. (Uninterruptable Power Source).

Manually Adding Counts: It is possible to manually add counts to both memories as necessary.



1) Make sure the Rainwatch is displaying the counter you want to set or add to (Total or Current).

2) Operate the mode switch left (RESET/SET) and hold it for 10 seconds to enter the rainfall counter setting mode. The display will reset to zero after 6 seconds and the most significant digit (left most) will begin blinking after the mode switch is held for an additional 4 seconds (10 seconds total) indicating that it can be preset. Release the toggle switch.

3) To set the blinking display digit, operate the mode switch to the left (RESET/SET) side and let it return to the middle. The display number will advance by one. Continue to toggle the mode switch left, advancing to the number desired.

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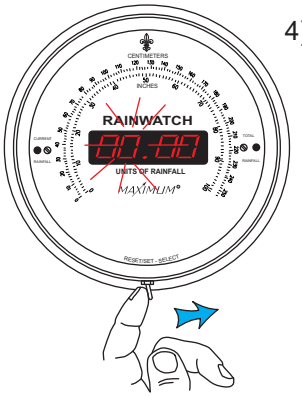
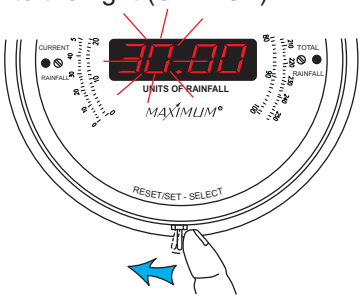
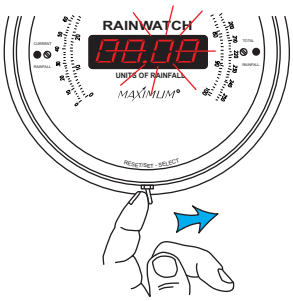
RAINWATCH

OPERATION RELATED INFORMATION CONTINUED



4) To advance to the next digit, toggle the Mode switch to the right (SELECT). The next digit to be set will begin blinking. Toggle the mode switch to the left to advance to the desired number.





5) Repeat step 4 for the third and fourth digit.

6) When complete, or after no activity for 10 seconds, the Rainwatch will automatically return to normal mode.

Freezing Weather: Freezing weather will not damage the unit. However, readings of snow or freezing rain may not correlate to actual rainfall amount.

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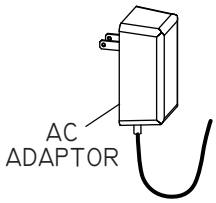
RAINWATCH

TROUBLE SHOOTING

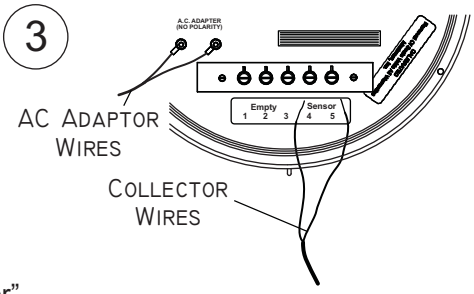
1 If the display is NOT lit check the voltage output from the AC Adaptor. This particular adaptor puts out between 11 and 15 VAC. If the voltage is not correct, then the adaptor is faulty.

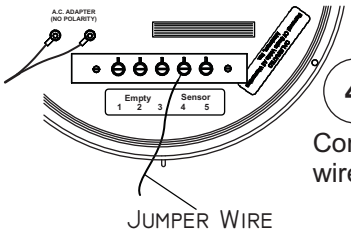
2 If the display IS lit and shows “Err” the power needs to be cycled to clear this message.



1) Unplug the AC adaptor from the 110 VAC power outlet.
2) Wait 15 seconds
3) Plug the AC adaptor back into the 110 VAC power outlet.
4) If the “Err” message does not clear, the unit needs service.

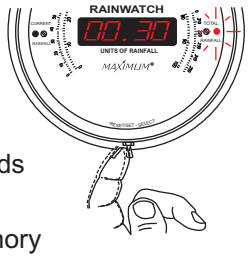
3 If the display IS lit but the unit is not counting, then remove the indicator from the wall and disconnect the collector wires from terminals #4 and #5.



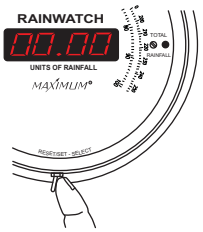


4 Connect one end of a 3" or 4" long “jumper” wire to terminal #4.

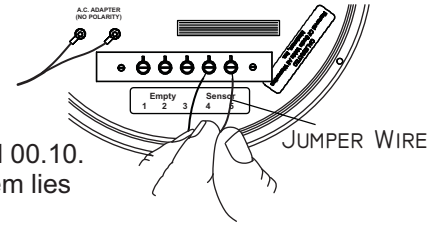
5 Reset the “memories” to 0.



1) Select the memory to reset by toggling the switch right (SELECT) to choose “CURENT” or “TOTAL”.
2) Hold toggle switch to left (RESET/SET) for 6 seconds and the count will zero.
3) Repeat steps 1 and 2 above to reset the other memory as well.



4) Using the free end of your jumper wire, touch terminal #5 and release it. The display should read 00.01.



5) Repeat step 4 nine more times. The display should then read 00.10. This indicates that the instrument is alright and that the problem lies in the wire or in the collector.

6 Contact the factory for advice as to how to troubleshoot the wire and the collector.

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FCC NOTICE

Warning: Changes or modifications to this equipment not expressly approved by Maximum, Inc. in writing as the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a CLASS B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTES

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Electrical Damage - Common Causes & Recommended Prevention

Electrical damage can be caused by many different factors. Below are some of the more common causes and some suggested methods of minimizing potential problems.

Common Causes:

Storm Activity - lightening in your area can do damage to your instruments in different ways. The obvious way is due to a direct or nearby strike. In addition, lightening storms, dust storms, dry snowstorms and strong dry winds can all cause static electricity to build up on and around your external sensors. Regardless of the cause, this built up electricity itself through the cable connecting the external sensors to the instrument.

Power Surges - A surge may come from the electric company's switching generators or power grids, from local industries or after power interruption when accumulated power suddenly surges back through AC lines. Even the on-and-off switching of large electrical appliances, such as refrigerators or clothes dryers can create damaging fluctuations. This is especially true with sensitive weather recording devices.

Yourself - Are you constantly giving and/or receiving a shock every time you touch a doorknob or other person? If so, you have a great deal of static electricity in your environment. In either case, it is possible for a person to carry enough of a charge to damage an instrument.

Recommended Prevention:

Use Surge Protectors - for the AC adapter, a UL 1449 rated surge protector with EMI/RFI filtering is recommended. This rating will be clearly listed on the packaging of all good quality surge protector.

Discharge Yourself - If the instruments are located in an environment where static electricity is a problem, make sure that you discharge yourself before touching the instrument(s). The shock that you get from touching a doorknob or another person can often be sufficient to damage an instrument.

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