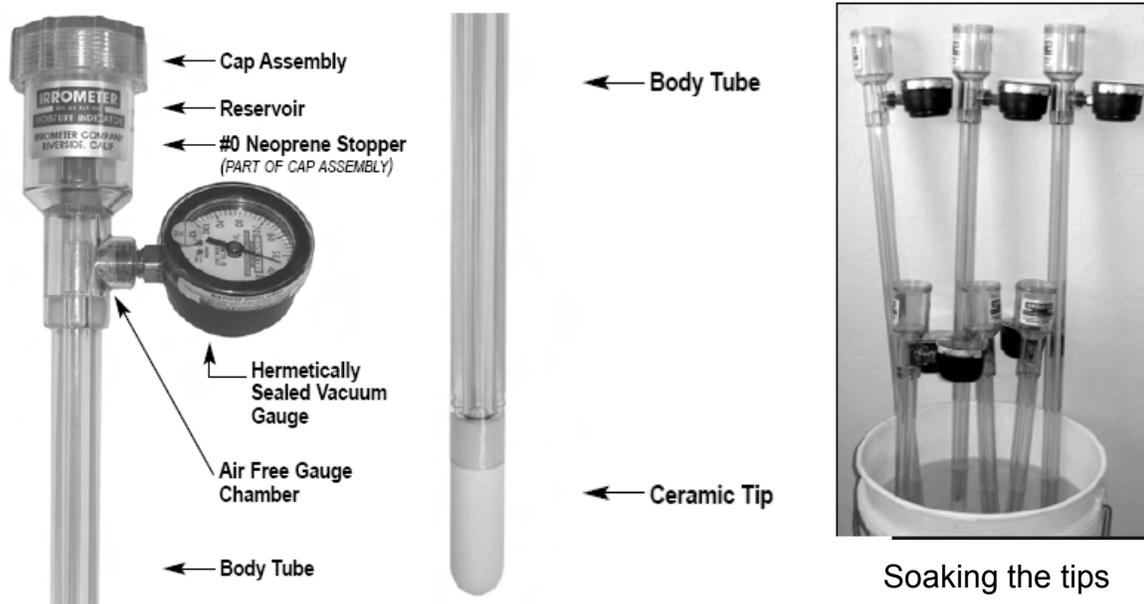


Tensiometer Quick Reference Guide.



Preparation

Soak the tip - The ceramic tip must be saturated when the tensiometer is installed. For best results, the tensiometers should be left, with the cap off, to soak in a bucket of water for 2 or 3 days. At this stage, water should not be added to the tube. This allows for removal of air in the tip.

Fill and test unit - After the units have soaked, but before they're taken to the field, it is advisable to test the tensiometer by filling the tensiometer tube and half the reservoir with distilled water. Because the tube opening is small, it is difficult to fill simply by pouring in water because air in the tube cannot escape. Therefore, the tube should be held at an angle and small amounts of water added gradually until the tube is filled. Gently tap the tube to remove the small "champagne" bubbles. Finally, place the pump onto the reservoir opening and apply a vacuum to the tensiometer. This can be done by one person but is much easier with two. After 5 or 6 good pulls, the tensiometer gauge should read about 80 cbars. If not, check that you have a good seal with the pump. You will probably notice bubbles rising from the bottom of the tube as the vacuum is applied. This is because the tube and gauge are being de-aired which will allow the tensiometer to function properly. When removing the pump, release the vacuum slowly by using the finger release to bleed air into the reservoir.

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Check gauge - Replace the cap and rubber stopper. The cap does not need to be screwed on tightly. Rather turn the cap until you feel the stopper touching the tube. Give the cap a final quarter turn to snug it into place. While in water, the tensiometer should read 0 cbars (saturation). Pull the tensiometer out of the water and gently dry the ceramic tip by holding it in a paper towel. This should cause the needle to move up slightly. When the paper towel is removed, you may notice some water oozing out of the ceramic cap.

In the field - Keep the tensiometers in water, saturated sand, or a plastic bag when transporting them to the field to prevent the tip from drying.

The tensiometers can be filled in the field just before installation. Some green dye is included with the service kit. Dying the filler water makes it easier to check the fluid level and do maintenance. Empty any water from the previous preparation step and re-fill with dyed water. De-air the tensiometer in the same fashion as was done with the pre-test.

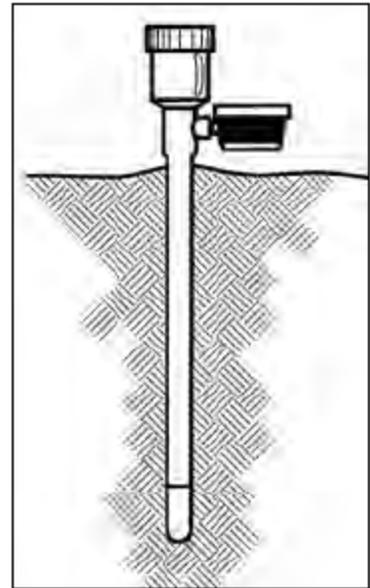
Installation

The most important thing to keep in mind is that good contact between the soil and ceramic tip is essential for getting good readings.

Installation hole - An installation hole can be created with a 7/8" pointed steel rod, soil probe, or soil auger. Marking the implement will aid in creating a hole of the correct depth. A similar mark should be made on the tensiometer tube to ensure that the tip is buried to the desired depth. For best performance, the depth of the hole should be such that the vacuum gauge is between 1 and 6 inches from the soil surface.

Insert tensiometer - Create a milkshake-consistency slurry of native soil and water and add it to the hole. This will help create good soil-sensor contact. You may need a stick or dowel rod to get it to the bottom of the hole. Push the tensiometer into the hole. Insert the tensiometer by pushing on the filler cap. Do not put any strain on the gauge itself. After inserting the tensiometer, bank some native soil up against the tensiometer to ensure good soil contact and prevent preferential flow of water down the hole. In some cases, it is advisable to install the sensor at a slight angle.

Post installation - Unless the soil is very wet, you should see the needle move away from the 0 cbar value. This is because water is moving out of the tensiometer tube and into the soil, creating a vacuum at the top of the water column in the tube. It may be advisable to mark the location with flags so the tensiometer can be located easily. If the field will be cultivated, be sure that the site is visible and, if necessary, protected from vehicle traffic.



Maintenance

The main servicing issues are maintaining sufficient water in the reservoir and removing air from the tensiometer tube. The water from the reservoir is used to replenish the water in the tube. It is best to do maintenance after an irrigation or rainfall because this is when soil moisture tension is lowest.

Air removal - The drier the soil, the more easily air can enter the tube through the ceramic tip. This air can be removed (and water added) simply by unscrewing the cap enough to allow water from the reservoir to enter the tube. Any trapped air will then be able to bubble out. Tap the tube gently to facilitate this. If the water level in the reservoir is low, remove the cap and add more dyed filler water. When replacing the cap, remember that it needs to be snug, not tight.

Every 1 or 2 months, it is recommended that the system be completely de-aired by attaching the pump and pulling a vacuum on the tube.

Storage - If the tensiometers will be out of service for a short time, they should be kept in water or saturated sand so the tip remains moist. For long-term storage, clean the tip with a stiff brush, fill the tube with clean water and allow it to drain. This will flush out any sediment in the pores of the tip. The tensiometer can then be allowed to dry and stored in a location that will not experience sub-freezing temperatures.

Troubleshooting

Gauge always reads zero - This could be because the soil is saturated. However, if an excess amount of air has been entrapped in the tube, the gauge will also read zero. First, double-check that the tube is snugly seated in the installation hole. Next, refill the tube and de-air the system. It should be possible to get the needle to about 80 cbars when pulling a vacuum with the pump. After being re-filled and de-aired, the tensiometer should quickly resume proper functionality. If you notice larger than normal bubbles and/or the tensiometer continues reading zero, there is probably a leak in the system. This could be in the gauge, the tube or the ceramic tip. The tensiometer must be serviced or replaced.

Gauge is stuck in a single needle position - The gauge is damaged and needs replacement. This is a user-replaceable part. The tensiometer should be removed before replacing the gauge so it can be re-prepped and tested.

Tensiometer responds slowly to irrigation - This could be due to:

1. Air in the system: Refill tube and de-air.
2. Salts have partially clogged the pores of the ceramic tip: Tensiometer must be removed and flushed out by filling with clean water and allowing to drain.
3. Gauge is “sticky” due to minor damage: Tap the gauge before taking readings.