

**Cleaning and Servicing your Quick Draw Portable Tensiometer**

The 2900F1 QuickDraw Portable Tensiometer is a fine tool for routine moisture tension measurements on the farm or nursery. It is designed to compliment management decisions by providing a rapid estimation of soil moisture conditions.

The QuickDraw is a little more difficult to service the first time. For this reason, we recommend that the unit be kept serviced well at all times.

The soil environment is hard on farm tools. Keep the QuickDraw clean between uses. Use a small wash bottle or even a drinking water bottle works very well. Never put the QuickDraw away dirty. Simply wash the ceramic tip in water to remove soil and salty soil solutions. Keep the sponge in the carrying case clean at all times, by rinsing it once per week.

At the end of each day, take a few moments to flush out the interior of the tensiometer to remove salts in solution that may have entered the tensiometer water column in routine measurements, by using this procedure:

- a) Clean the ceramic tip as discussed above,
- b) Submerge the ceramic tip in water and use the "null" knob (see operating instructions) to draw excess clean water into the tensiometer.
- c) Dial the knob counter-clockwise (the vacuum gauge should initially register 30 to 50 cbar and drop to 0 cbar as water is drawn into the tensiometer. The excess water will accumulate in the head space behind the null knob. Repeat the procedure several times to insure that you have loaded the tensiometer with clean water.
- d) Remove the tensiometer tip from the water and reverse the flushing process, by dialing the null knob clockwise. The null knob piston will force excess water from the tensiometer through the ceramic tip. Be very careful to NOT OVER PRESSURIZE THE TENSIO METER. This may cause slight damage to the dial gauge or may alter the zero set point. When dialing the null knob in the clockwise direction the needle on the gauge will go positive and will lay against a pin on the face of the dial gauge just to the left of the zero marker on the gauge. Use small adjustments to the null knob to force the excess water out of the unit and wait for the dial to return to zero between adjustments to avoid damage.
- e) Repeat the process until all the excess water has been removed.
- f) The QuickDraw should perform as normal.

At the end of the growing season, most QuickDraw users simply put the unit on the shelf in warm location as instructed. The QuickDraw Tensiometer is a water column based instrument and is susceptible to freezing. The following spring they go to use the instrument and it doesn't work. WHY?

- a) Typically the instrument has not been cleaned as described above,
- b) When placed on the shelf, has the sponge been wetted?
- c) Sitting on the shelf in a warm location will dry out the sponge over the off-season months, and will

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therefore draw water out of the tensiometer. This may cause the unit to cavitate and loose hydraulic contact between the ceramic tip and the interior water column. The unit will not work as before, until it has been reserviced.

To avoid this situation follow these simple tips:

- a) Clean the QuickDraw tensiometer as described above,
- b) Keep the sponge wet,
- c) At the end of the season, take a little time to wrap the ceramic tip in "Saran-Wrap" (this product works the best as a vapor barrier),
- d) Replace the QuickDraw with the ceramic tip wrapped in Saran Wrap into the carrying case,
- e) Place the unit in a non-freezing location.
- f) Next spring, un-wrap the saran and re-wet the sponge. The unit should be in top working order.

### **Tips for Routine Measurements:**

The QuickDraw can be used for different types of measurements; for spot checks and measures from a permanent location:

- a) Use for spot checks to determine the wetting area from drippers or to determine if there is enough moisture for germination in the seed-bed. Simply use the coring tool to shape the hole at the depth of measurement. Insert the QuickDraw and wait for the reading to become steady.
- b) One can make routine measurements at a given depth in the same hole each time measurements are necessary. Use ½" PVC as a riser from the depth to measure to the soil surface. Place the pipe at the depth of measurement , minus an inch or so. Use an end cap or aluminum foil to prevent irrigation from a sprinkler from entering the pipe and wetting the soil at depth instead of from surface infiltration. Remove the cap and insert the QuickDraw and force the ceramic tip into the soil at the depth of measurement. Make your measurement as normal. Re-cap the riser pipe when finished.

Use the null knob to adjust the vacuum in the tensiometer to your set point for irrigation particular to the soil and crop being monitoring. The advantage of adjusting the null knob is to quickly determine if the set point has been reached or not and the question ... is it time to irrigate? Can be easily determined. If the vacuum dial gauge exceeds the set point, then it is definitely time to schedule the irrigation. If the vacuum dial gauge decreases in vacuum, then the soil is more moist than your set point for irrigation and your decision is to not irrigate.

Using this approach, allows the user to rapidly make management decisions. Absolute, at equilibrium, measurements are not required using this approach.

### **Tips for Scheduling Irrigations based upon managed, allowed depletion for 12 soil textural classifications:**

The table on the opposite page has been developed from data presented by Waterright at the Center for Irrigation Technology, Fresno State University. Each soil textural classification affects the way water is held and released to the crop. Typically one has applied the 50% MAD rule, where soil available water does not deplete further than the 50% managed allowed depletion limit. This insures that the crop is under no water stress and maximum growth and yield is possible. The 50% limit can be related to the "knee-of-the-moisture/tension-curve" where water at lower tensions impart no stress, while at greater tensions the crop experiences mild and then moderate to severe water stress. Use the following guide to help your irrigation management decisions.

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**Approximate soil moisture/tension values for the "knee-of-the-curve", and Managed Allowable Depletion for 12 Soil Textural Classifications.**

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**Approximate range of values for each soil textural classification**

| Soil Texture Classification | Bulk Density<br>g/cm <sup>3</sup> | Field Capacity<br>cbar=kPa | "Knee of Curve"<br>cbar=kPa | 50%   |                                  | MAD*  |                                  | Available |                                  | Water |                                  | Field |                                  | Capacity |                                  | Wilting |                                  | Percent<br>cm <sup>3</sup> /cm <sup>3</sup> |
|-----------------------------|-----------------------------------|----------------------------|-----------------------------|-------|----------------------------------|-------|----------------------------------|-----------|----------------------------------|-------|----------------------------------|-------|----------------------------------|----------|----------------------------------|---------|----------------------------------|---|
|                             |                                   |                            |                             | in/ft | cm <sup>3</sup> /cm <sup>3</sup> | in/ft | cm <sup>3</sup> /cm <sup>3</sup> | in/ft     | cm <sup>3</sup> /cm <sup>3</sup> | in/ft | cm <sup>3</sup> /cm <sup>3</sup> | in/ft | cm <sup>3</sup> /cm <sup>3</sup> | in/ft    | cm <sup>3</sup> /cm <sup>3</sup> | in/ft   | cm <sup>3</sup> /cm <sup>3</sup> |   |
| Sand                        | 1.66                              | Min                        | 20                          | 1.14  | 0.04                             | 0.84  | 0.07                             | 1.56      | 0.13                             | 0.72  | 0.06                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.68                              | Max                        | 25                          | 1.32  | 0.04                             | 0.96  | 0.08                             | 1.80      | 0.15                             | 0.84  | 0.07                             |       |                                  |          |                                  |         |                                  |   |
| Loamy Sand                  | 1.61                              | Min                        | 25                          | 1.44  | 0.04                             | 0.95  | 0.08                             | 1.91      | 0.16                             | 0.96  | 0.08                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.61                              | Max                        | 30                          | 1.50  | 0.05                             | 1.08  | 0.09                             | 2.04      | 0.17                             | 0.96  | 0.08                             |       |                                  |          |                                  |         |                                  |   |
| Sandy Loam                  | 1.53                              | Min                        | 22                          | 1.61  | 0.05                             | 1.06  | 0.09                             | 2.14      | 0.18                             | 1.08  | 0.09                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.57                              | Max                        | 27                          | 1.85  | 0.07                             | 1.54  | 0.13                             | 2.62      | 0.22                             | 1.08  | 0.09                             |       |                                  |          |                                  |         |                                  |   |
| Silt Loam                   | 1.37                              | Min                        | 27                          | 2.24  | 0.08                             | 1.84  | 0.15                             | 3.16      | 0.26                             | 1.32  | 0.11                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.44                              | Max                        | 32                          | 2.47  | 0.10                             | 2.30  | 0.19                             | 3.62      | 0.30                             | 1.32  | 0.11                             |       |                                  |          |                                  |         |                                  |   |
| Silt                        | 1.43                              | Min                        | 25                          | 2.39  | 0.10                             | 2.38  | 0.20                             | 3.58      | 0.30                             | 1.20  | 0.10                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.43                              | Max                        | 30                          | 2.41  | 0.10                             | 2.42  | 0.20                             | 3.62      | 0.30                             | 1.20  | 0.10                             |       |                                  |          |                                  |         |                                  |   |
| Loam                        | 1.41                              | Min                        | 30                          | 2.06  | 0.06                             | 1.47  | 0.12                             | 2.79      | 0.23                             | 1.32  | 0.11                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.46                              | Max                        | 35                          | 2.33  | 0.08                             | 1.77  | 0.15                             | 3.21      | 0.27                             | 1.44  | 0.12                             |       |                                  |          |                                  |         |                                  |   |
| Sandy Clay                  | 1.30                              | Min                        | 35                          | 3.27  | 0.04                             | 1.02  | 0.08                             | 3.78      | 0.31                             | 2.76  | 0.23                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.33                              | Max                        | 40                          | 3.51  | 0.06                             | 1.25  | 0.11                             | 4.13      | 0.35                             | 2.88  | 0.24                             |       |                                  |          |                                  |         |                                  |   |
| Sandy Clay Loam             | 1.37                              | Min                        | 40                          | 2.39  | 0.04                             | 0.93  | 0.08                             | 2.85      | 0.24                             | 1.92  | 0.16                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.43                              | Max                        | 45                          | 2.63  | 0.06                             | 1.42  | 0.12                             | 3.34      | 0.28                             | 1.92  | 0.16                             |       |                                  |          |                                  |         |                                  |   |
| Clay Loam                   | 1.29                              | Min                        | 45                          | 2.99  | 0.06                             | 1.41  | 0.12                             | 3.69      | 0.31                             | 2.28  | 0.19                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.33                              | Max                        | 50                          | 3.24  | 0.08                             | 1.92  | 0.16                             | 4.20      | 0.35                             | 2.28  | 0.19                             |       |                                  |          |                                  |         |                                  |   |
| Silty Clay Loam             | 1.26                              | Min                        | 40                          | 3.27  | 0.08                             | 1.97  | 0.16                             | 4.25      | 0.35                             | 2.28  | 0.19                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.29                              | Max                        | 50                          | 3.34  | 0.09                             | 2.12  | 0.18                             | 4.40      | 0.37                             | 2.28  | 0.19                             |       |                                  |          |                                  |         |                                  |   |
| Silty Clay                  | 1.21                              | Min                        | 38                          | 4.19  | 0.08                             | 1.89  | 0.16                             | 5.13      | 0.43                             | 3.24  | 0.27                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.23                              | Max                        | 42                          | 4.34  | 0.08                             | 1.96  | 0.16                             | 5.32      | 0.44                             | 3.36  | 0.28                             |       |                                  |          |                                  |         |                                  |   |
| Clay                        | 1.21                              | Min                        | 55                          | 3.86  | 0.05                             | 1.23  | 0.10                             | 4.47      | 0.37                             | 3.24  | 0.27                             |       |                                  |          |                                  |         |                                  |   |
|                             | 1.28                              | Max                        | 60                          | 4.52  | 0.08                             | 1.83  | 0.15                             | 5.43      | 0.45                             | 3.60  | 0.30                             |       |                                  |          |                                  |         |                                  |   |

Source: Waterright ~ Center for Irrigation Technology, Cal State Univ. Fresno, [www.waterright.org](http://www.waterright.org)

\* MAD = managed allowed depletion

\*\* "Knee of the curve" = the change in the soil moisture-tension relationship, where water content or water tension dominates the relationship.

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