OPERATING/FINE TUNING YOUR SYSTEM

With your Soil Moisture Sensors installed and wired, you are now ready to begin using them to control your irrigation system. For newly landscaped areas, it is advisable to temporarily bypass the sensors. This allows you to continue operating your irrigation controller as needed to establish a good root system for the first 60-90 days. Once this has been completed, and the root system has been established, you can begin to use and fine tune the WATERMARK soil moisture control system.

TESTING YOUR SYSTEM

1. Set Moisture Control Dial to OFF position. All valves should operate on a manual controller/time clock sequence.
2. Set Moisture Control Dial to DRY position. Sensors will override valve (prevent operation) when soil is wet.
3. Set Moisture Control Dial in the WET range. When soil has been allowed to dry sufficiently, sensors will allow valves to operate on a manual controller/time clock sequence.
4. Verify soil water status in sensor area with a soil probe.

Watermark Irrigation
No More *than necessary*
No Less *than required*

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#19A

WATERMARK

INSTALLATION AND OPERATING INSTRUCTIONS
WATERMARK SENSORS
and the
WATERMARK ELECTRONIC MODULE

WATERMARK ELECTRONIC MODULE

The WATERMARK Electronic Module (WEM,) with its pair of sensors, can be used to control:
- An individual valve (one WEM per valve)
- A group of valves watering areas of similar water demand (a Hydrozone) (one WEM per Hydrozone)
- All the valves on a controller (one WEM per controller)

The WEM can be installed indoors or outdoors, at the controller or at the valve.

WATERMARK SENSORS

The WATERMARK Soil Moisture Sensors are installed in an active root system area, representative of that plant material which is being used as the control point for the individual valve zone or the Hydrozone area. If used to control an entire controller, select the area of heaviest water use. In selecting the site, factors such as sprinkler distribution, topography, appearance of the turf or plant material and the amount of sun exposure should be considered. It would be preferable to locate the sensor in the drier area, avoiding low spots, which may be on the wetter side due to runoff and drainage. Wires from the sensors are run back to the location where the WEM is mounted.

Installing WATERMARKS

WATERMARKS are installed beneath the ground with two sensors at each location in the active root system of the turf or plant material being monitored. Depth of placement varies with the rooting depth of turf or plant material.

TYPICAL INSTALLATION DEPTHS

Shallow Rooted Turf...........................2" to 5" deep (in root system)
Deep Rooted Turf..............................6" to 8" deep (in root system)
Shrubs/Ground Cover.....................8" to 14" deep (in root system)
Trees...16" to 24" deep (in root system)

How to Install

STEP 1:
Soak WATERMARK sensors in water before installation. Always install a "wet" sensor.

STEP 2: For root systems that are less than 12" deep, sensors are installed 4" to 6" apart at each location at the same depth (see Typical Installation Depths). For root systems deeper than 12" (deep-rooted shrubs or trees), sensors are installed at slightly varying depths. This gives an "average" reading, over the entire root profile, of the two sensors combined to activate or eliminate irrigation as needed. Sensor wires are run below grade to the adjacent splice box located 2-3 feet from the sensors.

STEP 3: Install a splice box (Ametek #182001/2 Econo Box or equal) within 2-3 feet of the sensor location and cut a trench from the splice box to the sensor location for the sensor wire run.

STEP 4: At the end of the trench, excavate a hole to the depth required for the sensors to be installed (see Typical Installation Depths). Install the two sensors 4" – 6" apart by pressing them partly into the soil at the appropriate depths in this hole. A piece of 1/2" PVC pipe (class 315) can be used as an insertion tool to push the sensor in, being careful not to pinch the wires. Be sure sensors are installed in the active root system of the turf, shrubs or trees. Sensors should be installed at a downward angle into the soil, NOT horizontal. Sensors **MUST** be firmly packed in the soil.

Note: The sensor wires can be run in conduit if desired. The top of the sensor will socket inside ½" class 315 PVC pipe, and can be solvent welded with ABS to PVC cement.

INDICATOR LIGHT

Each WATERMARK Electronic Module (WEM) comes with an indicator light to make the unit simple to use and easy to understand. When the irrigation controller is powering a valve being controlled by the WEM, and the soil moisture conditions are drier than the setting you have selected on the WEM, then the light will come on, indicating irrigation is allowed. When the irrigation controller is powering a valve being controlled by the WEM, and the soil moisture conditions are wetter than the setting you have selected on the WEM, then the light will not come on, indicating irrigation is not needed and has not been allowed.

WEM OVERRIDE

There may be times when the WEM needs to be bypassed to allow the controller to operate in manual mode, for system maintenance, etc. There are two ways to bypass the WATERMARK Electronic Module. The first can be done at the WEM by turning the Moisture Control Dial to the "OFF" position. This closes the WEM switch and allows the valve(s) connected to the WEM to operate as desired.

The second way to override the WEM is with the addition of a Bypass Circuit, which is wired to a toggle switch at the irrigation controller. This is desirable on multiple WEM systems because the system user can bypass all WEMs at once. This Bypass Circuit requires a second common wire from the controller to all valve/WEM locations. It is spliced into the Red wire of the WEM and the valve solenoid. At the controller, this Bypass Circuit is connected to the main system common through a toggle switch installed on a controller panel. By closing the toggle switch, all sensors are bypassed (See WEM Bypass Circuit wiring diagram).

Optional WEM Bypass Circuit
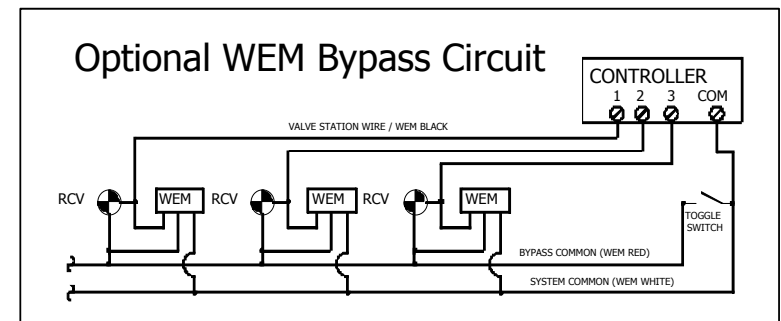
programming your irrigation controller. The correct procedure in programming is as follows:

1. Allow the controller to come on as often as possible (except maybe the night before the mowing day). This means the controller is daily "asking" the moisture sensors if irrigation is needed. It will operate *ONLY* when the sensors say it's necessary.
2. Set the valve cycle timer (duration or run time) for short cycles. This prevents the runoff you often see with longer cycles. The soil can absorb the water only so fast, and long cycles usually don't permit all the water to penetrate the soil where it's needed.
3. With short cycles, you'll need to have several repeat cycles, or start times, each day. Have an irrigation consultant help you set up a program of this type to meet peak consumptive use based on your specific system and plant material. Since this program can be used year round (except in freezing climates) with your moisture sensor control, you will eliminate the need for seasonal program adjustments. The Sensors will automatically adjust the irrigation to whatever is needed, regardless of the weather.
4. Monitor your system and plant material to fine tune your moisture settings for proper balance and correct plant response. You can fine tune by:

   A. Adjusting the moisture setting for a wetter or drier control.
   B. Changing the programmed cycle duration to prevent excessive runoff.
   C. Changing the number of repeat cycles, or start times, to increase or decrease total irrigation "potential" to meet the peak consumptive use of the turf or plants.

In setting up this final program, it may be advisable to use the services of a consultant who can help you evaluate your irrigation system efficiency and provide you with a schedule that matches your specific situation.
Once you have established a balanced program, further adjustments become less necessary. All you need to do is monitor the results, thus eliminating the constant programming of the Controller for seasonal needs.

NOTE: The WaterPerfect Irrigation Scheduling and Water Management Software program is available to assist you in creating a recommended schedule for the controller and selection of an appropriate moisture setting. Please refer to the WaterPerfect brochure.

STEP 5: Backfill the sensors firmly to ensure a snug fit and run the sensor wires to the splice box. Backfill the sensor wire trench.

STEP 6: Separate the two conductors for each sensor and strip insulation for making the waterproof splices. Splice one wire from each sensor together, running them in series. Then splice each remaining wire to the wires running back to the site where the WEM is located. Refer to Sensor Wire Sizing Chart:

SENSOR WIRE SIZING

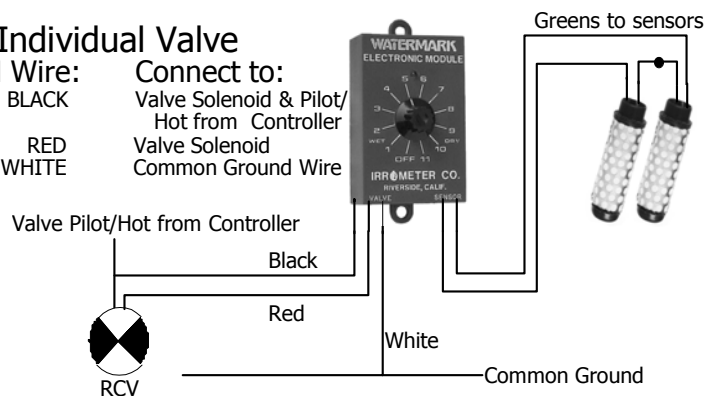| Length of Run	Wire Size
Up to 1000'………………………………………………………	#18 AWG-UF Valve Wire
1000' to 2000'………………………………………………	#16 AWG-UF Valve Wire
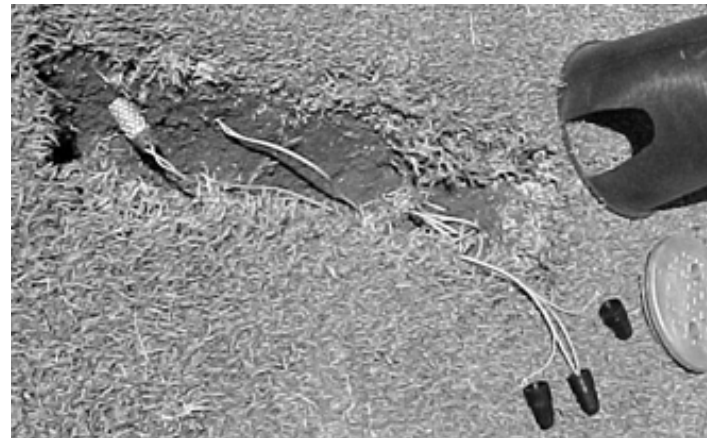
**You are now ready to install the
WATERMARK Electronic Module (WEM):**

Step 7: Typically the WEM is mounted on the wall, or in the control enclosure, near the irrigation controller (when used to control Hydrozones or the entire controller). If controlling an individual valve, the WEM is best mounted near the valve it is to control and in the area irrigated by that valve. Take care to ensure the module does not become submerged in a flooded valve box. Mounting the WEM to the underside of the lid of the valve box usually works quite well.

Run wires from the valve(s) being controlled, or the controller, to the WEM and make waterproof connections as follows (see wiring diagram):
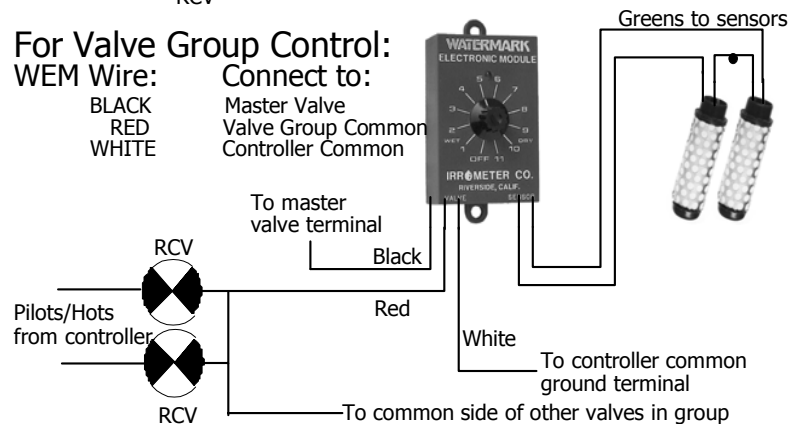
For Individual Valve

WEM Wire:	Connect to:
BLACK	Valve Solenoid & Pilot/ Hot from Controller
RED	Valve Solenoid
WHITE	Common Ground Wire

Greens to sensors

Valve Pilot/Hot from Controller

Black

Red

White

Common Ground

RCV

For Valve Group Control:

WEM Wire:	Connect to:
BLACK	Master Valve
RED	Valve Group Common
WHITE	Controller Common

Greens to sensors

To master valve terminal

Black

RCV

Pilots/Hots from controller

Red

White

To controller common ground terminal

To common side of other valves in group

RCV

For All Valve Control:

WEM Wire:	Connect to:
BLACK	Master Valve
RED	Valve Common
WHITE	Controller Common

Greens to sensors

To master valve terminal

Black

To Valve/Field Common

Red

White

To controller common ground terminal
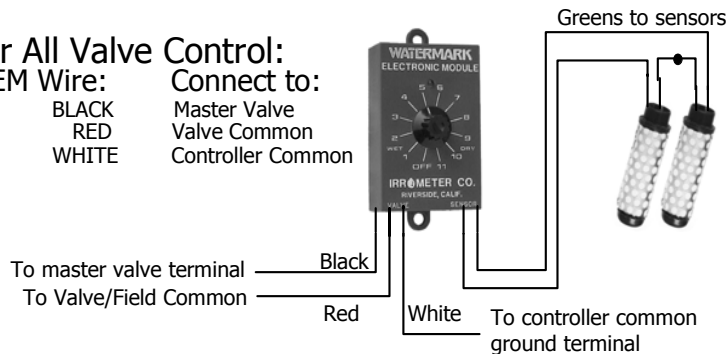
On the sensor side of the WEM, connect one green wire to each sensor. The remaining two sensor wires (one from each sensor) are connected to each other (sensors wired in series, see step 6).

WEM WIRES   CONNECT TO:
GREEN.........................Both Sensors
The WEM functions as a switch on the common, for whatever number of valves are connected to that individual common wire.

PLEASE NOTE: Sensors must be located in and irrigated by the **last valve** to run in each valve "group". Resequence valves to accomplish this as necessary. Keep a record in the controller enclosure of which valves are in each group, and which valves water the sensors.

You are now ready to set your irrigation controller to use the WATERMARK SOIL MOISTURE SENSORS.

SOIL MOISTURE SETTING
Each Hydrozone, or "irrigation need" group can be set for differing soil moisture levels. The adjustment dial gives you from very wet (position #1 – 10 centibars of soil suction) to very dry (position #11 – 120 centibars of soil suction). The range from position #1 to #4 (approximately 10 centibars to 25 centibars) is the normal range for most water sensitive turf or plant material. The intermediate to drier end of soil moisture is from position #5 to #8 (approximately 35 to 70 centibars) is useful for most shrubs and ground cover. The very dry end of soil moisture is from position #9 to #11 (approximately 85 to 125 centibars). You should use this area with caution, and with a consultant's advice. Some of the very deep-rooted drought tolerant plant materials may be able to tolerate this level of dryness but only if you have proceeded with caution.

The WEM is adjustable from 10 to 120 centibars and has an OFF position to allow for overriding the sensors.

PROGRAMMING THE CONTROLLER
Keep in mind that your Soil Moisture Sensors only serve to override your irrigation controller/time clock to prevent excessive or unnecessary irrigation. The irrigation controller is still "in control" and determines "when" irrigation can occur and "how long" a given valve can run. Thus, the key to successful use of this entire system depends on properly