



# **MICRO GROW**

## **GREENHOUSE SYSTEMS, INC**

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### **Water Pro VPD Control System**

# WATER PRO

The WATER PRO is a watering controller that can be installed directly in the greenhouse. The basic system is made up of the Controller with 12 Built-in Relays, One VPD Sensor, One Photocell Light Sensor and One 24-VAC/100-VA External Transformer. The WATER PRO gives the grower an ultimate tool to control mist and irrigation for an inside growing area and through this tool makes available current worldwide OCS patents involving the use of Vapor Pressure Deficit (VPD) and Crop Aging. When using VPD, the WATER PRO constantly monitors “all” environmental changes that surround the plants and as these changes take place, will automatically regulate the amount of water delivered to the plants. The WATER PRO is a standalone system, which can be expanded. You can add 12-Relay Outputs with the addition of a Water Pro Expansion Unit. You can, also, add a VPD Sensor. The WATER PRO can be networked to a PC and used with our optional Growlink PC Software for sensor data logging and remote control operations.

USE A QUALIFIED AND LICENSED ELECTRICIAN AT ALL TIMES

## WIRING METHODS

Always use stranded wire when connecting cables or conductors to the WATER PRO termination board and WATER PRO Expansion Module plugs. This will allow flexibility. Use no smaller than #18 gauge, stranded wire for all outputs. Consult the national electrical code or local codes if in doubt about the insulation ratings of the wire in use. Remember to always use a qualified and licensed electrician.

## SENSOR CONDUCTORS

Route sensor conductors separately from control conductors. This is very important so as to reduce electrical interference. Never route sensor conductors in conduits used for other voltages. This is in violation of most electrical codes and will cause dangerous interference to the control system.

## CONTROL CONDUCTORS

Route all control conductors separately from sensor conductors. This is very important so as to reduce electrical interference. Control conductors may be routed in conduits that contain other power system wiring only if the insulation material on the conductors is the same as the power system wiring.

NOTE: WHEN FIRST SETTING UP AND PRIOR TO PROVIDING LIVE INPUT POWER TO THE WATER PRO MAKE CERTAIN ALL OF THE ON/OFF/AUTO SWITCHES ARE IN THE OFF POSITION ON THE WATER PRO AS WELL AS THE WATER PRO EXPANSION MODULE.

## **INSTALLING THE UNIT**

The WATER PRO should be installed as close as possible to the crop area you're going to control. The VPD Sensor is hung above and in the center of the crop area. Make sure the sensor is mounted so that no water hits the sensor or can be sucked into the fan. The Photocell Light Sensor is hung where it can distinguish between night and day.

### **IF YOU HAVE PURCHASED A WATER PRO EXPANSION MODULE**

1. CAUTION -----Turn the WATER PRO OFF.
2. Plug the fourteen-conductor ribbon cable into the WATER PRO.
3. Connect the power leads coming from the WATER PRO Expansion Module.
4. Connect the cable wires from your solenoid valves (24VAC type) to the WATER PRO Expansion Module plugs.
5. Make sure the plugs are secured into the WATER PRO Expansion Module.  
Screw and tighten the WATER PRO Expansion Module onto its enclosure and mount the lexan door.
6. Make sure all ON/OFF/AUTO switches are in the OFF position.

**\*\*Refer to Station Setup, to setup your expansion stations.\*\***

### **IF YOU HAVE PURCHASED AN ADDITIONAL VPD SENSOR**

1. Hang the VPD Sensor in the middle of the area where you want to control your watering. If this distance from the WATER PRO exceeds 100 feet, you will need to run a Sensor Extension Cable from the WATER PRO and join this cable to the VPD Sensor Cable.
2. Connect the VPD Sensor to the termination connector on the back of the WATER PRO.

Reasons to purchase another VPD Sensor:

- a. Tighter sensing control of the watering area.
- b. Additional greenhouse watering area to control.
- c. To be use as a spare.

### **IF YOU HAVE PURCHASED THE PC CONTROL SOFTWARE**

1. Run the communications cable from the PC to the WATER PRO. This is RS-485 and the maximum distance any WATER PRO can be from the PC is 5000 feet.
2. Connect the communication cable to the WATER PRO. Up to 32 WATER PROs can be placed on the communications line.

Provided all equipment has been installed, all interconnection wiring has been completed and sensors are in place and connected into the WATER PRO it is now time to throw the wall switch and energize the unit.

### **TESTING THE INSTALLATION**

Prior to powering on and testing your system, make sure all of the ON/OFF/AUTO SWITCHES are in the OFF position. After applying power to the unit test your installation by turning on each of the Output Stations, one at a time, with its corresponding ON/OFF/AUTO switch. Throw the switch into the ON position for this test. The device (solenoid valve, pump, injector, etc..) which you've wired to this station should turn on. Put the switch back to its OFF position prior to turning on the next Output Station.

## FEATURES OF THE EQUIPMENT

### INPUTS and OUTPUTS

The Sensor Inputs to the WATER PRO are:

- |                         |                               |
|-------------------------|-------------------------------|
| 1. Air Temperature #1   | From VPD Sensor #1            |
| 2. Leaf Temperature #1  | From VPD Sensor #1            |
| 3. Relative Humidity #1 | From VPD Sensor #1            |
| 4. Photocell            |                               |
| 5. Air Temperature #2   | From VPD Sensor #2 (Optional) |
| 6. Leaf Temperature #2  | From VPD Sensor #2 (Optional) |
| 7. Relative Humidity #2 | From VPD Sensor #2 (Optional) |

The WATER PRO standard unit has 12 outputs. It can be expanded to 24 outputs by adding a WATER PRO SYSTEM EXPANSION MODULE. Each output can be defined as Irrigation, Misting, Aux (pumps, injectors, etc), or Not In Use.

### LED LIGHTS

- |                            |  |
|----------------------------|--|
| 1. Run                     | 6. Set Disable Target Groups                               |
| 2. Manual Mode             | 7. Set Alarms  |
| 3. Set System              | 8. Calibrate   |
| 4. Set Stations            | 9. End of Schedule Warning (Blinks when Crop Age Finished) |
| 5. Set Aging Target Groups |  |

### SWITCHES

Top Left Switch is the RUN/SET Switch

Top Middle Switch is the PRIOR/NEXT Switch

Top Right Switch is the VALUE Switch

1. RUN/SET Switch Up --- Always go to Run Mode and Clear Alarm.
2. RUN/SET Switch Down --- Toggle between Major Modes (Run, Manual, Set System, Set Stations, etc..).
3. PRIOR/NEXT Switch Up ---Go to previous item within current Mode.
4. PRIOR/NEXT Switch Down ---Go to next item within current Mode.
5. VALUE Switch Up --- Increase current value. In Run Mode, Freeze Display.
6. VALUE Switch Down --- Decrease current value. In Run Mode, Freeze Display.

NOTE: If both the Top Middle and Top Right Switches are both held down for a period of 5 seconds the unit will reset to factory defaults.

### SETTING UP THE UNIT

First, a few things you must understand. The 3-switches underneath the LCD and on the front of the WATER PRO are used to accomplish the setup. The Left Switch (**RUN/SET**) is used to go to the appropriate Mode. The Right Switch (**VALUE**) is used to answer the question. The Middle Switch (**PRIOR/NEXT**) is used to go to the next question. The 12-switches that go down the right side of the WATER PRO front panel are the built-in manual overrides for each of the station outputs.

Please follow the steps in order. Prior to setting up the unit for the first time make sure the 12-switches that go down the right side of the unit are in the OFF position.

### **Set System Mode**

Go into the SET SYSTEM MODE. This is where you will decide the system parameters. Choose the number of VPD Sensors connected to the system. Also, choose the number of Stations, Aging Groups and Disable Groups you'll be using. Choose the Maximum Number of Stations that can be on at one time. Set the Clock, Date, Sunrise/Sunset and Light Sensor Sensitivity. If you want to use the enclosed relay to activate a device when a Crop Model finishes answer YES to the End of Schedule Alarm question. You can enter a Custom System ID and Remote ID Code if you will be using the optional Growlink software with this system. Choose how you would like to read the temperature sensors (F for Fahrenheit or C for centigrade).

### **Set Alarms Mode**

Go into the SET ALARMS MODE. This is where you can set the Low and High Alarms for each sensor of the VPD Sensor(s).

### **Set Station Mode**

Go into the DAY MODE. This is where you will decide to use the Photocell Sensor (daily sunrise time) or set a time for the Day Mode to begin. If you use the disable in the SET STATIONS MODE, this Day Mode setting will be the end time of the night disable.

### **Night Mode**

Go into the NIGHT MODE. This is where you will decide to use the Photocell Sensor (daily sunset time) or set a time for the Night Mode to begin. If you use the disable in the SET STATIONS MODE, this Night Mode setting will be the beginning time of the night disable.

### **Set Stations**

Go into the SET STATIONS MODE. This is where you will pick the type (**PRO** for misting or **IRR** for irrigation) for each of the 12-stations, choose the runtime (0-60 seconds for PRO and 0-60 minutes for IRR) for each station and attach (if you want) the night disable (**OFF** for no watering to take place during the disable period or **ON** to disregard disable period altogether) for each station.

### **Set Targets**

Go into the SET TARGETS MODE. This is where you will set the target for each of the 12-stations. Choose the station for which you want to set the target. Using the PRIOR/NEXT switch, move the blinking cursor to the right of the screen and three digits will appear. If the station for which you are setting a target is a PRO (misting) station the target range is from 0010 to 9990. You will set the first three digits of the target with the fourth digit always at 0 and not shown on the display. If the station for which you are setting a target is an IRR (irrigation) station the target range is from 00100 to 99900. You will set the first three digits of the target with the fourth and fifth digits always at 00 and not shown on the display.

### **Manual Mode**

Go into the MANUAL MODE to turn on stations and zero out Accumulated VPDs. Choose the station (this is done with the PRIOR/NEXT switch). Use the VALUE switch to turn the station ON. Once you have turned the station ON, a couple of things will happen. First, the station will turn on for the amount of runtime you set in the SET STATIONS MODE. Second, any Accumulated VPD will be zeroed out for the station.

## **SENSOR INFORMATION**

Go into the RUN MODE. The WATER PRO will scroll through the sensor readings in this mode.

## **STATION INFORMATION**

Go into the SHOW SYSTEM MODE.

## **HOW TO DETERMINE VPD TARGETS**

**MIST**--To determine the target for a particular station, you will need to do the following. In the SET TARGETS MODE and for a Mist Station you will need to enter a large target (our recommendation for early crop mist is 1000). The large target is to ensure the station won't automatically water the crop until "you" determine the daily target. When you feel the mist station needs watered, go into the MANUAL MODE, choose the station and trigger the station on with the VALUE switch. Also, note the time of day on your watch. When the plants are ready to be watered the very "next time" (AND YOU NEED TO DETERMINE THIS SO KEEP WATCH OVER YOUR PLANTS), you'll need to note the reading of the Accumulated VPD for the station in the SHOW SYSTEM MODE as well as the new time of day on your watch.

**REMEMBER YOU'VE DETERMINED THE PLANTS NEED WATER. NOW THAT YOU'VE NOTED THE ACCUMULATED VPD AND THE TIME, GO BACK INTO THE MANUAL MODE AND TRIGGER THE STATION ON SO THE PLANTS GET SOME WATER!**

You now have the target for the day. Go into the SET TARGETS MODE, choose the station and enter in the new target.

If you want to go the next step, with the information you now have you can figure the targets for each day that the crop will be under mist at this specific station. Here's how! Take the NEW TARGET and divide by the number of minutes between the two mists. This gives you the VPD per minute. For each new daily target you need to figure how much time would there be between each misting for that specific day if the environmental conditions were the same as when you came up with your first target. Multiply the number of minutes by the VPD per minute and you can develop a target for each day. Hint: If you're developing a model to do mist to propagate young plants, the targets should go up as the plant grows. Targets going up mean that the amount of mist is going down.

**IRRIGATION**--To determine the target for a particular station, you will need to do the following. In the SET TARGETS MODE and for an Irrigation Station you will need to enter a large target (our recommendation for small plant irrigation is 10000). The large target is to ensure the station won't automatically water the crop until "you" determine the daily target. When you feel the irrigation station needs watered, go into the MANUAL MODE, choose the station and trigger the station on with the VALUE switch. Also, note the time of day on your watch. When the plants are ready to be watered the very "next time" (AND YOU NEED TO DETERMINE THIS SO KEEP WATCH OVER YOUR PLANTS), you'll need to note the reading of the Accumulated VPD for the station in the SHOW SYSTEM MODE as well as the new time of day on your watch.

## **GENERAL MODES**

### **RUN**

When the WATER PRO is in the Run Mode, the LED Display will scroll through the following information:

1. Time
2. Date
3. Customer Identification (optional setup by owner)
4. Air Temperature #1
5. Leaf Temperature #1
6. Relative Humidity #1
7. Air Temperature #2 (If optional sensor installed)
8. Leaf Temperature #2 (If optional sensor installed)
9. Relative Humidity #2 (If optional sensor installed)
10. VPD #1 Calculation
11. VPD #2 Calculation (If optional sensor installed)

NOTE: When a Station has finished a Crop Age, a message will join this scrolling information telling you which station has finished. Also, Hi-Low active alarms will scroll.

### **MANUAL MODE**

This Mode is used to trigger the individual stations. When a station is triggered on from this Mode the VPD Accumulation Total for that station ZEROS OUT and starts a new accumulation. Each station that has been setup in the system and made active will ask the question TRIG STATION with the number of the station. For stations that have been setup for MIST you will be asked YES or NO. For stations that have been setup for IRRIGATION you will be asked the number of times you would like to trigger the station (0 to 5 times). NOTE: THIS IS THE ONLY MODE WHERE THE ACCUMULATED VPD CAN BE ZEROED OUT.

### **SET SYSTEM**

This Mode is used to setup the following:

1. Number of VPD Sensors (1 or 2).
2. Number of Stations (1 to 12)(\*\*up to 24 if you have the WATER PRO SYSTEM EXPANSION MODULE).
3. Number of Aging Groups (1 to 6).
4. Number of Disable Groups (1 to 4).
5. Max Number of Stations ON (1 to 24).
6. End Of Sched Alarm (NO or YES).
7. Set Clk (Clock).
8. Month/Day/Year.
9. Sunrise & Sunset.
10. Light Sensor Sensitivity (Low/Med/High)
11. Custom System ID (Off/Display/Program).
12. Review I/O Assignments (N or Y).
13. Remote ID Code (0 to 31).
14. Temperature Read in (F or C).

This Mode will give you a lot of information, once the stations are set up on the unit. After stations are set up and when you come back into the SET SYSTEM Mode the question will say Show Status. If you answer YES, the unit will show you information about each station. This information includes Station Name, Whether the Station is Off or On, Station Target Station Accumulated VPD and amount of time left on an active watering cycle.

Note: Answer the questions by putting in only the number of stations, crop aging groups and disable groups you plan to set up. This will keep the unit from asking for information about stations, crop age groups, and disable groups that you are not planning on setting up.

### **SET STATION**

This Mode is used to set up each of the stations. Here, you will choose whether the station will be used for Misting, Irrigation, Auxiliary or Not In Use, Fixed Target or Crop Age Group, Disable Group, VPD Sensor or Manual VPD, Crop Day, and the amount of ON TIME for the device attached to the station.

### **SET CROP AGING TARGET GROUPS**

This Mode is used to set up your Crop Aging. You can set up six different groups. Crop Age Groups can be set up for both Misting and Irrigation stations with either Increasing or Decreasing Targets. You can change your 20%, 40%, 60%, and 80% midpoint targets for the Crop Age Group. If you change your 20% target this will effect all targets from the Day 2 Target to the target for the day prior to the 40% midpoint target. If you change the 40% midpoint target this will effect all targets from the target the day after the 20% midpoint target to the target for the day prior to the 60% midpoint target. 60% and 80% midpoint changes follow this same pattern. Each target for each Crop Age day can be viewed in this Mode. Increasing Targets within a Crop Age Target Group will reduce the amount of water the crop receives as the crop ages. Decreasing Targets will increase the amount of water as the crop ages.

If you are setting up an Increasing Target Crop Age, Too Low and Too High messages will flash on the unit when adjusting the midpoint targets if the target you are adjusting is lower than the previous midpoint target or higher than the next midpoint target. This is just an indication for you to help you setup targets. Even though the message (Too Low or Too High) might flash the unit still accepts whatever target you choose.

If you are setting up a Decreasing Target Crop Age, Too High and Too Low messages will flash on the unit when adjusting the midpoint targets if the target you are adjusting is higher than the previous midpoint target or lower than the next midpoint target. This is just an indication for you to help you setup targets. Even though the message (Too High or Too Low) might flash the unit still accepts whatever target you choose.

### **SET DISABLE TARGET GROUPS**

This Mode is used to set up your night time Disables. You can set up to four different groups. If you set up a group and that group is attached to a misting station the misting station will disable for whatever time is called for in the Disable Group prior to Sunrise. If you attach the Disable Group to an irrigation station the irrigation station will disable for whatever time is called for in the Disable Group prior to Sunset. No matter what type of station (misting or irrigation) disables, the disable will last until the next Sunrise. The midpoints for a Disable Group can be adjusted just as the midpoints for a Crop Age Group. Each disable target for each Disable day can be viewed in this Mode.

## **SET ALARMS**

This Mode is used to set up Alarms so that you can receive a warning if environmental conditions in the greenhouse are not what you want them to be. You can set both High and Low Alarms. The WATER PRO can be hooked to your external alarming system (Sensaphone, bell, light, etc...). A dry relay hookup for your alarm system is provided on the termination board in the bottom of the WATER PRO. If you decide not to use this dry relay for alarms you can use this relay to warn you when a crop-aging program has finished.

## **CALIBRATE**

This Mode is used to calibrate the VPD Sensors. The calibration procedure should be done with a reliable thermometer, out of direct solar influence when calibrating Air Temperature. Use a wet bulb/dry bulb or a sling Hygrometer to calibrate the Relative Humidity. The Relative Humidity Sensor is good for a range of 0 to 100% with a plus/minus 2% acceptable error. The Temperature Sensors are good for a range from 0 to 120° F with a plus/minus 1° F acceptable error.

## **END OF SCHEDULE WARNING**

This Mode is used to let you know when a CROP AGE has finished on one of the stations. The LED Light will activate and blink when a Crop Age has finished.

## **UNDERSTANDING VPD (VAPOR PRESSURE DEFICIT)**

There has been a significant amount of study by a number of environmental and watering experts concerning this basic principle of using VPD to determine when plants need water. Unlike other methods used to determine watering, using VPD has turned out to be the most accurate method to date. VPD looks at the entire environmental conditions surrounding the plant. The VPD Sensor that we use measures the Temperature of the Air, Relative Humidity of the Air, and the Temperature of the Leaf of the Plant. With these instantaneous sensor values we can determine the VPD of the plants in the greenhouse at regular intervals (every 10 seconds). As the environmental conditions change so does the VPD. By adding the VPDs together we work our way toward a target where we know the plant must have water. After we water the plant the process starts all over again.

Just what is VPD and how does it relate to plants? Not really a difficult question to answer. To understand VPD we must understand the following:

1. How water moves through a plant.
2. A plant's structure.
3. How environmental factors effect plant water use.

### *Plant Water Movement*

The amount of water a plant needs is controlled by what takes place in the leaf, not in the soil. When plants are watered, the roots take up water which moves through the stem to the leaf. There, it evaporates into the air. A process known as "transpiration". As water evaporates from the leaf, leaf tissues start to dry, which results in the leaf pulling more water in through the stem from the roots. This water vapor movement out of the leaf is critical because the faster the water evaporates from the leaf, the more water is taken from the soil and pulled through the plant to satisfy the plants needs. It is what takes place in the leaf, not the soil that will determine your plants watering requirements.

### *Plant Structure*

Water evaporates from cells to the air inside the leaf. This air is always saturated at 100 percent relative humidity. Vapor Pressure Deficit is a measure of the difference in the amount of water in the air inside the leaf and the amount in the air around the leaf. The greater this difference, the faster the plants lose water.

### *Plants and the Environment*

The best example to understand the basics of VPD is as follows. Let's take a basin of water and a dry sponge. If you bring the basin of water and the dry sponge together, they will try to neutralize each other out. The basin of water will lose water and the dry sponge will gain water. This neutralizing principle happens with plants. If you take a plant and put it into a dry (low humidity) environment the plant will transpire a certain amount. As the Relative Humidity in the air increases, provided the Air & Leaf Temperatures remain constant, the VPD decreases and the plant transpires less. If the Leaf Temperature increases and the Relative Humidity and Air Temperature remain constant the VPD increases and the plant transpires more. If the Air Temperature decreases and the Relative Humidity and Leaf Temperature remain constant the VPD increases and the plant transpires more. As you can see, all the environmental factors (Air Temperature, Leaf Temperature, and Relative Humidity) play a part in the water lost by plants through transpiration. If the Air Temperature and the Leaf Temperature are the same and the Relative Humidity of the Air is 100%, there would be no VPD.

## **HOW TO DETERMINE CORRECT WATERING TARGETS**

### ***FIXED TARGET:***

If you are establishing Fixed Targets for Mist or Irrigation, you will use the Manual Mode, Set System Mode and the Set Station Mode exclusively. The Set Station Mode is where you enter the target, the Manual Mode is where you trigger the station to zero out the VPD accumulation, the Set System Mode is where you watch the station accumulate VPD and approach the target you entered in the Set Station Mode. When you feel that a station (zone) needs watered you will read the accumulated VPD in Set System for that station and that will be your correct watering target. After doing this a couple of times, you will establish the perfect fixed target for the station. If you, presently, water your crop by using time, there is a shortcut you can use to establish a target. During a span of time when you feel the time clock or whatever timing method you are using is delivering water to the plants adequately, you can do the following:

- a. Set up a station with a High Fixed Target (1000 for Mist and 50,000 for Irrigation). The objective will be to NOT hit the target while we are in the process of figuring out what the target should actually be.
- b. When the time clock or whatever waters the subject plants, go into the Manual Mode and Trigger the Station you have set the high fixed target to.  
You do this by:
  1. Use the RUN/SET switch to go into the Manual Mode.
  2. Use the VALUE switch to answer Yes for whichever Mist Station you are working with or enter a number of times for whichever Irrigation Station you are working with.
  3. Push the PRIOR/NEXT switch toward the NEXT position to activate the station. Leave the ON/OFF/AUTO Switch for this station in the OFF position. The station will zero-out the current VPD Accumulation and start accumulating toward the High Target.

- c. The next time the time clock waters the plants check the current VPD Accumulation for the station. This is your target! You can divide this target by the number of minutes between time clock waterings to come up with a VPD per minute figure. This can give you targets for other time periods you use between waterings.

*CROP AGE TARGETS (INCREASING or DECREASING):*

If you are establishing Crop Age Targets for Mist or Irrigation, you will use the Manual Mode, Set System Mode and the Set Aging Targets Mode exclusively. The Set Aging Targets Mode is where you enter and adjust the targets, the Manual Mode is where you trigger the station to zero out the VPD accumulation, the Set System Mode is where you watch the station accumulate VPD and approach the targets you entered in Set Aging Targets Mode. When you feel that a station (zone) needs watered you will read the accumulated VPD in Set System for that station and that will be your correct watering target. After doing this a couple of times, you can establish the perfect Increasing or Decreasing Crop Age Programs for the crops in your greenhouse. If you water your crop by using time there is a shortcut you can use to establish targets. During a span of time when you feel the time clock or whatever timing method you are using is delivering water to the plants adequately, you can do the following:

- a. Set up a station with a High Fixed Target (1000 for Mist and 50,000 for Irrigation). The objective will be to NOT hit the target while we are in the process of figuring out what the target should actually be.
- b. When the time clock or whatever waters the subject plants, go into the Manual Mode and Trigger the Station you have set the high fixed target to.  
You do this by:
  - 1. Use the RUN/SET switch to go into the Manual Mode.
  - 2. Use the VALUE switch to answer Yes for whichever Mist Station you are working with or enter a number of times for whichever Irrigation Station you are working with.
  - 3. Push the PRIOR/NEXT switch toward the NEXT position to activate the station. Leave the ON/OFF/AUTO Switch for this station in the OFF position. The station will zero-out the current VPD Accumulation and start accumulating toward the High Target.
- c. The next time the time clock waters the plants check the current VPD Accumulation for the station. This is your target for that day of your crop age. You can divide this target by the number of minutes between when you zeroed out the VPD Accumulation and took the current VPD Accumulation, which is the same time it took between time clock waterings. This gives you a VPD per minute figure.
- d. Multiply this figure by any number of minutes you currently use in your crop growing and you have a Target for a specific day. The work you put into this effort will really pay off. If you are establishing for the first time a crop age program to use for misting in propagation it will take effort and time. Will it be worth it? Just think of all the propagation you will do in the future for the crop you are putting this crop age program together.

How about all those plants that you grow in the nursery that actually need more water as they grow and where a Decreasing Target Crop Age Program will satisfy that need from day to day. That should tell you whether your time and patience is worth the effort. Believe us, it will be!

## SYSTEM SETUP

### INITIAL SETUP

After the unit has been installed and tested it's time to start the steps to set it up.

### STATION SETUP

#### SET STATION 1

1. If you want to set up this station, answer YES. Use the VALUE switch to enter this choice.
2. Push the PRIOR/NEXT switch to NEXT to go to the next question.
3. Choose what you would like to do with this station (AUX, MISTING, IRRIGATION, or NOT IN USE). Use the VALUE switch to enter your choice.
4. Push the PRIOR/NEXT switch to NEXT to go to the next question.
5. If you chose AUX, enter in the stations you would like to link to the auxiliary station. Use the VALUE and PRIOR/NEXT switches to link this station to other stations.
6. Push the PRIOR/NEXT switch to NEXT to go to the next question.
7. Choose the amount of time you would like to have this auxiliary station continue running after a station, which is linked to it, turns off. Use the VALUE switch to enter this choice.
8. Push the PRIOR/NEXT switch to NEXT to go to the next question.
9. If you want to change the name, answer YES. Use the VALUE switch to enter this choice.
10. Choose the name you would like to call this station. Use the VALUE and PRIOR/NEXT switches to enter the name.
11. Push the PRIOR/NEXT switch to go to the next station set up.
12. If you chose MISTING or IRRIGATION, choose the type target IRR. (AGING or FIXED) you would like to use. Use the VALUE switch to make your choice.
13. Push the PRIOR/NEXT switch to NEXT to go to the next question.
14. If you chose FIXED TARGET, enter in the target. If you are trying to TARGET determine what the target should be, enter in the highest possible target (300 for a misting station and 10,000 for an irrigation station). Use the VALUE and the PRIOR/NEXT switches to enter this target. Refer to (How to Determine Correct Watering Targets) to learn how to determine your actual target.
15. Push the PRIOR/NEXT switch to NEXT to go to the next question.
16. Choose from what day you would like to keep track of the station. Use the VALUE switch to enter your choice.
17. Push the PRIOR/NEXT switch to NEXT to go to the next question.
18. Choose whether you would like to use a DISABLE program or not. Use the VALUE switch to enter your choice. Remember to a misting station recognizes a disable time relative to sunrise and an irrigation station recognizes a disable time relative to sunset. Both misting and irrigation stations reactivate from disables at sunrise.
19. Push the PRIOR/NEXT switch to NEXT to go to the next question.
20. Choose the VPD Sensor you would like to attach to this station or chose Manual VPD if you would like to run the station as a time clock.
21. Push the PRIOR/NEXT switch to NEXT to go to the next question.

22. If you chose Manual VPD in order to run this station on time, enter VPD in the VPD number. The number you enter in is accumulated once a minute. For Example: If you entered in 100 and your Fixed Target is 60000, it would take 10 hours to reach the target. You will accumulate 100 per minute, 6000 per hour. Use the VALUE and the PRIOR/NEXT switches to enter this target. Manual VPD range is 1 to 999.
23. Push the PRIOR/NEXT switch to NEXT to go to the next question.
24. Choose how long you want the station to activate. Use the VALUE switch to enter your choice.
25. Push the PRIOR/NEXT switch to NEXT to go to the next question.
26. If this is an irrigation station, pulse irrigation may be used by choosing how many times you would like to repeat the watering. Use the VALUE switch to enter your choice.
27. Push the PRIOR/NEXT switch to NEXT to go to the next question.
28. If you decided to use pulse irrigation and chose to repeat watering you may now choose how much time you would like to wait between pulses. Use the VALUE switch to enter your choice.
29. Push the PRIOR/NEXT switch to NEXT to go to the next question.
30. If you want to change the name, answer YES. Use the VALUE switch to enter this choice.
31. Choose the name you would like to call this station. Use the VALUE and PRIOR/NEXT switches to enter the name.
32. Push the PRIOR/NEXT switch to go to the next station setup.
33. If you chose an AGING program, the day of the Crop Age Program you want the station to be on is entered here. You can come back to this after you set up an AGING program to use with this station.
34. Push the PRIOR/NEXT switch to NEXT to go to the next question.
35. Choose whether you would like to Hold The Last Day (which means let the station water after the AGING program has finished as it watered on the last day of the of the AGING program) or Stop Watering. Use the VALUE switch to enter this choice.
36. Push the PRIOR/NEXT switch to NEXT to go to the next question.
37. Choose whether you would like to use a DISABLE program or not. Use the VALUE switch to enter your choice. Remember to a misting station recognizes a disable time relative to sunrise and an irrigation station recognizes a disable time relative to sunset. Both misting and irrigation stations reactivate from disables at sunrise.
38. Push the PRIOR/NEXT switch to NEXT to go to the next question.
39. Choose the VPD Sensor you would like to attach to this station or chose Manual VPD if you would like to run the station as a time clock.
40. Push the PRIOR/NEXT switch to NEXT to go to the next question.
41. If you chose Manual VPD in order to run this station on time, enter VPD in the VPD number. The number you enter in is accumulated once a minute. For Example: If you entered in 100 and your Fixed Target is 60000, it would take 10 hours to reach the target. You will accumulate 100 per minute, 6000 per hour. Use the VALUE and the PRIOR/NEXT switches to enter this target.
42. Push the PRIOR/NEXT switch to NEXT to go to the next question.
43. Choose how long you want the station to activate. Use the VALUE switch to enter your choice.

44. Push the PRIOR/NEXT switch to NEXT to go to the next question.
45. If this is an irrigation station, pulse irrigation may be used by choosing how many times you would like to repeat the watering. Use the VALUE switch to enter your choice.
46. Push the PRIOR/NEXT switch to NEXT to go to the next question.
47. If you decided to use pulse irrigation and chose to repeat watering you may now choose how much time you would like to wait between pulses. Use the VALUE switch to enter your choice.
48. Push the PRIOR/NEXT switch to NEXT to go to the next question.
49. Choose the name you would like to call this station. Use the VALUE and PRIOR/NEXT switches to enter the name.
50. Go to the next station setup.

You have finished the station setup. To continue the system setup, push the RUN/SET switch to enter into the SET AGING TARGET GROUPS Mode.

## **CROP AGING SETUP**

### **SET AGING 1**

1. If you want to set up aging, answer YES. Use the VALUE switch to enter this choice.
2. Push the PRIOR/NEXT switch to NEXT to go to the next question.
3. Choose the number of days that you would like to have in this aging group. Use the VALUE switch to enter your choice.
4. Push the PRIOR/NEXT switch to NEXT to go to the next question.
5. Choose the range for targets (10 to 9990 for misting and 100 to 99900 for irrigation). Use the VALUE switch to enter your choice.
6. Push the PRIOR/NEXT switch to NEXT to go to the next question.
7. Choose the first day target. If you are trying to determine what the target should be, refer to (How To Determine Correct Watering Targets).
8. Push the PRIOR/NEXT switch to NEXT to go to the next question.
9. Choose the final day target. If you are trying to determine what the target should be, refer to (How To Determine Correct Watering Targets).
10. Push the PRIOR/NEXT switch to NEXT to go to the next question.
11. Midpoints (20%, 40%, 60% and 80%) of the overall range from the Day one target to the final day target can be adjusted at this point.

**WARNING:** If this is the FIRST TIME this crop age program has been setup, choose Yes, Reset First. The WATER PRO sets the targets for each day of the crop-aging program. As you do your crop modeling and come back into this crop aging program to adjust the midpoints NEVER answer this question by putting in Yes, Reset First. If you do, you will loose all of your midpoint changes. Choose Yes when you want to come back in and adjust midpoints. Use the VALUE switch to enter this choice.

12. Push the PRIOR/NEXT switch to NEXT to go to the next question.
13. If you want to change the name, answer YES. Use the VALUE switch to enter this choice.
14. Choose the name you would like to call this aging target group. Use the VALUE and PRIOR/NEXT switches to enter the name.

15. Push the PRIOR/NEXT switch to go to the next aging target group setup.

You have finished the crop aging setup. To continue the system setup, push the RUN/SET switch to enter into the SET DISABLE TARGET GROUPS Mode.

## **NIGHT DISABLE SETUP**

### **SET DISABLE 1**

1. If you want to setup a disable, answer YES. Use the VALUE switch to enter this choice.
2. Push the PRIOR/NEXT switch to NEXT to go to the next question.
3. Choose the number of days that you would like to have in this disable group. Use the VALUE switch to enter your choice.
4. Push the PRIOR/NEXT switch to NEXT to go to the next question.
5. Choose the first day disable. Use the VALUE and PRIOR/NEXT switches to enter this value.
6. Push the PRIOR/NEXT switch to NEXT to go to the next question.
7. Choose the Final Day Disable. Use the VALUE and PRIOR/NEXT switches to enter this value.
8. Push the PRIOR/NEXT switch to NEXT to go to the next question.
9. Midpoints (20%, 40%, 60% and 80%) of the overall range from the Day one disable target to the final day disable target can be adjusted at this point.

**WARNING:** If this is the FIRST TIME this disable program has been setup, choose Yes, Reset First. The WATER PRO sets the values for each day of the disable program. If you change any midpoints than come back into this disable program at a later time to adjust the midpoints NEVER answer this question by putting in Yes, Reset First. If you do, you will loose all of your midpoint changes. Choose Yes when you want to come back in and adjust midpoints. Use the VALUE switch to enter this choice.

10. Push the PRIOR/NEXT switch to NEXT to go to the next question.
11. If you want to change the name, answer YES. Use the VALUE switch to enter this choice.
12. Choose the name you would like to call this disable target group. Use the VALUE and PRIOR/NEXT switches to enter the name.
13. Push the PRIOR/NEXT switch to go to the next disable target group setup.

**NOTE:** If you use a Disable Program in conjunction with a Crop Aging Program for a station, and when you change the crop age day, the disable changes as well.

You have finished the night disable setup. To continue the system setup, push the RUN/SET switch and go to the Manual Mode.

Now that you have set the system, stations, crop-aging groups and disable groups, it's time to activate VPD accumulations for each station. We do this in the Manual Mode on the WATER PRO. We will use this mode a lot as you work toward determining the actual targets for your crops.

**NOTE:** ALL STATIONS THAT HAVE BEEN SET UP SHOULD NOW HAVE THEIR ASSOCIATED ON/OFF/AUTO SWITCH IN THE AUTO POSITION.

## **MANUAL MODE**

### **TRIG STATION 1**

**MIST 1.** If the zone connected to this station is ready to be misted, you will start that mist sequence by answering YES to this question. Use the VALUE switch to enter your choice. Once you enter the answer, push the PRIOR/NEXT switch once in the NEXT direction. Two things will happen. First the mist will activate for this station or go into a queue to activate when other stations which are now activated turn off, and second you will move to the next station. The mist will stay on for the length of time you entered in the Set Station Setup and after it turns OFF the VPD Accumulation will zero out for this station. As you do your crop modeling to establish targets you will use the Manual Mode to force mist and zero out VPD Accumulations. Only in the Manual Mode can the VPD Accumulation for a station be zeroed out.

**NOTE: USE OF THE ON/OFF/AUTO SWITCHES DO NOT ZERO OUT VPD ACCUMULATIONS.**

**IRR 1.** If the zone connected to this station is ready to be irrigated, you will start that irrigation sequence by entering the number of times you want the station to irrigate. Once you enter the number, push the PRIOR/NEXT switch once in the NEXT direction. Two things will happen. First the irrigation will activate for the station or go into a queue to activate when other stations which are now activated turn off and second you will move to the next station. The irrigation will stay on for the length of time you entered in the Set Station Setup. The VPD Accumulation will zero out. As you do your crop modeling to establish targets you will use the Manual Mode to force irrigation and zero out VPD Accumulations.

**NOTE: Only in the Manual Mode can the VPD Accumulation for a station be zeroed out.**

**\*\*Refer to How to Determine Correct Watering Targets\*\***

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