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Water Pro VPD Misting and Irrigation Control

WATER PRO

The WATER PRO is a watering controller that can be installed directly in the greenhouse. The basic system consists of the Controller with 12 Built-in Relays, One VPD Sensor, One Photocell Light Sensor and One 24-VAC/40-VA External Transformer.

The WATER PRO gives the grower the ultimate tool to control mist and irrigation for an inside growing area. By constantly monitoring "all" of the environmental changes that surround the plants, the WATER PRO will then automatically regulate the amount of water delivered to the plants.

The WATER PRO is a standalone system. The system can be expanded with the addition of a WATER PRO EXPANSION unit. This adds 12 more Relay Outputs. A second VPD Sensor can also be added. The WATER PRO can be connected to a remote PC and used with the optional GROWLINK Software for sensor data logging and remote control operation.

USE A QUALIFIED AND LICENSED ELECTRICIAN AT ALL TIMES

TRANSFORMER – wire to the two AC screws, the ground screw is not used. Be careful not to cross the wires of the power cord or energized solenoid wires. The resulting short will blow the transformer.

ELECTRICAL CIRCUIT

The electrical circuit that feeds the machine tool transformer must have no other loads connected to it. This will prevent damaging surges from other related electrical devices. Follow all local and national codes in the connection of all of the greenhouse equipment. Always allow for voltage drop conditions. Always consider that the greenhouse is a wet environment. Plug the transformer into a surge protector.
*** We would highly recommend using a surge protector when operating your misting controller so that it will stop voltage spikes and surges that could damage your controller, such damage is not covered by your warranty.**

WIRING METHODS

Always use stranded copper wire when connecting cables or conductors to the WATER PRO termination board and WATER PRO EXPANSION module plugs. Stranded wire allows more flexibility. Do not use any wire smaller than #18 gauge stranded for all outputs. Remember to always use a qualified and licensed electrician.

SENSOR CONDUCTORS

Always route the sensor conductors separately from the control conductors. This is very important 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 to reduce electrical interference. Control conductors may be routed in conduits that contain other power system wiring only if the insulation material on the control conductors is the same as that of the power system wiring. Consult the national electrical code or local codes if in doubt about the insulation ratings of the wire in use.

NOTE: WHEN FIRST SETTING UP AND BEFORE PROVIDING POWER TO THE WATER PRO, MAKE CERTAIN ALL OF THE ON/OFF/AUTO SWITCHES ARE IN THE OFF POSITION. THIS APPLIES TO 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 to be controlled. 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 built into the WATER PRO enclosure.

INSTALLING A WATER PRO EXPANSION MODULE (OPTIONAL)

1. CAUTION! First Turn the WATER PRO unit OFF.
2. Connect the conductors from your solenoid valves (24VAC type) to the WATER PRO EXPANSION module plugs.
3. Make sure all plugs are secured into the WATER PRO EXPANSION module then turn the screw locking the panel in its enclosure and latch the Lexan door.
6. Make sure all ON/OFF/AUTO switches are in the **OFF** position.

Refer to STATION SET-UP, to set up the new expansion stations

INSTALLING AN ADDITIONAL VPD SENSOR (OPTIONAL)

1. Hang the VPD Sensor in the middle of the area to be controlled. If the distance from the WATER PRO exceeds 100 feet, run a Sensor Extension Cable from the WATER PRO and connect it to the VPD Sensor Cable.
2. Connect the VPD Sensor to the termination connector on the back of the WATER PRO.

Consider purchasing a second VPD Sensor for the following reasons:

1. More thorough sensing control of the watering area or zone is needed.
2. Additional greenhouse watering area/zones to be controlled.
3. Back-up.

INSTALLING A GROWLINK PC CONTROL CABLE (OPTIONAL)

1. Run the communications cable from the PC location to the WATER PRO. This is a special type of computer communications cable (RS-485) and the maximum distance the WATER PRO can be from the PC is 5000 feet.
2. Connect the communication cable to the WATER PRO. Up to 32 WATER PRO units can be linked on the communications line. The farthest WATER PRO in the

chain cannot exceed the 5000 foot maximum.

After all equipment has been installed, all interconnection wiring has been completed and sensors are in place and connected into the WATER PRO, the system should be tested.

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 powering on the unit, test your installation by turning **ON** each of the Output Stations, one at a time, with the corresponding ON/OFF/AUTO switch. Move the switch to the **ON** position for this test. (Not AUTO). The device (solenoid valve, pump, injector, etc.) that is wired to this station should activate. Move the switch back to the **OFF** position before activating the next Output Station.

FEATURES OF THE EQUIPMENT

INPUTS and OUTPUTS

The Sensor Inputs to the WATER PRO are as follows:

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. Sunrise/Sunset from 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 unit has 12 outputs that can be expanded to 24 outputs by adding a WATER PRO SYSTEM EXPANSION module. Each output is custom designed to your greenhouse specifications. Typically, they're defined as Irrigation, Misting, Aux (pumps, injectors, etc.), or Not Used.

INDICATOR LIGHTS
- Run
- Manual Mode
- Set System
- Set Station
- Set Aging Target Groups
- Set Alarms
- Calibrate
- End of Schedule Warning (Blinks when crop age finished)

SWITCHES
Top left **RUN/SET** Switch
Top center **PRIOR/NEXT** Switch

Top right **VALUE** Switch

RUN/SET
Switch Up: Starts the **Run** Mode and clears an Alarm.
Switch Down: Toggles between all Modes. (Run, Manual, Set System, Set Stations, etc.)

PRIOR/NEXT
Switch Up: Moves to the previous item within the current Mode.
Switch Down: Moves to the next item within the current Mode.

VALUE
Switch Up: Increases the displayed value. In Run Mode, freezes the display.
Switch Down: Decreases the displayed value. In Run Mode, freezes display.

NOTE: Holding down both the PRIOR/NEXT and the VALUE Switches for 5-seconds will reset the unit to its factory defaults.

SETTING UP THE UNIT

GENERAL MODES:
RUN
When the WATER PRO is in the Run Mode, the LCD Display will scroll through the following information:

- Time
- Date
- Customer Identification (entered by owner)
- Air Temperature #1
- Leaf Temperature #1
- Relative Humidity #1
- Air Temperature #2 (If optional sensor installed)
- Leaf Temperature #2 (If optional sensor installed)
- Relative Humidity #2 (If optional sensor installed)
- VPD #1 Calculation
- VPD #2 Calculation (If optional sensor installed)

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

MANUAL MODE
This Mode is used to activate the individual stations. When a station is activated manually, the VPD Accumulation Total for that station ZEROS OUT and starts a new accumulation. Each station that has been set up in the system and made active will ask the question TRIG STATION with the number of that station. For stations that have been setup for MIST the choices will be, YES or NO. For stations that have been set up for IRRIGATION the choices will be the number of times to trigger that station, (0 to 5).

NOTE: THIS IS THE ONLY MODE WHERE THE ACCUMULATED VPD CAN BE ZEROED OUT.

SET SYSTEM

This Mode is used to set the following:

- Number of VPD Sensors: 1 or 2
- Number of Stations: 1 to 12 (Up to 24 with the EXPANSION)
- Number of Aging Groups: 1 to 6
- Number of Disable Groups: 1 to 4
- Max Number of Stations ON: 1 to 24, please set for 4 or less to prevent over taxing transformer
- End Of Sched Alarm: NO or YES
- Set Clock: (enter correct time)
- 8. Month/Day/Year: (enter date)
- 9. Sunrise & Sunset: (enter correct times)
- 10. Light Sensor Sensitivity: Low/Med/High
- 11. Custom System ID: Off/Display/Program
- 12. Review I/O Assignments: NO or YES
- 13. Remote ID Code: 0 to 31
- 14. Temperature Read in: F or C

This Mode provides a lot of information to the grower, once the stations have been entered into the unit. After all stations are set up and the SET SYSTEM Mode is activated, the display will read, SHOW STATUS? Answer YES to see information on 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 all questions with only the number of stations, crop aging groups and disable groups that are currently being set up. This will prevent the unit from asking for information about stations, crop age groups, and disable groups that do not exist.

SET STATION

This Mode is used to set up each of the stations. Choose whether the station will be used for Misting, Irrigation, Auxiliary or Not Used. Then choose from 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 Crop Aging. Set up to six different groups. Crop Age Groups can be set up for both Misting and Irrigation stations with either Increasing or Decreasing Targets. The 20%, 40%, 60%, and 80% midpoint targets for the Crop Age Group can be changed. If the 20% target is changed, this will affect all targets from the Day 2 Target to the target for the day prior to the 40% midpoint target. If the 40% midpoint target is changed, this will affect 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 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 being adjusted is lower than the previous midpoint target or higher than the next midpoint target. This is just an indicator to assist in setting up targets. Even though the message (Too Low or Too High) might flash, the unit will accept whatever target is entered.

If 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 being adjusted is higher than the previous midpoint target or lower than the next midpoint target. This is just an indicator to assist in setting up targets. Even though the message (Too High or Too Low) might flash, the unit still accepts whatever target is entered.

SET DISABLE TARGET GROUPS
This Mode is used to set up the nighttime Disables. Set up to four different groups. When setting up a group that is attached to a misting station, the misting station will disable for the amount of time called for in the Disable Group prior to Sunrise. When attaching the Disable Group to an irrigation station, the irrigation station will disable for the amount of time called for in the Disable Group prior to Sunset. No matter what type of station (misting or irrigation) is disabled, 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. Alarms will activate a warning if environmental conditions in the greenhouse exceed the chosen parameters. Both High and Low Alarms can be set. The WATER PRO can be connected to an existing external alarming system (Sensaphone, bell, light, etc...). A dry relay hookup for the alarm system is provided on the termination board in the bottom of the WATER PRO. The dry relay for the alarm can also be used to warn when a crop-aging program has finished.

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

END OF SCHEDULE WARNING
This Mode will activate when a CROP AGE has finished on one of the stations. The LED Light will activate and blink when a Crop Age has finished.

HOW TO DETERMINE VPD TARGETS

MIST To determine the target for a particular station, do the following: In the SET STATION MODE for a MIST STATION, 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 the grower has determined the daily target. When the grower believes the mist station needs to be watered, do the following: In the MANUAL MODE, choose the mist station and activate it while noting the time of day. When the plants need to be watered the very next time, **(THE GROWER NEEDS TO DETERMINE THIS BY PHYSICALLY WATCHING THE PLANTS)**, note the reading of the Accumulated VPD for this station in the SHOW SYSTEM MODE as well as the new time of day. You now have the target for the day. Go into the SET STATION MODE, choose the station and enter in the new target.

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

To go the next step with the available information, the targets for each day that the crop will be under mist at this specific station can be calculated. Do the following: Take the NEW TARGET and divide by the number of minutes between the two mists. This gives the VPD per minute. For each daily target, calculate how much time between each misting for that specific day if the environmental conditions were identical to the first target. Multiply the number of minutes by the VPD per minute to develop a target for each day. Hint: If developing a model for 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, do the following: In the SET STATION MODE for an IRRIGATION STATION, 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 the grower determines the daily target. When the grower believes the irrigation station needs to be watered, do the following: In the MANUAL MODE, choose the station and activate it while noting the time of day. When the plants are ready to be watered the very next time **(THE GROWER NEEDS TO DETERMINE THIS BY PHYSICALLY WATCHING THE PLANTS)**, note the reading of the Accumulated VPD for this station in the SHOW SYSTEM MODE as well as the new time of day. You now have the target for the day. Go into the SET STATION MODE, choose the station and enter in the new target.

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

To go the next step with the available information, the targets for each day that the crop will be under irrigation at this specific station can be calculated. Do the following: Take the NEW TARGET and divide by the number of hours between the two irrigations. This gives the VPD per hour. Multiply the number of hours by the VPD per hour to develop a target for each day. Hint: If developing a model to do irrigation, the targets should go down as the plant grows. Targets going down mean that the amount of irrigation is going up.

UNDERSTANDING VPD (VAPOR PRESSURE DEFICIT)

There has been a significant amount of study by environmental and horticultural experts concerning the basic principles of VPD and its usefulness in determining the watering needs of plants. Unlike other methods used to determine watering needs, VPD has turned out to be the most accurate method to date. VPD looks at all the environmental conditions surrounding the plant. The MICRO GROW VPD Sensor measures the air temperature, relative humidity, and the temperature of the plant leaf. These instantaneous sensor values determine the VPD of the plants in the greenhouse at regular intervals. As the environmental conditions change so does the VPD. By adding the VPD intervals together, a pattern or target emerges where we know the plant must have water. After watering the plant, the process starts all over again.

Just what is VPD and how does it relate to plants? To understand VPD we must understand the following:

1. How water moves through a plant.
2. A plant's structure.
3. How environmental factors affect a plant's 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 in 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 its needs. It's the changes that take place in the leaf, not in the soil, that determines the plant's watering requirements.

Plant Structure

Water evaporates from plant 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 (humidity) in the air inside the leaf and the amount of water in the air around the leaf. The greater this difference, the faster the plants lose water.

Plants and the Environment

One example to understand the basics of VPD is as follows: Take a basin of water and a

dry sponge and bring them together. This will cause each of them to try and neutralize the other. The basin will lose water and the dry sponge will gain water. This same neutralizing principle happens with plants. Take a plant and put it into a dry (low humidity) environment and the plant will transpire more than usual. 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:

To establish Fixed Targets for Mist or Irrigation, use the Manual Mode, the Set System Mode and the Set Station Mode exclusively. The Set Station Mode is where the target is entered. The Manual Mode is where the station is activated to zero out the VPD accumulation. The Set System Mode is where the accumulated VPD information is displayed as it approaches the target that was entered in the Set Station Mode. When a station (zone) needs to be watered, read the accumulated VPD in Set System for that station and that will be the correct watering target. After doing this a couple of times, a perfect fixed target for the station will be established.

If the crop is presently being watered using time intervals, there is a shortcut to establish a target. During an interval when the timing method being used is delivering water to the plants adequately, do the following:

1. 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 in the process of calculating what the target should actually be.
2. When the timer or other device being used waters the plants, go into the Manual Mode and Trigger the Station with the high fixed target.
To do this:
    a) Use the **RUN/SET** switch to go into the Manual Mode.
    b) Use the **VALUE** switch to answer YES for the Mist Station or enter the number
    of times for the Irrigation Station.
    c) 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.
3. The very next interval that the timer waters the plants, check the current VPD Accumulation for the station. This is the target! Divide this target by the number of

minutes (or hours) between each timer watering to calculate a VPD per minute (or hour) figure. This method will help determine targets for other time periods being used between waterings.

CROP AGE TARGETS (INCREASING or DECREASING):

If establishing Crop Age Targets for Mist or Irrigation, use the Manual Mode, Set System Mode and the Set Aging Targets Mode exclusively. The Set Aging Targets Mode is where the target is entered and adjusted. The Manual Mode is where the station is triggered to zero out the VPD accumulation. The Set System Mode is where the accumulated VPD information is displayed as it approaches the targets entered in the Set Aging Targets Mode. When a station (zone) needs to be watered, read the accumulated VPD in Set System for that station and that will be the correct watering target. After doing this a couple of times, a perfect Increasing or Decreasing Crop Age Program will be established. If the crop is presently being watered using time intervals, there is a shortcut to establish a target.

During an interval when the timing method being used is delivering water to the plants adequately, do the following:

1. 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 in the process of calculating what the target should actually be.
2. When the timer or other device waters the plants, go into the Manual Mode and Trigger the Station with the high fixed target.

To do this:

a) Use the **RUN/SET** switch to go into the Manual Mode.

b) Use the **VALUE** switch to answer YES for the Mist Station or enter a number of times for the Irrigation Station.

c) 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.

3. The very next interval that the timer waters the plants, check the current VPD Accumulation for the station. This is the target for that day of your crop age. Divide this target by the number of minutes (or hours) between the time when the VPD Accumulation was zeroed out and the current VPD Accumulation. This should be the same as the time between timer waterings. This yields a VPD per minute figure.
4. Multiply this figure by any number of minutes (or hours) currently used in crop growing to obtain a Target for a specific day.

Establishing a crop age program for the first time will require hard work and diligence. However, the ability to use Crop Age Targets for misting and irrigation will be well worth the trouble, considering all of the propagation of one's greenhouse. The effort put into this now will pay off in the future. Especially for plants grown in the nursery that need more water as they grow, a Decreasing Target Crop Age Program will satisfy those needs daily.

STATION SETUP

SET STATION 1

1. To set up this station, answer YES using the **VALUE** switch to enter this choice.
2. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
3. Choose the activity for this station (AUX, MISTING, IRRIGATION, or NOT IN USE). Use the **VALUE** switch to enter a choice.
4. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
5. **If choosing AUX**, enter in the stations 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 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. To change the name, answer YES using the **VALUE** switch to enter this choice.
10. Designate the name of 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 choosing MISTING or IRRIGATION**, choose the type of target (AGING or FIXED) to use. Use the **VALUE** switch to enter this choice.
13. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
14. **If choosing FIXED TARGET**, enter in the target. If attempting to determine a new target, enter a high target (1000 for a misting station and 50,000 for an irrigation station). Use the **VALUE** and the **PRIOR/NEXT** switches to enter this target. Refer to the section titled; How to Determine Correct Watering Targets, for complete instructions on using targets.
15. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
16. Choose the day to begin keeping track of the station. Use the **VALUE** switch to enter this choice.
17. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
18. Choose whether or not to use a DISABLE program. Use the **VALUE** switch to enter this choice. Remember that 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 to attach to this station or choose Manual VPD to run the station as a time clock.
21. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
22. **If choosing Manual VPD** in order to run this station using time, enter in the VPD number. The number entered is accumulated once a minute. For example, if 100 were entered and the Fixed Target was 60000, it would take 10 hours to reach the target. An accumulation of 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 the length of time the station will activate (water/mist the plants when the target is reached). Use the **VALUE** switch to enter this 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 the number of times to repeat the watering. Use the **VALUE** switch to enter this choice.
27. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
28. **If using pulse irrigation** by repeat watering, now decide how much time should elapse between pulses. Use the **VALUE** switch to enter this choice.
29. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
30. To change the name, answer YES. Use the **VALUE** switch to enter this choice.
31. Designate the new name of 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 choosing an AGING program**, the day of the Crop Age Program the station is to be on can be entered here. Return to this selection after an AGING program is set up for use with this station.
34. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
35. Choose whether to Hold The Last Day (which means let the station water after the AGING program has finished, exactly as it watered on the last day of the of the AGING program) or to 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 or not to use a DISABLE program. Use the **VALUE** switch to enter this choice. Remember that 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 to attach to this station or choose Manual VPD to run the station as a time clock.
40. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
41. **If choosing Manual VPD** in order to run this station using time, enter in the VPD number. The number entered is accumulated once a minute. For example, if 100 were entered and the Fixed Target was 60000, it would take 10 hours to reach the target. An accumulation of 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.
42. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
43. Choose the length of time the station will activate (water/mist the plants when the target is reached). Use the **VALUE** switch to enter this 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 the number of times to repeat the watering. Use the **VALUE** switch to enter this choice.
46. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.

47. **If using pulse irrigation** by repeat watering, now decide how much time should elapse between pulses. Use the **VALUE** switch to enter this choice.
48. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
49. Designate the new name of this station. Use the **VALUE** and **PRIOR/NEXT** switches to enter the name.
50. Go to the next station setup.

CROP AGING SETUP

SET AGING 1

1. To set up aging, answer YES, using the **VALUE** switch to enter this choice.
2. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
3. Choose the type of targets (Increasing for Mist, Decreasing for Irrigation).
4. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
5. Choose the number of days in this aging group. Use the **VALUE** switch to enter this choice.
6. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
7. Choose the range for targets (10 to 9990 for misting and 100 to 99900 for irrigation). Use the **VALUE** switch to enter this choice.
8. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
9. Choose the first day target. When attempting to determine a new target, refer to the section; How To Determine Correct Watering Targets.
10. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
11. Choose the final day target. If attempting to determine this target, refer to the section, How To Determine Correct Watering Targets.
12. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.

WARNING: If this is the FIRST TIME this crop age program has been set up, choose "Yes, Reset First". The WATER PRO resets the targets for each day of the crop aging program. As the crop modeling continues, it will be necessary to re-enter this program to adjust the midpoints. NEVER answer this question by choosing "Yes, Reset First". Doing so will erase all of the midpoint changes. Choose, "Yes" when re-entering this program to adjust the midpoints. Use the VALUE switch to enter this choice.

13. 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.
14. Push the **PRIOR/NEXT** switch to NEXT to go through the midpoint settings.
15. Once completely through the midpoint settings, the Day 1 Target will come up. To review each day's target, push the **VALUE** switch.
16. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
17. To change the name, answer YES. Use the **VALUE** switch to enter this choice.
18. Designate the name of this aging target group. Use the **VALUE** and **PRIOR/NEXT** switches to enter the name.
19. Push the **PRIOR/NEXT** switch to go to the next aging target group setup.

NIGHT DISABLE SETUP

SET DISABLE 1

1. 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 in this disable group. Use the **VALUE** switch to enter this 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. Remember, if setting up this disable to attach to a misting station, the amount of time entered here is the amount of time prior to sunrise the disable will become active. If setting up this disable to attach to an irrigation station, the amount of time entered here is the amount of time prior to sunset the disable will become active. All disables become inactive at sunrise.
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. Remember, if setting up this disable to attach to a misting station, the amount of time entered here is the amount of time prior to sunrise the disable will become active. If setting up this disable to attach to an irrigation station, the amount of time entered here is the amount of time prior to sunset the disable will become active. All disables become inactive at sunrise.
8. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.

WARNING: If this is the FIRST TIME this crop age program has been set up, choose "Yes, Reset First". The WATER PRO resets the targets for each day of the crop aging program. As the crop modeling continues, it will be necessary to re-enter this program to adjust the midpoints. NEVER answer this question by choosing "Yes, Reset First". Doing so will erase all of the midpoint changes. Choose, "Yes" when re-entering this program to adjust the midpoints. Use the VALUE switch to enter this choice.

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.
10. Push the **PRIOR/NEXT** switch to NEXT to go through the midpoint settings.
11. Once completely through the midpoint settings, the Day 1 Target will come up. To review each day's target, push the **VALUE** switch.
12. Push the **PRIOR/NEXT** switch to NEXT to go to the next question.
13. To change the name, answer YES. Use the **VALUE** switch to enter this choice.
14. Designate the name of this disable target group. Use the **VALUE** and **PRIOR/NEXT** switches to enter the name.
15. Push the **PRIOR/NEXT** switch to go to the next disable target group setup.

NOTE: If using a Disable Program in conjunction with a Crop Aging Program for a specific station, changing the crop age day will change the disable day as well.

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

MANUAL MODE

Example #1

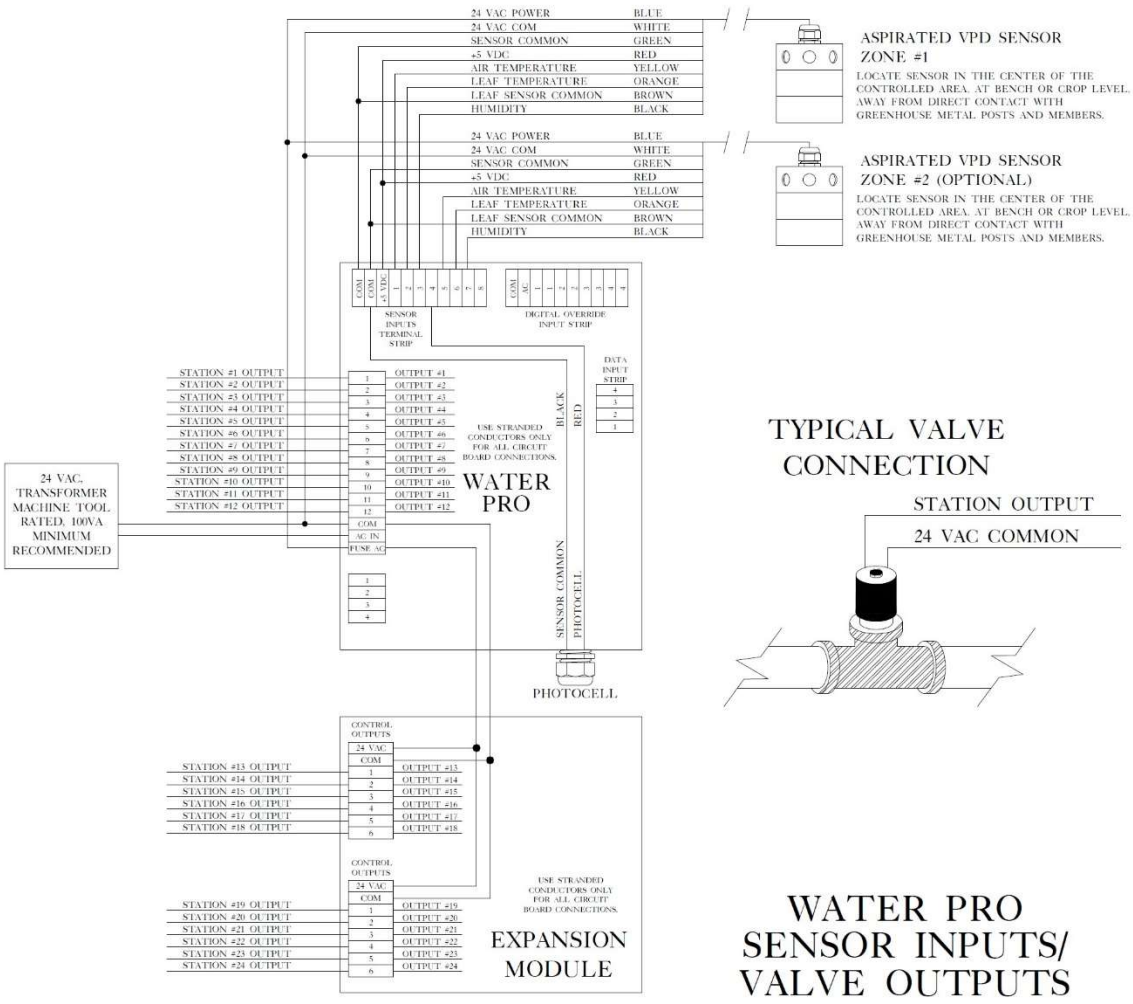
TRIG STATION 1
If the zone connected to this station is ready to be misted, start that
mist sequence by answering YES to this question. Use the **VALUE** switch to enter your choice. Once you enter the answer, push the **PRIOR/NEXT** switch once in the NEXT direction. Two things will happen. First, the mist will activate for this station or go into a queue to activate when the other stations which are currently activated finish. Second, you will move to the next station. The mist will stay on for the length of time entered in the Set Station Setup. After it turns OFF, the VPD Accumulation will zero out for this station. Continue crop modeling to establish targets using 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.

Example #2

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

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


24 VAC POWER BLUE
24 VAC COM WHITE
SENSOR COMMON GREEN
+5 VDC RED
AIR TEMPERATURE YELLOW
LEAF TEMPERATURE ORANGE
LEAF SENSOR COMMON BROWN
HUMIDITY BLACK
ASPIRATED VPD SENSOR ZONE #1
LOCATE SENSOR IN THE CENTER OF THE CONTROLLED AREA, AT BENCH OR CROP LEVEL, AWAY FROM DIRECT CONTACT WITH GREENHOUSE METAL POSTS AND MEMBERS.
ASPIRATED VPD SENSOR ZONE #2 (OPTIONAL)
SENSOR INPUTS TERMINAL STRIP
DIGITAL OVERRIDE INPUT STRIP
DATA INPUT STRIP
STATION #1 OUTPUT
STATION #2 OUTPUT
STATION #3 OUTPUT
STATION #4 OUTPUT
STATION #5 OUTPUT
STATION #6 OUTPUT
STATION #7 OUTPUT
STATION #8 OUTPUT
STATION #9 OUTPUT
STATION #10 OUTPUT
STATION #11 OUTPUT
STATION #12 OUTPUT
24 VAC, TRANSFORMER MACHINE TOOL RATED, 100VA MINIMUM RECOMMENDED
USE STRANDED CONDUCTORS ONLY FOR ALL CIRCUIT BOARD CONNECTIONS.
WATER PRO
BLACK
RED
SENSOR COMMON
PHOTOCELL
PHOTOCELL
CONTROL OUTPUTS
STATION #13 OUTPUT
STATION #14 OUTPUT
STATION #15 OUTPUT
STATION #16 OUTPUT
STATION #17 OUTPUT
STATION #18 OUTPUT
STATION #19 OUTPUT
STATION #20 OUTPUT
STATION #21 OUTPUT
STATION #22 OUTPUT
STATION #23 OUTPUT
STATION #24 OUTPUT
EXPANSION MODULE
TYPICAL VALVE CONNECTION
STATION OUTPUT
24 VAC COMMON
WATER PRO SENSOR INPUTS/ VALVE OUTPUTS

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