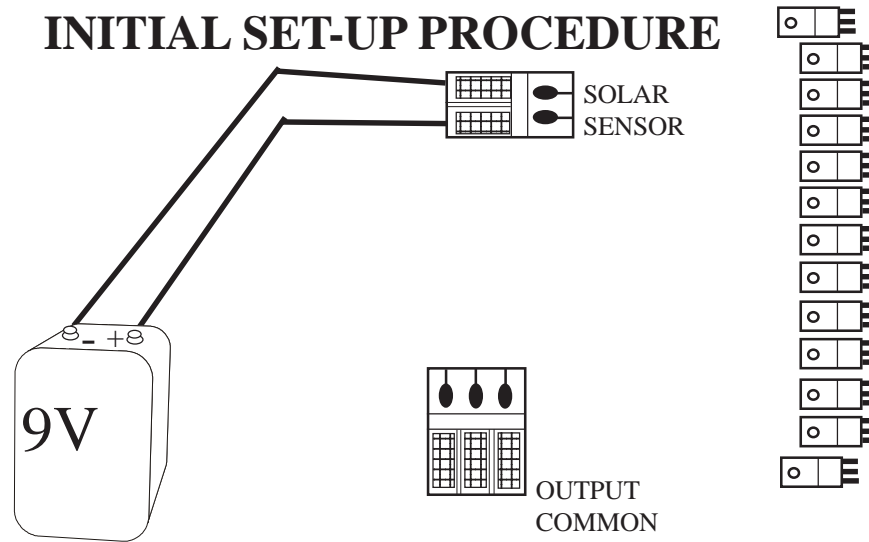


SOLAR-GRO 12 INSTALLATION INSTRUCTIONS: INITIAL SET-UP PROCEDURE



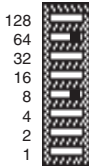
With a 9V battery attached to the Solar Input leads as depicted above, The reading will be from 1,700 to 9,800 FOOT-CANDLES. This is an inexpensive and convenient method of "Testing" the Solar 12's capabilities in your home before putting it into action in your greenhouse.

IF YOU HAVE:



AND:

ZONE 1 SEC ON



THEN PRESS:

MANUAL START



If you want to initiate a watering cycle by pushing the MANUAL START button, the Solar Cel must be reading sunshine as indicated by the LED read-out, then the controller will water each zone that is "on" for that length of time.

IF YOU HAVE:



YOU MUST HAVE:

NIGHT-TIME WATERING

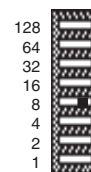


REPEAT INTERVAL IN HOUR

ZONE 1

AND:

SEC ON



THEN PRESS:

MANUAL START



If you want to initiate a watering cycle by pushing the MANUAL START button, and the Solar Cel is not reading sunshine as indicated by the LED read-out, then you must have the SEC ON pushed "on" in NIGHT-TIME WATERING and at least one switch "on" in each zone, then the controller will water each zone that is "on" for the length of time set in the zone.

If you attempt to initiate a watering cycle and do not have the switches set as described, Zone 1 will flash momentarily and CYCLES TODAY will increase in number even though only Zone 1 may water for a short duration. This may also increment cycles today by more than one.

SOLAR-GRO 12 INSTALLATION INSTRUCTIONS:

INITIAL SET-UP PROCEDURE PHASE 1

(stylus)

FLASHES
ZONE THAT
IS "ON" 0

MANUAL
START ■

← ON OFF →

<p>ZONE 1</p> <p>128 64 32 16 8 4 2 1</p> <p>→ SEC ON</p>	<p>uMOLES/sec/m²m WATTS/m²m FOOT-CANDLES LANGLEYS/day KILOLUX CYCLES TODAY YESTERDAY LAST 7 DAYS</p> <p>1 2 3 4 5 6 7 8</p> <p>SOLAR INTENSITY</p>
<p>ZONE 2</p> <p>128 64 32 16 8 4 2 1</p> <p>→ SEC ON</p>	<p>Down-Count MOLES Down-Count MINUTES Since Sunrise MOLES Previous Day MOLES Previous 3 Days MOLES Previous 10 Days MOLES Sunrise Watering ZONE Delay</p> <p>9 10 11 12 13 14 15 16</p> <p>SOLAR GAIN</p>
<p>ZONES 3-12</p> <p>128 64 32 16 8 4 2 1</p> <p>→ SEC ON</p>	<p>HYDRO-GARDENS 800-634-6362</p> <p>ITEM 6W012 SOLAR - GRO 12</p>
<p>DAY-TIME REPEAT INTERVAL</p> <p>MOLES 8.0 4.0 2.0 1.0 .8 .4 .2</p> <p>HOURS</p>	<p>Use NIGHT-TIME WATERING only when you determine:</p> <ol style="list-style-type: none"> 1) The SOLAR CEL is not sending a signal to the SOLAR GRO 12 and you are using it as a day-timer. 2) You wish to water at night.
<p>NIGHT-TIME WATERING</p> <p>8 4 2 1</p> <p>REPEAT INTERVAL IN HOUR</p>	

The SOLAR-GRO 12 uses the SOLAR SENSOR to distinguish between DAY TIME and NIGHT TIME. At shortly after sunrise, the SOLAR-GRO 12 will acknowledge daytime as soon as it has collected .02 MOLES of sun. It will move "Since Sunrise MOLES" collected the previous day to "Previous Day MOLES". "Previous Day MOLES" will be added to "Previous 3 Days MOLES", etc. If a voltage interruption occurs (power outage), the SOLAR-GRO 12 will lose all of the information it has collected.

If the SOLAR-GRO 12 ever fails to water as scheduled, the SOLAR CEL may be damaged or not functioning properly, the SOLAR-GRO 12 can still be used as a "regular" timer. If the SOLAR CEL is not attached, the SOLAR-GRO 12 will not be able to distinguish day from night, and will water based on the programmed schedule 24 hours a day. Therefore, you will need to unplug it at night, and plug it back in again in the morning. THIS PROCEDURE WILL NOT WORK IF THE SWITCHES FOR EACH ZONE AND

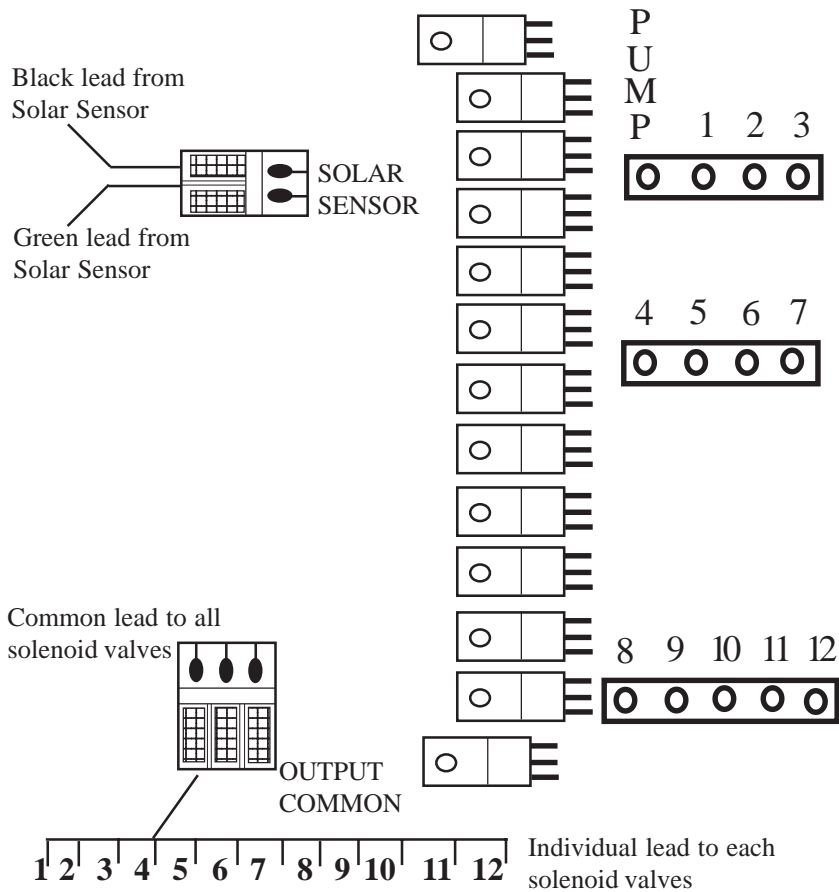
THE "NIGHT-TIME WATERING" ARE NOT PUSHED "ON". The "on time" length will be set by the "SEC ON" in the zone & a zone will **only** be activated if at least one of its "SEC ON" switches is "on".

INITIAL CHECK OUT PROCEDURE BEFORE INSTALLING IN YOUR GREENHOUSE

- 1) Connect an electrical cord (120 volts) to the leads of the SOLAR-GRO 12 transformer.
- 2) The display will read "0" in the far right LED.
- 3) With the stylus, push the "on" switches indicated above. All other switches should be off.
- 4) Push the MANUAL START button.
- 5) The display will flash the number of the zone that is "on" for 15 seconds and then flash "0".
- 6) If you have a solenoid valve, or other device that "measures" 24 volts, hold one lead to the common output, and the other to the zone that is "on". This will confirm that all zones are operating correctly, and will help you become familiar with the SOLAR-GRO 12.

SOLAR-GRO 12 INSTALLATION INSTRUCTIONS:

INITIAL SET-UP PROCEDURE PHASE 2

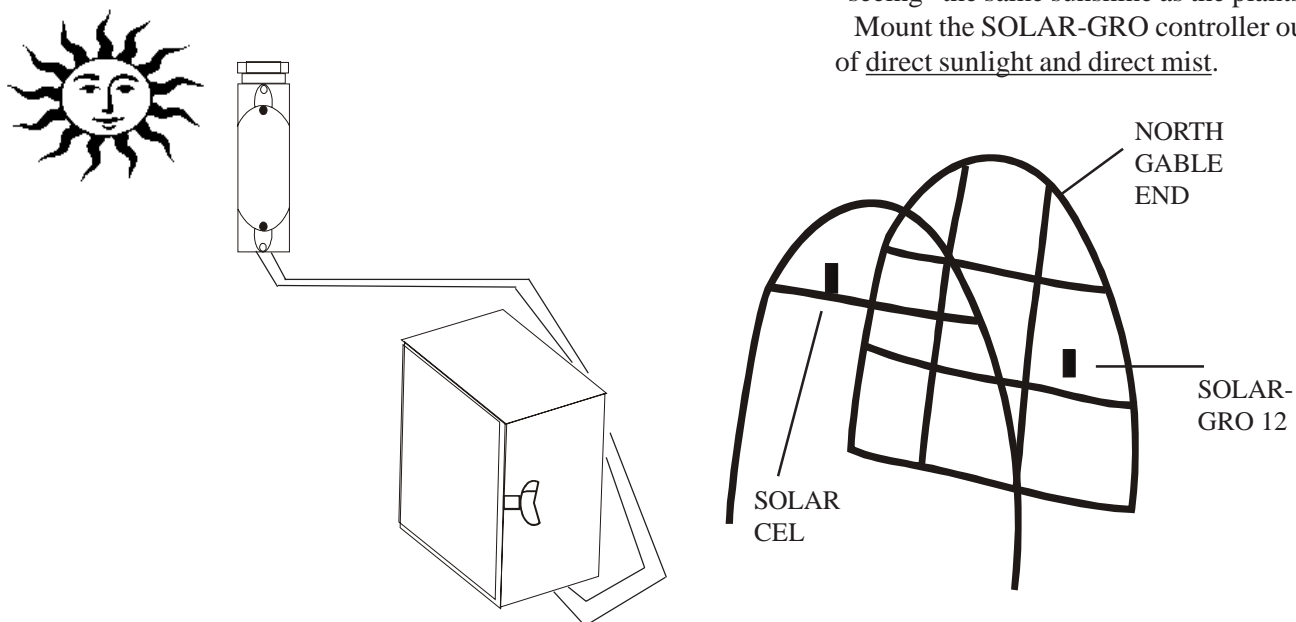


The bottom circuit board where you will connect the wires for your solenoid valves is pictured opposite. If you don't understand wiring, have a qualified electrician do the wiring for you. If high power transmission lines are nearby, use shielded wire to connect the SOLAR-GRO. If not, use 18 - 24 gauge coated wire. Shield this wire from direct sunlight and mist to extend its life. The maximum distance you can mount the SOLAR-GRO is 100 feet.

The pump terminal is "on" during the entire watering cycle and can be used to run a pump with a 24 volt relay.

The SOLAR SENSOR should be vertically (pointed toward the sky as pictured below) on a greenhouse frame member with the white disk not shaded by anything. It should be high enough in the greenhouse to prevent shading from the SOLAR CEL "seeing" the same sunshine as the plants.

Mount the SOLAR-GRO controller out of direct sunlight and direct mist.



SOLAR-GRO 12 INSTALLATION INSTRUCTIONS:

The concept of using the SOLAR-GRO 12 as your watering schedule controller is based on the premise that the plants will not need to be watered until they have absorbed enough available solution from the media. This only occurs when the intensity and length of sunshine striking their leaves make photosynthesis occur steadily. Your initial setting may be the same as that depicted on the previous page which is based on spring/summer conditions.

If the SOLAR-GRO 12 accumulates 1,000,000 uMoles in an hour, it will then water every 2 hours because it has collected 1 Mole each hour. 1 Mole is the same as accumulating 6000 Foot-Candles in an hour. You can switch your SOLAR-GRO 12 from “uMOLES/sec/m*m” and “FOOT-CANDLES/hr” to see this relationship.

Tomato and cucumber plants need about 3,000 foot-candles before they can begin effective photosynthesis. This amount of light is typically seen during a moderately cloudy winter day. The approximate minimum for decent growth is a daily accumulation of 60,000 Foot-Candles. During a moderately cloudy winter day as previously mentioned, only 24,000 Foot-Candles will be collected during an 8 hour day. This is far below the minimum for good growth.

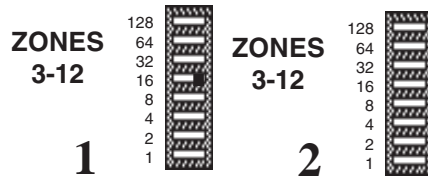
TABLE OF MEASUREMENT COMPARISON

1,000,000 uMOLES	=	1 MOLE
16,667 uMOLES/sec/m*m accumulated	=	1 MOLE accumulated
6,000 Foot-Candles constant for an hour	=	1 MOLE accumulated
7,533 Foot-Candles	=	1 LANGLEY
93 Foot-Candles	=	1 KILOLUX
10.8 Foot-Candles	=	1 WATT/m*m

A constant read-out of 472 uMOLES/sec/m*m will result in 1 MOLE being collected in a hour. At this level of light, the Foot-Candles reading will be about 3,000.

WHAT TO EXPECT FROM YOUR SOLAR-GRO 12

The timer will “walk thru” Zone 3 through Zone 12 even if nothing is controlled by these zones when you have allocated time with a “SEC ON” switch. Drawing 1 will water Zones 3 thru 12 for 16 seconds each (192 seconds total time). Drawing 2 will NOT water Zones 3 thru 12.



<p>DAY-TIME MOLES HOURS</p> <p>REPEAT 8.0</p> <p>INTERVAL 4.0</p> <p> 2.0</p> <p> 1.0</p> <p> .8</p> <p> .4</p> <p> .2</p> <p>Will initiate watering every 2 MOLES.</p>	<p>DAY-TIME MOLES HOURS</p> <p>REPEAT 8.0</p> <p>INTERVAL 4.0</p> <p> 2.0</p> <p> 1.0</p> <p> .8</p> <p> .4</p> <p> .2</p> <p>Will initiate watering every 2 HOURS.</p>
--	--

NIGHT-TIME WATERING REPEAT INTERVAL IN HOUR

8

4

2

1

Will water every 2 hours at night based on your zone settings.

SWITCH ON WILL DISPLAY:

uMOLES/sec/m*m

WATTS/m*m

FOOT-CANDLES

LANGLEYS/day

KILOLUX

CYCLES TODAY

YESTERDAY

LAST 7 DAYS

uMOLES/sec/m*m

WATTS/m*m

FOOT-CANDLES

LANGLEYS/day

KILOLUX

CYCLES TODAY

YESTERDAY

LAST 7 DAYS

uMOLES/sec/m*m

WATTS/m*m

FOOT-CANDLES

LANGLEYS/day

KILOLUX

CYCLES TODAY

YESTERDAY

LAST 7 DAYS

SWITCH ON WILL

Initiate watering cycle shortly after sunrise

Down-Count MOLES

Down-Count MINUTES

Since Sunrise MOLES

Previous Day MOLES

Previous 3 Days MOLES

Previous 10 Days MOLES

Sunrise Watering

ZONE Delay

Provide a 6 second delay between zones to allow system pressure to rebuild

Down-Count MOLES

Down-Count MINUTES

Since Sunrise MOLES

Previous Day MOLES

Previous 3 Days MOLES

Previous 10 Days MOLES

Sunrise Watering

ZONE Delay