

# **MICRO GROW**

## **GREENHOUSE SYSTEMS, INC**

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Revision 3.0  
5/2003

**Shadestat System  
(Growstat Series)**

# INSTALLATION PROCEDURES

## PANEL MOUNTING

Mount the control panel in an accessible location. Make sure that the location is free of vibration and in close proximity to the devices being controlled. Always consider voltage drop of electrical current when locating the control panel. Securely mount the panel.

## SWITCHING CONTACTORS AND RELAYS

The control panel will operate the greenhouse equipment via load contactors and load relays. **ALL RELAYS AND LOAD CONTACTORS USED MUST HAVE A SURGE SUPPRESSOR INSTALLED ACROSS THE COIL OF THE RELAY OR LOAD CONTACTOR.** These surge suppressors are readily available from Micro Grow Greenhouse Systems, Inc. All load contactors and relays are also readily available from Micro Grow Greenhouse Systems, Inc. To decide which to use, follow this guide:

### LOAD CONTACTORS:

Exhaust fans, pad pumps, horizontal air flow fans, heating pumps, fan jets, large heaters, crop lighting, and all other larger electrical loads over 1/6 H.P.

### LOAD RELAYS:

Signal switching such as the small control lines for gas fired heaters, control lines for vent and shade system controls, small loads such as motorized shutters, other loads up to 1/6 H.P.

### CUSTOM CONTACTOR AND RELAY PANEL AVAILABLE

A UL, custom pre-wired load contactor and load relay panel is available from Micro Grow Greenhouse Systems, Inc. This panel will contain all of the required switching apparatus for your project, as well as a correctly sized machine tool transformer. Contact Micro Grow Greenhouse Systems, Inc for pricing and availability.

## TRANSFORMERS

The control panel is to be powered by a 24 VAC transformer. It is most important to use a MACHINE TOOL TYPE. A Machine Tool Transformer is a heavy-duty variety that will allow for high inrush currents that are associated with the use of load contactors and relays. Micro Grow Greenhouse Systems, Inc. stocks this type of transformer. Use no smaller than a 40 VA Machine Tool Transformer.

## ELECTRICAL CIRCUITS

The electrical circuit that feeds the machine tool transformer must have no other loads connected to it. This will prevent a damaging surge 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. Always follow the code rulings for disconnect switches and overcurrent devices on greenhouse equipment. USE A QUALIFIED AND LICENSED ELECTRICIAN AT ALL TIMES.

## WIRING METHODS

Always use stranded wire when connecting cables or conductors to the actual circuit board of the control panel. This will allow flexibility. Use no smaller than #18 gauge, stranded wire for all outputs. Use no smaller than the recommended wire size of stranded cable for inputs; generally #22 gauge.

## **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 the electrical code and will cause dangerous interference to the control system. Always locate the actual sensor in the center of the range that is being controlled for accurate readings. Do not allow the sensor to come in contact with any greenhouse structure member such as a post that would give off any radiated heat and cause a false temperature reading. Do not locate the sensor where a particular piece of equipment would cause false readings, such as a heater blowing directly on the sensor. Mount all wind/rain sensor in a clear area, free of any wind obstructions.

## **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. Consult the national electrical code or local codes if in doubt about the insulation ratings of the wire in use. Remember; always use a qualified and licensed electrician.

## **VENT SYSTEMS / ROLL UP CURTAINS**

When connecting a vent system, or roll up curtain ventilation system to the control panel, you must use a separate control box designed for that particular vent system. These are readily available from Micro Grow Greenhouse Systems, Inc. Generally these separate control boxes feature overcurrent protection for the particular motor on the vent or shade system, provisions for direct limit switch connections, and a manual means of operating the vent system independent of the main control system. These separate control boxes will connect the main control system either directly through the outputs of the control system, or they will require control relays for interconnection to the main control system. Consult the individual instructions that come with the vent or shade controls for detailed information.

## **SYSTEM TESTING**

It is always important to completely and fully test the electrical system by energizing circuits and verifying equipment operations before automatically operating the equipment from the control panel. This would include setting all of the vent limit switches at the individual control panels.

# Micro Grow Greenhouse Systems, Inc.

## Shadestat Solar Monitor and Control

### Overview:

The Shadestat Solar Monitor and Control delivers to the greenhouse grower features that were, up until now, unavailable without the purchase of a complex computer-based control system. Micro Grow has combined a small microprocessor control system with the power and sophistication of our larger computer-based shade operation system. The Shadestat delivers an accurate, cost effective solar monitor and shade controller for any grower.

The Shadestat will constantly monitor the outdoor solar level. When the sun is too intense, the Shadestat will send an automatic signal to operate a shade system motor control box. You may select up to eight independent stages of operation, each with a different level percentage of shade cloth coverage. The light level is measured in K-Lux (thousands of Lux), a function of foot-candles of light. (One foot Candle = 10.76 Lux)

An added feature of the Shadestat is a built in energy mode. The purpose of the energy mode is to use the shade system in the evening hours in order to function as a heating blanket or energy shield.

The Shadestat features an internal 24 hour time clock, adjustable time delays and differentials, and on-board memory that will display the highest solar level sensed within the last 24 hours. Operating on low voltage 24 VAC, the Shadestat is easy to install, and will operate virtually any shade curtain system available in the greenhouse industry.

### Installation:

#### Sensor Placement:

Select a location outdoors where the sensor will be able to sense the full impact of the sun without any obstructions. The south side of the greenhouse or building is best. Securely mount the sensor with the housing facing straight up.

#### Transformer:

Install a 24 VAC control transformer and provide the 24 VAC power source at the required terminals on the internal circuit board. When connecting the control transformer to the 120 VAC or 230 VAC power circuit, make sure that there are no other loads connected to the electrical circuit in use for the control transformer. Verify that the transformer is sized sufficiently to handle the connected load. A minimum of 40 VA will be required. If you will operate more than one shade control panel, the transformer must be upgraded to handle the increased load. We recommend a machine tool variety for multiple control systems. All transformers are available from Micro Grow.

#### Motor Control Box Requirements:

You must use a motor control box in conjunction with the Shadestat. This control box may be purchased from Micro Grow. The Shadestat will also interface with many other motor control boxes built by others in the greenhouse industry. The purpose of the control box will be to provide the actual motor rated relays and/or contactors to operate the motor. The control box will also contain overload protection for the motor, the low voltage travel limit connections, and at times, the 24 VAC control transformer.

#### Shadestat Outputs:

The Shadestat features pilot duty "dry switched" output contacts. This means that there will be no voltage generated on the output terminals, only an electrical contact closure. Please refer to the enclosed diagrams for some common industry standard control panels that will connect to the Shadestat.

## System Setup and Operation:

### System Run Mode:

During the run mode, the Shadestat will display on the front panel screen the following items:

1. The current solar level
2. The actual position of the shade system
3. The time of day
4. The energy mode status (if activated)

\*\* NOTE: At any time during the programming, you may return to the run mode by pressing the RUN switch up.

### Setting the Desired K-Lux Solar Level:

Depress the **SET** switch once. The **Solar K-Lux level** indicator bar will be flashing. Use the **VALUE** switch to set the desired solar level that you want the Shadestat to use to start closing the shade system. You may have to adjust this level over a few days to determine the correct setting to close. A bright sunny day may run 100 K-Lux, depending upon your geographic region.

### System Closing Time:

The Shadestat control needs to know the total time that the shade system takes to go from a fully open to a fully closed position. Enter this time by going the following:

1. Depress the **SET** switch until the **SET SYSTEM** indicator bar is flashing.
2. Enter the total minutes by using the **VALUE** switch.
3. Depress the **SET** switch to advance to the seconds then enter the seconds.

### Set Desired Number of Stages and Positions:

The Shadestat can close the shade system in up to eight stages. All eight stages do not have to be used. The grower may program as few as one stage or as many as eight stages. To set the stages:

1. Depress the **SET** switch until the **SHADE POSITION** indicator bar is flashing.
2. The number "1" will be displayed along with a flashing number. The flashing number represents the first closing percentage desired. If only one stage of operation is desired, enter a figure from "95" (%) to "CL" (Fully Closed). If additional stages are desired, enter a number less than 95%, and proceed by depressing the **SET** switch again. You may enter any number from 1 to 99. The **CL** designation means 100% closed.

### Set Energy Mode (Heat Retention):

The next step will be to enter the **Energy** mode position if that feature is in use. If the **Energy** mode is not used, go to the next step. The energy mode will activate your shade system for use as an energy or heat retention curtain. After advancing through the normal shade stages, the display will read "En" and a flashing corresponding position. Enter the desired position to close to upon a heat retention mode by using the **VALUE** switch.

### Set Override Mode:

If an override device such as a Micro Grow Weatherstation or a Weatherstat were used, the override function would be set here. This setting is configured in the same manner as the energy mode. The display will read "Or" with a corresponding position. Enter the desired position to close to upon a heat retention mode by using the **VALUE** switch. Typical override signals would provide a condition for the system to close to if rain or wind speed were detected. Override signals would be attached to input two.

## Set Differential, Separation, and Time Delay:

The Shadestat will use differential and separation settings to react quickly or more slowly to solar conditions. The differential will be the amount of decreasing solar light that the Shadestat will need to sense before opening the shade system up to the next stage. The separation will be in use only if more than one stage is selected for operation. The separation represents the amount of increasing solar change required in order to proceed to the next stage of closing.

1. Depress the **SET** switch until the display shows “**SEP**” and a corresponding flashing value. This value represents the K-Lux separation required to proceed to the next stage of closing. If only one stage is used, this setting will have no bearing. Use the **VALUE** switch to change this setting in increments of (5) K-Lux.

2. Depress the **SET** switch until the display shows “**dif**” and a corresponding flashing value. This value represents the K-Lux differential required to proceed to the next stage of opening. Use the **VALUE** switch to change this setting in increments of (5) K-Lux.

3. Depress the **SET** switch until the display shows “**dl**” and a corresponding value. This value represents the time delay in minutes required to proceed to the next stage of operation. Use the **VALUE** switch to change this setting in increments of five (5) minutes. The total delay range is 0, 5, 10, or 15 minutes.

## Set Energy Mode:

The Shadestat features an energy mode that will close the shade system in the evening hours, or at any time of day or night, in order to conserve energy and act as a heating conservation device. You may select this mode to be initiated by the photocell (on sunset), the internal time clock, or a combination of both parameters.

1. Depress the **SET** switch until the display shows “**En on**” briefly. This will be followed by time readout on the display with the hour segment flashing. Enter the desired time that you wish the energy mode to start closing the shade system for purposes of a heat shield. You may select a time of day (“**9:00**”), the solar sensor photocell when sunset occurs (“**PHO**”), or leave the energy mode feature inactive by selecting “**OFF**”. If a time of day is desired, use the **VALUE** switch when the flashing hours are displayed and hold it down, counting through the hours of the day, releasing it when the desired time is reached. Depress the **SET** switch again and set the minutes in the same manner. Finally, depress the **SET** switch to select AM or PM.

2. To set the desired time that the Shadestat will come out of the energy mode, depress the **SET** switch to display “**En OFF**” briefly. Follow the above instructions to set the time of day, or the solar level (sunrise) that will cancel the energy mode.

## To Set the Time:

Depress the **SET** switch until the **SET TIME** indicator is lighted. Set the actual time of day by using the **VALUE** switch. Depress the **SET** switch to set the minutes. Depress the **SET** switch an additional time to select AM or PM.

## System Calibration:

Calibrating the K-Lux sensor should not be necessary under normal conditions within the first year of operation, as sensors are factory calibrated. If you feel the sensor requires calibration, first determine the proper light level with a quality foot-candle meter. Depress the **SET** switch until the “**CALIB**” flashed briefly on the display. The first item that can be calibrated is the solar K-Lux level. Use the **VALUE** switch to enter a new level. The best time to calibrate the solar level will be mid morning. Press the **SET** switch again until the “Shade Position” bar flashes with the current position. You may also use the calibration feature here to reposition the shade system motor and synchronize it with the Shadestat indicated position. Simply enter the actual position of the shade cloth motor by using the **VALUE** switch. The Shadestat will then drive the shade system motor to the correct position.

## Customizing the Shadestat for Your Use:

By using the internal DIP switch settings, you may customize the Shadestat for your particular needs. These features include backing off the shade system in stages when it is coming out of the energy mode in the morning. See below for these DIP switch settings.

### **To Check the High Solar Level History:**

While the Shadestat is in the **RUN** mode, hold the **RUN** switch up again momentarily, this will give you the highest solar level recorded within the past 24 hours by the Shadestat solar sensor.

### **Run Mode:**

The Shadestat will automatically return to the run mode after a time delay if no program switches are depressed. You may return to run immediately at any time by holding up the **RUN** switch.

### **DIP Switch Settings:**

NOTE: Switches 1 thru 4 and 11 and 12 are not used. Leave these switches in the OFF position. The default factory settings are in **bold**.

#### NUMBER OF BACKOFF STAGES WHEN EXITING THE ENERGY MODE:

**#5 OFF #6 ON Opens fully immediately no stages.**

#5 ON #6 OFF 2 stages; 50% closed, then fully open.

#5 ON #6 OFF 3 stages; 75% closed, then 50% closed, then fully open.

#5 ON #6 ON 4 stages; 87.5% closed, then 75% closed, then 50% closed, then fully open.

#### TIME DELAY BETWEEN BACKOFF STAGES:

**#7 OFF #8 OFF 5 Minutes**

#7 ON #8 OFF 10 Minutes

#7 OFF #8 ON 15 Minutes

#7 ON #8 ON 30 Minutes

SAFETY TIME DELAY (NOTE: Use this setting **ONLY** if the motor control panel connected to the Shadestat features internal time delay relays.)

**#9 OFF #10 OFF No Delay**

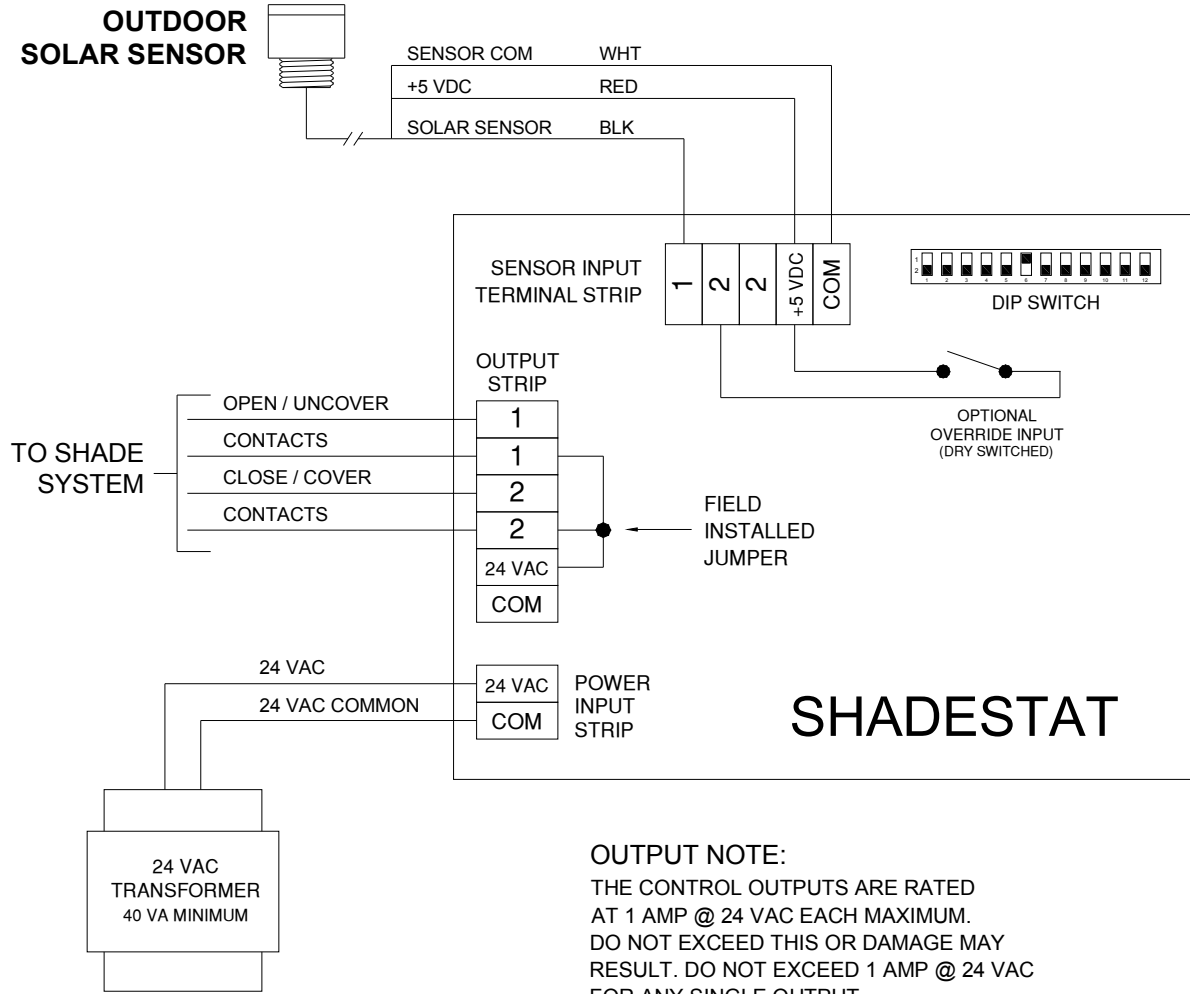
#9 ON #10 OFF 10 Seconds

#9 OFF #10 ON 6 Seconds

#9 ON #10 ON 6 Seconds?

**SENSOR NOTE:**

SOLAR SENSOR MUST BE MOUNTED OUTDOORS IN MANNER THAT IT RECIEVES UNOBSTRUCTED SUNLIGHT AND IS POINTED IN UPWARD DIRECTION. (SOUTH SIDE RECOMMENDED)



**OUTPUT NOTE:**

THE CONTROL OUTPUTS ARE RATED AT 1 AMP @ 24 VAC EACH MAXIMUM. DO NOT EXCEED THIS OR DAMAGE MAY RESULT. DO NOT EXCEED 1 AMP @ 24 VAC FOR ANY SINGLE OUTPUT.

# SHADESTAT INPUTS AND OUTPUTS

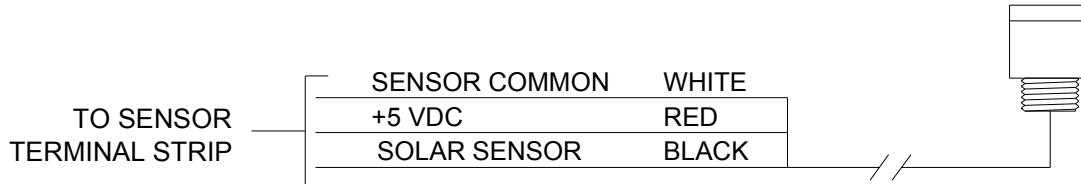


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|                            |         |             |          |
|----------------------------|---------|-------------|----------|
| Project                    |         |             |          |
| SHADESTAT INPUTS & OUTPUTS |         |             |          |
| Drawn by                   | Date    | Distributor | Order ID |
| SC                         | 4/16/10 | MICRO GROW  | N/A      |



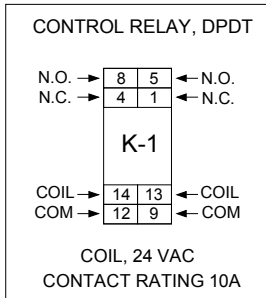
# OUTDOOR K-LUX SOLAR SENSOR



SOLAR SENSOR MUST BE MOUNTED OUTDOORS, IN MANNER THAT IT RECEIVES UNOBSTRUCTED SUNLIGHT AND IS POINTED IN UPWARD DIRECTION. (SOUTH SIDE RECOMMENDED)

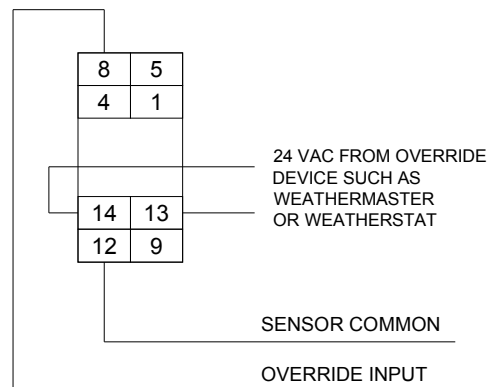
# OVERRIDE INPUT

## RELAY NOTES



- 14, 13 = 24 VAC COIL
- 12, 9 = COMMON TERMINALS
- 8, 5 = NORMALLY OPEN TERMINALS
- 4, 1 = NORMALLY CLOSED TERMINALS

## 10 AMP RELAY



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Project

**SHADESTAT OVERRIDE & SENSORS**

Drawn by

Date

Distributor

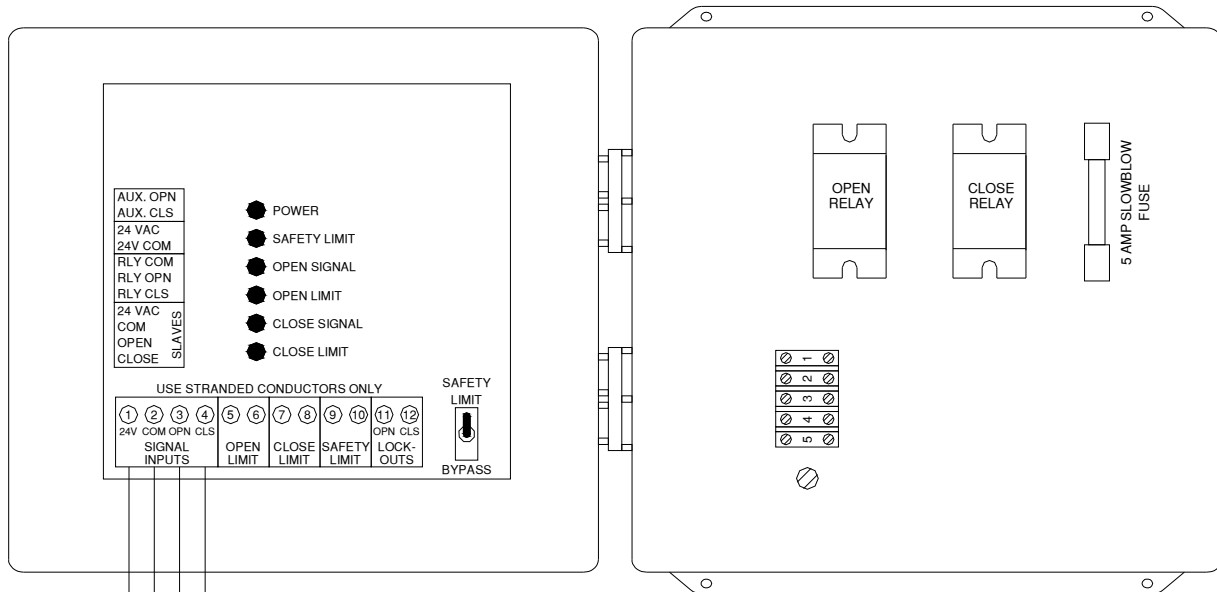
Order ID

SC

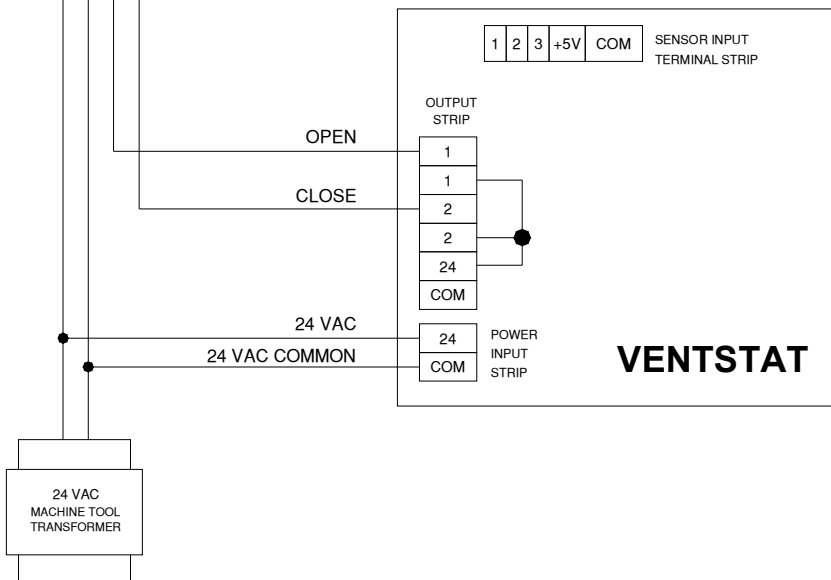
4/16/10

MICRO GROW

N/A



**SERIES 100 SLAVE**



OUTPUT NOTE:  
THE CONTROL OUTPUTS ARE  
RATED AT 1 AMP EACH.

**VENTSTAT**

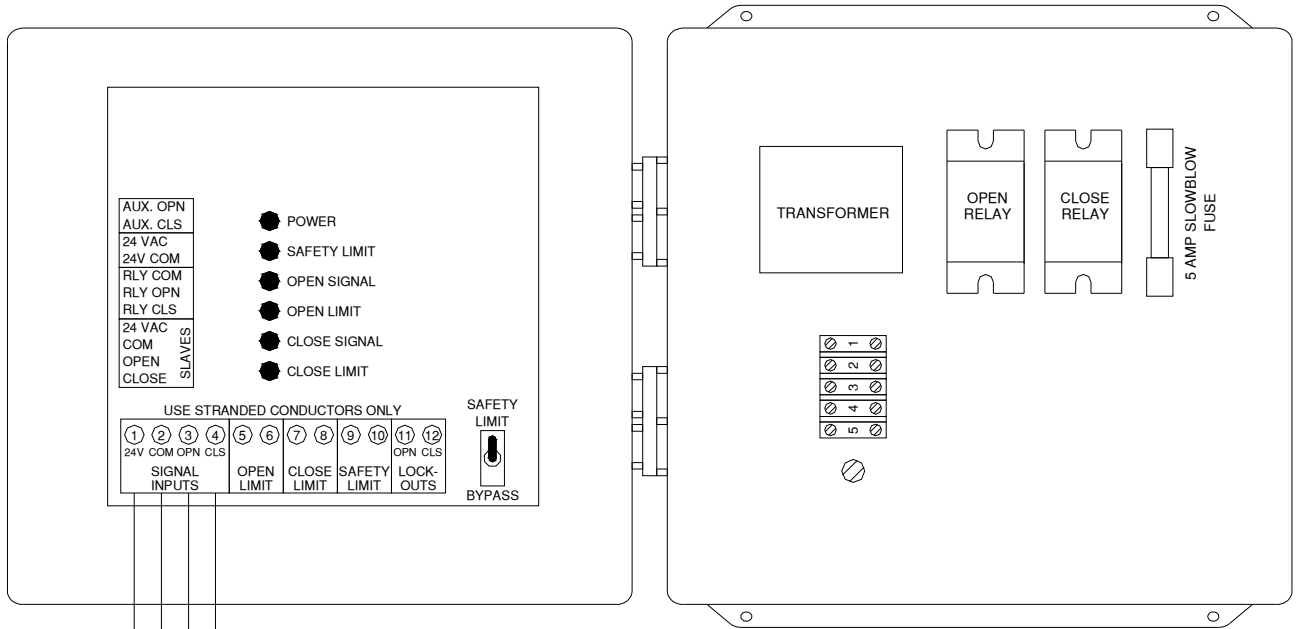
**SHADESTAT CONNECTION TO SERIES 100 SLAVE**



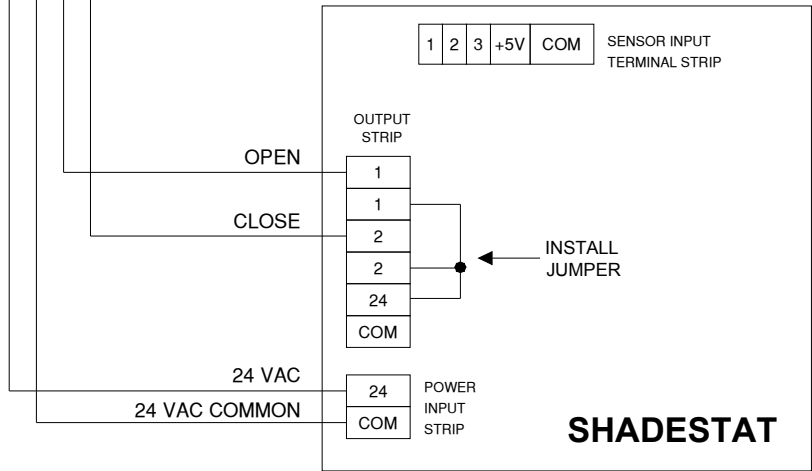
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Project  
**SHADESTAT CONNECTION TO SERIES 100 SLAVE**

|          |         |             |          |
|----------|---------|-------------|----------|
| Drawn by | Date    | Distributor | Order ID |
| SC       | 1/13/10 | N/A         | N/A      |



**SERIES 100 MASTER**



**OUTPUT NOTE:**  
THE CONTROL OUTPUTS ARE RATED AT 1 AMP EACH.

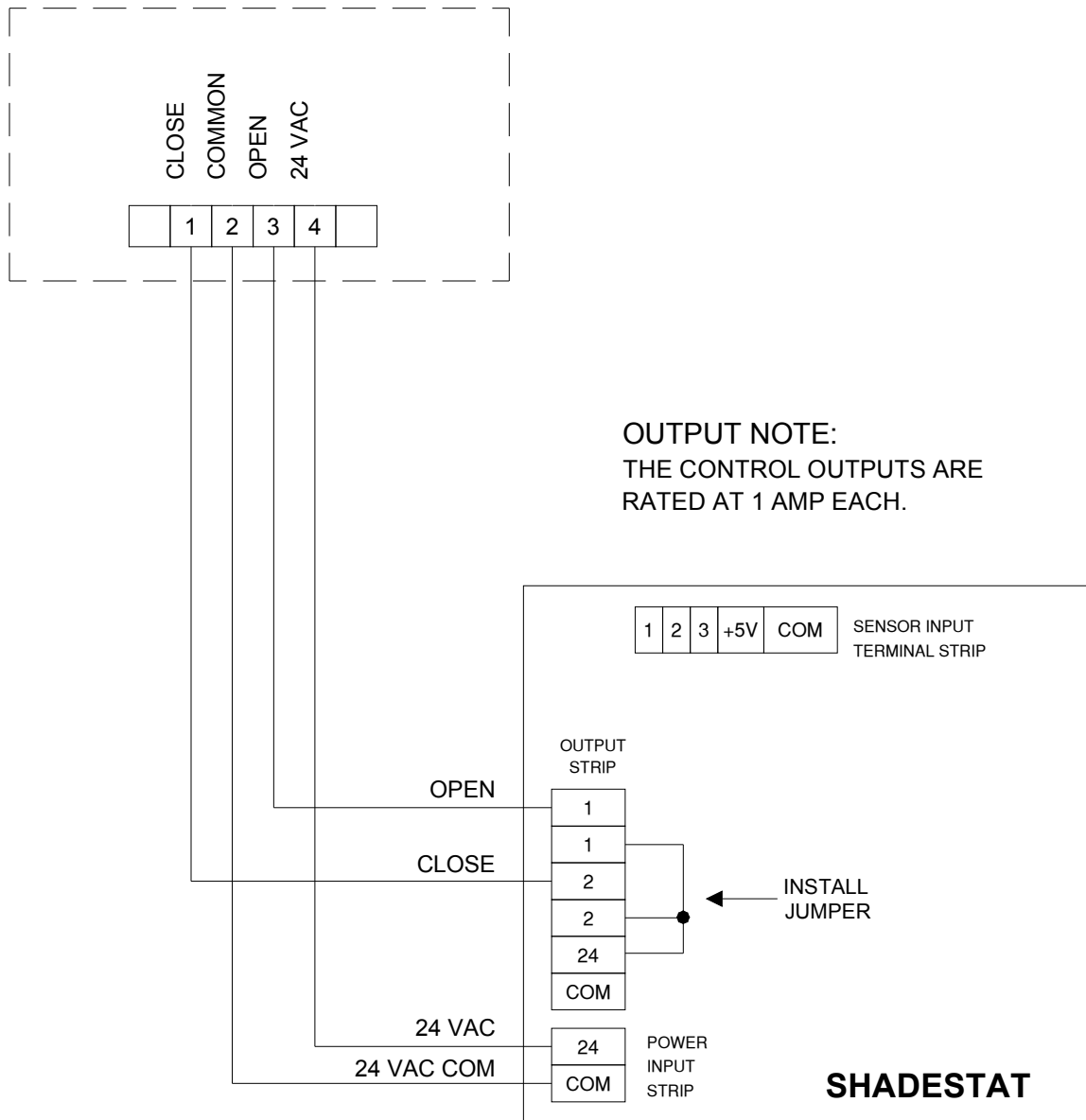
**SHADESTAT CONNECTION TO SERIES 100 MASTER**



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|   |                 |                    |                 |  |
|---|-----------------|--------------------|-----------------|--|
| Project<br><b>SHADESTAT CONNECTION TO SERIES 100 MASTER</b> |                 |                    |                 |  |
| Drawn by<br>SC  | Date<br>1/13/10 | Distributor<br>N/A | Order ID<br>N/A |  |

## WADSWORTH LST VENT CONTROL SYSTEM

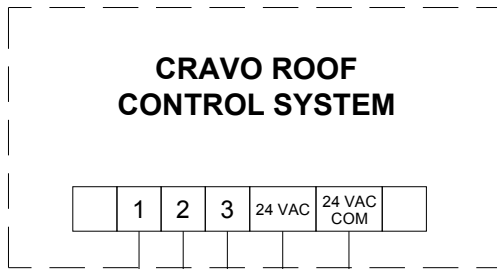


## SHADESTAT CONNECTION TO WADSWORTH 2000-LST & WADSWORTH 100-LST

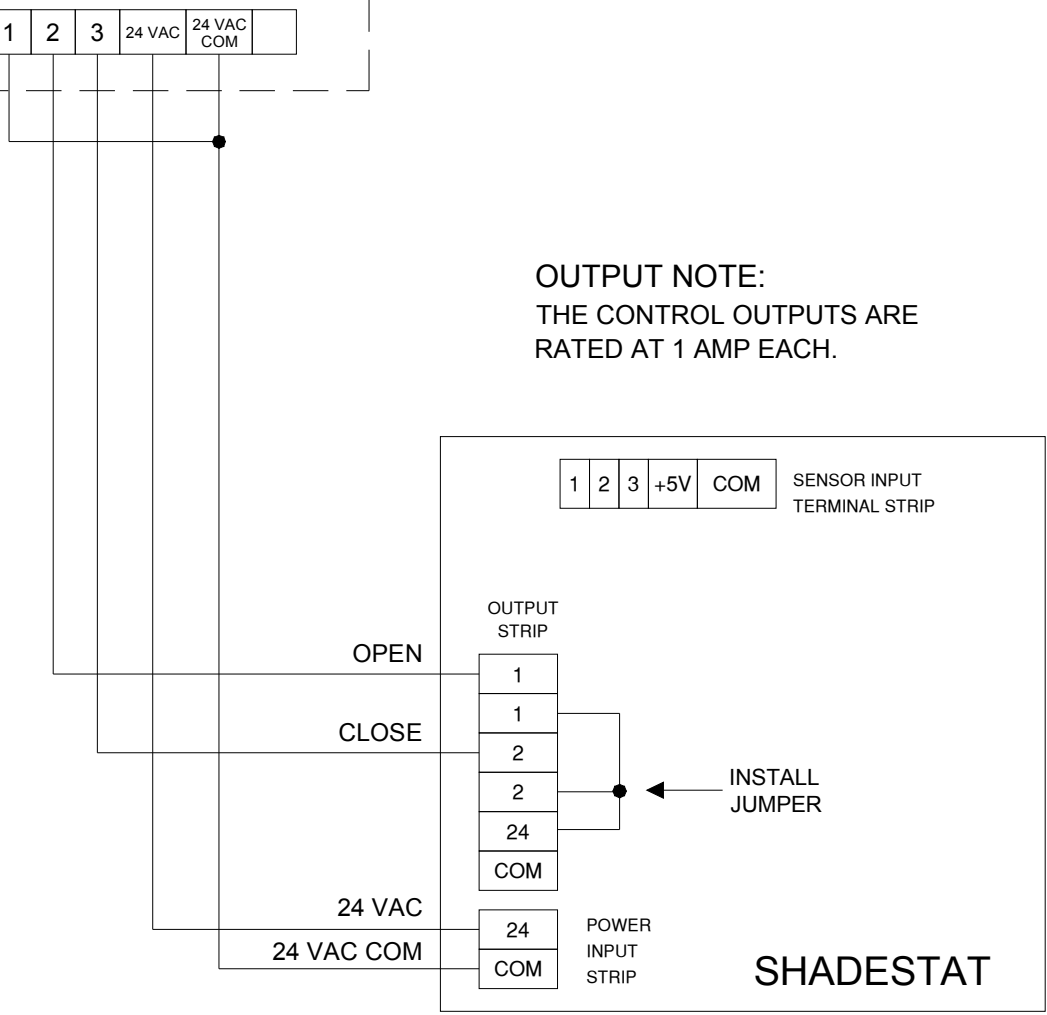


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|  |         |             |          |
|--|---------|-------------|----------|
| Project                                      |         |             |          |
| <b>SHADESTAT CONNECTION TO WADSWORTH LST</b> |         |             |          |
| Drawn by                                     | Date    | Distributor | Order ID |
| SC   | 1/13/10 | N/A         | N/A      |



**OUTPUT NOTE:**  
THE CONTROL OUTPUTS ARE RATED AT 1 AMP EACH.



## SHADESTAT CONNECTION TO CRAVO ROOF CONTROL SYSTEM



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Project **SHADESTAT CONNECTION TO CRAVO**

|          |         |             |          |
|----------|---------|-------------|----------|
| Drawn by | Date    | Distributor | Order ID |
| SC       | 1/13/10 | N/A         | N/A      |

## **LIMITED WARRANTY**

Micro Grow Greenhouse Systems, Inc. warrants that all of the products Micro Grow Greenhouse Systems, Inc. manufactures are free from defects at the time of shipment by Micro Grow Greenhouse Systems, Inc. This warranty covers defects in workmanship and materials. No warranty is extended on any parts, materials, or components manufactured by others and purchased by Micro Grow Greenhouse Systems, Inc., and any warranty on these materials is limited to the warranty supplied by the original manufacturer or supplier of said products only. This warranty excludes any and all damages cause by installation by unqualified individuals, damage by misuse or neglect, shipment damage, alterations to original manufacturing, and improper installation or use for any reason than intended by manufacturer. This warranty may not be altered in any manner except with the written authorization of one the officers or owners of Micro Grow Greenhouse Systems, Inc. The only and sole liability of Micro Grow Greenhouse Systems, Inc. under this warranty is limited to repairing, replacing or the issuance of credit for any products returned to Micro Grow Greenhouse Systems, Inc., during the warranty period of twelve (12) months from date of shipment. This warranty is specifically conditioned upon Micro Grow Greenhouse Systems, Inc. being notified in writing promptly upon discovery of any product defects by the buyer or end user. The product must then be returned prepaid to Micro Grow Greenhouse Systems, Inc. within the twelve month warranty period for inspection by Micro Grow Greenhouse Systems, Inc. Upon inspection of said product, Micro Grow Greenhouse Systems, Inc. will notify buyer or end user of its findings. At Micro Grow Greenhouse Systems, Inc. sole discretion, the product will be replaced, repaired or a credit will be issued for the original sale price of the product, provided that damage has not occurred due to misuse, neglect, improper use or installation as outlined above, shipping damages or accident.

**MICRO GROW GREENHOUSE SYSTEMS, INC. SHALL NOT BE LIABLE FOR ANY DAMAGES BEYOND THE ACTUAL ORIGINAL COST OF THEIR PRODUCT EITHER DIRECTLY OR INDIRECTLY ARISING FROM DEFECTIVE PRODUCTS OR WORKMANSHIP.**