

NWVS-4 & NWVS-8 INSTALLATION AND USER MANUAL

LOW VOLTAGE STEP CONTROL WITH VERNIER STAGE

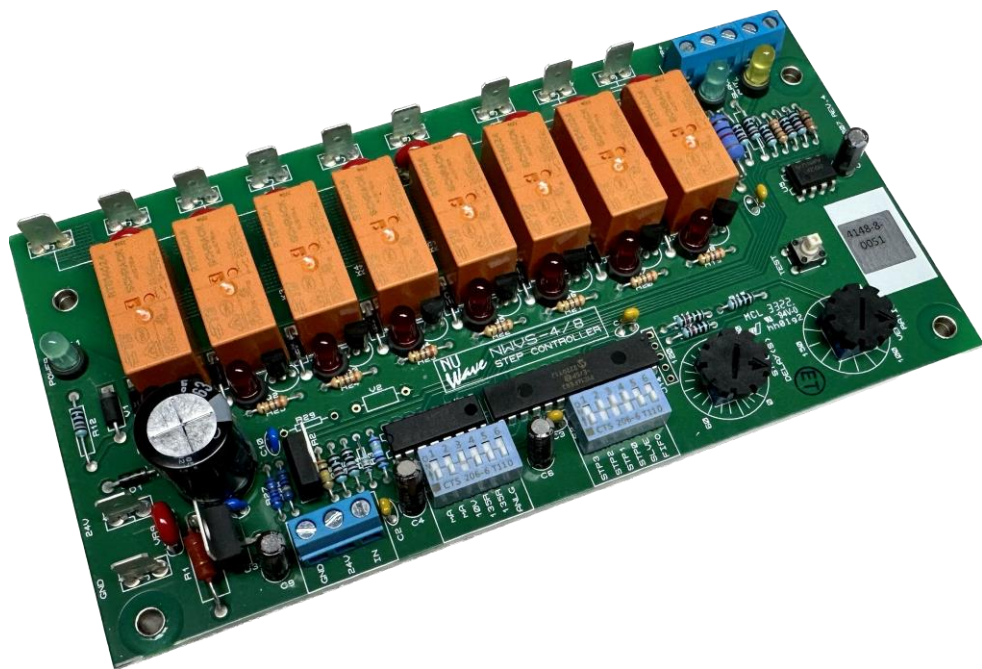


Table Of Contents

1. Ordering Code.....	3
2. Description	3
3. Key Features.....	3
4. Installation / Safety Information.....	3
4.1 Limited Warranty.....	4
4.2 Mounting Instructions/Dimensions	4
4.3 24VAC Power Input and Internal Wiring	5
5. Dipswitch Settings.....	6
5.1 Input Selection	6
5.2 Stage Selection.....	7
5.3 Output Mode Selection	7
5.4 Master/Slave Selection	8
5.5 Vernier Output Type Selection	8
6. Adjustment Potentiometers	8
6.1 Stage Delay Adjustment.....	8
6.2 Vernier Ratio	9
7. Test Button.....	9
8. Indicator LEDs.....	9
9. Outputs	9
9.1 Relay Outputs	9
9.2 Vernier Output – Time Proportioned Drive Specifications.....	9
9.3 Vernier Output - Master/Slave Configuration	10
10. Electrical Specifications	10
11. Wiring Diagrams.....	12
11.1 Command Input Wiring	12
11.2 8 Stage Wiring - Time Proportioned Vernier for SSR Drive.....	13
11.3 8 Stage Wiring – SCR Power Control on Vernier.....	14
11.4 16 Stage Wiring Using Slave Board.....	15

1. Ordering Code

NWVS-8 – Eight Position Step Control with Vernier Output

NWVS-4 – Four Position Step Control with Vernier Output

2. Description

The NWVS is a microcontroller-based step controller that provides precise modulation in multi-stage heater applications such as duct heaters. The built-in Vernier stage allows for smooth, precision control of the load without increasing switching wear in the system contactors.

3. Key Features

- Adjustable Stage Delay
- Pulsed or Analog Vernier output
- Adjustable Vernier ratio
- Expandable to 16 stages
- LIFO/FIFO selection
- Test button
- Brown out protection

4. Installation / Safety Information

Responsibility for determining suitability for use in any application / equipment lies solely on the purchaser, OEM and end user. Suitability for use in your application is determined by applicable standards such as UL, cUL and CE and the completed system involving this component should be tested to those standards.



WARNING: FIRE HAZARD!! Even quality electronic components **CAN FAIL KEEPING FULL POWER ON!** Provide a **SEPARATE (redundant) OVER TEMPERATURE SHUTDOWN DEVICE** to switch the power off if safe temperatures are exceeded.



WARNING: HIGH VOLTAGE!! This control is wired to a transformer, Solid State Relay, and contactors with high voltage on them. This control must be installed in a **GROUND**ED enclosure by a qualified electrician in accordance with applicable local and national codes including NEC and other applicable codes. Provide a safety interlock on the door to remove power before gaining access to the device.

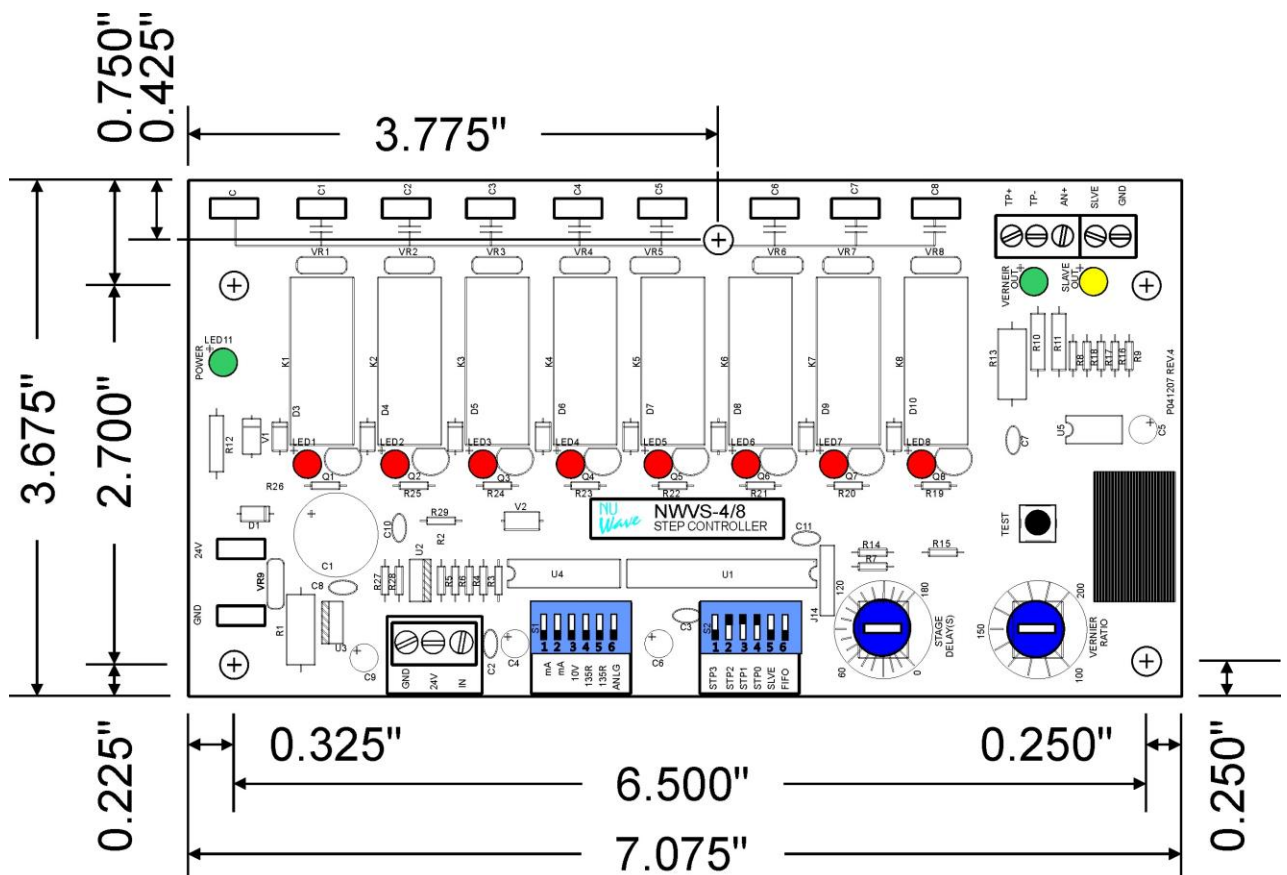
4.1 Limited Warranty

NuWave Technologies, Inc. warrants this product to be free from defect in workmanship and materials for a period of one (1) year from the date of purchase.

1. Should unit malfunction, return it to the factory. If defective it will be repaired or replaced at no charge.
2. There are no user serviceable parts on this unit. This warranty is void if the unit shows evidence of being tampered with or subjected to excessive heat, moisture, corrosion or other misuse / misapplication.
3. Components which wear or damage with misuse are excluded, e.g. relays.
4. NuWave Technologies, Inc. shall not be responsible for any damage or losses however caused, which may be experienced as a result of the installation or use of this product. NuWave Technologies, Inc. liability for any breach of this agreement shall not exceed the purchase price paid E. & O.E.

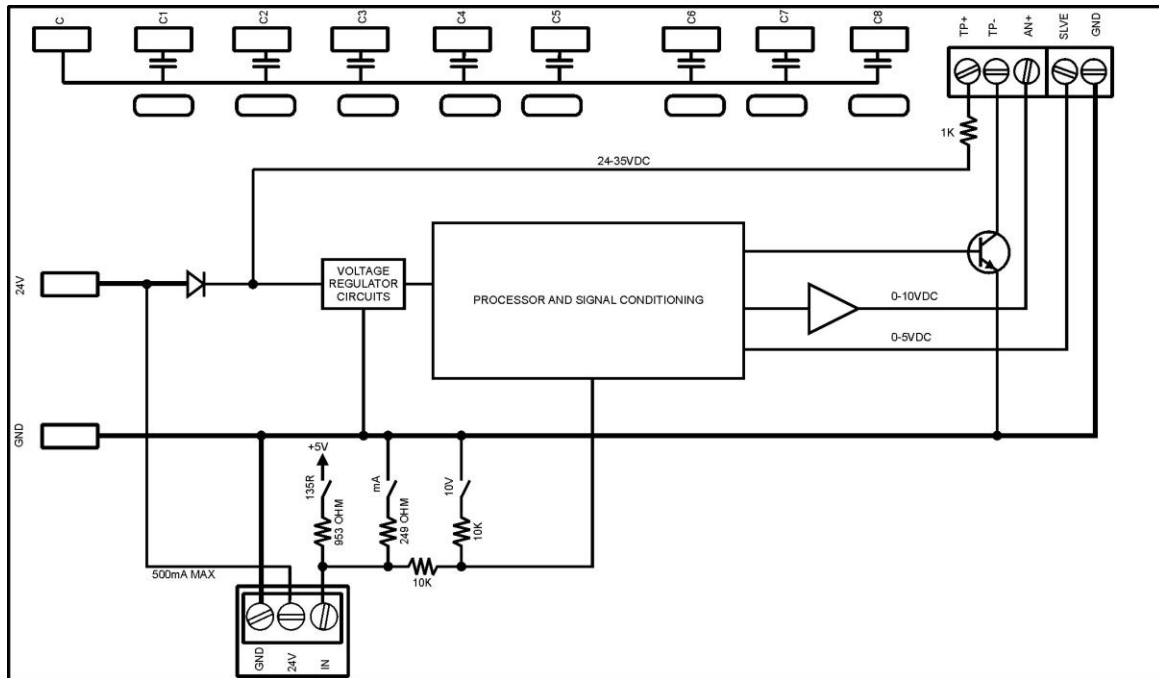
4.2 Mounting Instructions/Dimensions

The NWVS should be mounted using #6 screws at the five locations shown below. The board is supported by five, 0.300" or 0.375" high spacers (supplied attached to the board). For proper thermal management, avoid mounting the board with the output relays underneath the other board components.



4.3 24VAC Power Input and Internal Wiring

The NWVS internal power supply is half wave rectified. The command input and analog outputs share a common ground with the 24VAC power input ground. The diagram below details the internal wiring of the NWVS.



WARNING: EXCEEDING 30MA OR 15V ON THE COMMAND INPUT CAN PERMANENTLY DAMAGE THE NWVS CAUSING THE OUTPUTS TO STAY ON 100%. USE CARE WHEN WIRING THE COMMAND INPUT AND USE A SEPARATE (REDUNDANT) OVER TEMPERATURE SHUTDOWN DEVICE TO SWITCH POWER OFF IF SAFE TEMPERATURES ARE EXCEEDED.

5. Dipswitch Settings

5.1 Input Selection

S1 positions 1-5 select which command input the NWVS will accept.

	Switch S1				
Position→	1	2	3	4	5
Label→	mA	mA	10V	135R	135R
Input					
0-5V	OFF	OFF	OFF	OFF	OFF
1-5V	OFF	ON	OFF	OFF	OFF
0-10V*	OFF	OFF	ON	OFF	OFF
2-10V*	OFF	ON	ON	OFF	OFF
0-20mA	ON	OFF	OFF	OFF	OFF
4-20mA	ON	ON	OFF	OFF	OFF
0-135 OHM	OFF	OFF	OFF	ON	ON

*If the 0-10V range is selected, the NWVS will start responding with output just above 0V on the command input. If the 2-10V range is selected, the NWVS will start responding with output just above 2V on the command input.

5.2 Stage Selection

S2 positions 1-4 select the number of output stages.

	Switch S2			
Position→	1	2	3	4
Label→	STP3	STP2	STP1	STP0
Stages				
1	OFF	OFF	OFF	OFF
2	OFF	OFF	OFF	ON
3	OFF	OFF	ON	OFF
4	OFF	OFF	ON	ON
5	OFF	ON	OFF	OFF
6	OFF	ON	OFF	ON
7	OFF	ON	ON	OFF
8	OFF	ON	ON	ON
9	ON	OFF	OFF	OFF
10	ON	OFF	OFF	ON
11	ON	OFF	ON	OFF
12	ON	OFF	ON	ON
13	ON	ON	OFF	OFF
14	ON	ON	OFF	ON
15	ON	ON	ON	OFF
16	ON	ON	ON	ON

5.3 Output Mode Selection

LIFO (last in first out) and FIFO (first in first out) modes are both available by setting of S2 position 6.

	Switch S2
Position→	6
Label→	FIFO
Output Mode	
LIFO	OFF
FIFO	ON

LIFO mode is the normal default mode. In this mode the output stages respond to the command input like a level bar graph.

FIFO mode circulates the on stages to promote even use of the contactors and elements. For example, the first stage that was turned on when the power was increasing will be the first stage turned off when the power is decreasing.

5.4 Master/Slave Selection

S2 position 5 selects master or slave operation.

Switch S2	
Position →	5
Label →	SLV
Master/Slave Select	
Master	OFF
Slave	ON

When the NWVS is set for slave operation, the command input becomes the slave input. The slave's command input is wired to the master's slave output.

5.5 Vernier Output Type Selection

S1 position 6 selects Analog or Time Proportioning Vernier Output.

Switch S1	
Position →	6
Label →	ANLG
Analog/Time Proportioning	
Time Proportioning	OFF
Analog	ON

When Time Proportioning is selected, the Vernier output is a 24VDC current limited 4 second cycle time PWM signal. The SSR used to control the Vernier heater is driven from terminals TP+ and TP-.

When Analog is selected, the Vernier output is a 0-10V analog signal for driving a phase angle controller. The 0-10V signal is present on the AN+ and GND terminals.

6. Adjustment Potentiometers

6.1 Stage Delay Adjustment

The Stage Delay is the time that it takes for additional stages to turn on or off. The Stage Delay is adjustable from 0-180 seconds (0-3 minutes). The stage delay must be set above zero or excessive contact wear can occur.

If the unit is to be used as a slave, then the stage delay should be set to 0 on the slave, because the master's setting of stage delay will control it.

The Test Button will turn on each stage one at a time while pressed and will turn off the stages at the stage delay time when let go.

6.2 Vernier Ratio

The Vernier Ratio is the ratio of the Vernier heater to the heaters used on the individual stages. The Vernier Ratio is adjustable from 100 - 200%.

- If the Vernier heater is the same power as the individual stage heaters, then the Vernier Ratio should be set to 100%.
- If the Vernier heater is twice the power of the individual stage heaters, then the Vernier Ratio should be set to 200%.

7. Test Button

When the test button is held down, the command input is forced to 100% and all of the stages will turn on at one stage per second. When the button is released, the stages will turn off at the set stage delay rate.

8. Indicator LEDs

- | | |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power LED | – On when power is applied. |
| Individual Stage LEDs | – On as each stage is turned on. |
| Vernier Output LED | – Increases in intensity when power is increasing and Analog is selected. When Time Proportioning is selected, turns on when the output is energized. |
| Slave Output LED | – Increases in intensity when power is increasing to the slave input. |

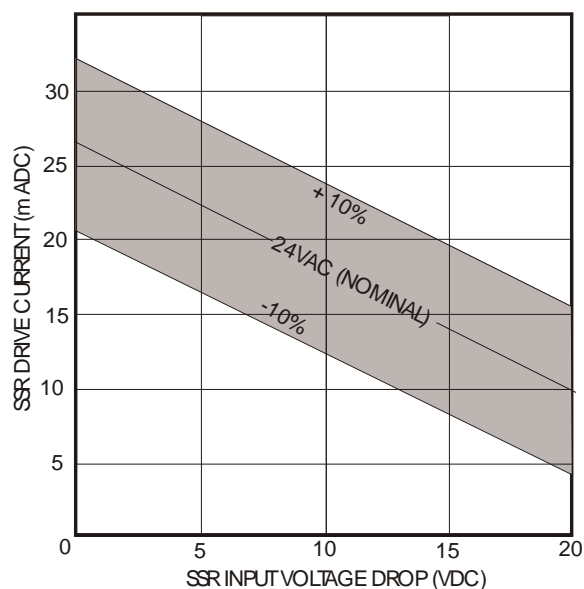
9. Outputs

9.1 Relay Outputs

The NWVS uses mechanical relays to switch the coils of the load contactors. The life span of the NWVS output relays are directly related to the user stage delay setting as well as the load contactor specifications. Since the stage delay and the choice of load contactor is determined by the end user, there is no guarantee or warranty expressed or implied related to the life of the output relays or load contactors.

9.2 Vernier Output – Time Proportioned Drive Specifications

When Time Proportioning is selected, the Vernier output is a 24VDC current limited 4 second cycle time PWM signal. The SSR used to control the Vernier heater is driven from terminals TP+ and TP-. The drive specifications are power supply related and are shown below.



SSR DRIVE CURRENT vs SSR VOLTAGE DROP AND POWER SUPPLY

9.3 Vernier Output - Master/Slave Configuration

In a Master-Slave Configuration, the master unit's Vernier output should be used for driving the SSR or SCR Power Control.

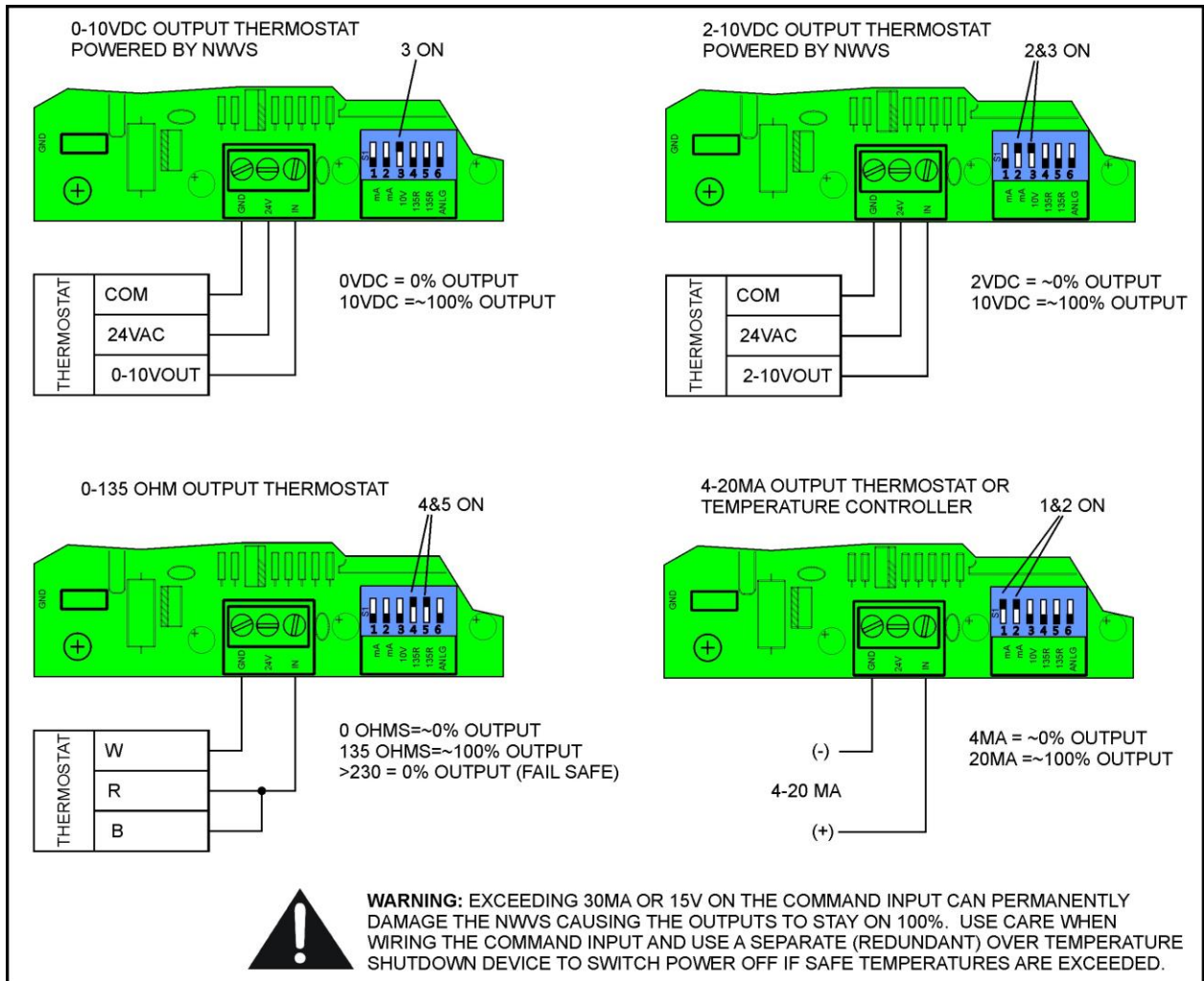
10. Electrical Specifications

- Power Input** - 24VAC -15/+15% 50/60Hz < 10VA.
- 24V Thermostat Power** - Aux Output Rated at 24VAC @ 500mA max.
- Brown Out Protection** - Stages restart from zero upon loss of power.
- Command Inputs** - 0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA, 0-135Ohm. Selectable via dipswitch.
- Stages** - Selectable from 1 to 16 stages via dipswitch. More than 8 stages requires an additional NWVS setup for slave operation.
- Stage Outputs** - 30 VAC @ 1.0A SPST Mechanical Relays w/MOV protection, up to a max of 5A total for all of the stages. Up to 8 stages per board. Use a Class 1 (properly fused) or Class 2, CSA or UL recognized transformer for power supply & relay outputs.
- Vernier Output** - Selectable via dipswitch # S1-6:
 - Time Proportioning (S1-6 OFF):** Current limited ~24VDC nominal. Time Proportioned 4 second cycle time for driving an SSR.
 - Analog (S1-6 ON):** 0-10VDC output for driving an SCR power control. 10VDC output tolerance is +5/-8% at 24VAC power. 10VDC output tolerance is +5/-25% at 20VAC power.
- Slave Output** - 0-5V output for expanding beyond 8 stages.
- Stage Output Modes** - LIFO or FIFO Selectable via dipswitch.

- Stage Delay** - Adjustable from 0-180 seconds via potentiometer.
- Verneir Ratio** - Adjustable from 100 to 200% via potentiometer.
- Stage Output Indication** - Each Stage has a Red LED that is energized when the relay coil on the board is energized. The Red LED does not directly detect the state of the normally open relay output, but if the relay is operating correctly, the contacts should be closed when the Red LED is energized.
- Vernier Output Indication-** Green LED that varies in intensity when analog mode is selected or blinks when time proportioning is selected.
- Slave Output Indication** - Yellow LED that varies in intensity when a slave output signal is present.
- I/O Connectors** - 0.250" Faston lugs for power and stage outputs, screw terminal blocks for low voltage I/O and command.
- Ambient Temp. Range** - 0 to 80°C.
- Board Specifications** - 7.075" x 2.700", RoHS compliant.
- Shipping Weight** - Approximately 2 lbs.

11. Wiring Diagrams

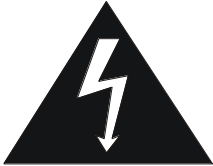
11.1 Command Input Wiring



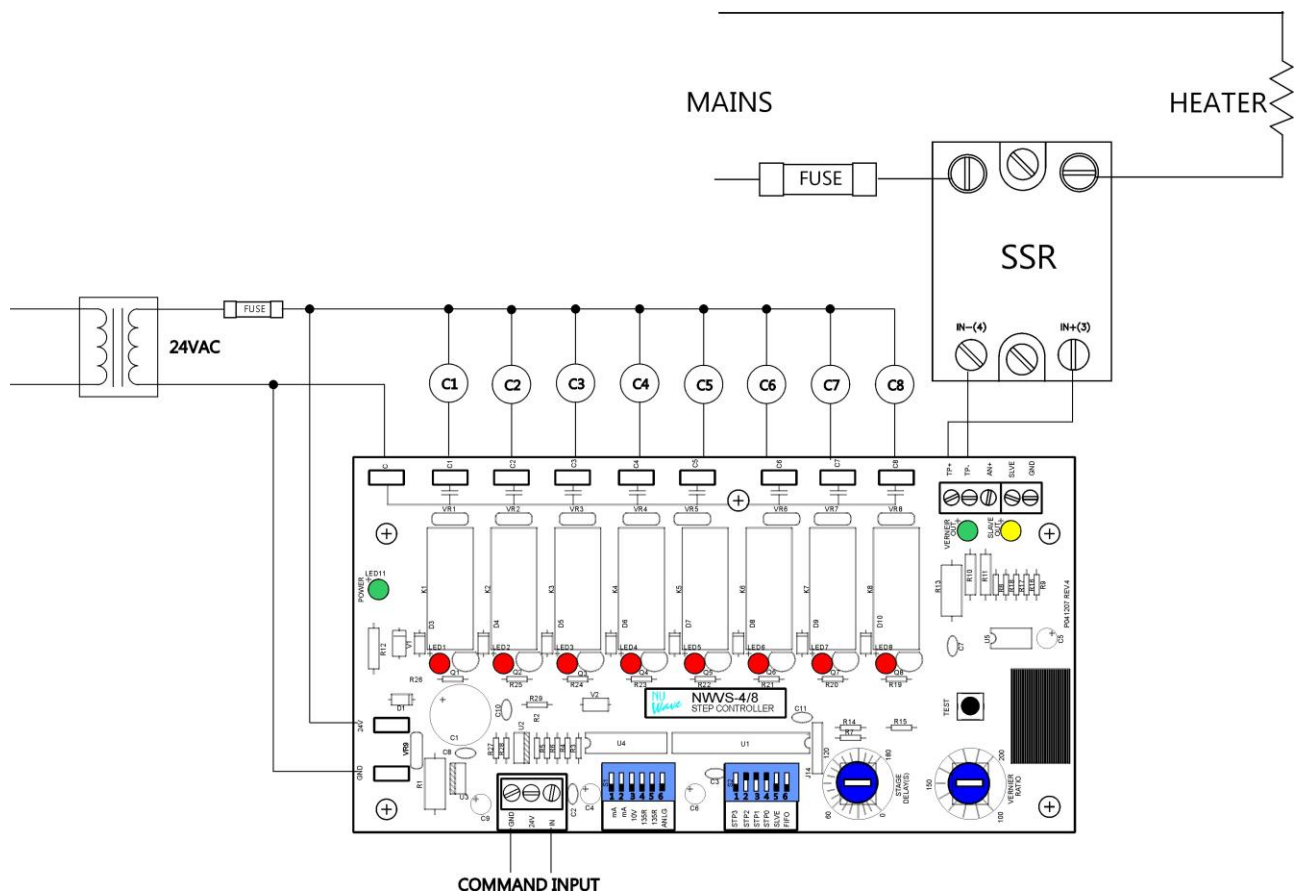
11.2 8 Stage Wiring - Time Proportioned Vernier for SSR Drive



WARNING: FIRE HAZARD!! Even quality electronic components CAN FAIL KEEPING FULL POWER ON! Provide a SEPARATE (redundant) OVER TEMPERATURE SHUTDOWN DEVICE to switch the power off if safe temperatures are exceeded.



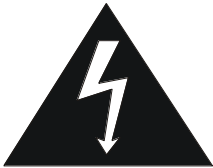
WARNING: HIGH VOLTAGE!! This control is wired to a transformer, Solid State Relay, and contactors with high voltage on them. This control must be installed in a GROUNDED enclosure by a qualified electrician in accordance with applicable local and national codes including NEC and other applicable codes. Provide a safety interlock on the door to remove power before gaining access to the device.



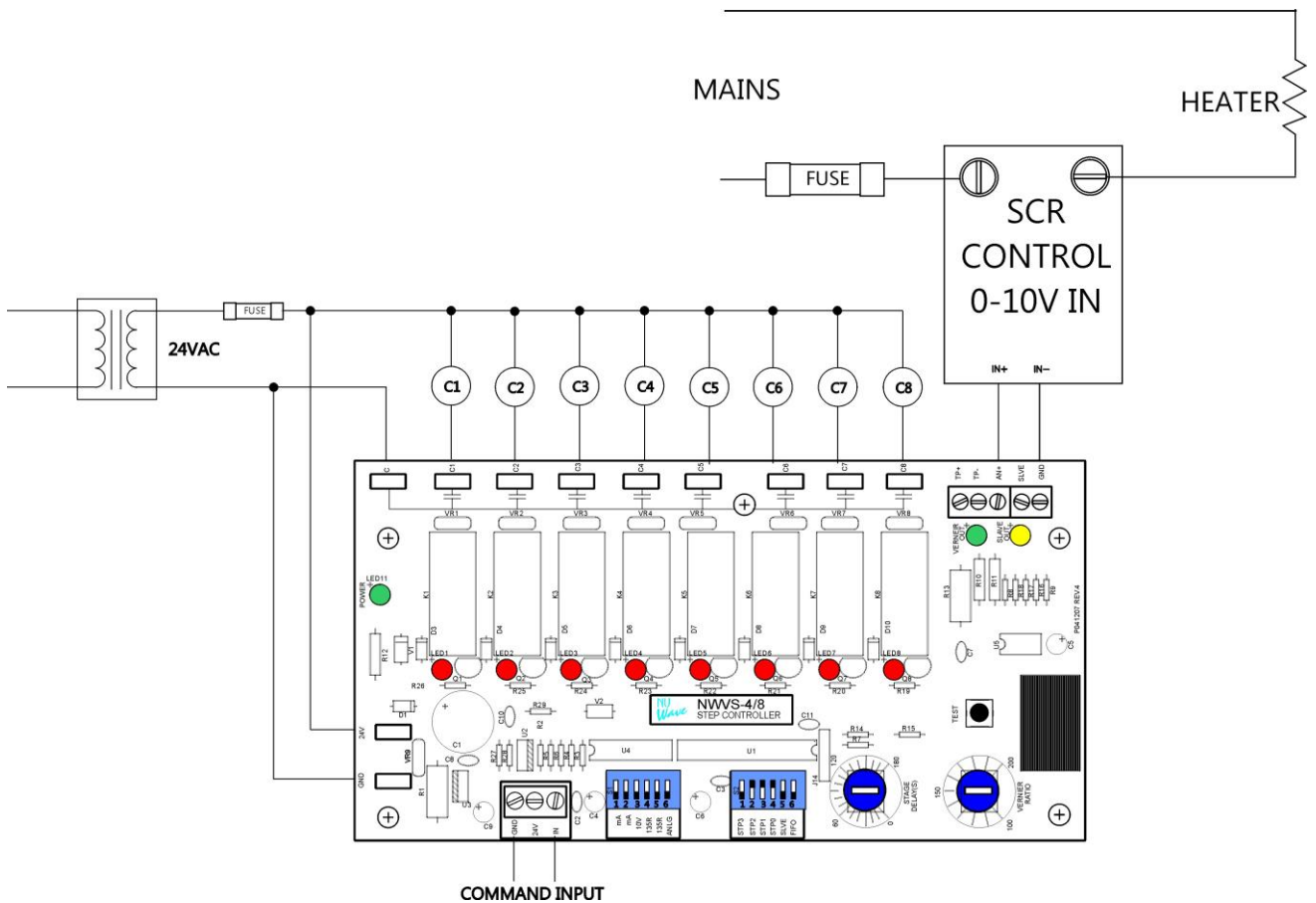
11.3 8 Stage Wiring – SCR Power Control on Vernier



WARNING: FIRE HAZARD!! Even quality electronic components CAN FAIL KEEPING FULL POWER ON! Provide a SEPARATE (redundant) OVER TEMPERATURE SHUTDOWN DEVICE to switch the power off if safe temperatures are exceeded.



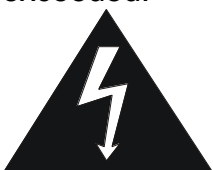
WARNING: HIGH VOLTAGE!! This control is wired to a transformer, Solid State Relay, and contactors with high voltage on them. This control must be installed in a GROUNDED enclosure by a qualified electrician in accordance with applicable local and national codes including NEC and other applicable codes. Provide a safety interlock on the door to remove power before gaining access to the device.



11.4 16 Stage Wiring Using Slave Board



WARNING: FIRE HAZARD!! Even quality electronic components CAN FAIL KEEPING FULL POWER ON! Provide a SEPARATE (redundant) OVER TEMPERATURE SHUTDOWN DEVICE to switch the power off if safe temperatures are exceeded.



WARNING: HIGH VOLTAGE!! This control is wired to a transformer, Solid State Relay, and contactors with high voltage on them. This control must be installed in a GROUNDED enclosure by a qualified electrician in accordance with applicable local and national codes including NEC and other applicable codes. Provide a safety interlock on the door to remove power before gaining access to the device.

