ER1000

The Burst Fire Controller for Zero Crossing Solid-State Relays with Analog Input Control

1 Features

- Burst Fire Controller
- Controls power through zero crossing solid-state relays
- Compatible with both 50Hz and 60Hz power systems
- Supports analog control inputs: 0-20mA, 4-20mA, 0-5V, 0-10V, 0-1.1V and potentiometer (POT)
- 10-step (to version 2.0) solid state relay control
- **Starting with V2.1 the 20-step mode is supported**
- Operating input voltage: 7 – 24Vdc, 7-17Vac
- PCB size optimized for direct mounting on solid state relays
- Ideal for thermal management applications
- Built-in LED status indicator
- Output period time: 200ms
- Output power 120mW, 80mA
- No Coding or programming required
- Compact PCB Size: 44.00 x 38.00 mm

2 Description

The ER1000 is a burst fire controller designed for controlling the power of thermal systems, such as heaters. It operates by controlling a zero-crossing solid-state relay to switch the AC power to the load on and off. The output power cycles are regulated based on the analog input signal. The controller supports various types and ranges of analog signals, including 0–10V, 4–20mA, and a potentiometer (POT).

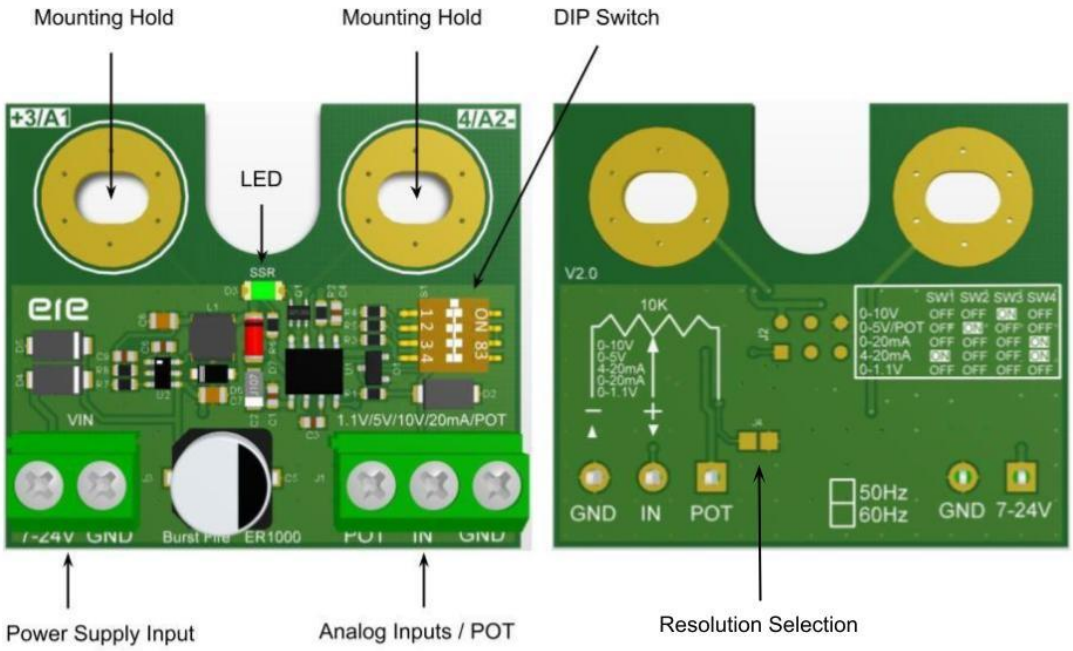


Figure 1: Board diagram

2. Mode Selection

The board operates in two modes: 10-step mode and 20-step mode. In 10-step mode (default, jumper open), the load is controlled in 10% increments across 10 steps per period. In 20-step mode (jumper closed), the load is controlled in 5% increments across 20 steps per period. The jumper position is shown below.

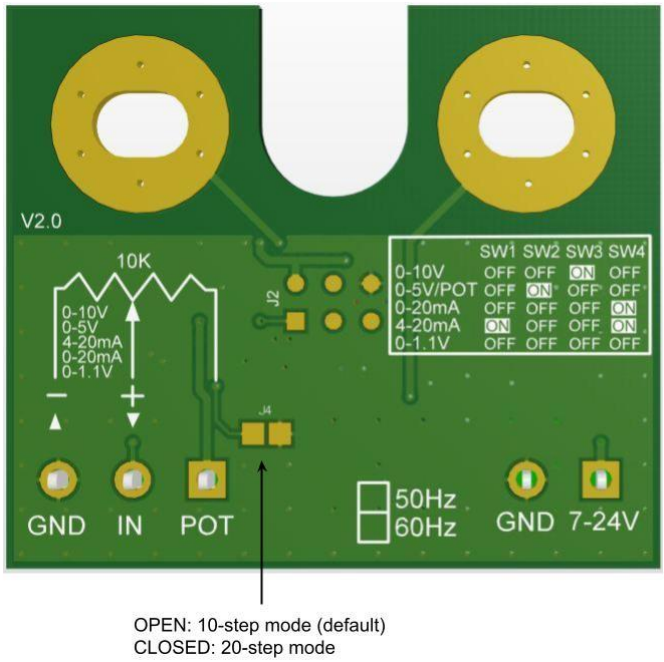


Figure 2: Mode selection

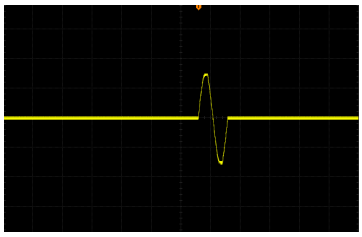
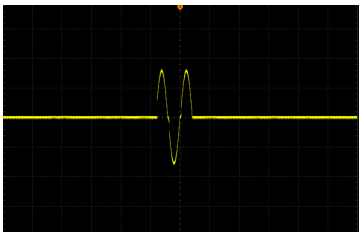
Table 1: Mode selection

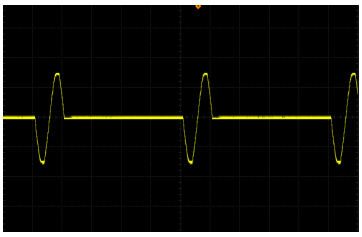
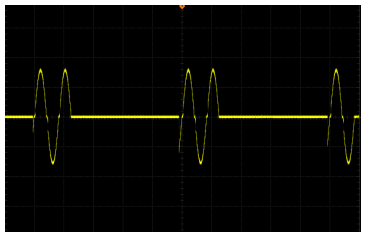
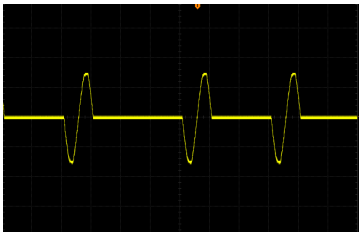
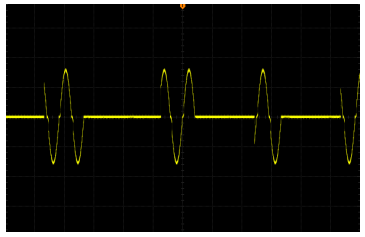
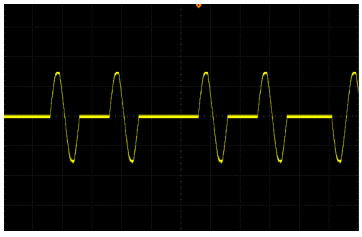
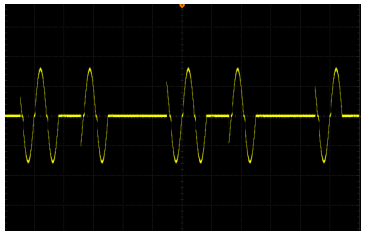
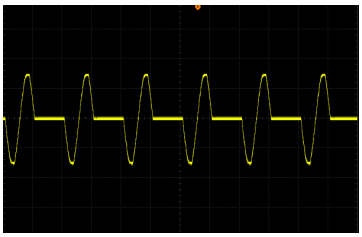
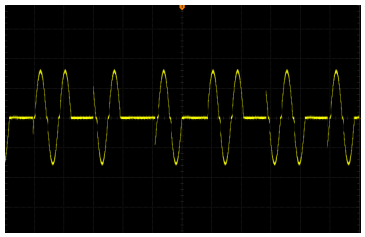
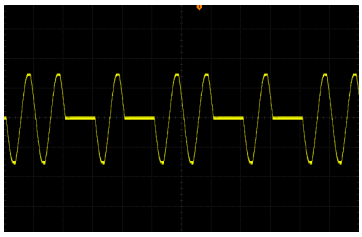
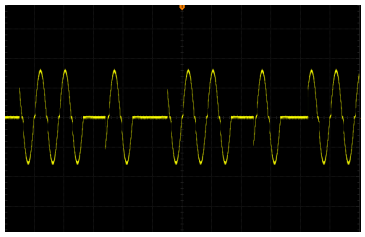
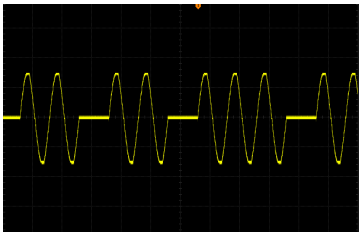
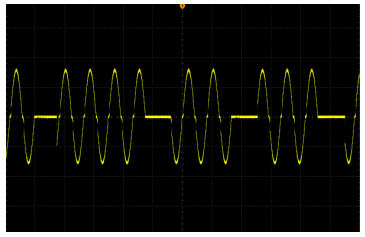
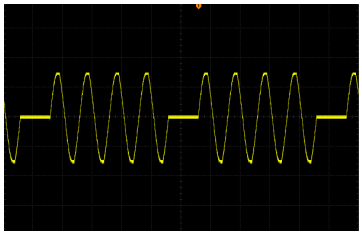
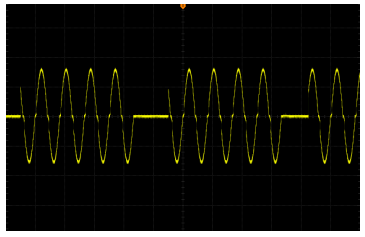
Mode	Jumper
10-step mode	open (default)
20-step mode	closed

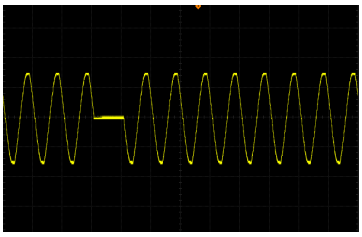
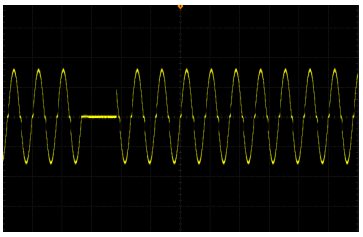
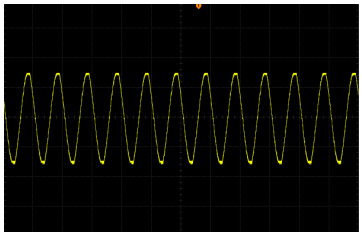
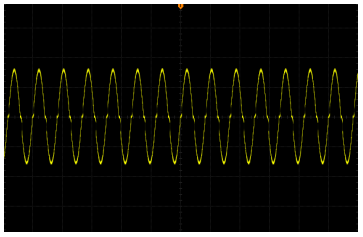
3 Output Cycles

In versions up to 2.0, the burst fire controller manages the load voltage exclusively in 10-step mode. The table below illustrates the load's output cycles corresponding to each analog input value.

Table 2: Load's output cycles in 10-step mode

Input (0-10Vdc)	Output Steps	Duty Cycles	50Hz Electrical Power System	60Hz Electrical Power System
1V	1	10%		

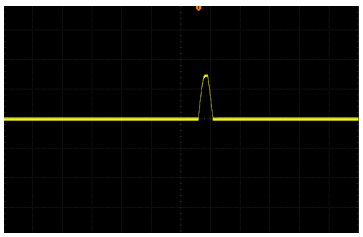
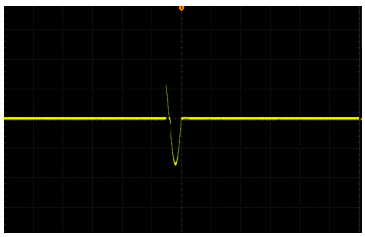
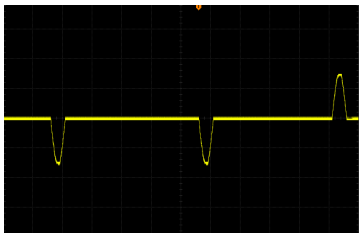
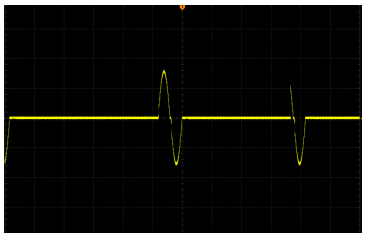
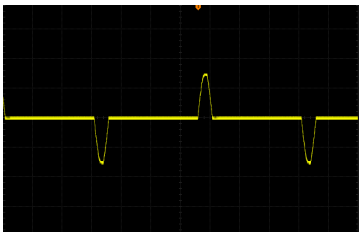
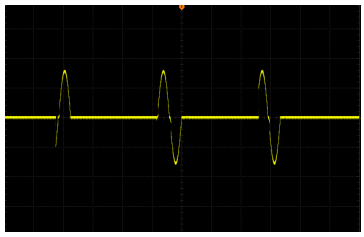
2V	2	20%		
3V	3	30%		
4V	4	40%		
5V	5	50%		
6V	6	60%		
7V	7	70%		
8V	8	80%		

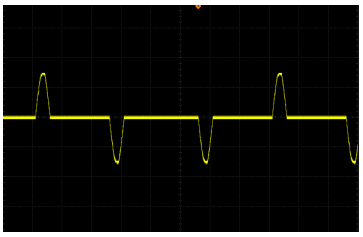
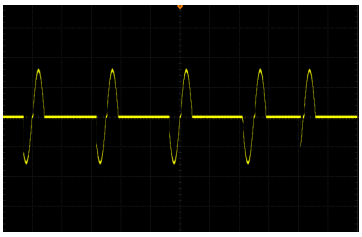
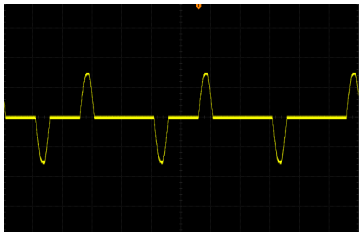
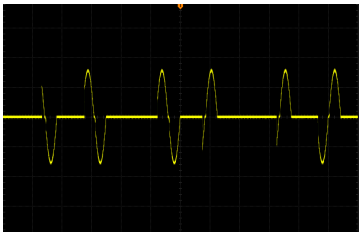
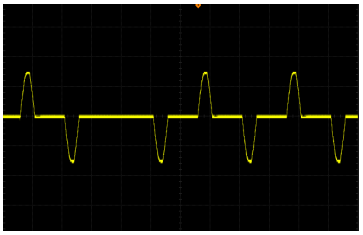
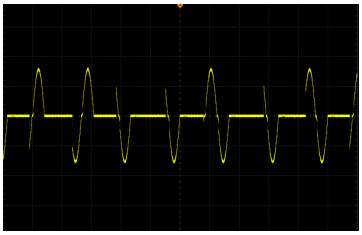
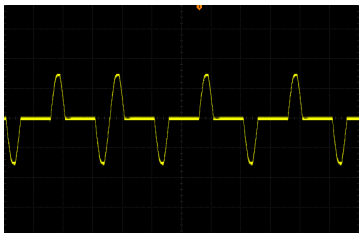
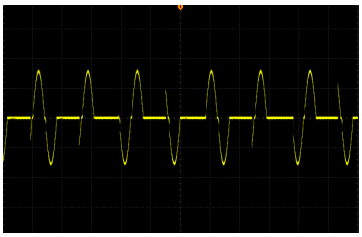
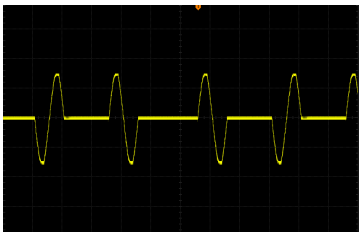
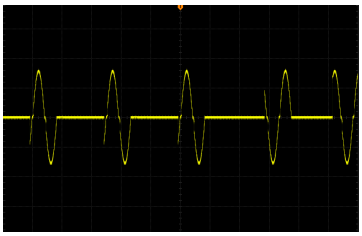
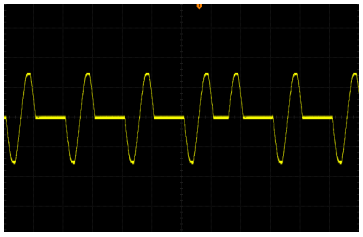
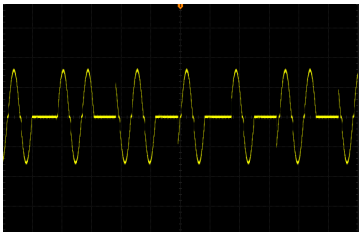
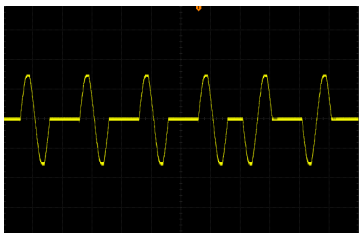
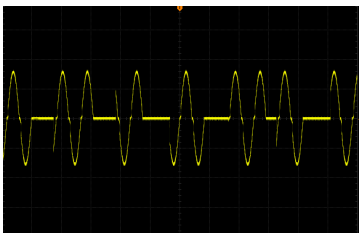
9V	9	90%		
10V	10	100%		

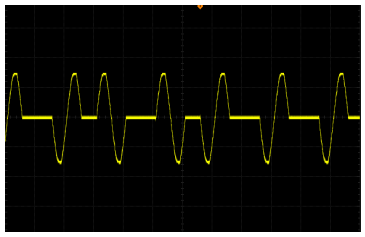
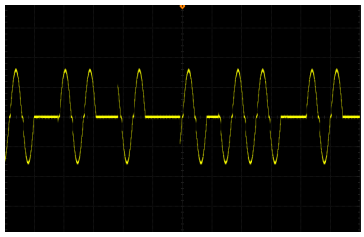
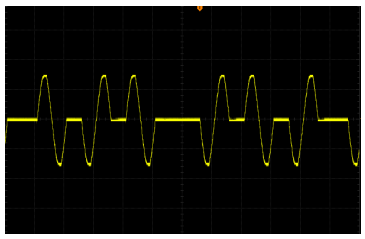
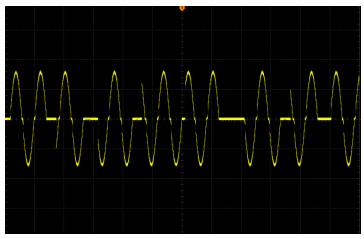
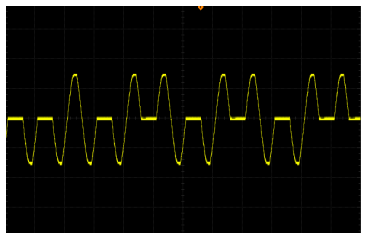
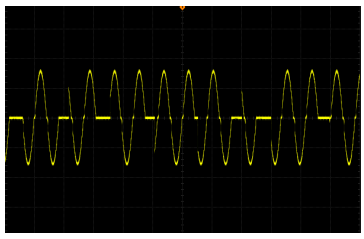
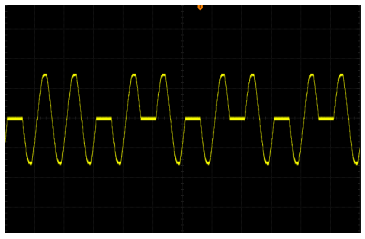
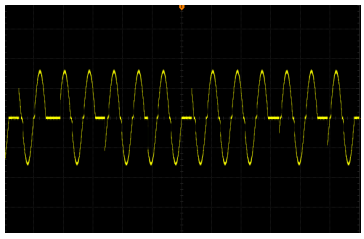
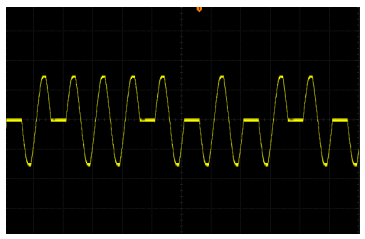
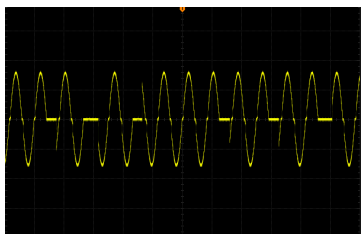
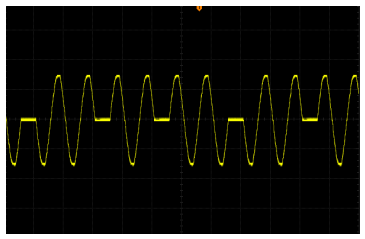
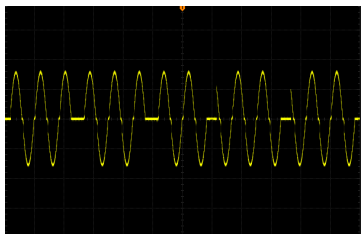
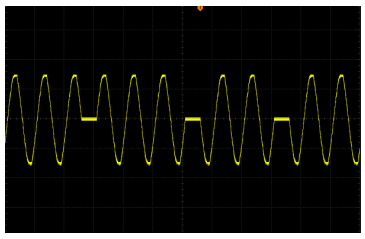
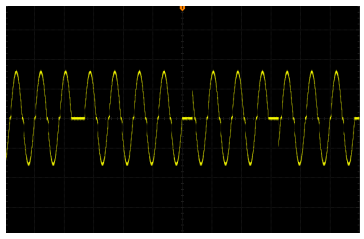
Starting with version 2.1, the load can also be controlled in 20-step mode, providing 5% adjustments per step across 20 steps per period. The table below illustrates the load's output cycles corresponding to each analog input value.

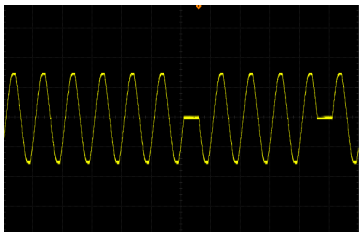
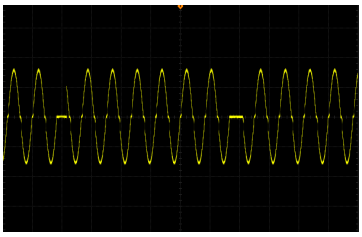
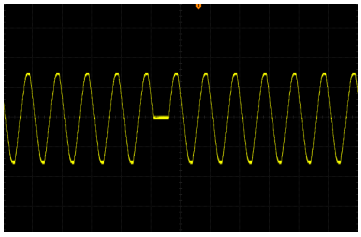
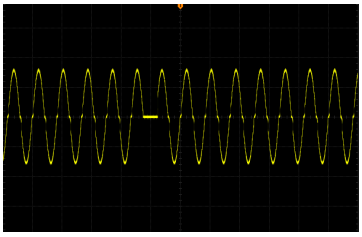
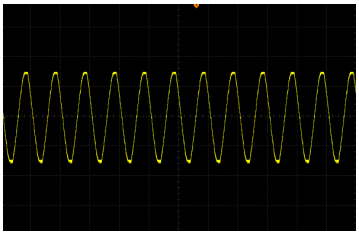
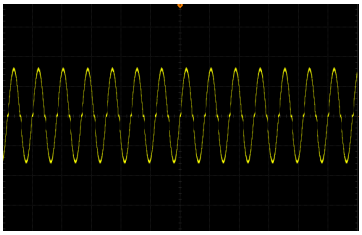
By closing the jumper, the board will control in 20-step mode.

Table 3: Load's output cycles in 20-step mode

Input (0-10Vdc)	Output Steps	Duty Cycle	50Hz System	60Hz System
0.5V	1	5%		
1V	2	10%		
1.5V	3	15%		

2.0V	4	20%		
2.5V	5	25%		
3.0V	6	30%		
3.5V	7	35%		
4.0V	8	40%		
4.5V	9	45%		
5.0V	10	50%		

5.5V	11	55%		
6.0V	12	60%		
6.5V	13	65%		
7.0V	14	70%		
7.5V	15	75%		
8.0V	16	80%		
8.5V	17	85%		

9.0V	18	90%		
9.5V	19	95%		
10V	20	100%		

4 Mounting Instructions

The controller board is designed to be mounted on a solid-state relay (SSR). It drives the SSR using a 5VDC control signal, so the selected SSR must be capable of accepting a 5V input signal.

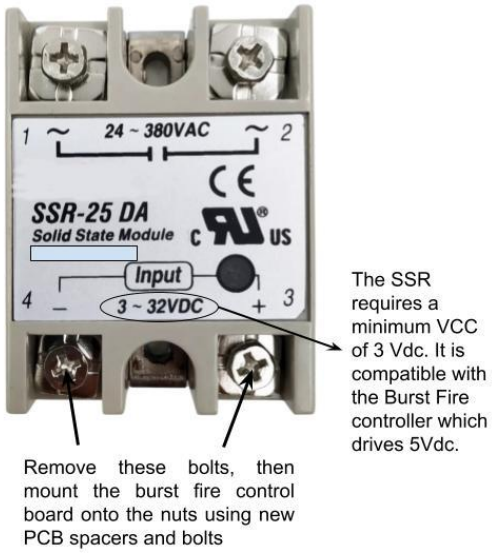


Figure 3: An example of a solid-state relay (SSR) used with the controller board

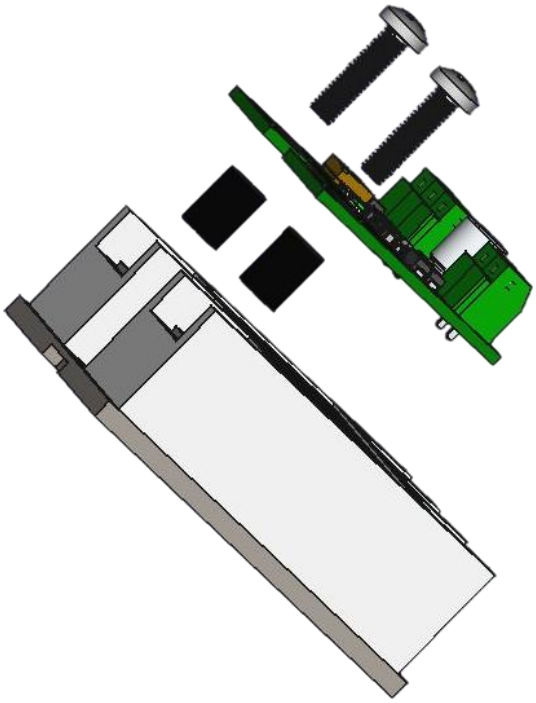
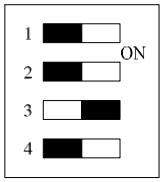
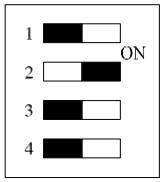
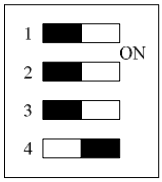
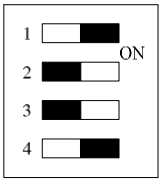
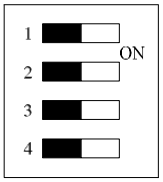
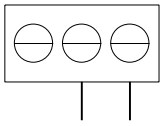
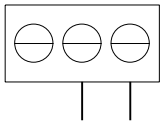
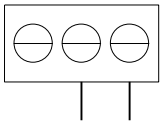
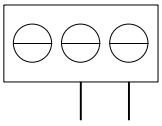
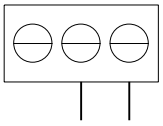
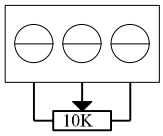


Figure 4: Mounting diagram

5 Analog Signals

To control the power delivered to the load using the burst fire controller, one of the supported analog signals must be connected to the analog input terminals. The controller accepts five types of analog signals: 0–10VDC, 0–5VDC, 0–20mA, 4–20mA, and 0–1.1VDC. Additionally, the board supports the use of a potentiometer (POT) for load control. Only one type of analog signal can be connected at a time. The DIP switches on the board must be configured according to the type of analog signal being used. The table below provides the DIP switch settings and connection methods for each analog signal type and the potentiometer.

Table 4: Analog signals for controlling an output signal

0-10Vdc	0-5Vdc/POT	0-20mA	4-20mA	0-1.1Vdc
				
				
				

6 Interfacing

The burst fire controller board requires a power supply and can operate with either an AC or DC power source.

6.1.1 DC Power Supply

Although the burst fire controller board can operate with an AC power supply, using a DC power supply provides more stable operation and better protection against electrical noise. The board accepts a DC voltage input range of 7–24VDC. It also supports a variety of analog input signals used to control the output. The compatible analog input signals include 0–10VDC, 0–5VDC, 0–1.1VDC, 4–20mA, and 0–20mA. Additionally, the board can control the output signal without any analog input by using a potentiometer (POT). When using analog signals or a potentiometer, the DIP switches on the board must be configured according to the selected input type.

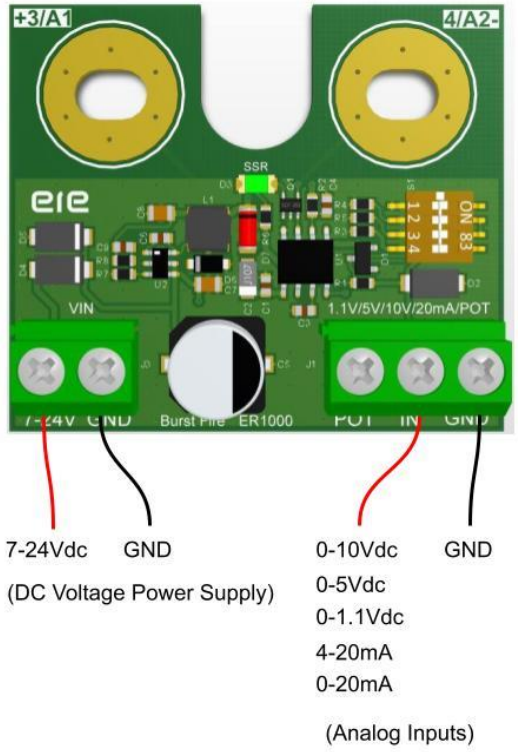


Figure 5: Using DC power supply

6.1.2 AC Power Supply

The burst fire controller board supports an AC voltage power supply. It can accept an AC voltage range from 7Vac to 17Vac, the 12Vac is recommended. Therefore, the board can operate using only a transformer for its AC power supply and does not require a DC power source.

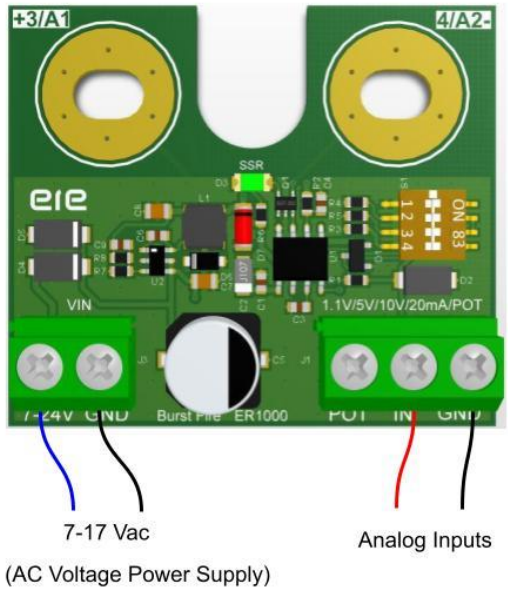


Figure 6: Using AC power supply

7 Specification

Parameters	Values
Ouput Voltage for Driving SSR	5 VDC
Maximum Output Power	120 mW
Maximum Output Current, IC (on)	80 mA
Maximum Output Voltage, VCE(on)	300 mV
Input Power Supply Voltage Range (VDC)	7-24 VDC
Input Power Supply Voltage Range (VAC)	7-17 Vrms
Period Time	200 ms
Total Steps per period (10-step mode)	10 steps
Step width (10-step mode)	10% (20ms) per step
Total Steps per period Steps (20-step mode)	20 steps
Step width (20-step mode)	5% (10ms) per step

The maximum output power dissipation must not exceed 120mW

8 Dimensions

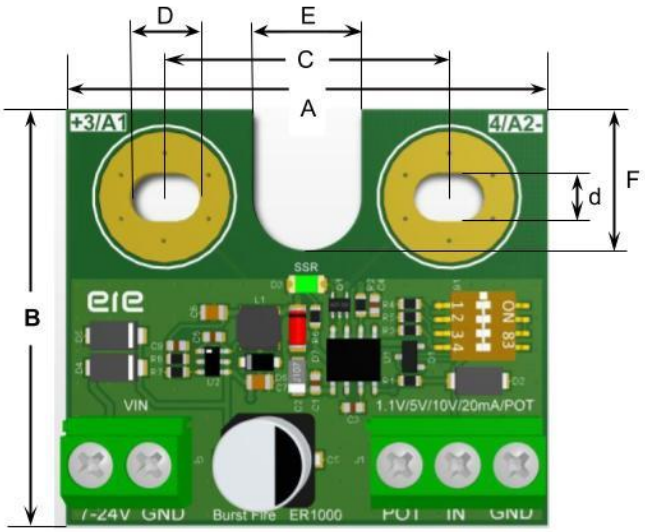


Figure 7: Board dimensions

Table 5: Board dimensions

Units	mm	inch
A	44.00	1.7323
B	38.00	1.4961
C	26.00	1.0236
D	6.50	0.2559
d	4.50	0.1772
E	10.00	0.3937
F	12.89	0.4724

9 Applications

The picture below shows how easily a burst fire controller board is used to control a heater with a potentiometer.

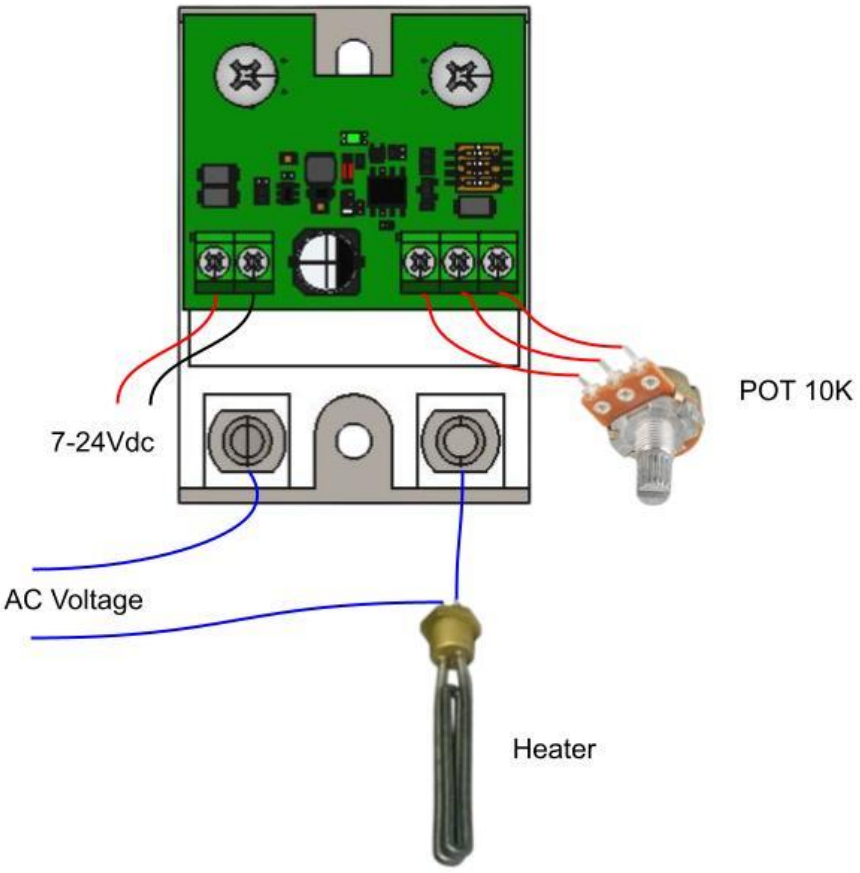


Figure 8: Heater control with POT