



# **ST/STR/STA Arc Intervention Circuitry Functionality**

**Rev A**

Spellman's ST/STR/STA power supply series have an arc intervention feature that senses arc currents via a fast-acting current sense transformer in the low-end return of the high voltage multiplier. Circuitry then converts the current to a voltage and level sensing is done to determine if an arc has occurred. Discrimination is required to prevent ordinary multiplier charging currents from setting off the arc detection circuitry, preventing normal operation.

The purpose of the arc intervention circuitry is to prevent power supply damage from continuous, long term arcing. Our arc detection circuitry is not a precision circuit, nor is it designed to sense every possible arcing event.

Internal series limiting assemblies limit short circuit discharge currents to safe and reasonable levels. Spellman sets the trip point for the arc detection circuitry to protect the power supply from excessive arcing, while allowing normal power supply functionality.

Finding the proper balance between protection and sensitivity is crucial to provide a unit that functions properly. Making the circuit too sensitive will yield a unit that trips off due to normal high voltage multiplier charging currents. Making the circuit too insensitive risks damaging the internal short circuit limiters from thermal overload due to excessive arcing.

If unique, precision arc sensing is required (beyond the capability of our arc intervention circuitry) Spellman recommends the customer implement this functionality external to the power supply with their own circuitry.



## The ST/STR/STA arc intervention protocol consists of four distinct parts:

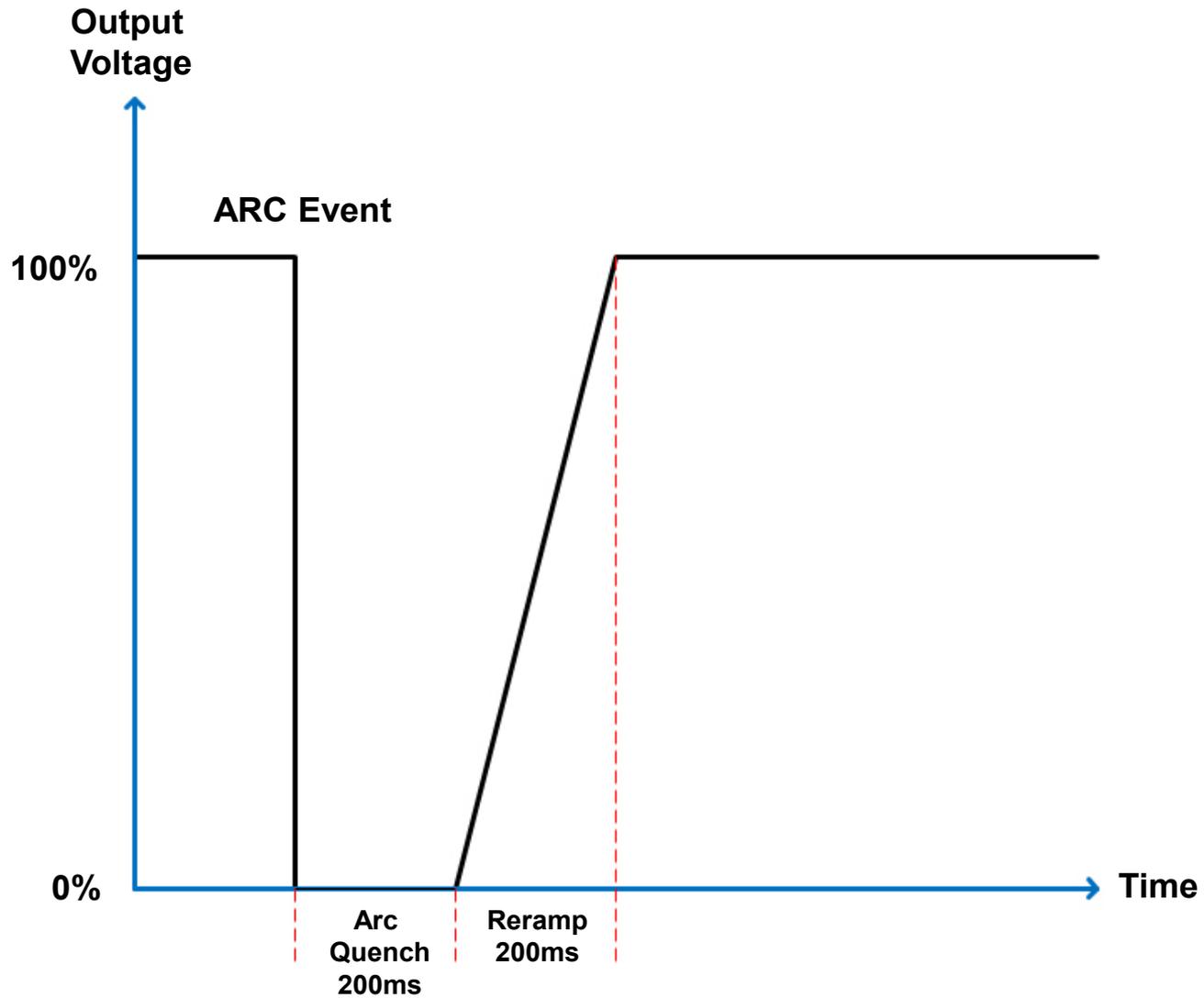
**ARC SENSE:** A wide bandwidth current transformer is used to sense the high voltage multiplier return current in real time. The magnitude of the arc discharge current is level sensed to determine if an arc has occurred. Arc events can be sensed in the microsecond timeframe.

**ARC QUENCH:** The instant an arc is detected the main oscillator is gated off for 200ms. This prevents any additional high voltage energy from being transferred to the arc, assisting in the arc quenching process.

**RERAMP:** After the arc quench time, the high voltage is re-enabled with a linear ramp. The controlled reapplication of output voltage can help to prevent another arc from occurring. The standard ramp time after the quench time period is 200ms.

**ARC COUNT:** Each arc event is loaded into an arc counting circuit. If four arcs occur in a 10 second time non-synchronous time period, the power supply will shut down with an “ARC” fault due to excessive arcing.

# Standard ST/STR/STA Arc Recovery



The ST/STR/STA utilizes a digital counting circuit to protect the power supply from excessive external arcing events. Each time an arc event occurs, the event is loaded into an arc counter.

If 4 arcs occurs in a 10 second time period, the power supply will trip off with an “ARC” fault latched on the front panel diagnostic display. Cycle the front panel Control Power ON switch or cycle the AC input power to clear the fault. If 4 arcs do **not** occur in the 10 second time period, any counts loaded into the counter are cleared. A new 10 second non-synchronous time window is opened and the cycle repeats.

**The standard arc intervention circuitry can be modified, but the customer needs to understand and take responsibility that change(s) could pose risk of thermal overload of the internal arc limiting assembly. Consult the factory if you feel you need customized arc intervention circuitry.**

**ARC SENSE:** The arc sense feature can be disabled, rendering all protective arc intervention circuitry nonoperational. Extreme caution is suggested if selecting this option.

**ARC QUENCH:** The arc quench time period can be shortened, lengthened or removed entirely.

**RERAMP:** The reramp time period can be shortened, lengthened or removed entirely.

**ARC COUNT:** The number of arcs counted and be increased, decreased or disabled. The time window can be increased, decreased or disabled.

It is imperative that both Spellman and our customers jointly understand the behavior and limitations of our power supplies during dynamic arcing conditions.

Our standard arc intervention circuitry may require customization for proper use in a specific application. The ST/STR/STA can make changes to the arc intervention circuitry via the GUI, making these units easier to tailor for unique situations.

Feel free to contact Spellman to review your requirements.

[www.spellmanhv.com](http://www.spellmanhv.com)

