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# Service Bulletin

**Date:** January 2001  
**From:** Capstone Customer Service  
**Subject:** SSR Transient Voltage Suppressor Installation Instructions

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Be sure to read and comply with the instructions contained within this Service Bulletin prior to installing transient voltage suppressors.

## **Introduction:**

This Service Bulletin describes the addition of transient voltage (or contact) suppressors whenever the Solid State Relay (SSR) output in the User Connection Bay (UCB) is connected to an external circuit containing relay coils, contactor coils, or electrical motors.

These transient voltage (or contact) suppressors are necessary and essential REGARDLESS of the voltage level at the device connected to the SSR output.

Notice that the SSR outputs are limited to 100 milliamps on AC circuits and to 50 milliamps on DC circuits.

## **Affected:**

All Capstone MicroTurbine installations that use the SSR outputs for various functions are affected.

### **Abstract:**

The SSR output circuits must NOT be connected to any inductive device, regardless of the voltage level, without the installation of a transient voltage (or contact) suppressor.

### **Description:**

The SSR outputs in the UCB are rated at a maximum of 240 VAC (rms) under both steady state and transient conditions. The voltage across the solid-state relays in the UCB must **NEVER EXCEED 350 VOLTS PEAK**. Even transient voltages above this value may cause severe damage to the solid-state relay circuitry.

High peak voltages can occur in any circuit that contains inductive loads similar to relay coils, contactor coils, or electrical motors. These high peak voltages can occur even though the steady-state voltages may be within the 240 VAC limits.

In certain instances, Capstone has experienced failure of the SSR outputs, and therefore failure of the UCB circuit board when the SSR outputs were used to drive even a small 120 VAC relay coil. Failures have occurred at 5 VDC where the SSR output has directly driven a relay. In each of these events, the failure was due to a transient over voltage that occurred when the relay coil was being de-energized.

### **Corrective Action:**

1. Suitable transient voltage (or contact) suppressors **MUST BE** installed in parallel with the SSR output whenever it is connected to a circuit that contains relay coils, contactor coils, or electrical motors. (Refer to the diagram on page 4).
2. If a transient voltage suppressor (an MOV or semiconductor) is utilized, it must have a maximum clamping voltage of less than 350 volts @ 100 milliamps. (Microsemi Corp. P/N 1.5KE300CA).

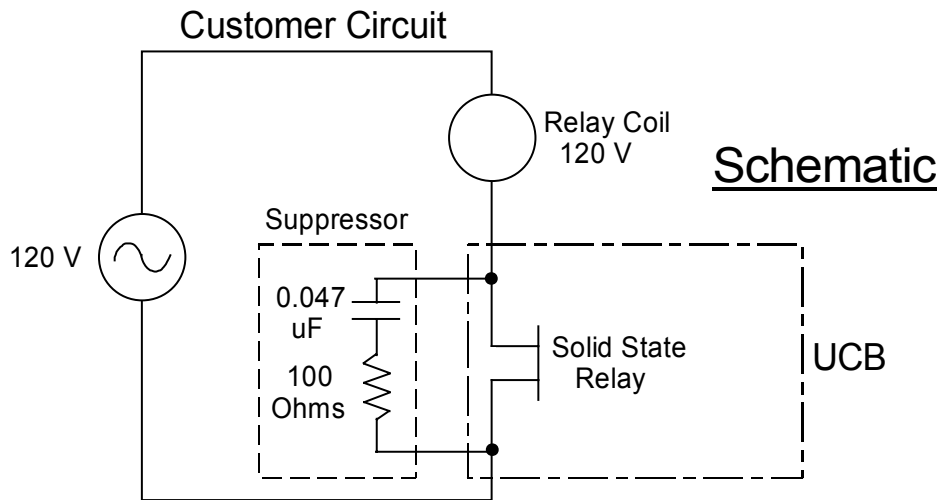
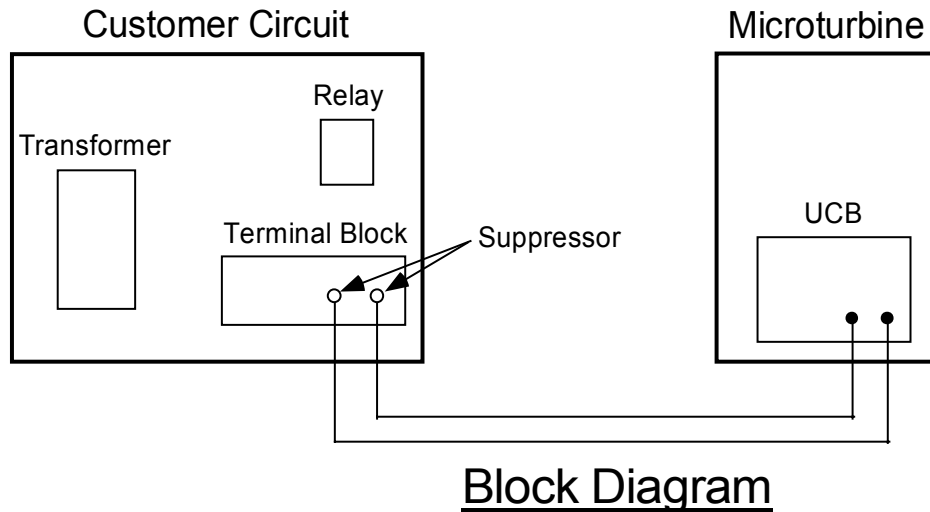
3. You may also employ an RC based contact suppressor. A suitable RC based device would have the following specific values: 250 VAC and 0.047uF at 100 ohms. Contact suppressor EVOX RIFA, Part Number PMR 209MB5470M100 may be used.
4. There is no **lower** voltage limit for each SSR output. However, voltage suppressors are not required on digital logic circuits.
5. The transient voltage suppressor should be installed even if the current system is operating without problems. Capstone assumes that nearly all load circuits will contain inductive elements that may eventually cause a severe transient voltage.
6. In the future, Capstone production services will ensure that all parts and recommended circuits are properly fitted with contact suppressors whenever there is even a slight possibility that transient over voltage may occur. The devices will be installed in Dual Mode Controllers and in External Auxiliary Load controllers (as used with the compressors in stand-alone systems).
7. It should also be noted that existing Dual Mode Controllers have not caused field failures of the SSR outputs. Therefore, Capstone does NOT recommend that contact suppressors be retrofitted into these particular devices.

This change will take effect immediately to prevent possible SSR failure problems. For additional information or if questions arise, please contact Capstone Customer Service.

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The following graphic illustrates a typical SSR circuit diagram.



NOTES:

1. Diagrams are shown for one circuit (or channel) only.
2. Diagrams apply to circuits connected to Terminal Block TB5, between terminals 1-2, 3-4, and 5-6.