

# Suppressing Nanosecond Wide Spikes With Varistors

## DETECTING THE SPIKES

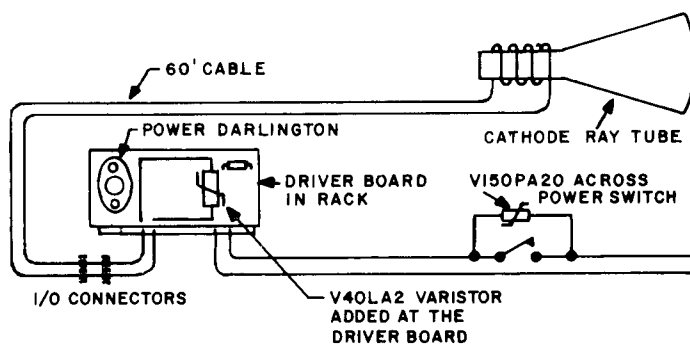
There are engineers that argue that "if you can't see it on an oscilloscope, it didn't happen." They, of course, have to be shown that the 120 volt line has 2000 volt spikes riding on it. That used to be difficult, since most large spikes are very narrow and almost impossible to sync and display on a scope. At GE Daytona Beach, they have been using a Memory Voltmeter for detecting very sharp transients with successful results. The instrument is used for sharp spike/transient detection on low level signal and DC power lines as well as 60 Hz AC power lines. This instrument displays with its digital voltmeter the peak value of any spike occurring since its last manual reset. Its bandwidth is approximately 500 MHz and records voltage transients from 1 volt to 2000 volts. A high voltage probe is available for higher voltage spikes. The instrument has been found invaluable and has been used in solving typical problems discussed below.

## SUPPRESSING THEM

General Electric GE-MOV® Varistors are being used in many electrical and electronic equipment applications by GE Daytona. They have proven themselves numerous times, not only in the reduction of EMI problems but also in preventing damage to very expensive electronic equipment. Several examples of how they successfully suppressed transients are illustrated below:

## FOCUS COIL CURRENT INTERRUPTION DAMAGING DRIVER CIRCUITS

A major trainer system was experiencing failures in a circuit which drives a focus coil for a Cathode Ray Tube. Failures were traced to inductive kickback of the coil when the manual switch in the system was opened. The transient was damaging ceramic capacitors in the 30 volt circuit. The memory voltmeter detected that transients of 1200 volts were being reflected. Varistors were tried across the coil. The V150PA20 Varistor reduced the spike to 220 volts. A MINI-MOV® Varistor (V40LA2) reduced the spike to 98 volts peak.

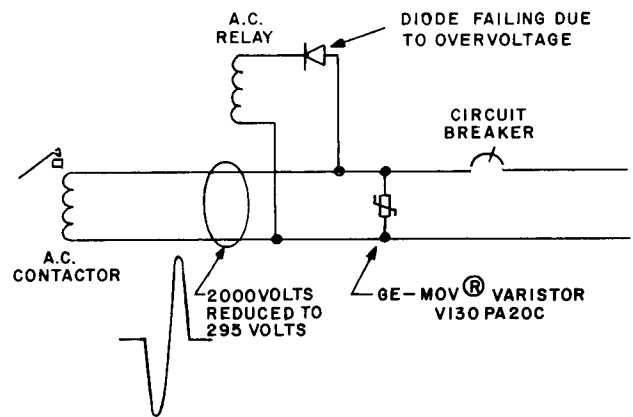


## FAILURES DUE TO SUDDEN POWER INTERRUPTION

Failures were occurring in a trainer system where the entire system was turned-off via a main circuit breaker. Interruption of the entire system current flow produced transients at the equipment which approached 2000 volts. Electricians at Daytona Beach added Varistors at the main circuit breaker panel; no failures due to transients have been experienced since.

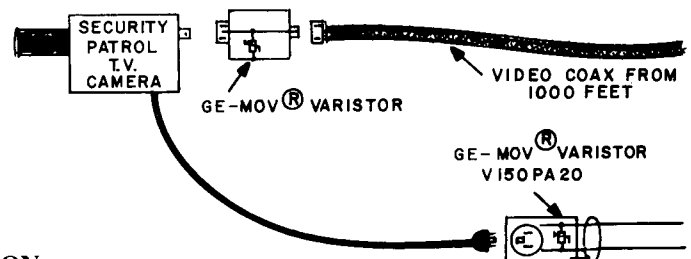
## SOLENOID SPIKES — DAMAGING AC RELAYS

AC relay failures occurred more frequently than expected. Engineers using an oscilloscope (80 MHz bandwidth) found nothing unusual, syncing the scope to one-of-a-kind transients are almost impossible. The Memory Voltmeter detected that a contactor was reflecting a spike which varied from 600 volts to 2000 volts. A new Varistor was added across the 120 volt line. The spike was reduced from a 2000 volt random spike to 295 volts peak. The AC relay has not experienced any failures since.



## LIGHTNING CAUSING DAMAGING SPIKES

The Inter-Plant Security TV System using utility 120 volt power was being damaged weekly due to either power line spikes or surges in the ground system. The problem was traced to transients during lightning/thunderstorms. The power outlets to the TV camera monitors were modified by adding a Varistor, and an adapter electrical box houses the Varistor. Varistors were also added between the floating ground system of the camera electronics, and facility or building ground. No failures have occurred in the Security TV Monitor System due to lightning transients since.



*This article was prepared by Gil Condon, General Electric Co., GSD, Daytona Beach, Fla. Reprinted by permission of GE Semiconductor Products Department.*

See General Semiconductor Ind. on page 1 and GE on page 9.