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**Change Request  
 ECR #1228200701**

**SOME SCMS CAUSE DMM SELF CAL ERRORS  
 ON LOW VOLTAGE RANGES**

**SYMPTOM**

Some SelfCal Modules (SCM) cause DMM gain factor reduction of a few hundred parts per million on the 250mV range, less for the 500mV and 1V ranges, and insignificant reduction on higher ranges.

**REASON**

The apparent reduction in gain factor was caused by response of op amps U9 and U10 to momentary shorting of relays K7 and K8 while switching polarities. The momentary shorting is due to relay turn-on time being faster than turn-off time. Relay K7 is controlled by the inverse hardware signal driving K8, so software cannot be used to eliminate the relay race condition.

Shorting of the outputs plus contact bounce while closing creates pulses at the outputs of U9 and U10. Feedback capacitor C14 couples those pulses into the non-inverting input of U9. Clamping circuitry in the op amp prevents damage, but allows the op amp to go into a saturated, non-linear mode from which recovery is much slower than normal. For one SCM, the input was driven >2V away from ground. When C14 was removed, the spike at the input was <1V and recovery time was normal. There was no problem with the positive polarity because there was no feedback capacitor to drive the non-inverting op-amp U10 into non-linear operation.

**AFFECTED PRODUCTS**

New SCM's are built without capacitor C14, and the capacitor is removed from SCM's sent in for checkout or repair. The error is quite small in most SCM's, so units in the field do not need to be returned for the upgrade.

**RESOLUTION**

Capacitor C14 is removed from the SCM with no negative effect on performance. It was not necessary for proper operation of the SCM, and should never have been part of the circuit.

**STATUS**

The BOM and schematic have been changed and the upgrade document for Rev E has been released.

**Document History:**

Rev	Date	Description of Change
-	12/28/07	Created.