SSC DETECTOR SOLENOID DESIGN NOTE #23

TITLE: Possible Electrical Circuits for Detector Solenoid

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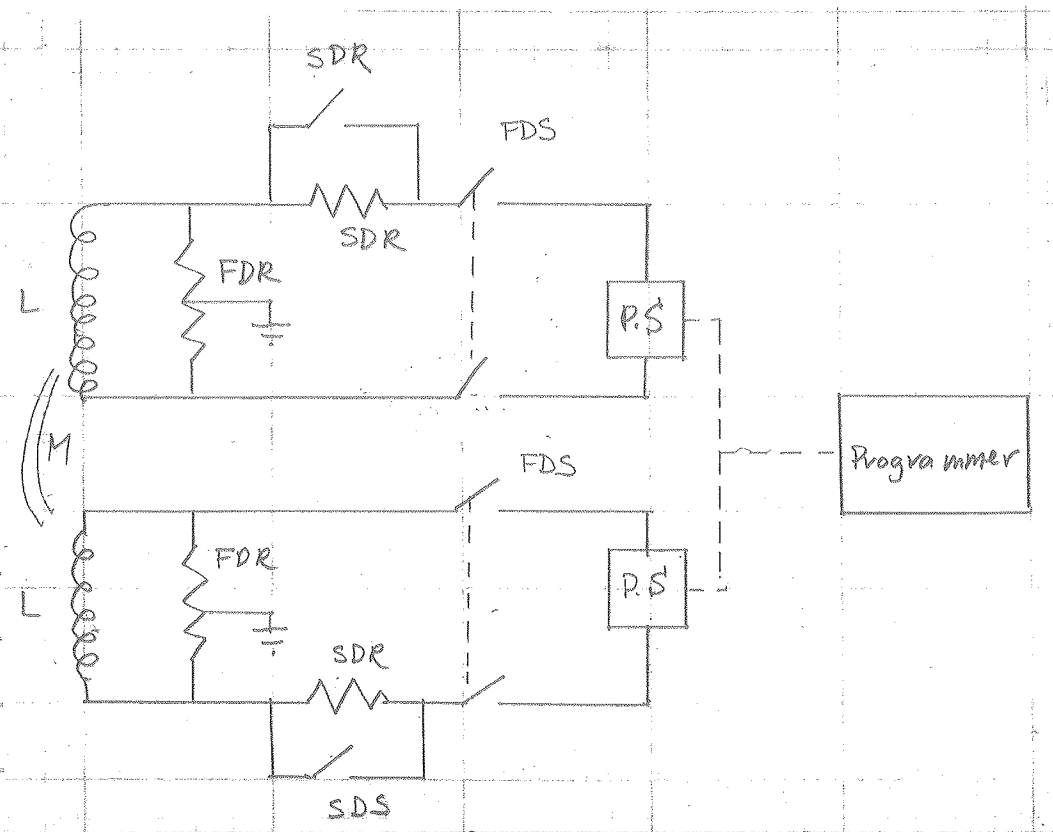
DATE: August 9, 1988

General discharge requirement:

On a discharge, either fast or slow, no point in the coil shall be more than 250 V from ground.

Case I. Two independent circuits, linked only through mutual inductance; two 5kA, 50V power supplies programmed to track.



$L = 60\ H^{*}$, $FDR = 0.1\ \Omega$, $SDR = 0.01\ \Omega$

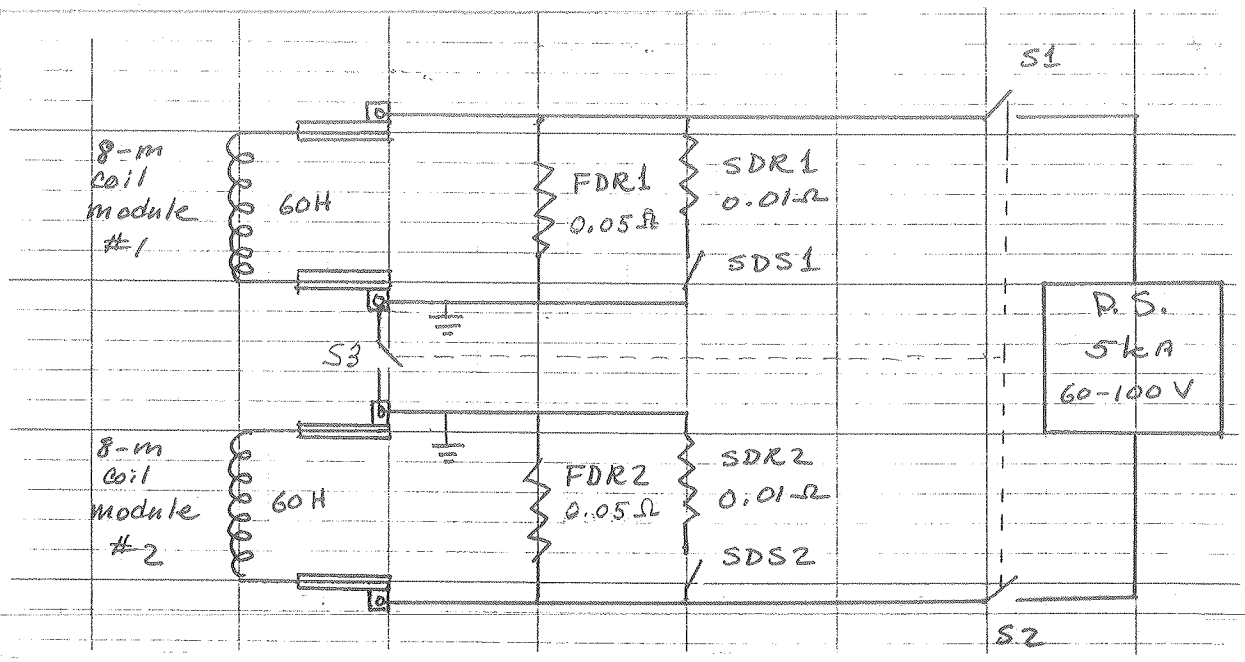
The ICEC 12 paper had this circuit.

* For 8-m coil assy.

Primary advantage: Faster charge, discharge time, higher conductor current density.

Primary disadvantages: A current decay in a quenched circuit will induce an increasing current in the still-superconducting circuit. If programmer fails only one coil might charge.

Case II. One power supply and operating circuit; two discharge circuits.

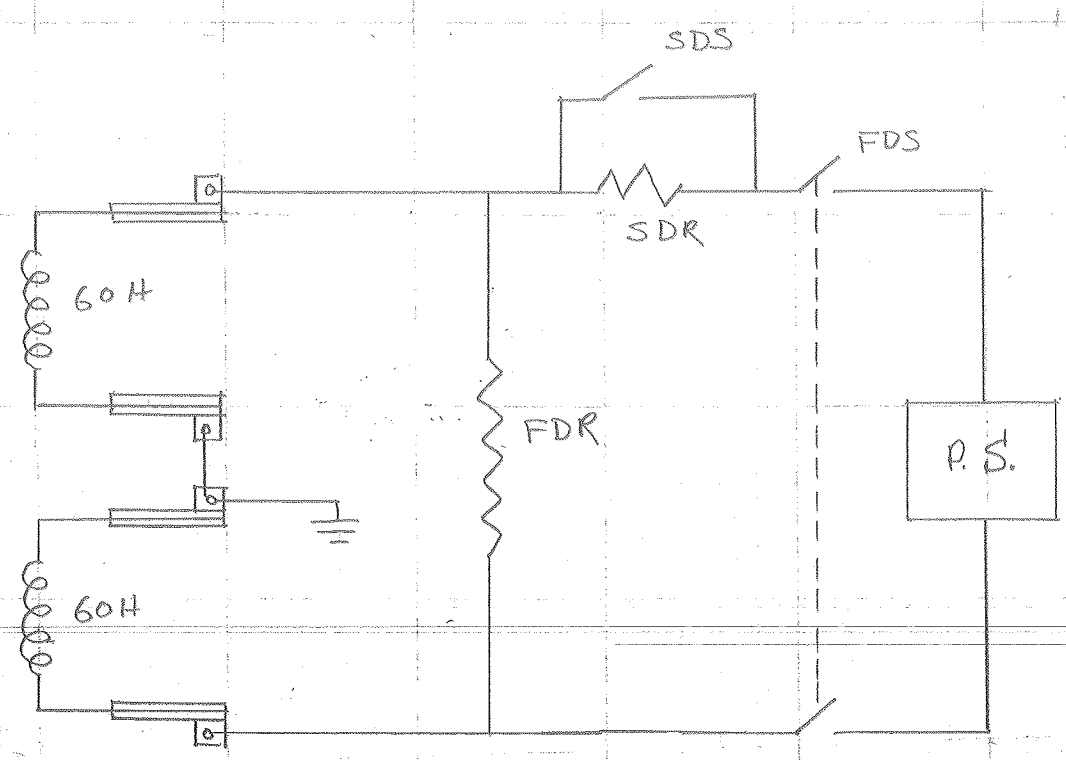


Primary advantage: Charging and operating currents same in both coils.

Primary disadvantage: Discharge currents not the same; current increases in non-quenching circuit. Slower discharge time, hence lower current density, than I.

Case III. Same as II, but without S3
Same advantages and disadvantages.

Case IV. Single charge, operate and discharge circuit.



$L = 120\,H$, $FDR = 0.1\,\Omega$; $SDR = 0.01\,\Omega$

Primary advantage: Same current in both coils - always.

Primary disadvantages: Longer charge time, or go to 100 V. Slower discharge times and hence lower current density, than I.

This circuit appears to provide greatest over-all reliability at the cost of additional copper en conductor, and slightly larger coil O.D.

Design Note #24 gives a revised coil design, to appear in the ASC paper.