TS-SSC 91-245
12/30/91
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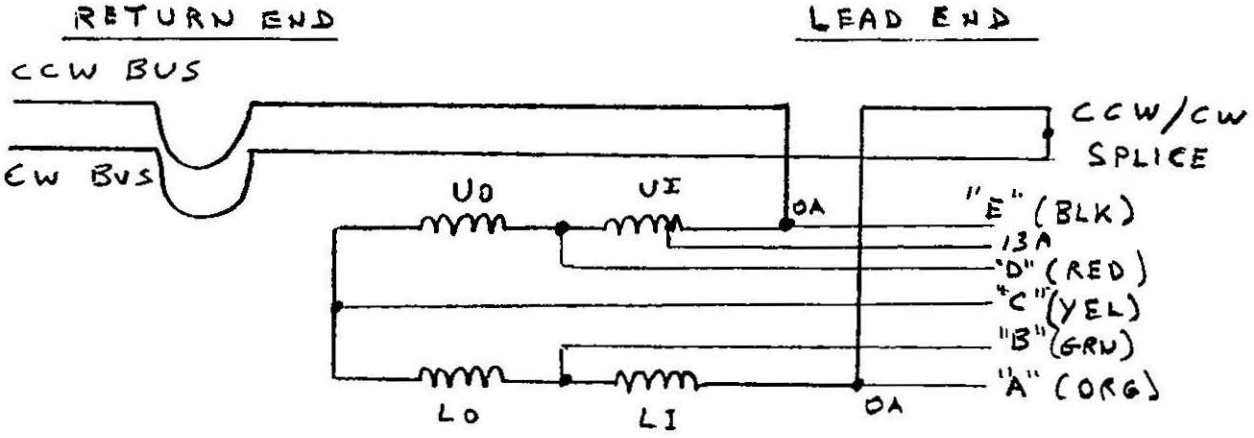
LOCATION OF UPPER INNER LEAD TO GROUND SHORT IN MAGNET DCA315

SUMMARY

On Wednesday 11/27/91 technicians found what looked like a bus to ground short during an electrical checkout prior to end-dome assembly installation. FNAL magnet DCA315 is electrically connected in a CCW configuration. This means that, for the single magnet test, the magnet leads are connected to the bus as shown below. See also FNAL DRW# ME-167548 and # MB-292688 Rev. A.



After troubleshooting we determined that the short was localized between the lead end plate and the end cap.

TROUBLESHOOTING PROCEDURE

We started by measuring the resistance to ground using a Fluke multimeter. We found the following readings:

1. Return end CCW bus to GND = 0.01 Ohms
2. OA to GND = 0.01 Ohms
3. Return end CW bus to GND = 5.64 Ohms

This test indicated that the short to ground was in the region around the upper quarter coil voltage tap 0A (BLK) or somewhere in the upper bus, because of poor sensitivity of the meter.

We then connected upper (CCW) and lower (CW) bus leads at the return end of the magnet to a current source (0.1 Amps). We then measured the voltage to ground at the following points:

1. Return end CCW bus to GND = +1.22 mVolts
2. E to GND = +0.01 mVolts
3. Voltage tap 13A to GND = -73.8 mVolts

This test indicated that the short was 1.1± 0.1 inches to the magnet side of OA quarter coil voltage tap. Assuming 590 feet/turn this measurement defined the short to be located in front of the end cap.

Technicians then removed the upper lead insulators and found the cause of the problem. During the installation procedure of the insulators, and because of the tight fit, the insulation around the conductor was overstressed and separated from the conductor itself. The insulators were tapped in place. It was at this time that the conductor was pushed back forming a kink that rubbed against a sharp edge of the end cap causing a short to ground.

REPAIR PROCEDURE

Technicians were asked to follow the procedure listed below:

1. Pull the lead out to remove the kink as much as possible
2. Using a borescope look around the lead for damage to the cable strands.
3. Remove damaged shrink tubing, kapton and fiberglass inside end plate till about 0.5" from the end cap
4. Repeat step #2
5. Wrap exposed cable using .002 inches of Kapton tape (2 layers, 1/2 lap). Then wrap .007 inch of fiberglass tape (2 layers, 1/2 lap) over the Kapton.
6. Measure resistance to ground. If less than 20 MOhms let supervisor know. If it is greater than 20 MOhms Hipot to ground up to 5000 Volts. If hipot is successful continue with the power bus soldering procedures for CCW magnet (ES#292431).
7. As of 12/6/91 technicians followed these procedures and both both resistance and hipot tests were successful.

Because the lead was pulled out to remove the kink by 1/4" we had to compensate by machining the inside of the back of the bus cover

plate and by inserting a G-10 wedge between the splice area and the back fixture to accommodate the dimensional change.
Also, new upper and lower lead end insulators were installed. These insulators were modified as per DRW# 0102-MB-292574 Rev. A and MB-292575 Rev A to prevent possible binding of the shrink tubing.