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C-A OPERATIONS PROCEDURES MANUAL

(Booster /AGS Ring Power Supply Group Procedure EPS-A-002)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

15.3.1.2 Procedure for Hipotting the AGS Main Ring Magnets

Text Pages 3 through 6

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
_____	_____	_____	_____
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Approved: _____ *Signature on File* _____
 Collider-Accelerator Department Chairman Date

M. Bannon

Booster/AGS Ring Power Supply Systems
Group Procedure EPS-A-002
Revision 00

15.3.1.2 Procedure for Hipotting the AGS Main Ring Magnets

1. Purpose

This procedure is to determine the integrity of the main ring magnet electrical insulation.

2. Responsibilities

- 2.1 The AGS Main Ring shall be in “Controlled Access LOTO”. No personnel shall be allowed in the ring during this test. A sign shall be placed on the south entrance stating Hipot test of main magnets under way or MCR shall be notified that test is underway.
- 2.2 The Main Ring Power Supply has to be released from a LOTO state.
- 2.3 The MCR has the ring in “Access Prohibited” condition, where only the AGS MMPS ‘S LOTO has been removed and all other equipment is still LOTO. “Controlled Access LOTO”
- 2.4 No grounds should be installed in the 242 area.
- 2.5 95 fast and slow switches Station I and II must be opened.

Note:

Before opening the fast 95 ‘s in enclosures L31 & L33 there is a new potter Brumfield 12v relay installed in the top of each of these enclosures, they must be removed from there socket otherwise the fast 95’s will not open and the SCR in the electronic box may be damaged.

Note:

No one shall press the rectifier standby/reset push button switch during test.

- 2.6 In Enclosure L34, contacts 57 I and II (the grounding contact) must be opened so there are no grounds in the system while Hipot testing is being done.

Note:

Note which switch is closed 57 I _____ or 57 II _____.

- 2.7 The new 95S switches front doors must be opened and the air valves turn off. Install a test barrier, to establish a “Test in Progress Area”.

Note:

In order to get inside front doors of the 95S switches, MCR must unlock from the MCR lock box Kirk Key #18265. This will be placed in the 4 key exchange on the side of the 89 switch enclosure in basement of 928 along with key #17251 from the air lockout of CB 52G . The #7251 key signifies that it is safe to enter the 95S enclosures and the #18265 key signifies that MCR understands we are about to enter the 95S enclosures to do Hipotting and the rings is on “Controlled Access LOTO” and no one is allowed in the ring while Hipot test is being performed.

- 2.8 The bus in the 95S switches must be put in a state where the ring magnets are neither grounded nor attached to the rectifiers. This is accomplished by sliding some G10 or plastic material between the magnet and ground bus in both 95S Station I & II cabinets and both the + / - bus in each cabinet.

3. Prerequisites

- 3.1 Two people trained in “Working Hot” and electrical and electrical safety shall perform the test.
- 3.2 The personnel shall have read this procedure and understand the test they are to perform.
- 3.3 The 242 area key and the 95 switch area keys shall be under the control of the tech performing the test.

Equipment and safety equipment needed to perform this test

- a) High voltage gloves
- b) Safety glasses
- c) Grounding stick
- d) Evershed Coffin (BIDDLE) Megger 5000vdc Model #1404075
- e) Spellman 15kv 33ma HIPOT Model #RMP15P500/OLT/
- f) Temp/Humidity Meter.

4. Procedure

Water resistance must be recorded of all 3 water systems used in cooling the systems.

- a) Choke Water – located south basement wall nest to air intake door.
 - b) Rectifier water-located on I beam in the center of the basement in 928 next to deionizer.
 - c) AGSMM water – located in 911 pump room – call pump room for assistance.
 - d) Record all water resistances on test data sheets.
- 4.2 Record the temp and humidity of the air during the test on the data sheet.

With the magnets open (neither grounded nor attached to the rectifiers) Megger check the magnets to ground at 1000, 2500 and 5000vdc and record resistance on test data sheet. Attachment A.

- a.) Attach the ground of the Megger on the ground bus in the 95S Station I.
- b.) Attach a ground to 95S switch Station I (-)
- c.) Attach the positive lead of the Megger to 95S switch Station I (+)
- d.) Set the Megger to 1000 VDC then turn on the Megger and record the resistance.
- e.) Switch the Megger to 2500 VDC and record the resistance.
- f.) Switch the Megger to 5000 VDC and record the resistance.
- g.) After measurements have been made, turn the Megger off and wait approx. 1 minute before installing the ground stick on 95S switch Station I (+).
- h.) After the ground stick is place on the positive bus, move the positive lead of the Megger to the 95S switch Station I (-). Remove the ground on this bus and repeat steps 4.2-d thru f.
- i.) After these measurements are taken, turn the Megger off and wait approx. 1 minutes before installing the ground stick on 95S switch Station I (-).

- 4.4 If the ring magnet resistance to ground looks good 300k ohms or higher, then it is safe to hi pot the ring using the Spellman [15KV@33MA](#) power supply. Record results on Attachment B.

This test will start out at 500VDC. Record the current when the voltage is set then record the current after it has been at that voltage for 1 minute. Repeat these current measurements as the voltage is raised up in 500VDC increments up to 3000 VDC. See Attachment B.

- a.) Attach the ground of the Hi-Pot on the ground bus in the 95S with Station I.
- b.) Attach a ground to 95S switch Station I (-)
- c.) Attach the positive lead of the Hipot to 95S switch Station I (+)
- d.) Turn the Hipot on and set the voltage to 500 VDC and after 1 min record the current.
- e.) Set the voltage to 1000 VDC and after 1 min record the current.
- f.) Set the voltage to 1500VDC and after 1 minutes record the current.
- g.) Set the voltage to 2000 VDC and after 1 minutes record the current.
- h.) Set the voltage to 2500 VDC and after 1 minutes record the current.
- i.) Set the voltage to 3000 VDC and after 1 minutes record the current.

After these measurements are taken, run the Hipot to zero and turn it off and unplug it, then wait approx. 5 minutes before installing the ground stick on 95S switch Station I (+). Now ground 95S switch Station I (+) and unground Station I (-) and attach the positive lead of the Hipot to 95S switch Station I (-) and repeat step 4.4.d thru i and record on test data sheet, Attachment B. After 95S switch Station I (-) readings are taken again turn the Hipot off and unplug the Hipot and wait approx. 5 minutes before grounding the 95S switch Station i (-) bus.

- 4.6 After completion of all testing, restore the 95S switches back to operating conditions and lock the front doors to the 95S switches and return all Kirk lock keys to their proper location. []

Install the potter Brumfield relay back into there relay socket, this should automatically close the fast and slow 95 switches. []

Close either 57 I or 57 II whichever switch was closed before test was started. []

57 I []

57 II []

- 4.7 Notify MCR of the completion of the test.
- 4.8 Put completed test data sheets into the AGS MM heat run, Megger, and Hipot data book located in the control room at Siemens.

ATTACHMENT B

Ring Hipot Readings from New 95S Switches in Siemens Basement

Date: _____

By: _____

I.) 95S Switch Station I (+), with Station I (-) grounded

Magnet Cables 589-1,2,3 & 592-1,2,3 Superperiods E,F,G,H,I,J,K

<u>Voltage</u>	<u>Start Current</u>	<u>Current after 1 Minute</u>
500 VDC	_____	_____
000 VDC	_____	_____
1500 VDC	_____	_____
2000 VDC	_____	_____
2500 VDC	_____	_____
3000 VDC	_____	_____

II.) 95S Switch Station I (-) , with Station I (+) grounded

Magnet Cables 589-4,5,6 & 592-4,5,6 Superperiods K,L,A,B,C,D,E

<u>Voltage</u>	<u>Start Current</u>	<u>Current after 1 Minute</u>
500 VDC	_____	_____
000 VDC	_____	_____
1500 VDC	_____	_____
2000 VDC	_____	_____
2500 VDC	_____	_____
3000 VDC	_____	_____
2500 VDC	_____	_____
3000 VDC	_____	_____

AGS OPERATIONS PROCEDURE FOR HIPOTTING THE AGS MAIN MAGNETS

ATTACHMENT C

CHECKLIST BEFORE HIPOTTING BEGINS

Initials

1. MCR coordinator has verified that the AGS is in “Access PROHIBITED” state. (ONLY MMPS’S LOTO REMOVED, ALL OTHER EQUIPMENT STILL IN “CONTROLLED ACCESS LOTO” _____

2. MCR coordinator understands that the AGS ring is ready to be hipotted and that he must release key #18265 which is in the AGSMMPS LOCK BOX in the Siemens rectifier room to the Hipot team so they can open the front doors of the 95S switches. _____

Also while testing is being conducted no one is allowed access to the Ring except members of the Hipot team

3. The Hipot team has installed a sign on the south entrance door stating no one allowed to enter ring when Hipot testing is in Progress. _____

CHECKLIST AFTER HIPOTTING COMPLETE

4. The Hipotting has been completed and the Hipot team has removed their sign from the south entrance door. _____

5. The MCR coordinator has been informed that the Hipotting is complete and the 18265 key has been returned to the AGSMMPS LOCK BOX in the rectifier room. _____

6. The AGS is now on standard “Controlled Access LOTO” and the 95 switches have been verified that they are again grounding the main magnets. _____

AGS RING IS BEING

HIPOTTED

“NO

ONE

ADMITTED”

DATE:_____

CONTACT

MCR (EXT 4662)

OR

SIEMENS CONTROL ROOM

EXT. 4547