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4-34 Commissioning

Table 4.B – SCR Snubber Circuit Resistance and Capacitance Values

Drive Rating	Sharing Resistance	Snubber Resistance	Snubber Capacitance
2400V (6P), 6600V	80 k Ω	45 Ω	0.5 μ f
3300V / 4160V	80 k Ω	60 Ω	0.5 μ f
2400V (18P)	80 k Ω	60 Ω	0.68 μ f

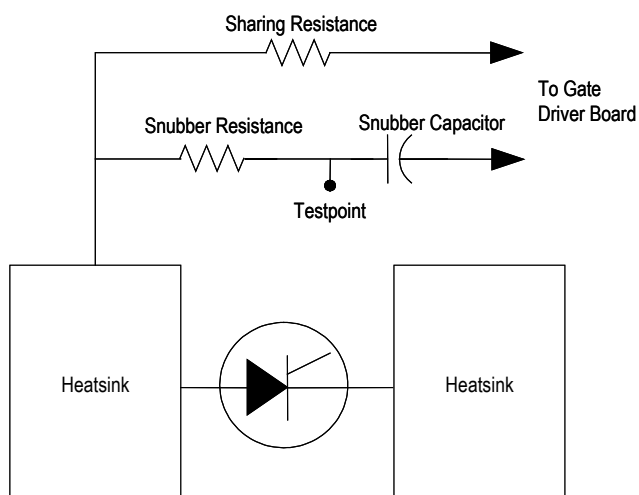


Figure 4.7 – SCR Snubber Circuit Connections

If a device or snubber component is found to be damaged, a detailed replacement procedure is located in Chapter 6 – Component Definition and Maintenance.

SCR Resistance Measurement	Measured Resistance
SCR Anode-Cathode Resistance (Heatsink to Heatsink)	_____ – _____ k Ω (Lowest) (Highest)
SCR Gate-Cathode Resistance (Across SCR Phoenix Connector)	_____ – _____ Ω (Lowest) (Highest)
Snubber Resistance (Test Point – Heatsink on Left)	_____ – _____ Ω (Lowest) (Highest)
Snubber Capacitance (Test Point – White Wire from Snubber Phoenix connector on Right)	_____ – _____ μ F (Lowest) (Highest)
Sharing Resistance (Red Wire from Snubber Phoenix connector – Heatsink on Left)	_____ – _____ k Ω (Lowest) (Highest)

SCR Anode to Cathode Resistance

Performing an Anode to Cathode resistance test verifies the integrity of the SCR. Unlike the SGCT, the SCR uses the snubber circuit to power the self-powered gate driver boards. The resistance measurement taken across each SCR should be constant; an inconsistent value may indicate a damaged sharing resistor, self-powered gate driver board or SCR.

Using an ohmmeter, measure the anode to cathode resistance across each SCR in the rectifier bridge, while looking for similar resistance values across each device. Easy access from the anode to cathode is available by going from heatsink to heatsink as shown in the diagram below:

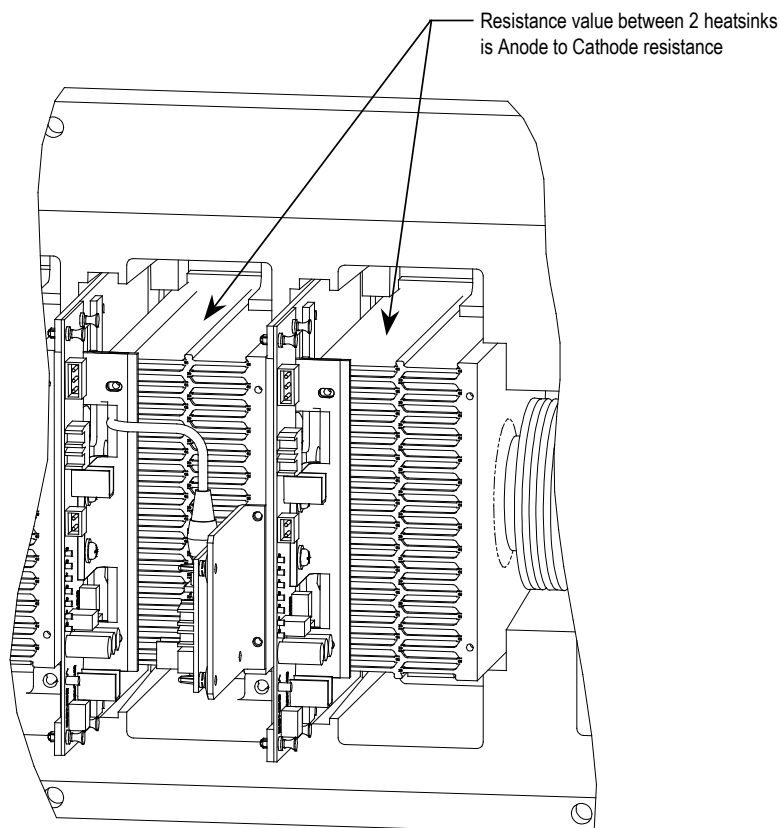


Figure 4.8 – Anode to Cathode Test

A good SCR and circuit should read between 22 and 24 k Ω .

An SCR that has failed from anode to cathode will commonly produce a resistance value of 0 for a shorted device or $\infty \Omega$ for an opened device. Unlike the SGCT, it is highly irregular for an SCR to have a partially shorted device. If an SCR is found to be out of tolerance, refer to Chapter 6 – Component Definition and Maintenance for detailed instructions on how to replace the SCR assembly.

SCR Sharing Resistance Test

To test the sharing resistor of an SCR module, disconnect the 2-pole plug of the self-powered gate driver board labeled SHARING and SNUBBER on the circuit board. The red wire of the plug is the sharing resistor. Measure the resistance between the red wire of the plug and the heatsink to the left. A value of 80 k-ohms indicates a healthy sharing resistor.

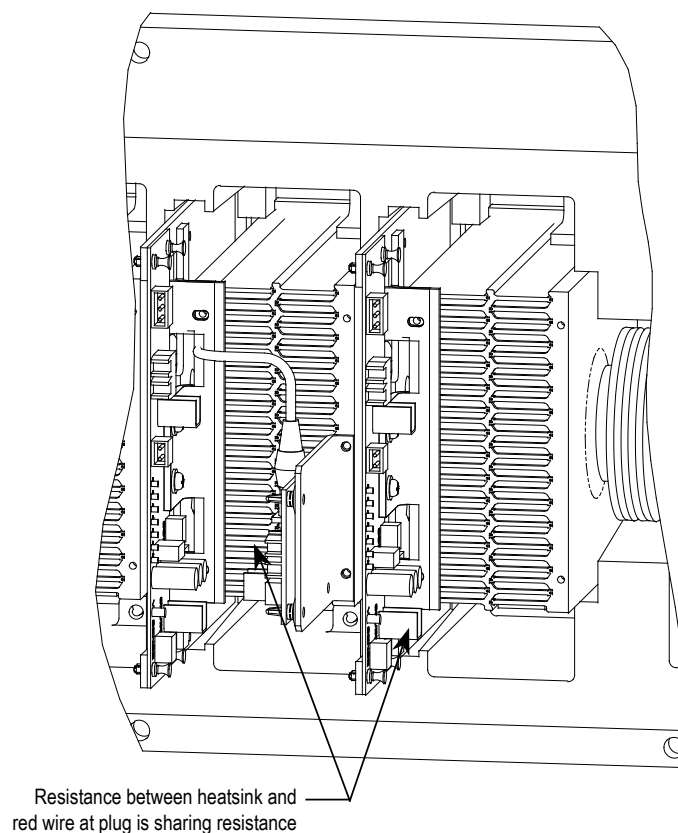


Figure 4.9 – SCR Sharing Resistance Test

Gate to Cathode Resistance

One test that can be performed on SCRs that cannot be performed on SGCTs is a Gate to Cathode Resistance Test. Performing a Gate to Cathode resistance measurement will identify damage to a SCR by revealing either an open or shorted gate to cathode connection. To test an SCR from gate to cathode, disconnect the SCR gate leads from the self powered gate driver board and measure the gate to cathode resistance on the SCR firing card Phoenix connector as shown below:

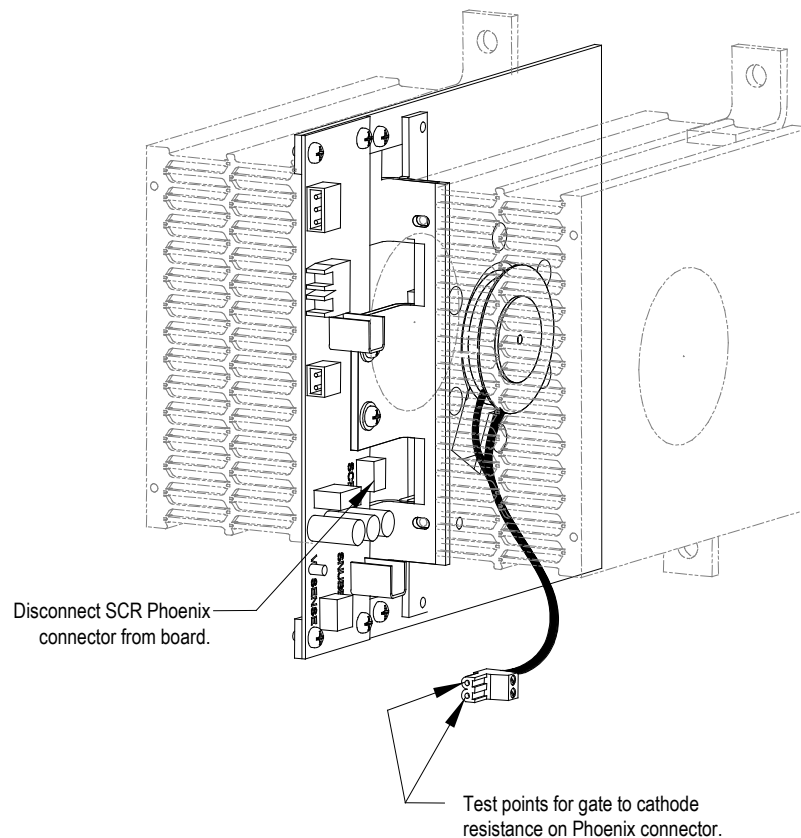


Figure 4.10 – SCR Gate to Cathode Test

The resistance value from gate to cathode should be between 10 Ω to 20 Ω . A value close to 0 Ω indicates that there is an internal short in the SCR. An extremely high value indicates that the gate connection in the device has broken.

If a Gate to Cathode test reveals a damaged SCR, a detailed replacement procedure is located in Chapter 6 – Component Definition and Maintenance.

Snubber Resistance (SCR Device)

Access to the snubber resistor is not required to test the resistance. The snubber circuit test point is located within the PowerCage under the heatsinks. For each device, there is one test point. To verify the resistance, measure the resistance between the test point and the heatsink above.

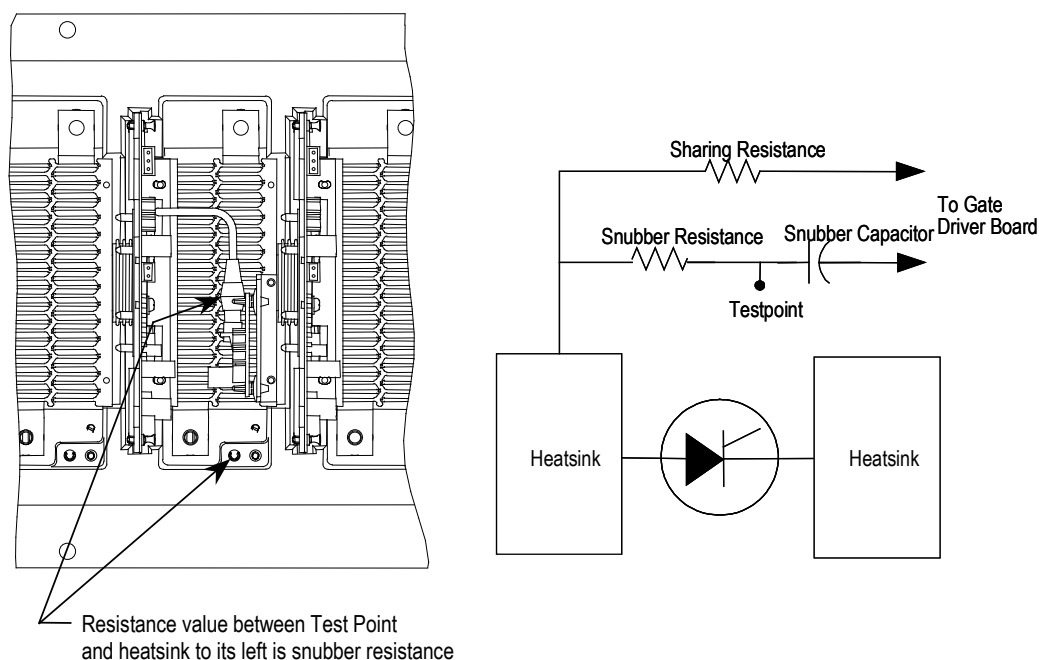


Figure 4.11 – Snubber Resistance Test

Refer to Table 4.B to determine the appropriate snubber resistance value for the current rating of the SCR used.

If the resistor is found to be out of tolerance, refer to Chapter 6 – Component Definition and Maintenance for detailed instructions on how to replace the snubber resistor assembly.

Checking Clamping Pressure

Periodically, the clamping force in the PowerCage should be inspected. Ensure there is no power to the equipment.

ATTENTION



To prevent electrical shock, ensure the main power has been disconnected before working on the drive. Verify that all circuits are voltage free using a hot stick or appropriate voltage-measuring device. Failure to do so may result in injury or death.

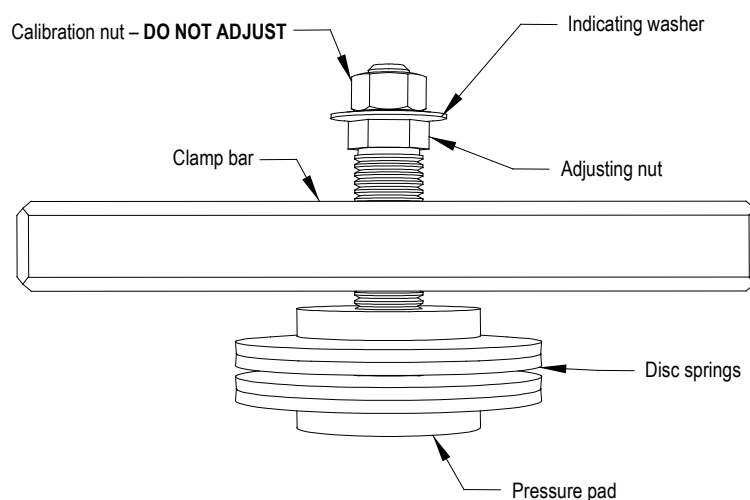


Figure 6.19 – Clamp Head Illustration

If proper force (as designated on the clamp head block) is applied to the clamping assembly, the indicating washer should just be able to rotate with fingertip touch. The disc should not rotate freely. Some force will need to be applied with your fingertips.

Clamping Pressure Adjustment

1. Ensure that all power to the drive is off.
2. Do not loosen the adjustment nut. If the clamping pressure is let off, the assembly procedure must be carried out to ensure uniform pressure on the thyristors.
3. Tighten with a 21-mm wrench on the adjustment nut (upward motion) until the indicating washer can be turned by fingers with some resistance. IT SHOULD NOT SPIN FREELY.

Silicon Controlled Rectifier and SCR Self-Powered Gate Driver Board Replacement

The method for replacing the Silicon Controlled Rectifier (SCR) is almost identical to that of the SGCT. The one exception is that the SCR and circuit board can be replaced independently of one another.

1. Ensure there is no power to the equipment.

ATTENTION



To prevent electrical shock, ensure the main power has been disconnected before working on the drive. Verify that all circuits are voltage free using a hot stick or appropriate voltage-measuring device. Failure to do so may result in injury or death.

2. Note the position of the Fiber Optic Cables for reassembly.
3. To Remove the SCR and SCR SPGD Board, it is necessary to remove the Gate Driver Power Supply connector (from snubber circuit), the fiber optic cable, and the SCR gate-cathode connection. Exceeding the minimum bend radius (50 mm/2 in.) of the fiber optic cables may result in damage.

ATTENTION



The fiber optic cables can be damaged if struck or bent sharply. The minimum bend radius is 50 mm (2 inches). The connector has a locking feature that requires pinching the tab and gently pulling straight out. The component on the printed circuit board should be held to prevent damage.

4. Remove the load on the clamp head assembly as described under 'Checking Clamping Pressure' on page 6-23.
5. Loosen the 2 captive screws with a long Phillips screwdriver until the circuit board is free. It may be necessary to adjust the position of the heatsinks to allow free movement of the SCR.
6. Slide the SCR and SCR SPGD Board straight out.
7. While grounded, unplug the Gate-Cathode phoenix connector from the SCR SPGD Board.

6-32 Component Definition and Maintenance

ATTENTION



The SCR and SCR SPGD Board can be destroyed or damaged by static charges. Personnel must be properly grounded before removing the replacement SCR and SCR SPGD Board from the protective anti-static bag that it is supplied in. Use of damaged circuit boards may also damage related components. A grounding wrist strap is recommended for handling sensitive circuit boards.

IMPORTANT

Never adjust the orientation of the SCR using the Gate and Cathode Leads. These connections are sensitive and the device orientation should only be adjusted by turning the device itself.

TO REPLACE THE SCR, FOLLOW STEPS 8-11, and 16-18.

TO REPLACE THE SCR SPGD BOARD, FOLLOW STEPS 12-15, and 16-18.

8. Loosen the tie wrap holding the G-C wire in place, and remove the device from the assembly.
9. Install the new device in the same position and using the same orientation as the original SCR, and firmly secure the G-C wires with the same tie wrap.
10. Connect the Gate-Cathode phoenix connector to the Gate Driver Board
11. Apply a thin layer of Electrical Joint Compound (Alcoa EJC No.2 or approved equivalent) to the contact faces of the new SCRs to be installed. The recommended procedure is to apply the compound to the pole faces using a small brush and then gently wiping the pole face with an industrial wipe so that a thin film remains. Examine the pole face before proceeding to ensure that no brush bristles remain.

IMPORTANT

Too much joint compound may result in contamination of other surfaces leading to system damage.

12. While grounded, use a long Phillips screwdriver to remove the 2 screws that hold the SCR SPGD Board to the metal bracket on the red glastic assembly. Retain the hardware.
13. Pull the 4 plastic clips that secure the SCR SPGD Board to the glastic assembly. Retain the hardware.
14. Install the new SCR SPGD Board in the assembly with the 4 plastic clips and use the screws to secure the board to the metal bracket.
15. Clean the heatsink with a soft cloth and rubbing alcohol.
16. Slide the SCR and SCRGD Board back into place until the mounting bracket makes contact with the heatsink. Use the Phillips screwdriver to tighten the assembly to the heatsink.
17. Reapply the clamping load as described in 'Uniform Clamping Pressure' above.
18. Connect the control power cable and the fiber optic cables, ensuring that the bend radius is not exceeded.

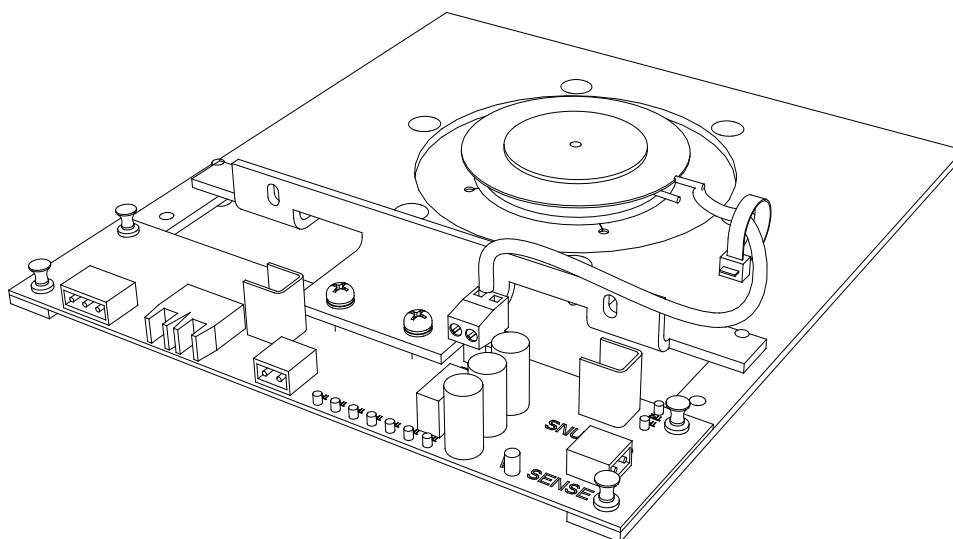


Figure 6.23 – SCR and SPGDB assembly



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