Contact Resistance of High Voltage Circuit Breakers
Circuit Breaker contacts

• For the purpose of this presentation the type of contacts that are focused on are those of the high voltage circuit breakers. These contacts allow the circuit breakers to tie in electric loads between two points, or lines.
• They are important to the electrical utility because if a fault occurs on a part of a line, the open contacts allow for the separation of that part of the line from the part that is experiencing normal conditions.
SF6 Gas Interruption
Circuit Breaker Current Interruption
Resistance in contacts

- The operation of the contacts creates arching between them, and this arching starts the increasing build-up process of resistance between the circuit breaker’s opening plates.
- The excessive build-up of resistance on the contacts begins to affect the current that the contacts are capable of carrying. This can prove to be detrimental to the circuit breaker.
Testing the contacts

• To test the contacts of the circuit breaker, you must apply a DC current and measure the voltage drop across the closed contacts.

• To achieve an accurate reading of the contact resistance, and because they are housed inside the circuit breaker enclosure, you must measure from one bushing terminal to another phase corresponding bushing terminal.
Circuit Breaker Corresponding Phases
Circuit Breaker Contacts Accessibility
Contacts’ Testing (cont’d)

- If the reading that you have is out of range for the equipment that you are testing, then you should strategically move closer to the contacts with one cable, while leaving the other stationary. This will help you to find the area that is affecting your reading.

- If you have tested and your readings are good, then you should repeat this test on the other bushings for the remaining two phases. The readings should be very close to one another.
Results

• If your contact resistance values are not stated on the name plate of the tested equipment, a good practical reading would be between 200 and 250 micro-ohms.

• A difference in contact resistance of more than 50 percent between the corresponding phase bushings, would warrant for more investigation.
Circuit Breaker contacts
### Typical Vacuum Interrupter Design (contacts shown in the open position)

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<th>Description</th>
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<td>2</td>
<td>Moving contact stem</td>
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<td>3</td>
<td>Fixed and moving contact subsystems</td>
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<td>Vapor (or ion) shield</td>
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<td>Bellow shield</td>
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<td>Ceramic enclosure (envelope) shown as two ceramic cylinders joined in the middle</td>
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*Contacts shown in open position*
Circuit Breaker contacts

Fig - A: Vacuum Interrupter
RMO200D

• The test device that we use in class to check the resistance of high voltage circuit breakers’ contacts is the RMO200D, it is produced by DV power.
• The device is designed for measuring the contact resistance of non-inductive test objects.
• The RMO200D generates a filtered DC current and output in an automatically regulated current ramp.
RMO200D

• An important feature that is new to the D-series is the capability to automatically demagnetize CT core’s after measurements are taken.

• The Device also comes with DV-Win software. This enables a unit operation from a PC or laptop computer with detailed analysis of test results and test report creation.
Work cited

Micro Ohmmeter RMO200D

• http://www.dv-power.com/products/circuit-breaker-test-equipment/micro-ohmmeters/rmo200d/

• http://blog.protecequip.com/blog/common-sense-testing/circuit-breaker-contact-resistance-measurement-test