Diagnostic Cards
-
Reinhausen - models C, D, E, F, G, M and T

Version 0 **Rev.0**

December 17, 2009

Cette version est une version préliminaire et temporaire pour **diffusion très limitée**.
Cette version fait référence au logiciel DIAC dont le développement est arrêté par Hydro-Québec.

Le logiciel OpenZen - Zensol (issu de nos logiciels existants CbaWin, GenWin, CbvWin, etc., copyright 1992 à 2009) remplacera DIAC totalement à court terme.

Il sera donc nécessaire de réviser et de corriger cette version, en supprimant notamment toutes les références à DIAC et en les remplaçant par les références équivalentes à OpenZen.

Merci de me contacter directement pour tout commentaire (bon ou mauvais), toute nouvelle idée, ainsi que toute suggestion d'amelioration de ce document ou du logiciel OpenZen et ces documents associés, dans le but ultime de l'obtention d'un logiciel et d'une documentation claire et pratique pour vous et tous nos utilisateurs. Tous vos retours d'information seront très appréciées.
Vous remerciant par avance pour votre collaboration,

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This version is a draft and temporary version for **limited distribution ONLY**.
This version refers to DIAC software whose development by Hydro-Québec is stopped.

The OpenZen – Zensol software (based on our existing softwares CbaWin, GenWin, CbvWin, etc., copyright 1992-2009) will completely replace DIAC in the short term.

This version needs to be reviewed and corrected by Tap-Changer specialists. Among other things, all references to DIAC software will be replaced by their equivalents in the OpenZen Software.

Text in red requires special attention and will be corrected.
If you want the original version of this text, please download the French document.

Please do not hesitate to contact me directly for any comment (good or bad), any new idea, or any suggestion regarding the improvement of this document or the improvement of the OpenZen software and any of its related documents, in order to ultimately obtain clear and useful documentations for you and all of our users. All of your feedbacks will be appreciated.
Thank you for your cooperation.

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Diagnostic Cards
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The following diagnostic cards focus on the symptoms of the major problems of Reinhausen tap-changers (OLTP) - models C, D, E, F, G, M and T as seen on the acoustic signatures. It is important to note that several of the anomalies illustrated here do not show up in the tabular report of the DIAC software.

The cards are prepared as a support for visual analysis of signatures; they are complementary tool to the report available in DIAC. Each card shows the anomaly as seen on the signature, the malfunction of the OLTP associated with this trace, and the necessary adjustment for its repair.

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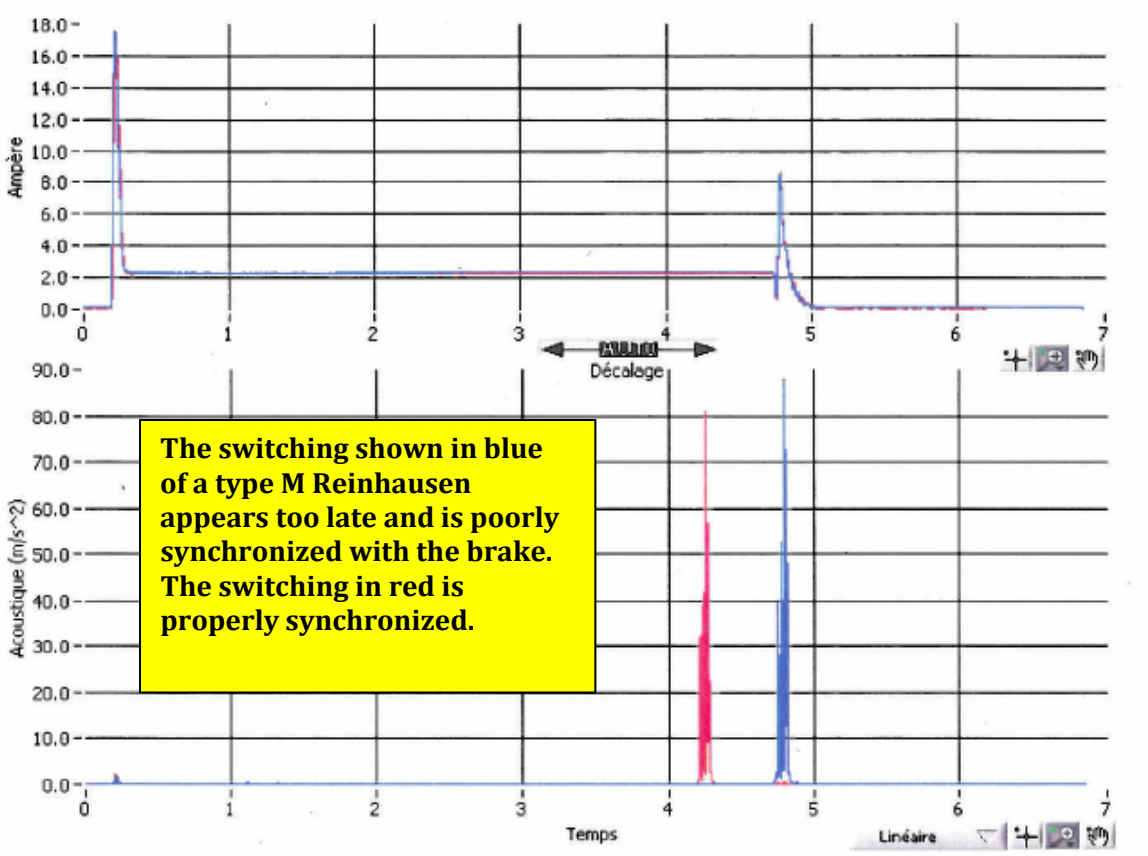
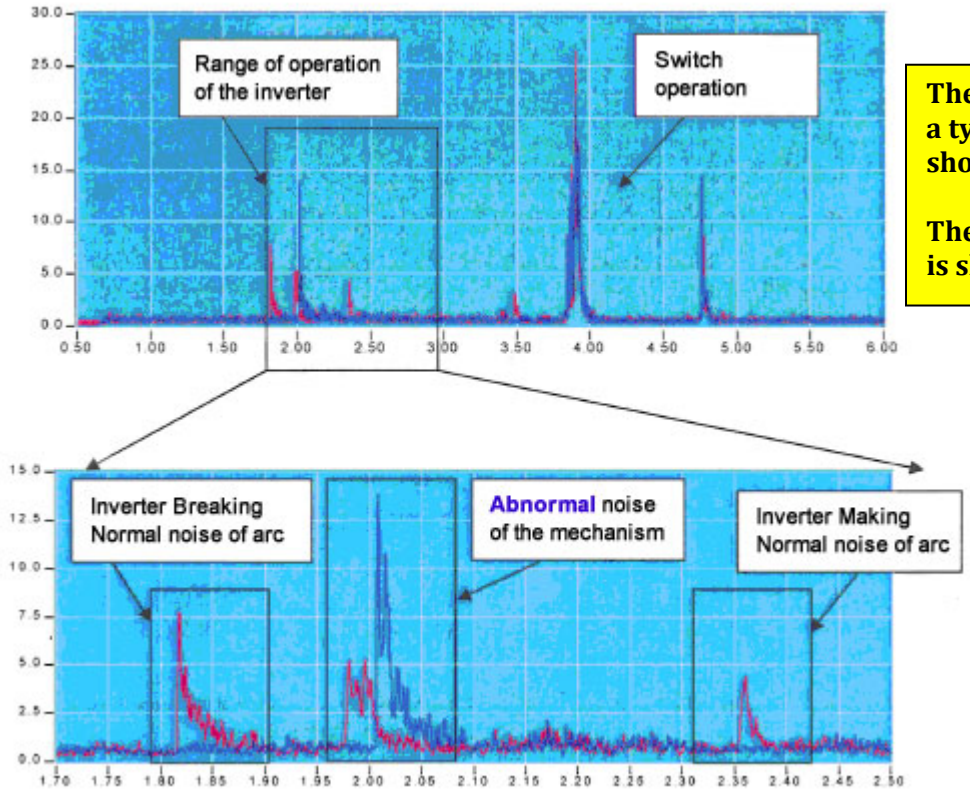
Card 1: Desynchronization of the switching	**Models :** All



The switching shown in blue of a type M Reinhausen appears too late and is poorly synchronized with the brake. The switching in red is properly synchronized.

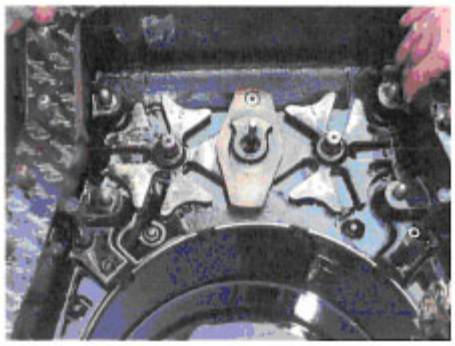
A desynchronization may result from a poor adjustment, or following an inspection of a poor reinsertion. In extreme cases, the switching is so misadjusted that it may not happen in the current operation but during the subsequent operation, which may cause a delay of taps between two devices in parallel.

Card 2: Wear of the transmission	**Models :** D type



The mechanical test of a type D Reinhausen is shown in blue.

The test under voltage is shown in red.



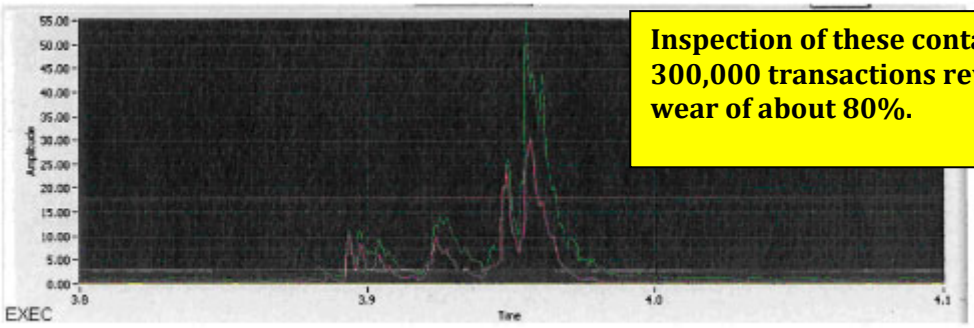
Maltese cross mechanism under the lid

Bearing and pin

Part of the drive mechanism to check if there is a suspicious noise in the reversal.

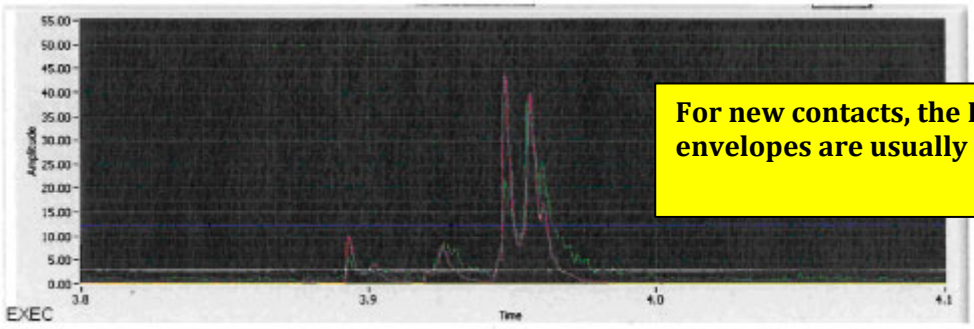
This noise (knocking) is caused by excessive wear of the drive mechanism under the lid (in particular, the bearing and the pin of the Maltese cross) causing a partial blockage of the mechanism. In an advanced state, this wear can cause the breaking of the switch inside the main tank. The abnormal noise is accompanied by a hard spot (handle or an increase of the motor current) visible during the operation.

Card 3: Wear of contacts	Models : M and T types



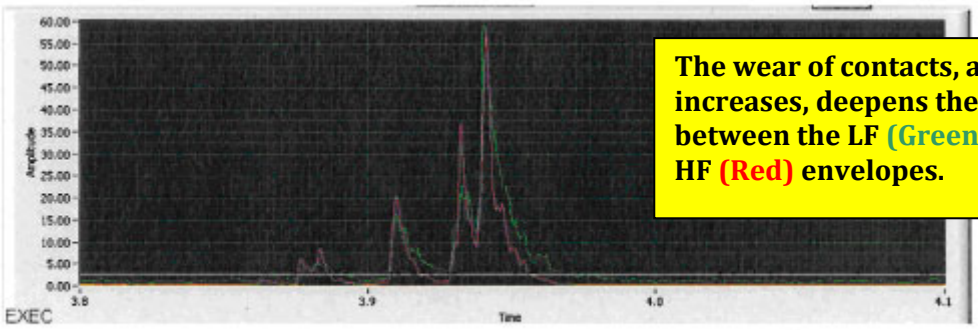
Inspection of these contacts after 300,000 transactions revealed a wear of about 80%.

a) After 300,000 operations (January 7, 2004 - Counter 632338 - In Load)



For new contacts, the HF and LF envelopes are usually similar.

b) New contacts (January 15, 2004 - Counter 634015)

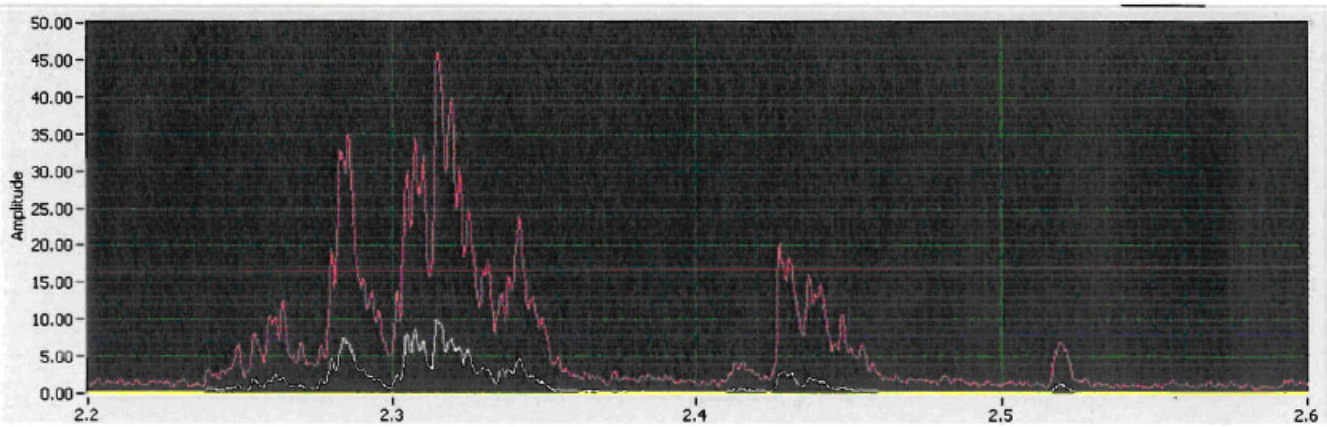


The wear of contacts, as it increases, deepens the gap between the LF (Green) and HF (Red) envelopes.

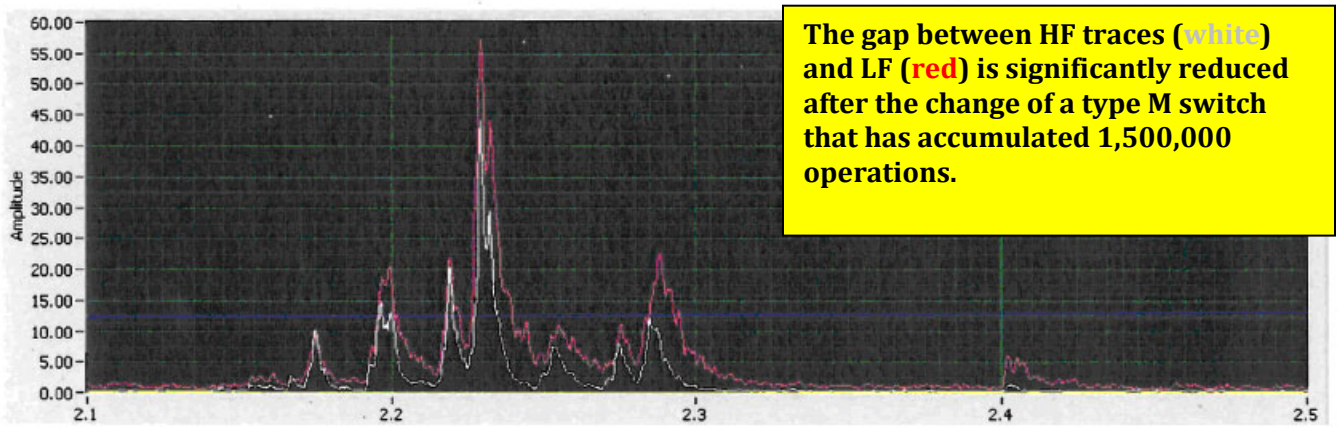
c) After 125,000 operations (November 5, 2004 - Counter 761087)

The wear of contacts on types M and T, are seen as gaps between low and high frequency envelopes. A new mechanism will show similar envelopes while the low-frequency envelope becomes dominant as the wear increases.

Card 4: General wear of the switch	Models : M and T types



a) Before the change of the switch



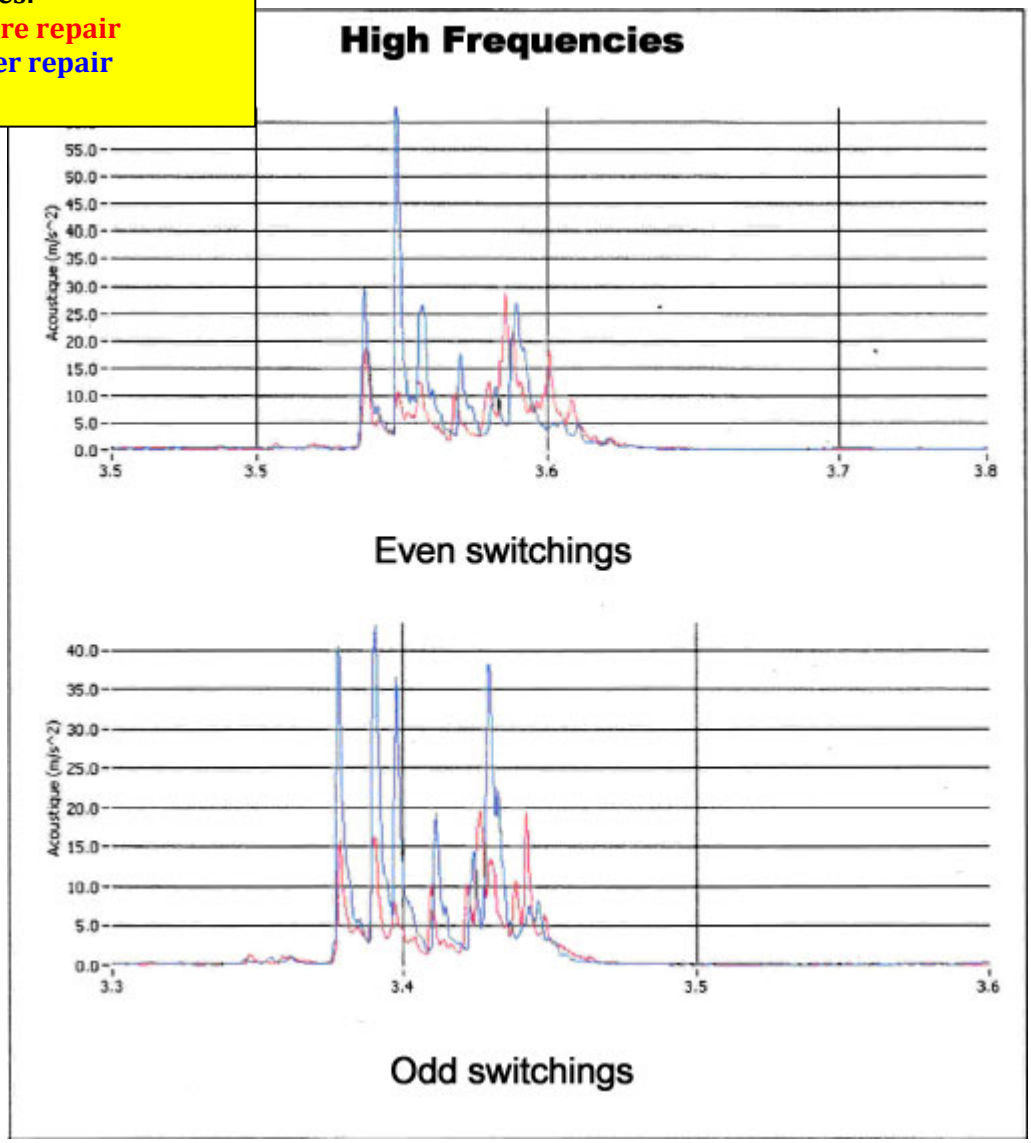
The gap between HF traces (white) and LF (red) is significantly reduced after the change of a type M switch that has accumulated 1,500,000 operations.

b) After the change of the switch

In addition to the wear of contacts, gaps between frequency bands are also indicative of the general wear of the switch. The above example illustrates a case of extreme wear of a type M mechanism.

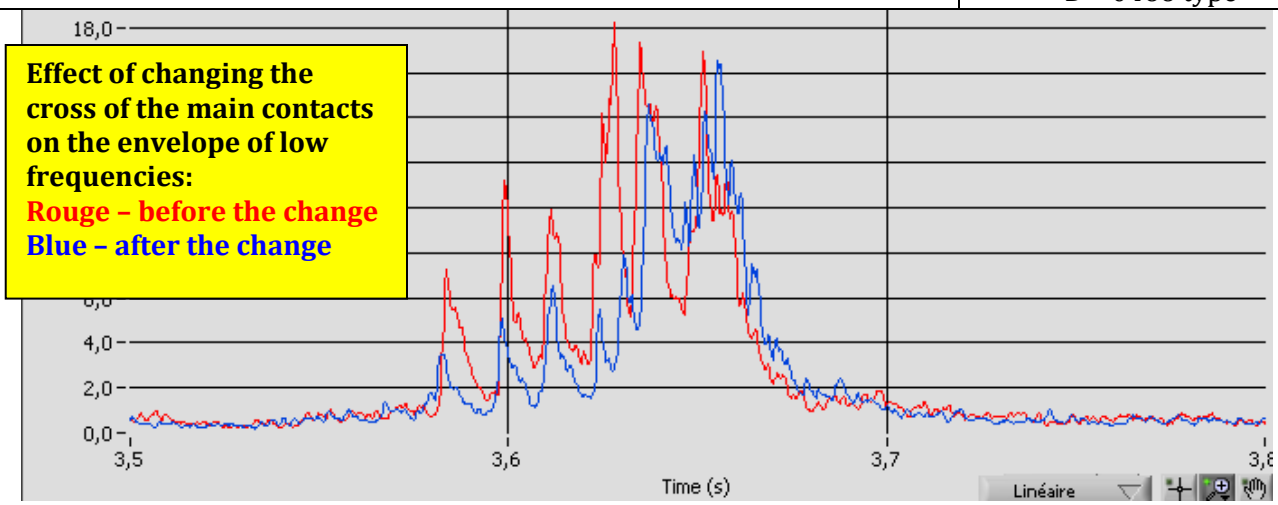
Card 5: Weakened springs	Models : D type

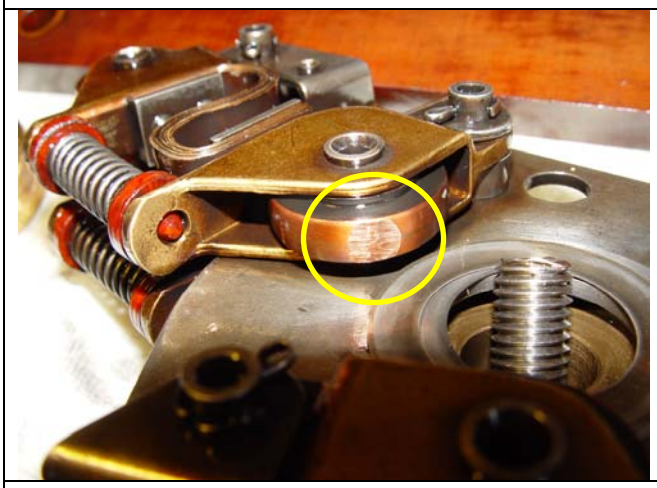
Effect of changing springs on the envelope of high frequencies:
Red– before repair
Blue – after repair



The weakening of a type D spring is expressed by a decrease in high frequency envelopes as shown in the example above.

Card 6: Wear of the cross of main contacts	Models : D – 0466 type





Damage observed on the cross used

The roll of the cross of the main contacts on a type D-0466 mechanism can wear off and show flats and streaks as above. Such type of wear can cause variations in the resistance measurements. The change of the cross is easily perceptible on the signatures of low-frequencies,