IBM 1401 Restoration Report - Wednesday, December 6th, 2023

Summary:

IBM 1402 Card Read-Punch machine (CT) relays' contact wires inspected and cleaned to remove oxidation. This was a follow up effort to relay testing done back on November 22nd, 2023.

Participants:

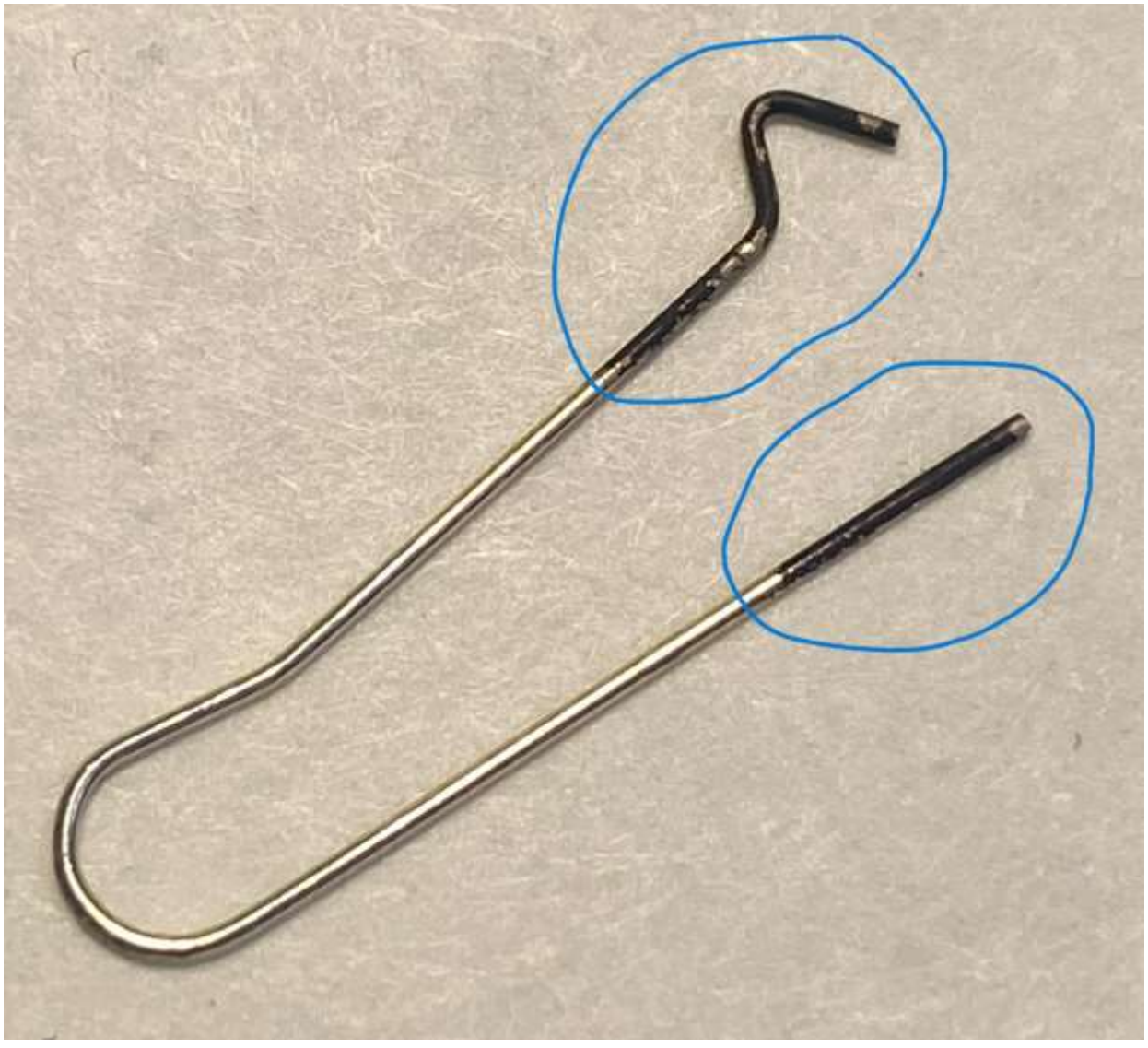
Arda Ugur, Marc Verdiell, David Clementson.

Methodology:

1. Each relay was tested pin by pin for conductivity. A bench multimeter and a bench DC power supply are used to measure the resistance for normally closed and normally open states by energizing the relays. Expected resistance value for each pin of relays was 0.1 ohms or below for a given relay to be considered "good".

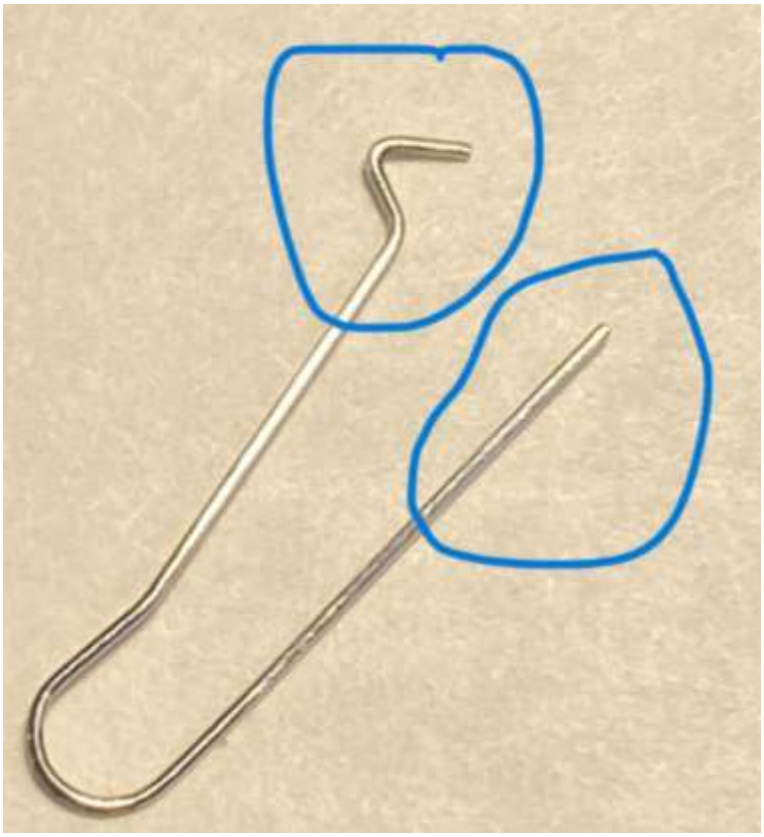
2. For relays that do not satisfy the criteria above, pins were removed from the relays.

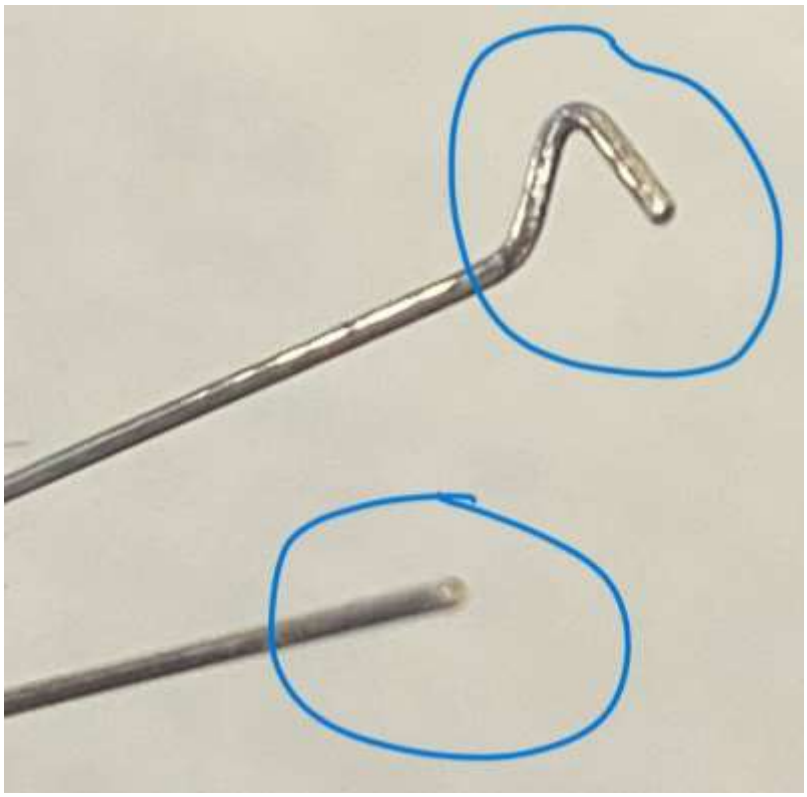
3. Removed pins were visually inspected for any chemical residue and/or indication of oxidation. Some pins were "fairly" clean while others showed black or gold/yellowish oxidation.



4. Such relays were cleaned on a flat surface using steel wool, as shown below.

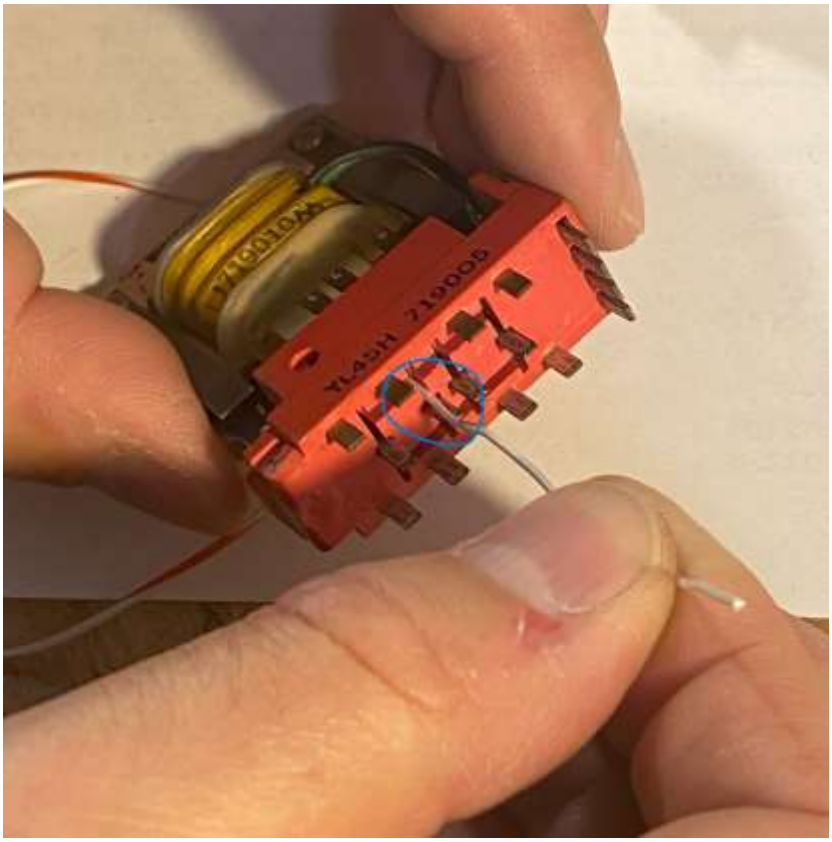
Cleaned contact wires are shown below. Please note that not only the sides of the pins but the front edges of the wires also need to be cleaned.

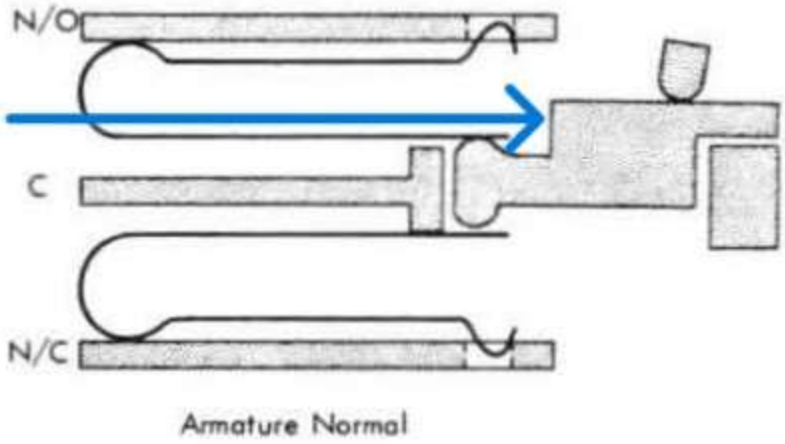




5. Once all the pins were cleaned, they were reinstalled back in the relays. This was a multi-step process (developed by Marc – I'm sure he can elaborate better) as follows:

    a. Insert a wire at the bottom of the pin slot to ensure the correct positioning of the relay wire.

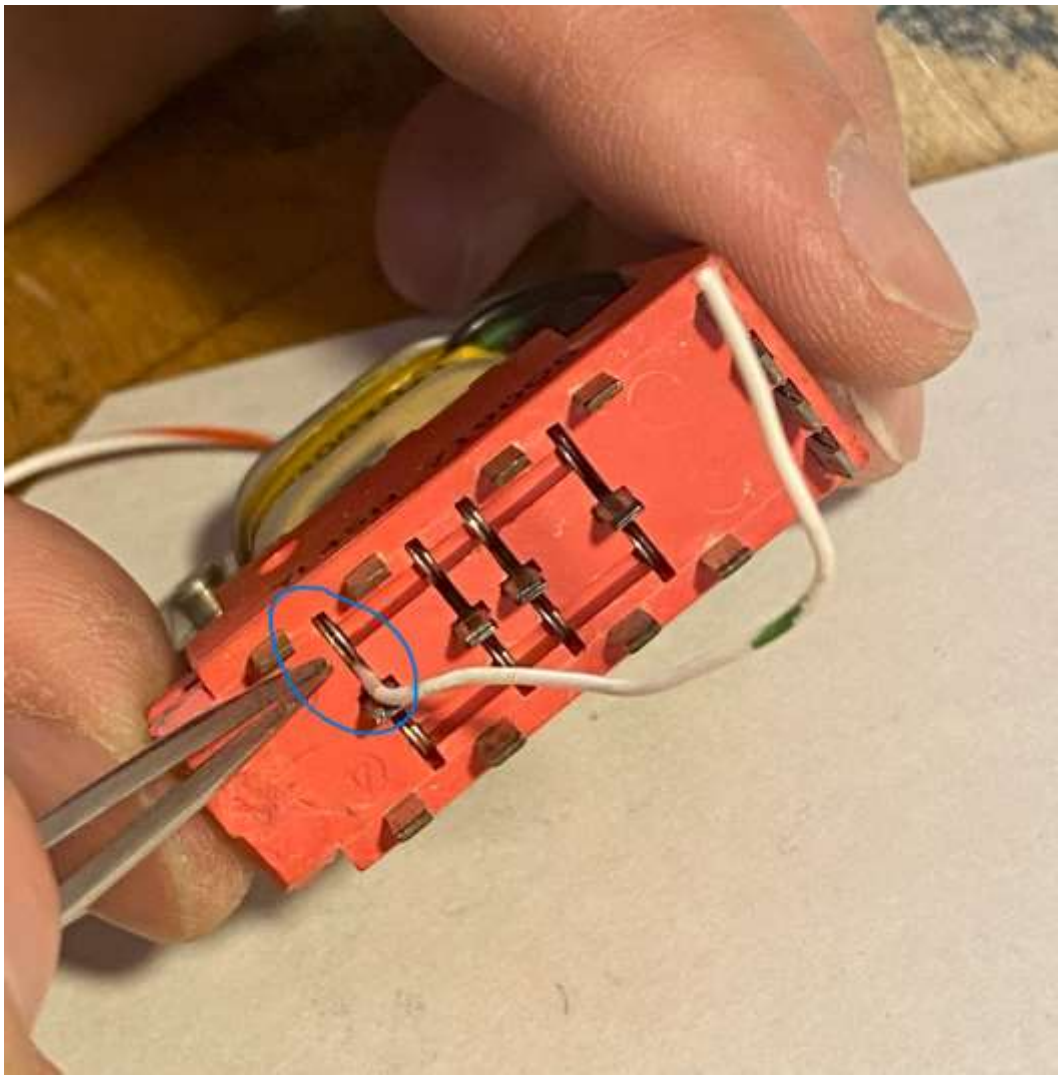




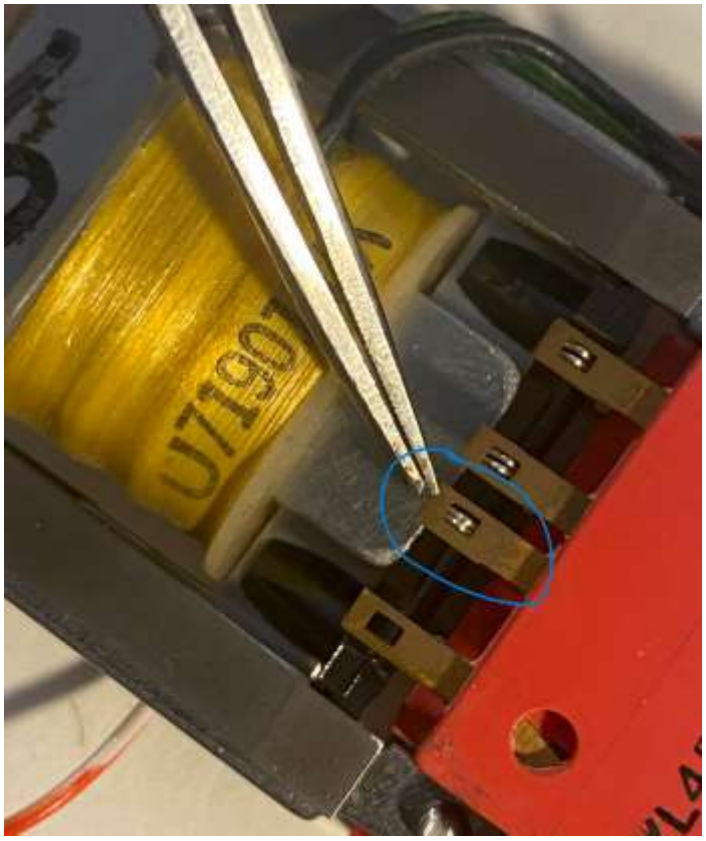
Armature Normal

This diagram shows approximately where the wire is placed before inserting relay wires.

b. Insert the relay wires in the slots. Pay attention to avoid wires crossing over. While inserting the second wire, it may be necessary to insert a second shimming wire as in step 5.a above to ensure correct positioning. This was mostly needed for green relays.

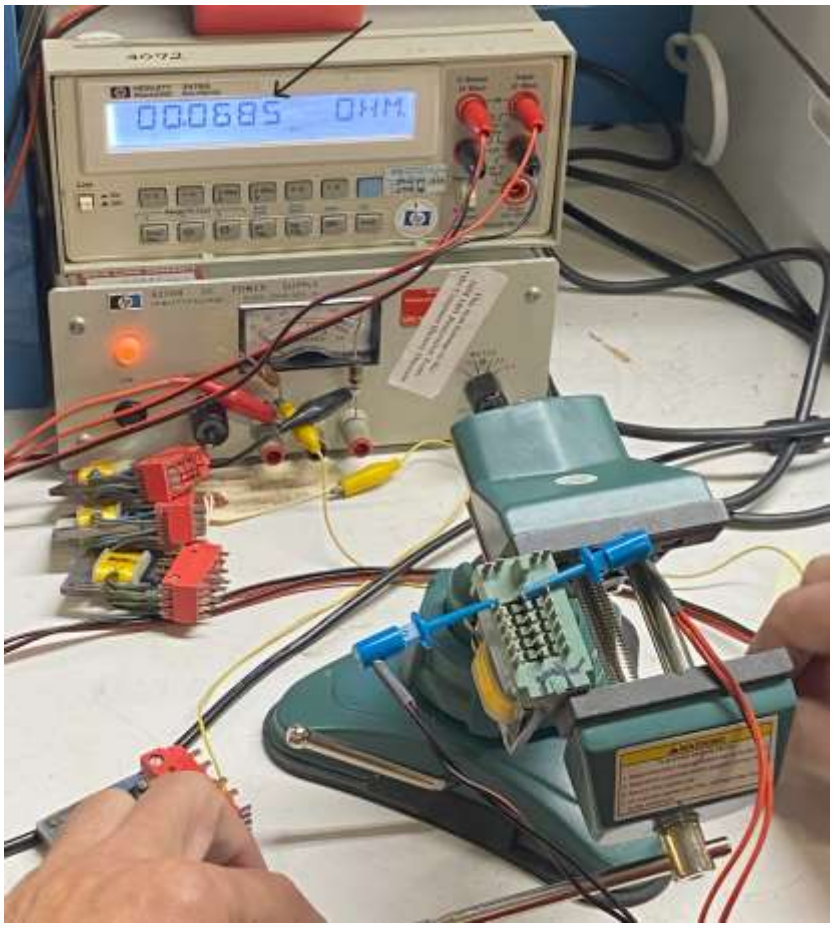


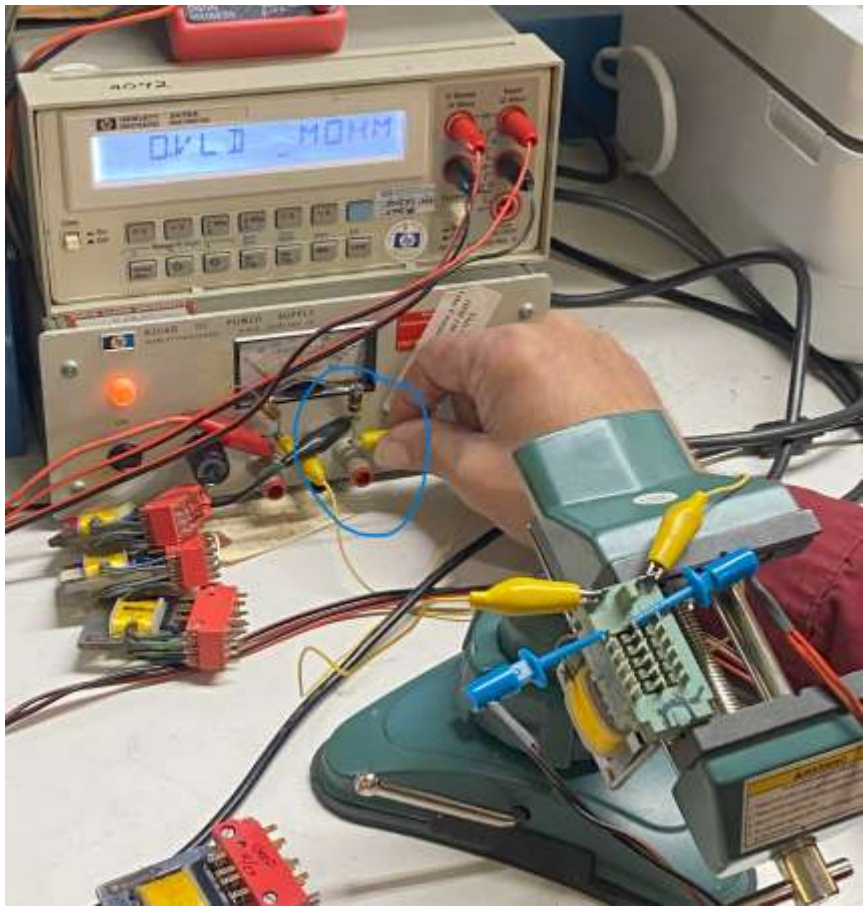
c. Ensure that all wires are installed and seated correctly on the eye socket of relay pins.

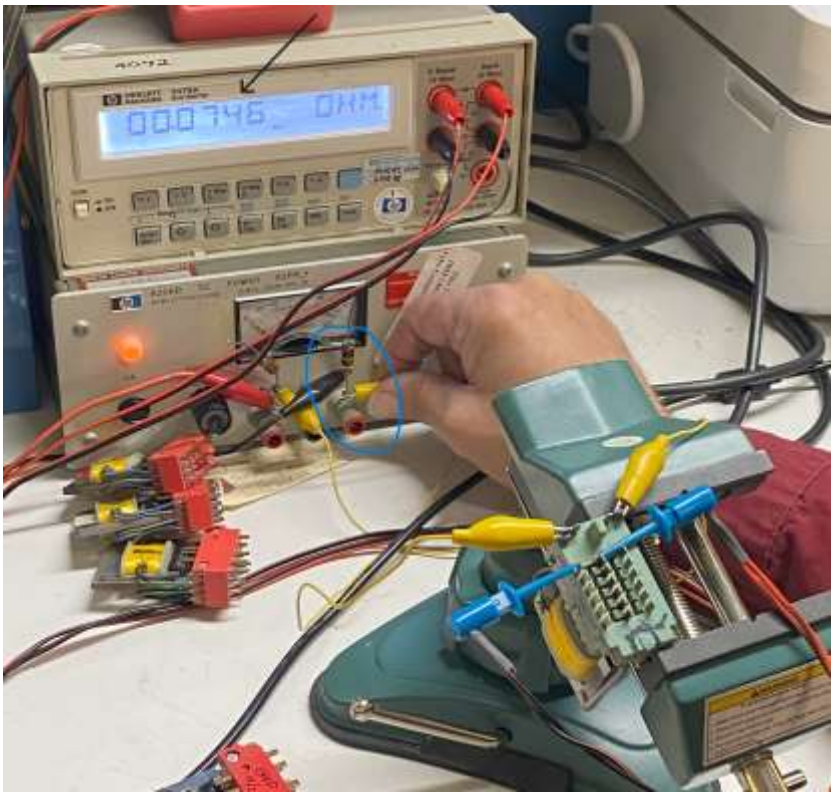


6. In parallel to cleaning relay contact wires, all contact pins on relays were cleaned by Marc using burnishing tool.

7. David tested all reassembled relay units for N/C and N/O states. Relays displayed resistance at or below 0.1 ohm or below considered “Good”. Else, relays inspected further for other mechanical failures or potential contact points/conductivity issues.


0.0685 OHM


OVLD MOHM


00.0746 OHM