



██████████ Lake Havasu City, AZ ██████████
Mailing Address ██████████
██████████ Lake Havasu City, AZ ██████████
Phone ██████████ Fax ██████████

NTSB Investigation of Gerdes A-510 Ignition Switch, N1311S, Cessna 182P, KRZR, July 26, 2018, ERA18LA199

Purpose

The purpose of this test is to determine if this switch functions according to design requirements. Any failures found during testing will be investigated to determine the root cause for the failure.

Test Procedure

The switch will be tested to the standard ACS A-510-2 Ignition switch test procedure which is conducted as follows:

Terminal Board:

1. Correct Orientation of terminal clips (use terminal board test fixture)
2. Terminal clips are tight (can't move by hand)
3. A-539-A contact is rotated counter-clockwise as far as possible within its pocket in the terminal board.
4. Passing boards are marked with a green dot on the center GRD terminal.

Switch Assembly:

1. Terminal board attached tightly to housing
2. Terminal board has been inspected (green dot).
3. Condition of housing (no deep scratches, gouges, etc.)
4. Function Test:
 - a. Place switch on test fixture, "L" & "R" should light up with switch in the "OFF" position.
 - b. Rotate key clockwise one position, "L" should remain on, "R" should go out.
 - c. Rotate key to the next position, "L" should go out, "R" should come on.
 - d. Rotate key to the next position, both "L" & "R" should go out.

- e. Rotate key once more to test momentary Start function, red "S" & "R" lights should come on, "L" should remain off. Both lights should not flicker as the key is turned as far as it will go.
 - f. Return key to the "OFF" position and repeat previous steps (at least two complete cycles).
- 5. Verify that the key is removable only in the "OFF" position.
 - 6. Verify that two keys are included.

Additionally, the following requests have been made by the NTSB:

- 1. Place the key and switch in the as-found position and determine what magneto is hot and what magneto is grounded
- 2. Please only report the factual observations. No opinion or speculation
- 3. Document whether the key can be removed in the Left, Right, Both, As-Found, and Start positions.
- 4. Determine why the key can be removed.
- 5. If there is any way to determine when the switch was manufactured and whether there was record it had been returned to Gerdes or ACS since being manufactured.

Test Results

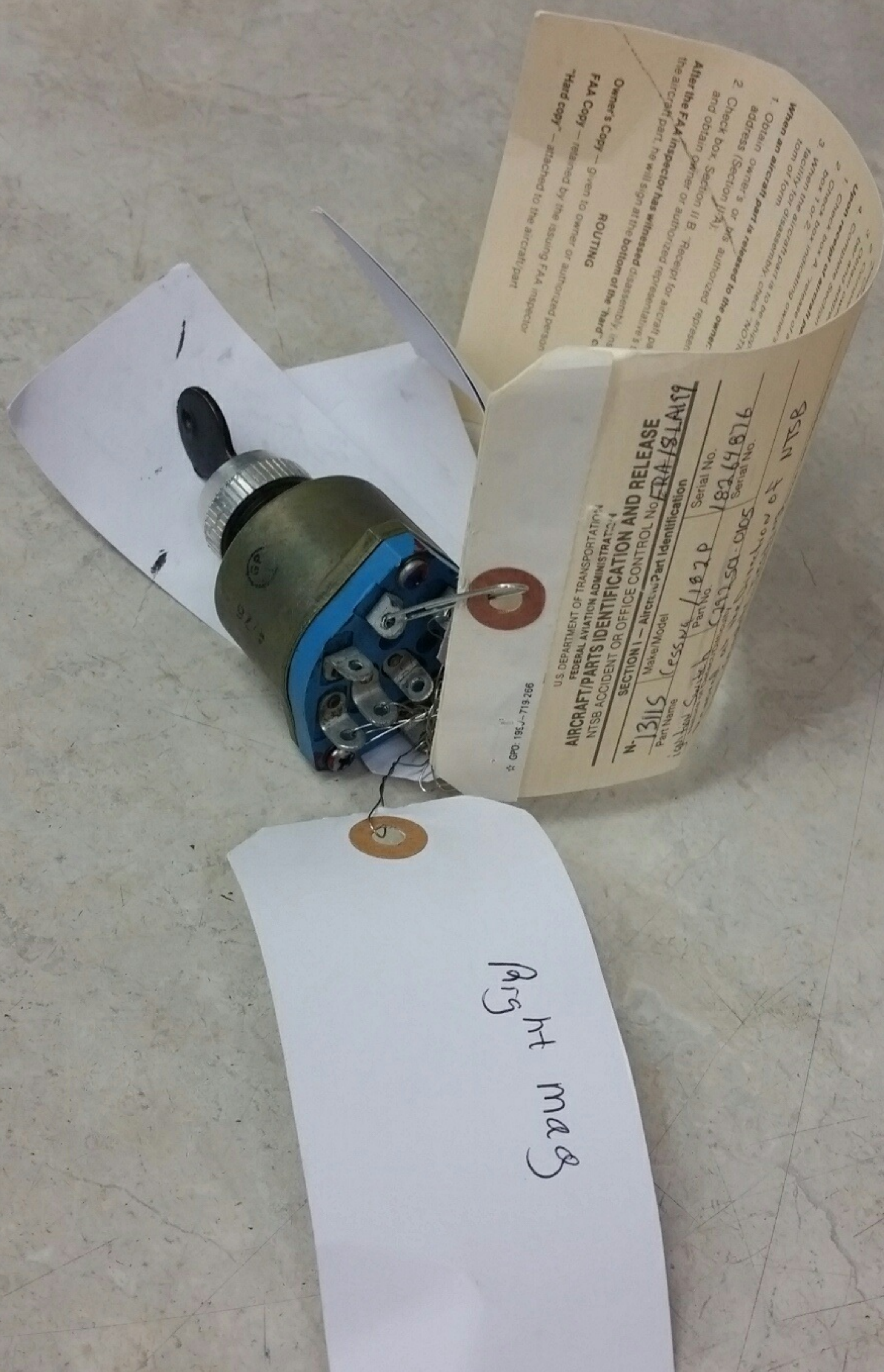
The ignition switch was first placed on the test fixture and the function test was performed according to current production A-510-2 Rev. AC test procedure. As the function test was conducted, the "L" and "R" magnetos grounded properly according to the test procedure. The key was removable in every position (Off, R, L, Both and Start). The terminal board was inspected to the test procedure and BO terminal was found to be partially loose. The switch was then disassembled to determine why the key was removable in every position. After inspecting the key tumbler and switch housing, the switch was reassembled and tested on the test fixture again. In the as-found position, the key was removable and the right magneto was not grounded, the left magneto was grounded. The key tumbler was removed and evaluated to determine why the key was removable in every position. It is unclear upon inspection why the key is removable, however it is also unclear if the key is the original key that was supplied with the switch as there is no markings to indicate that it is an original key, identified similar to current production switches (manufacturer logo, key number). The date stamp on the housing indicates that the switch was manufactured on April 1976 (4/76). There is no record of this switch being returned to Gerdes or ACS since being manufactured as neither Gerdes or ACS repaired switches after delivery.

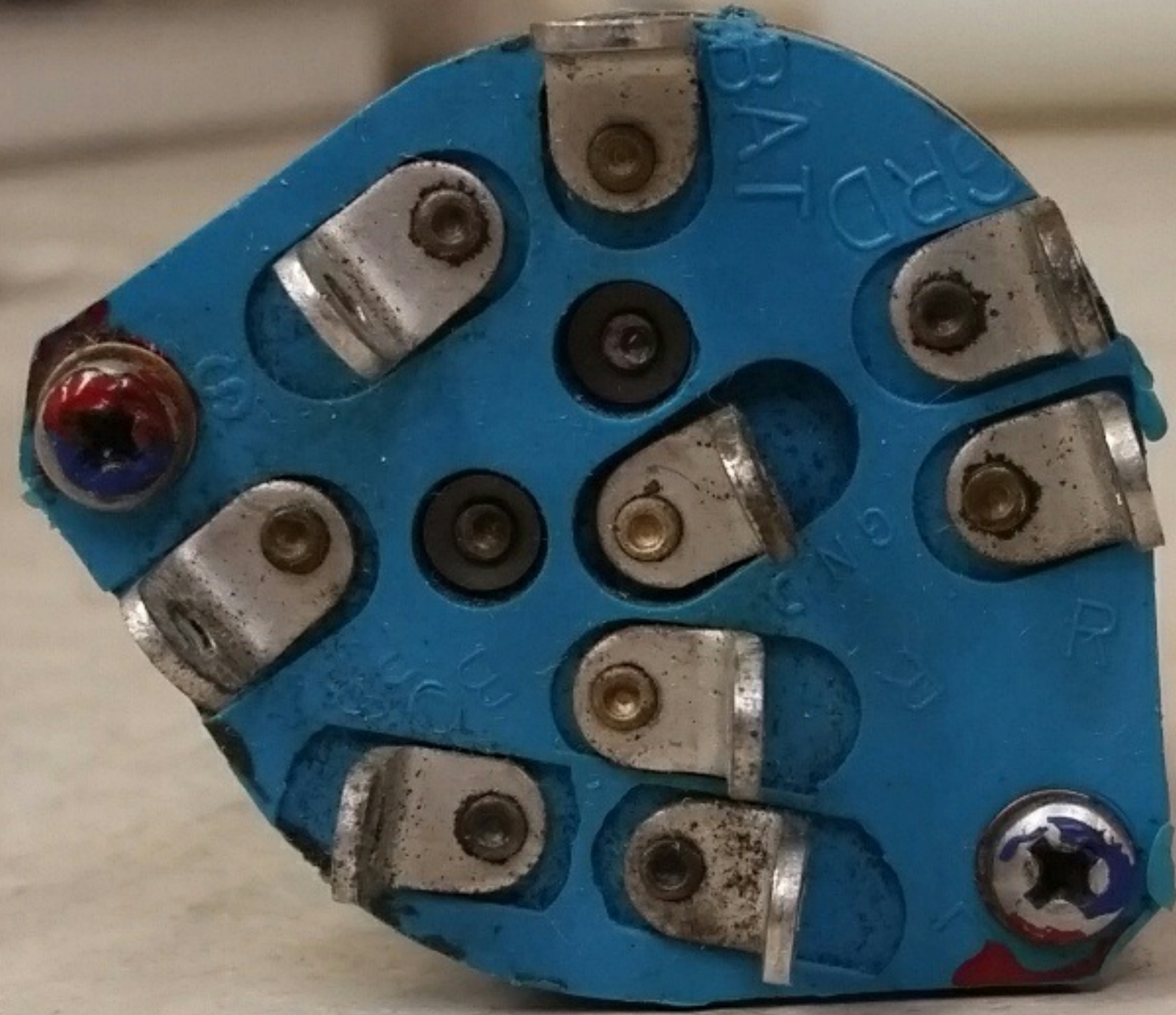
On 8/13/2018 I observed the switch functional test and the sequence of the test, I concur with the test results.

Raymond Q. Almgren 8/14/2018
FAA Aviation Safety Inspector
Phoenix MIDO Section AIR-874

 8-13-18
Jason Senger
ACS Products Quality Control Manager

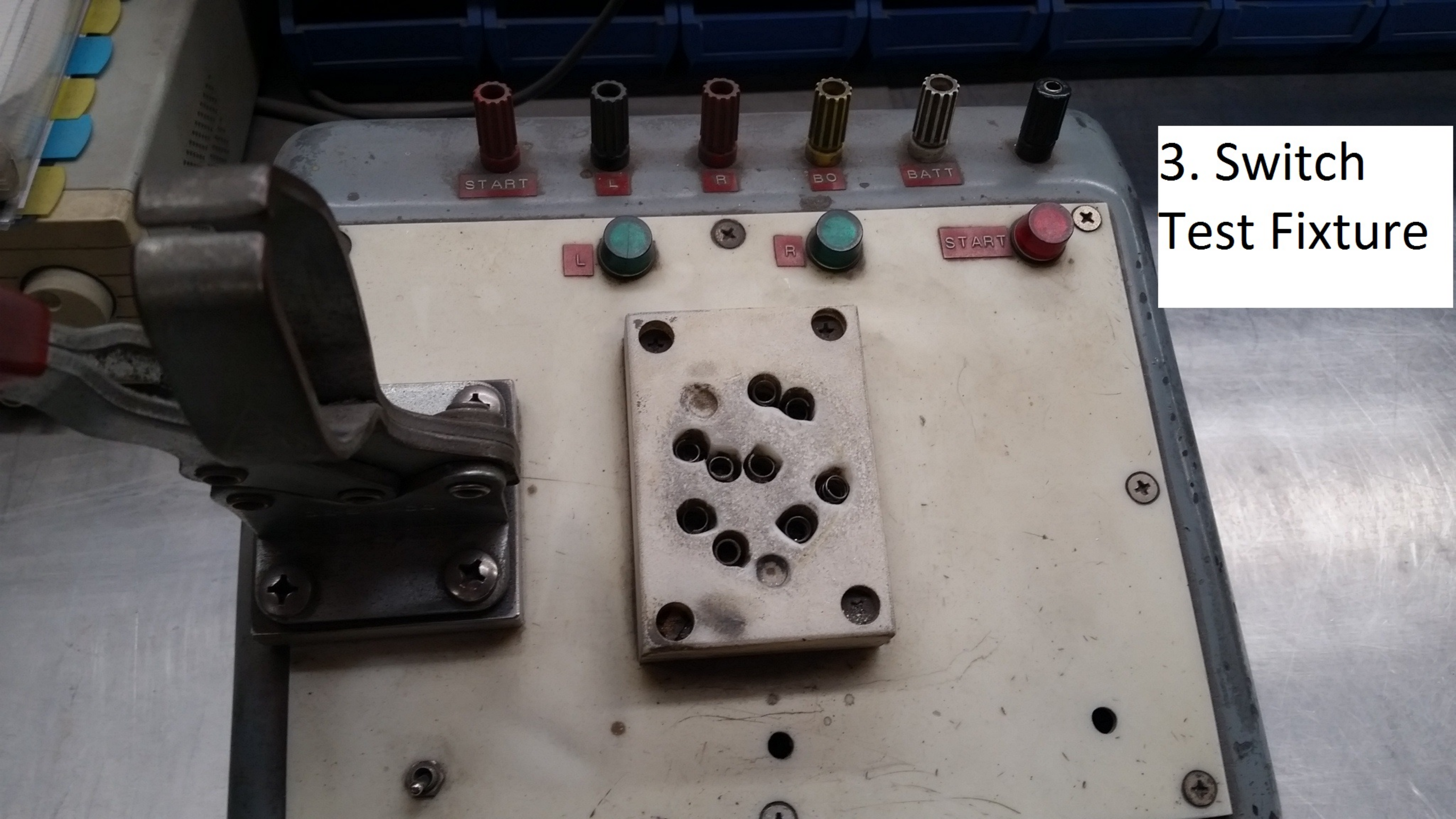
1. Assembly removed from sealed shipping box

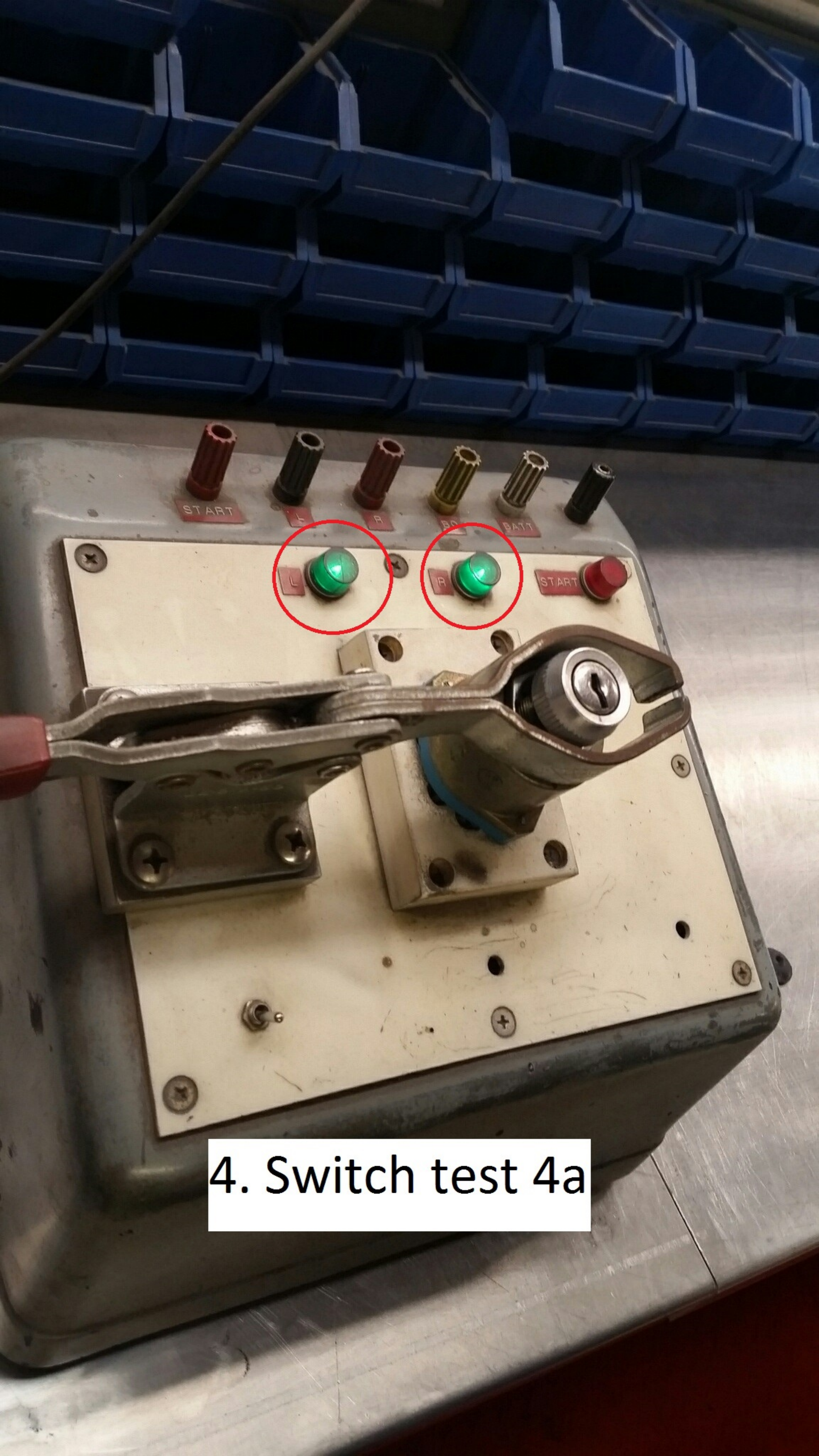




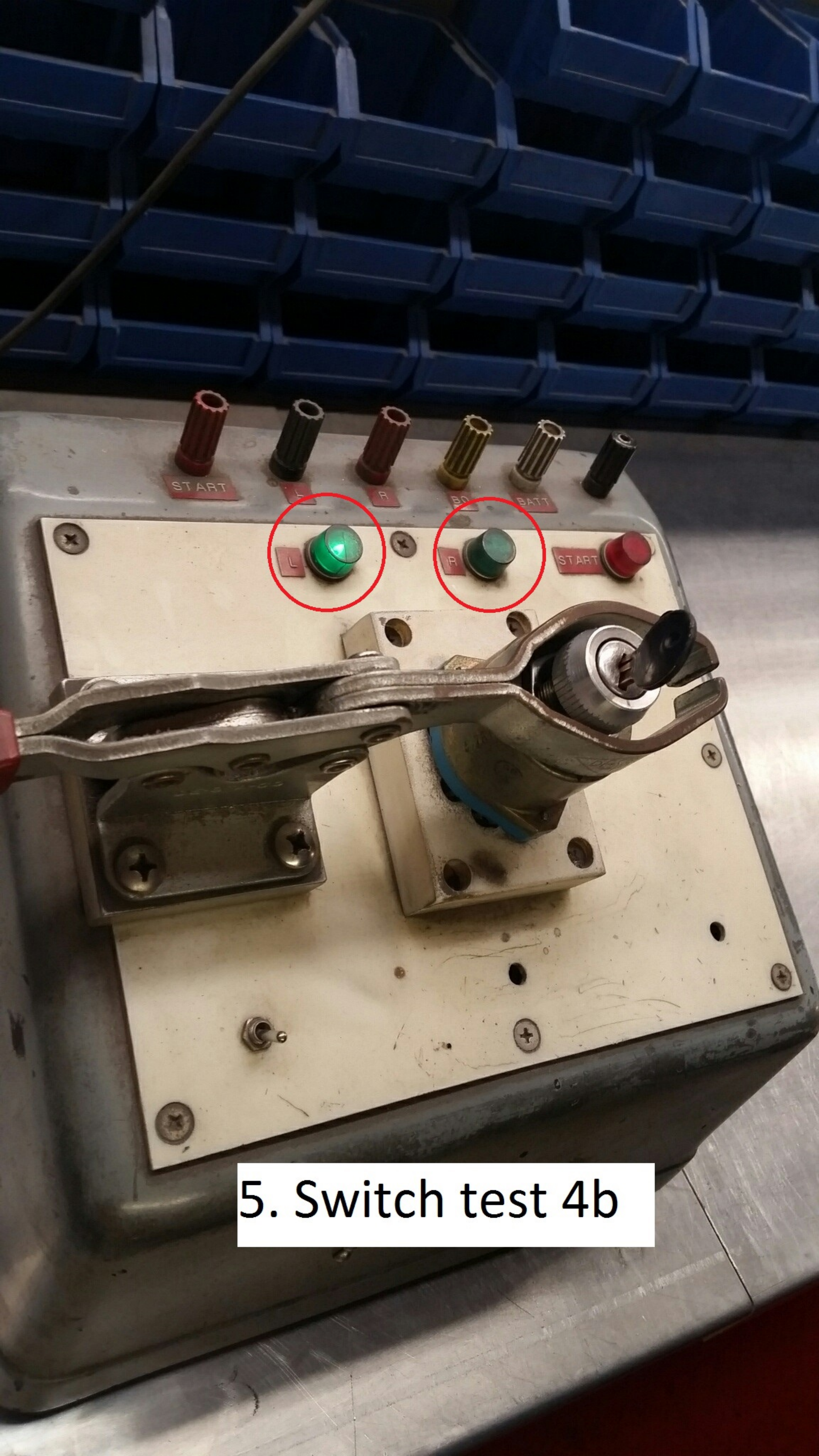
2. Electrical side of switch
when removed from shipping
box

3. Switch Test Fixture

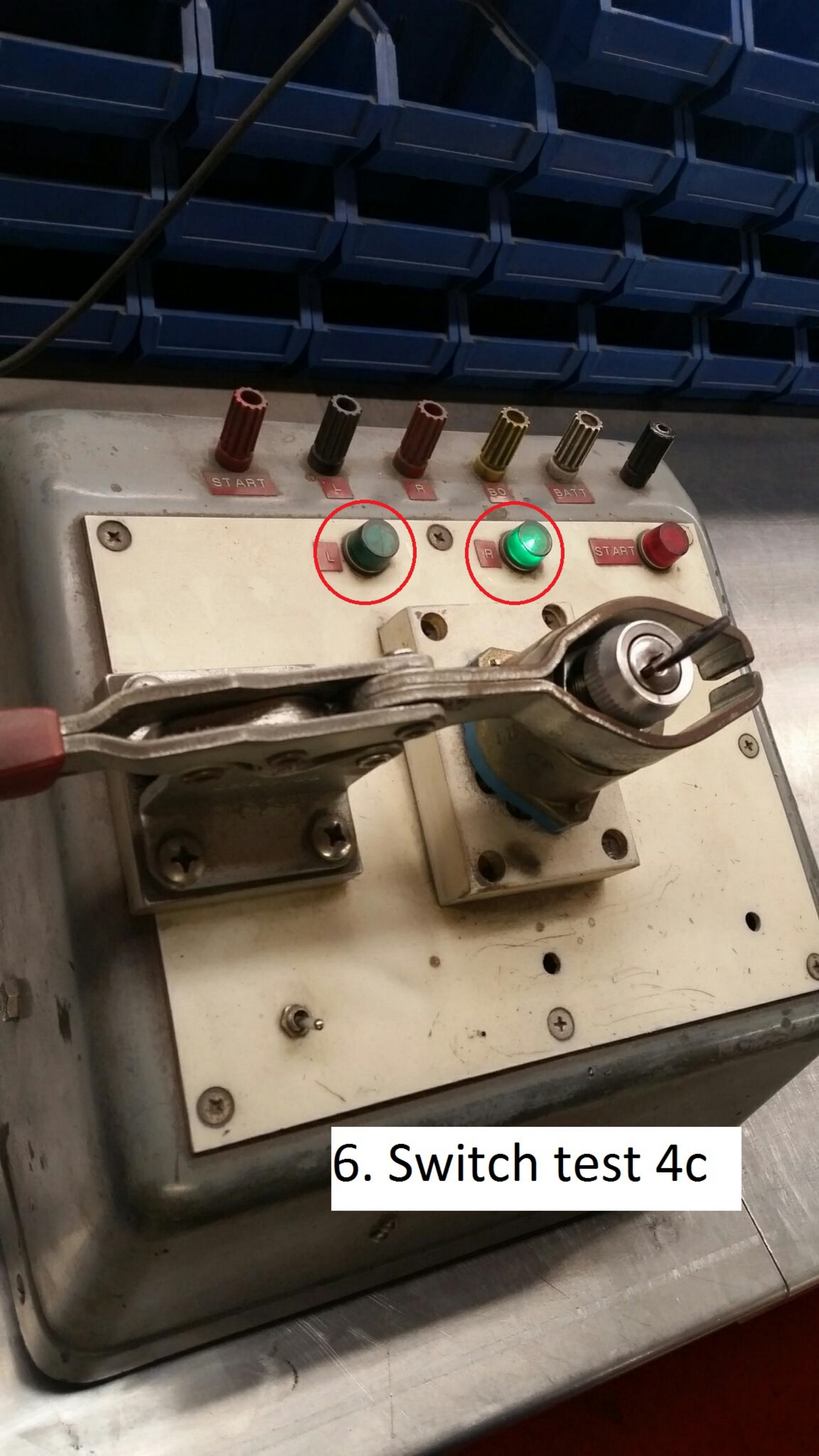




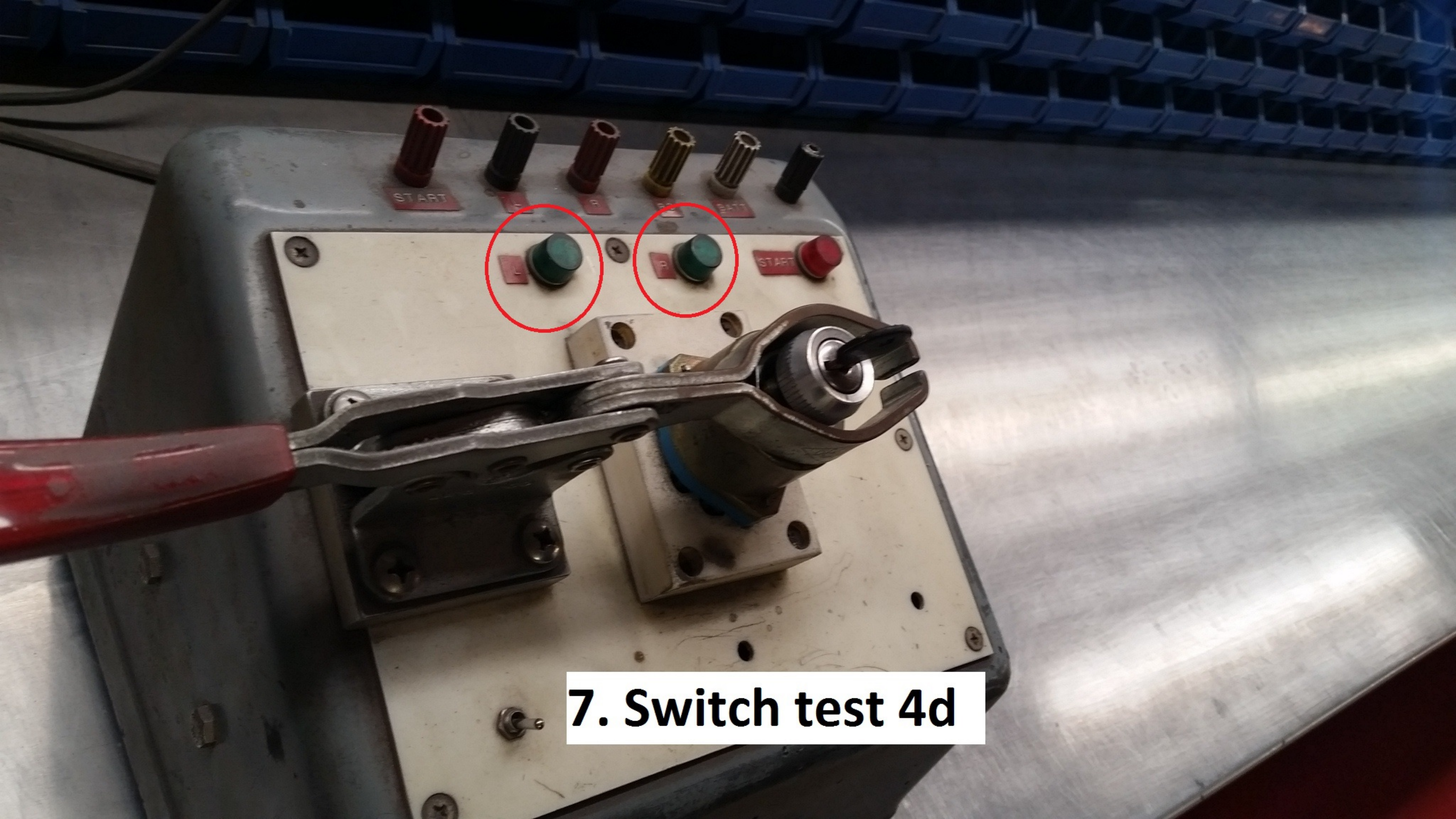
4. Switch test 4a



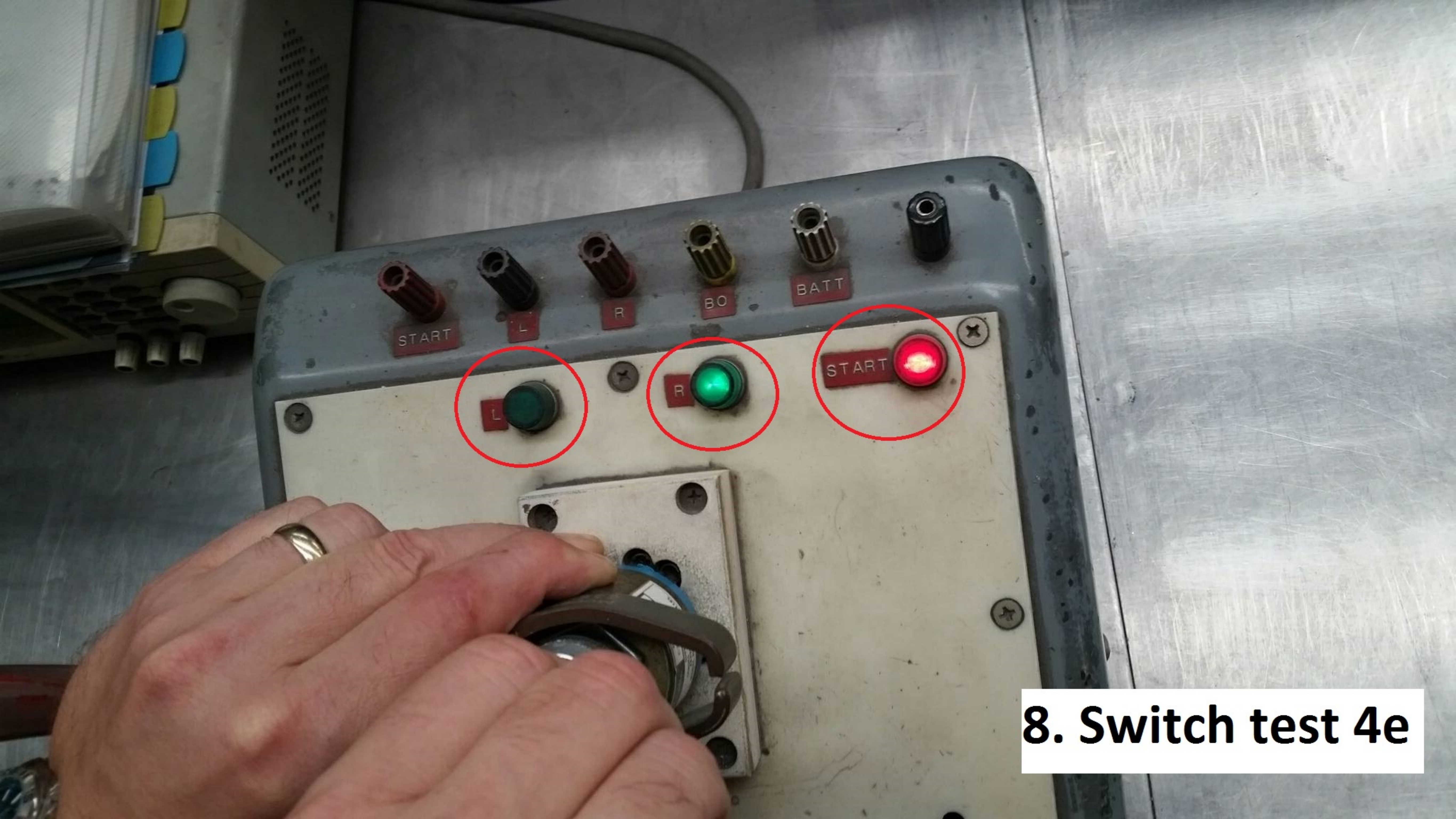
5. Switch test 4b



6. Switch test 4c



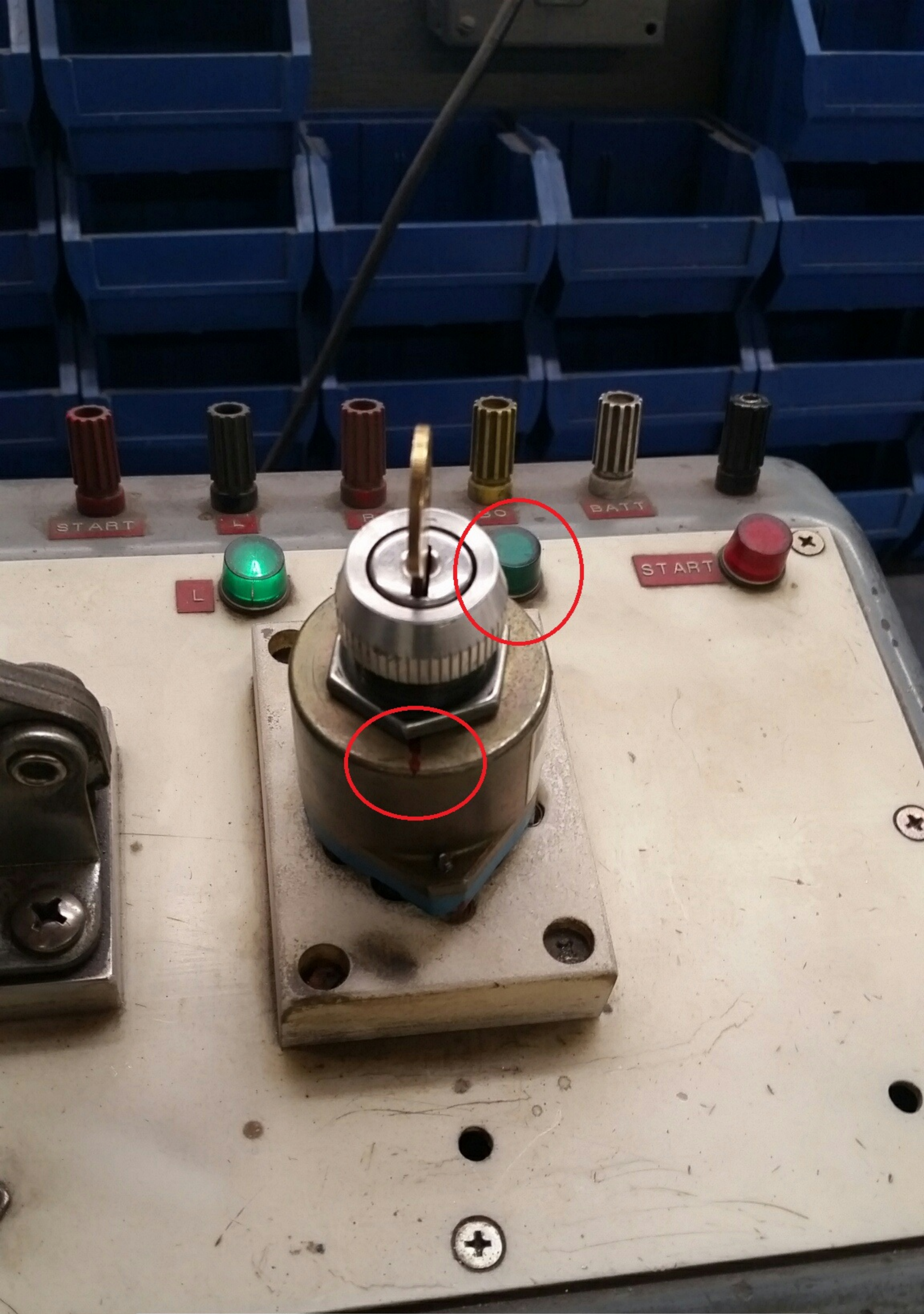
7. Switch test 4d



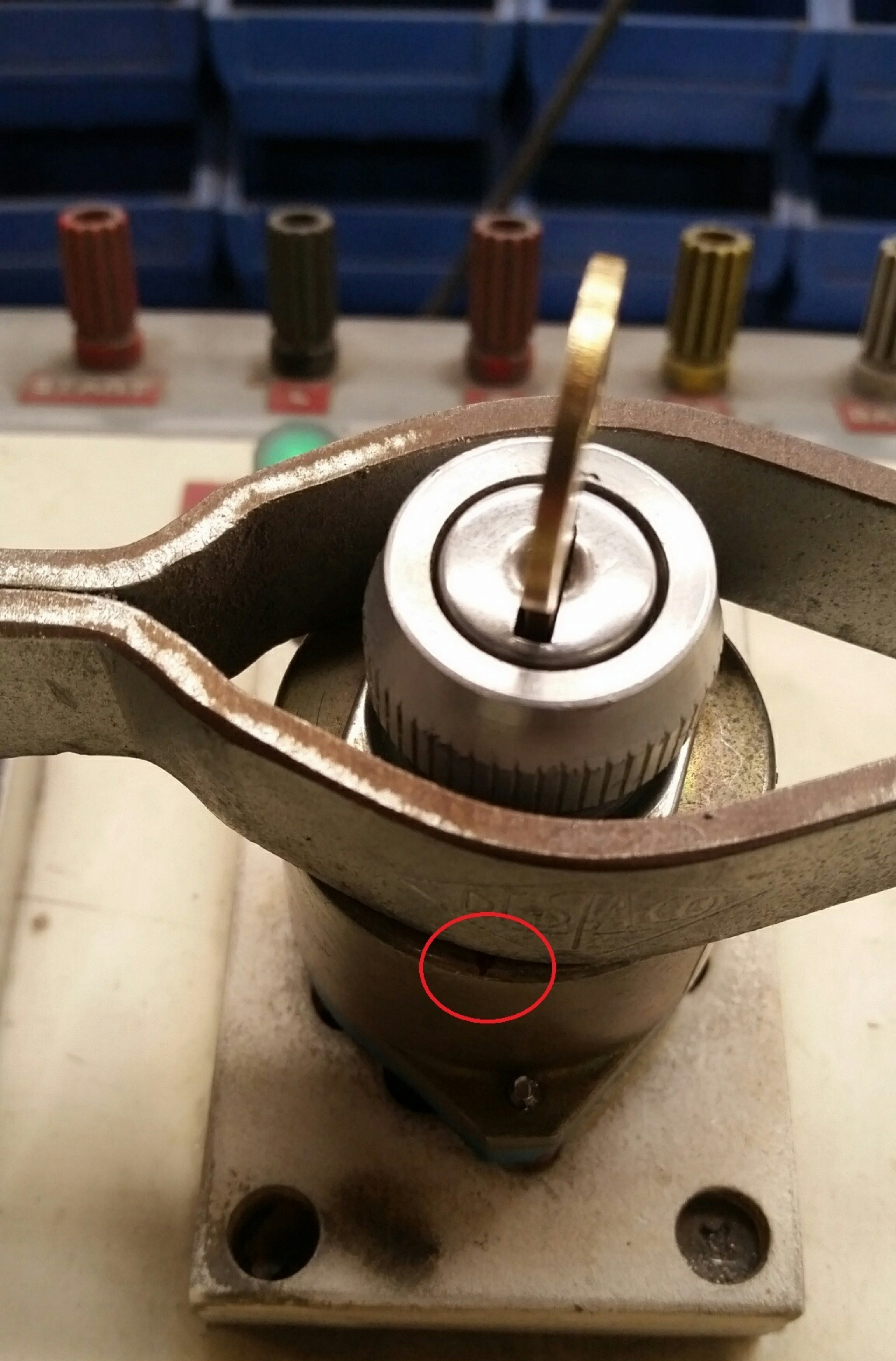
8. Switch test 4e



9a. Switch with key in 'as-found' position, right MAG indication is HOT (not grounded)



9b. Switch with key in as-found position, right MAG indication is HOT



9c Switch with key 'as-found'

**10. Key with rubber type
coating**

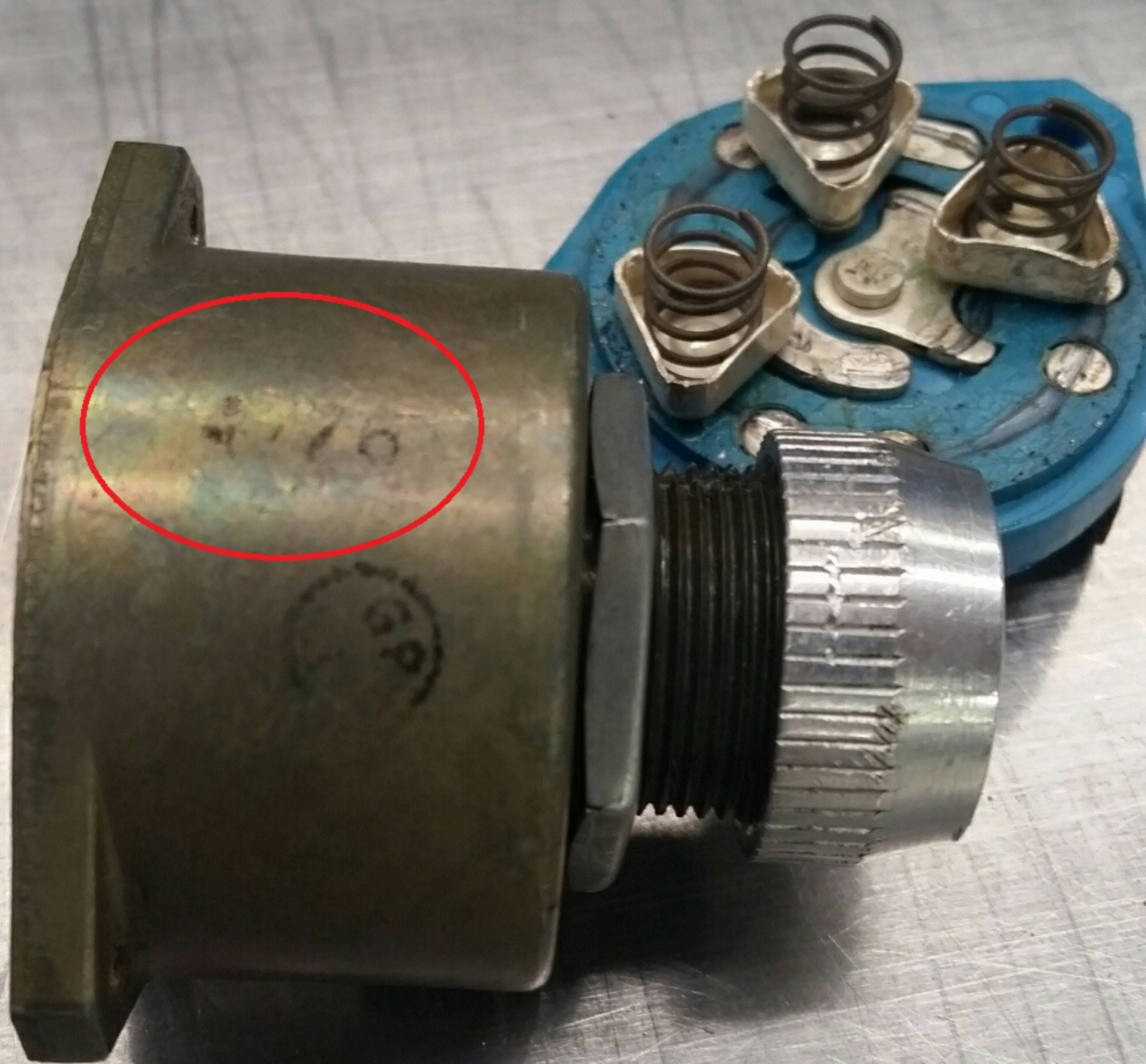


11. Key with rubber type coating removed, Y11 is stamped on key



12. Switch electrical





**11. Switch housing
4/76 ink stamp**

14a. Switch tumbler





14b Switch tumbler

**15. Switch
tumbler, housing and
key**

