



QA Technology Company, Inc.

A p p l i c a t i o n s N o t e
Performance Comparison
Lubricated vs. Unlubricated Probes
Document# D10019 Rev A ECN# 1919 Page 1 of 3

Background:

QA Technology's standard test probes are lubricated to increase their life. The lubricant drastically reduces the normal wear from the sliding metal-to-metal contact within the probe. The attached cycle test compares sixteen standard lubricated 100-25 series probes to sixteen identical but unlubricated probes.

Conclusions:

There are significant performance differences between lubricated and unlubricated probes:

- Unlubricated probes had electrical resistance greater than 50 milliohms (considered a failure) as early as 8,000 cycles. Three probes out of sixteen had failed by 30,000 cycles. (Note that cycle counts on a tester in a controlled laboratory environment are considerably higher than those in a production environment).
- The lubricated probes were tested to 250,000 cycles with no measurements greater than 24 milliohms. The test was stopped at this point due to the condition of the unlubricated probes. Lubricated probes are routinely tested to one million cycles with electrical resistance below 50 milliohms.
- Wear of the unlubricated probes generated a considerable amount of filings. The black wear particles were not only evident on the plunger shanks, but also formed piles around the socket bases. This wear not only results in electrical failure, but the particles also cause stick down failures. By the end of the test, six out of the sixteen unlubricated probes (38%) exhibited stroke failures, the earliest at 40,000 cycles.
- There is a significant increase in the amount of force required to compress an unlubricated probe. This observation is based on the relative condition of the contact platen after the test. The contacts made by lubricated probes were almost unnoticeable, but the platen had obvious indents and damage from the crown points of the unlubricated probes. This is probably not an issue on solder pads for single board tests, but may damage gold or otherwise delicate contact surfaces. More important, the increased force may cause fixture actuation problems.

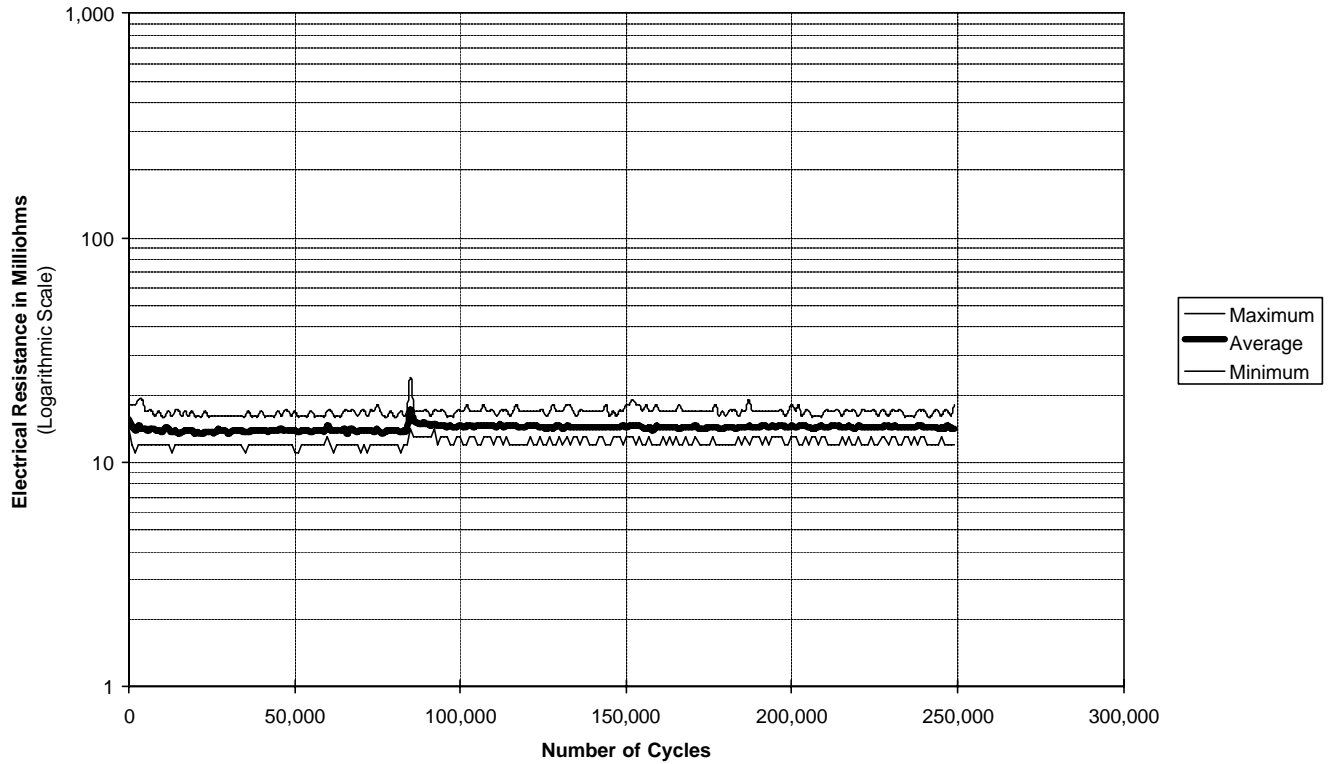
Test Details:

Sixteen pieces of QA Technology part number 100-PRP2544H (standard, lubricated probes) and sixteen identical probes without lubrication were run side-by-side on the contact test system for 250,000 cycles. Resistance measurements were made each 2,000 cycles, and stroke measurements each 5,000 cycles. For additional details, please refer to the attached summary report (run 1877) and description of the contact test system.



Resistance Summary for 100-PRP2544H with Lubricant Series

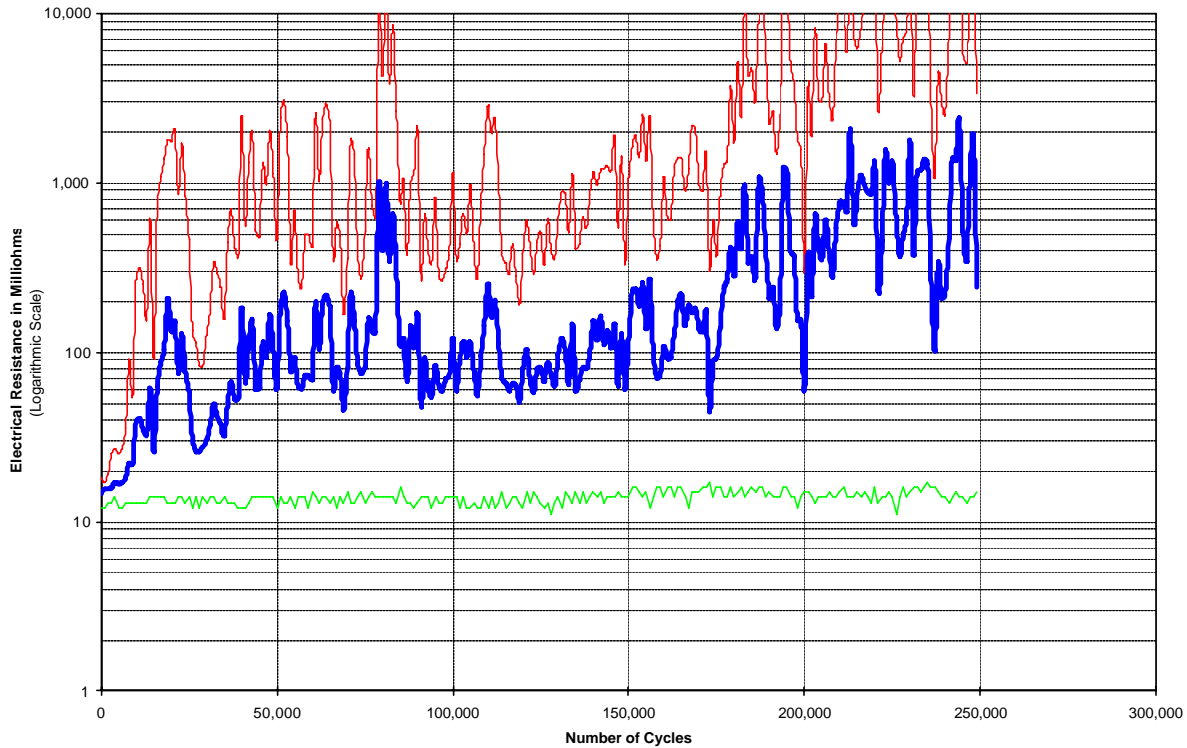
(From 4000 resistance measurements taken on a random sample of 16 probes)



| Statistics From Each Cycle Test | | | Statistics From All Test Data Combined For 100-PRP2544H with Lubricant Series | | | |
|---------------------------------|------|---|---|-----------|---|--------|
| Test No | 1 | 2 | 3 | All Tests | Total Number of Probes Tested: | 16 |
| Min (mΩ) | 11 | | | 11 | Total Number of Electrical Resistance Measurements: | 4,000 |
| Max | 24 | | | 24 | Number of Probes with Resistance Above 50 milliohms: | 0 |
| Avg | 14.2 | | | 14.2 | Percentage of Measurements Above 50 milliohms: | 0.000% |
| Std Dev | 1.32 | | | 1.32 | Number of Cycles to First Measurement Above 50 milliohms: | N.A. |



100-PRP2544H without Lubricant Series



| Statistics From Each Cycle Test | | | Statistics From All Test Data Combined For 100-PRP2544H Without Lubricant Series | | |
|---------------------------------|---------|---|--|-----------|--|
| Test No | 1 | 2 | 3 | All Tests | Total Number of Probes Tested: 16 |
| Min (mΩ) | 11 | | | 11 | Total Number of Electrical Resistance Measurements: 4,000 |
| Max | 32792 | | | 32792 | Number of Probes with Resistance Above 50 milliohms: 12 |
| Avg | 281.5 | | | 281.5 | Percentage of Measurements Above 50 milliohms: 23.475% |
| Std Dev | 1593.50 | | | 1593.50 | Number of Cycles to First Measurement Above 50 milliohms: 8000 |