



Outdoor and Marine R&D 2019

EPIRB PCB Conductive Growth Tests

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1: Executive Summary

An extended variant of the environmental testing, found to induce conductive growth in the product, was performed on a sample batch of PCBs.

An Acceptable Quality Limit (AQL) was applied to the remaining final batch of E100/E100G PCBs, the quantity of which is 1200. To achieve an AQL confidence level of 0.15 a sample batch of 80 PCBs was required. This batch size was increased to 100.

The sample batch was subjected to a continuous voltage of 10.5V in an environment of +55°C temperature and 95% humidity for 96 hours.

A current measurement was performed before and after the testing, with the result that current consumption of all PCBs had not changed over the testing period.

Ocean Signal have a confidence level better than 99.85% that the same issue will not occur with the remaining PCBs final batch of E100/E100G products.

2: Introduction

This report has been generated as an addendum to Report 921S-03420.

The previous document was generated due to reports that customer returns had suffered from a conductive growth contaminate on the PCB, causing batteries to become depleted.

The information in this report documents the subsequent tests performed to ensure that this issue will not occur on current and future production build.

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The E100/E100G is coming to end of life, the last batch of PCBs has already been purchased and delivered. The final remaining quantity of stock is currently 1200 PCBs. With this quantity, using the AQL charts in Fig. 1, applying General Inspection Level II and an AQL confidence level of 0.15 the sample size for testing is calculated be 80 PCBs.

The AQL charts also allow for 1 sample to have a major defect.

In the case of this testing, to ensure maximum confidence within Ocean Signal production, only a 0% failure will be deemed as acceptable.

The sample quantity was also increased from the calculated 80 PCBs to 100 PCBs.

Each PCB was then wired in parallel to ensure that all sample PCBs were powered with the same voltage for the duration of the test.

The testing was not performed at the Ocean Signal offices but was performed at an accredited test house, the test house used was TÜV SÜD.

TÜV SÜD

Octagon House

Concorde Way

Fareham

PO15 5RL



Fig. 2: Test setup at TÜV SÜD.

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4: Results

During the assembly process, each PCB is allocated a unique serial number. This can then be used to identify and track the PCBs through the testing process.

A current measurement of the PCBs was taken and logged prior to any testing.

All 100 sample PCBs were then connected to a power supply, set to 10.5V, and placed inside an environmental chamber at a temperature of +55°C and 95% humidity for 96 hours. The PCBs were left continuously powered for the duration of the test.

Once the testing was complete the PCBs were removed from the environmental chamber and left for 24 hours to ensure that any condensation had dried.

A second current measurement of the PCBs was then taken and logged.

PCB Serial No.	Current Reading Before Test	Current Reading After Test	Pass / Fail
	mA	mA	
JK-25-090-171	0.0001	0.0001	Pass
JK-25-156-171	0.0001	0.0001	Pass
JK-25-010-171	0.0001	0.0001	Pass
JK-25-089-171	0.0001	0.0001	Pass
JK-25-091-171	0.0001	0.0001	Pass
JK-25-092-171	0.0001	0.0001	Pass
JK-25-150-171	0.0001	0.0001	Pass
JK-25-094-171	0.0001	0.0001	Pass
JK-25-153-171	0.0001	0.0001	Pass
JK-25-154-171	0.0001	0.0001	Pass
JK-25-096-171	0.0001	0.0001	Pass
JK-25-095-171	0.0001	0.0001	Pass
JK-25-093-171	0.0001	0.0001	Pass
JK-25-121-171	0.0001	0.0001	Pass
JK-25-125-171	0.0001	0.0001	Pass
JK-25-048-171	0.0001	0.0001	Pass
JK-25-105-171	0.0001	0.0001	Pass
JK-25-128-171	0.0001	0.0001	Pass

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JK-25-099-171	0.0001	0.0001	Pass
JK-25-155-171	0.0001	0.0001	Pass
JK-25-100-171	0.0001	0.0001	Pass
JK-25-097-171	0.0001	0.0001	Pass
JK-25-098-171	0.0001	0.0001	Pass
JK-25-103-171	0.0001	0.0001	Pass
JK-25-104-171	0.0001	0.0001	Pass
JK-25-116-171	0.0001	0.0001	Pass
JK-25-113-171	0.0001	0.0001	Pass
JK-25-158-171	0.0001	0.0001	Pass
JK-25-159-171	0.0001	0.0001	Pass
JK-25-160-171	0.0001	0.0001	Pass
JK-25-166-171	0.0001	0.0001	Pass
JK-25-157-171	0.0001	0.0001	Pass
JK-25-114-171	0.0001	0.0001	Pass
JK-25-165-171	0.0001	0.0001	Pass
JK-25-167-171	0.0001	0.0001	Pass
JK-25-168-171	0.0001	0.0001	Pass
JK-25-140-171	0.0001	0.0001	Pass
JK-25-137-171	0.0001	0.0001	Pass
JK-25-119-171	0.0001	0.0001	Pass
JK-25-138-171	0.0001	0.0001	Pass
JK-25-139-171	0.0001	0.0001	Pass
JK-25-134-171	0.0001	0.0001	Pass
JK-25-133-171	0.0001	0.0001	Pass
JK-25-120-171	0.0001	0.0001	Pass
JK-25-135-171	0.0001	0.0001	Pass
JK-25-130-171	0.0001	0.0001	Pass
JK-25-129-171	0.0001	0.0001	Pass
JK-25-131-171	0.0001	0.0001	Pass
JK-25-132-171	0.0001	0.0001	Pass
JK-25-136-171	0.0001	0.0001	Pass
JK-25-079-198	0.0001	0.0001	Pass
JK-25-087-198	0.0001	0.0001	Pass
JK-25-093-198	0.0001	0.0001	Pass
JK-25-095-198	0.0001	0.0001	Pass
JK-25-055-198	0.0001	0.0001	Pass
JK-25-043-198	0.0001	0.0001	Pass
JK-25-047-198	0.0001	0.0001	Pass

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JK-25-088-198	0.0001	0.0001	Pass
JK-25-051-198	0.0001	0.0001	Pass
JK-25-054-198	0.0001	0.0001	Pass
JK-25-050-198	0.0001	0.0001	Pass
JK-25-042-198	0.0001	0.0001	Pass
JK-25-046-198	0.0001	0.0001	Pass
JK-25-086-198	0.0001	0.0001	Pass
JK-25-056-198	0.0001	0.0001	Pass
JK-25-052-198	0.0001	0.0001	Pass
JK-25-044-198	0.0001	0.0001	Pass
JK-25-048-198	0.0001	0.0001	Pass
JK-25-058-198	0.0001	0.0001	Pass
JK-25-085-198	0.0001	0.0001	Pass
JK-25-061-198	0.0001	0.0001	Pass
JK-25-057-198	0.0001	0.0001	Pass
JK-25-065-198	0.0001	0.0001	Pass
JK-25-062-198	0.0001	0.0001	Pass
JK-25-060-198	0.0001	0.0001	Pass
JK-25-010-198	0.0001	0.0001	Pass
JK-25-007-198	0.0001	0.0001	Pass
JK-25-018-198	0.0001	0.0001	Pass
JK-25-013-198	0.0001	0.0001	Pass
JK-25-009-198	0.0001	0.0001	Pass
JK-25-005-198	0.0001	0.0001	Pass
JK-25-017-198	0.0001	0.0001	Pass
JK-25-012-198	0.0001	0.0001	Pass
JK-25-130-198	0.0001	0.0001	Pass
JK-25-129-198	0.0001	0.0001	Pass
JK-25-132-198	0.0001	0.0001	Pass
JK-25-126-198	0.0001	0.0001	Pass
JK-25-125-198	0.0001	0.0001	Pass
JK-25-077-198	0.0001	0.0001	Pass
JK-25-127-198	0.0001	0.0001	Pass
JK-25-128-198	0.0001	0.0001	Pass
JK-25-037-198	0.0001	0.0001	Pass
JK-25-040-198	0.0001	0.0001	Pass
JK-25-039-198	0.0001	0.0001	Pass
JK-25-078-198	0.0001	0.0001	Pass
Pass JK-25-038-198	0.0001	0.0001	Pass

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JK-25-036-198	0.0001	0.0001	Pass
JK-25-028-198	0.0001	0.0001	Pass
JK-25-032-198	0.0001	0.0001	Pass
JK-25-024-198	0.0001	0.0001	Pass

5: Conclusion

From the results above, all 100 sample PCBs measured the same current before and after the testing, giving a measurement of 0.0001mA (100nA) for every reading (this reading was the limit of the meter).

This shows that none of the sample batch of PCBs, which equated to 8.3% of the total remaining stock, exhibited conductive growth.

From the AQL charts, in Fig. 1, the sample batch size gives an AQL confidence level of 0.15. Since the batch size used for the test was larger than required (100 samples rather than 80 samples), this means that Ocean Signal can be better than 99.85% confident that none of the remaining PCBs will suffer from conductive growth.