



SANTA BARBARA AUTOMATION

**Test Validation Modules
Installation and Operating Manual
Automotive/Aerospace Models**

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TEST VALIDATION MODULES

DESCRIPTION

Santa Barbara Automation offers a family of Test Validation modules for various industries. This document pertains to our automotive and aerospace series. These modules are also known as Test Certification modules.

During production testing various instruments are used to determine the quality of manufactured parts before delivery. Typically this involves testing for upper and lower limits of resistance, inductance, capacitance, thermal transient and insulation resistance.

Should an instrument fail to measure properly the manufacturer incurs a risk of shipping defective product. Even a simple instrument may drift with time and temperature or suffer internal damage with the result that the readings are incorrect.

For example, if a multimeter used for production test does not fail catastrophically, but instead measures incorrectly the problem may not be discovered for some time. The interval between when the defect occurs and when it is corrected is a risk that may result in recall of parts and significant expense.

Most instruments are calibrated once per year. Our Test Validation modules offer a fast, low cost means of verifying that test equipment is operating properly and accurately between calibration cycles by validating the equipment before each new batch of parts is tested.

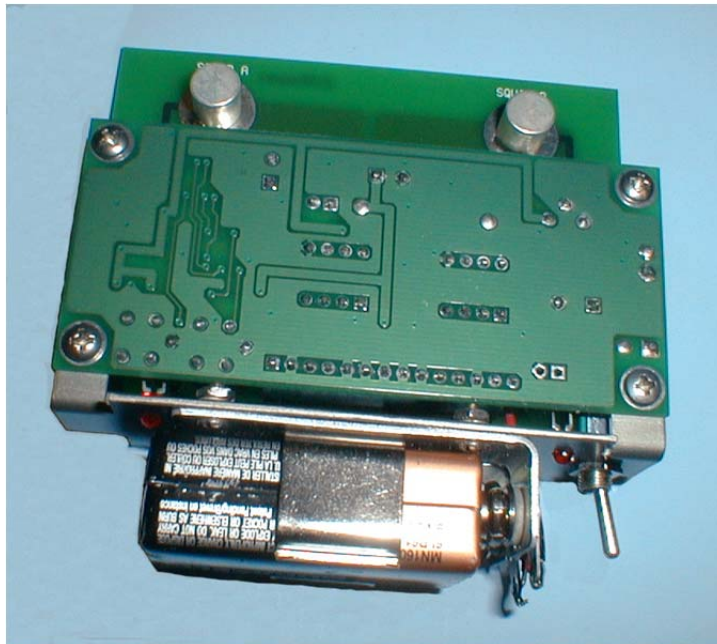


Figure 1: 2-Channel Test Certification module

For automotive and aerospace testing the test validation modules are offered in single channel, two, three and four channel, and up to 20 channel versions. Each module consists of one or more circuit boards and a power source. These modules are normally stand alone and are placed into the testing equipment, allowing verification of contacts and wiring as well as instrumentation.

Most validation modules are provided with battery power. This allows the module to be placed into the conveyor or index table and moved to the test position with no external wiring. If the test head and electrical contacts are lowered into contact with the test validation module and a normal test run the complete electrical system may be checked, or validated, prior to use.

A typical test environment may include several types of instrumentation, switching circuits, wiring and contacts to the part under test. Any of these may fail. The validation modules provide repeatable, accurate resistance, thermal transient and insulation resistance results for the complete test system including final wiring and contacts. Other options include inductance and capacitance.

PREPARATION FOR TESTING

Before a test may be conducted a set of test parameters must be created. This file is similar to the standard initiator test file but with much tighter tolerances. Create a test parameters file with very close pass/fail tolerances and provide a unique name for the file. For instance, for 2 ohm bridgewire initiators and a thermal transient test current of 300 milliamps;

[TestCert]	File Name
PartName="Single Channel Test Cert"	Part Name
BWRInitial=1.950 2.000 2.050	Initial Resistance Low, Target and High
BWRFinal=1.950 2.000 2.050	Final Resistance Low, Target and High
BWRDelta=-0.05 0 0.05	Difference between Initial and Final Resistance
ThermalResponse=28 30 32	Thermal Transient Low, Target and High

The validation module should produce results of 2.000 ohms for initial and final resistance and a thermal response of 30 millivolts. If the validation module fails the test it signifies that a problem exists that must be corrected before running production parts.

USING THE VALIDATION MODULE

Our single channel test certification module provides a convenient method for validation for manual testing equipment and thermal transient test systems.



Figure 2: Single Channel Test Certification module

The module has an on/off switch at one end and a cable for connection to the equipment at the other end. Various cable ends are available for different equipment. The most common are “D” connectors and gold-plated paddle contacts.

The single channel test validation module may be used to verify equipment performance for resistance, thermal transient response and insulation resistance. Nominal resistance values of 1.000 and 2.000 ohms are common, but others may be requested. Thermal transient values are typically 10% of the test current, in millivolts. For example, if a test current of 300mA is used, the thermal transient reading would be 30mV. For insulation resistance a nominal value of 10 megohms is used. The module is qualified for test voltages up to 500VDC. Again, other thermal transient and insulation resistance values may be requested at the time of order.

Before using the single channel test validation module turn on the switch and test the unit by pressing the small momentary switch near the middle of the circuit board. You should note a distinct “click” as the relay actuates and should note the red LED briefly illuminating.

Place the test validation module into the test chamber and connect the contact leads to the test contacts. When using the gold-plated paddle contacts be certain to maintain the proper polarity as noted by the colored leads.

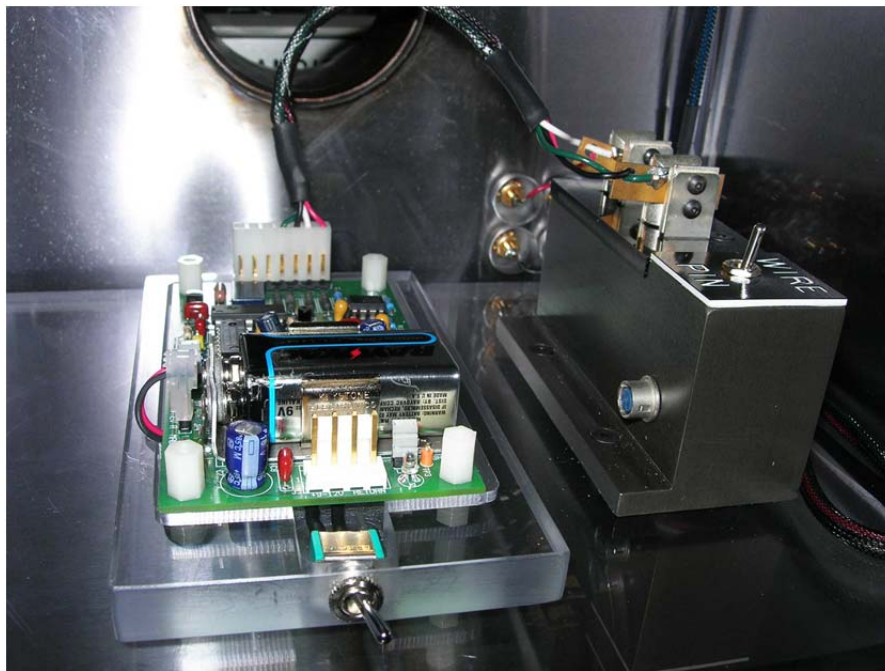


Figure 3: Test validation within test chamber

With the validation module switch turned on close the test chamber door and run a test with the test parameters file created earlier. If the polarity is incorrect or the power switch is off the thermal transient readings obtained will be near zero. However, the resistance readings will still be correct.

Observe the test results and pass/fail status on the monitor. The readings should be close to ideal and consistent over time. If the module fails the test check that the on/off switch is on and the battery is good and repeat the test. If the module still fails the equipment must be checked and the problem resolved before production may resume.



Figure 4: Contact detail

The standard validation module will produce results of 2.000 ohms for initial and final resistance and a thermal response of 30 millivolts. Insulation resistance (if used) should produce a value of 10.0 megohms. Should the validation module fail the test it signifies that a problem exists that must be corrected before running production parts.

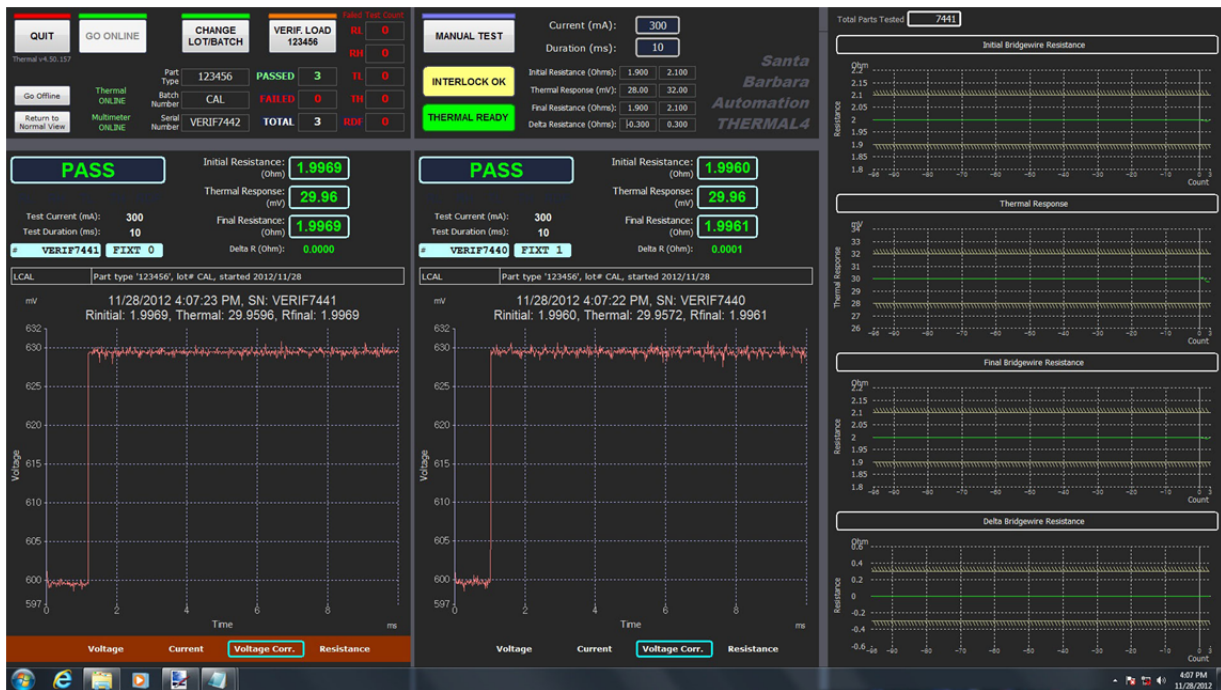


Figure 5: Test Validation Screen

A record of the test results and data may be saved and used to compare readings over time and between different testing equipment. This is useful when troubleshooting equipment or when attempting to determine the source of drift in production part characteristics. If the test validation results are consistent but the values for resistance, thermal response or other characteristics have changed the problem is likely the manufacturing process and not the final test equipment.

With a change in the output cable the test validation module may also be used to test the Santa Barbara Automation thermal transient test systems or thermal transient circuit boards. Our standard thermal transient test systems have a 15-pin D connector, while the thermal transient circuit board has a 9-pin D connector. We also offer Kelvin test leads for direct connection to products under development or unique parts.

The single greatest cause of erroneous readings on the production line is poor contact to the part under test. This may occur due to contact wear and degradation, the improper choice of contact materials or incorrect contact spacing for a given range of lead or pin size. Initial reject rates due to contact failure will be small and may occur randomly. It is not possible to detect such random problems with an occasional validation test, they must be avoided with good maintenance practices.

The circuitry used for the test validation module may be adopted to multiple channel equipment, providing 2,3,4,8 and up to 20 individual channels for complete machine validation. We recommend that each test validation module be returned every 12 months for calibration just as with other instrumentation. Santa Barbara Automation will calibrate and return the module along with test data and certificates noting calibration using instruments calibrated to standards traceable to the National Institute of Standards and Technology

KELVIN CONTACTS AND TEST VALIDATION OPTIONS

The preferred wiring to any of the validation modules is Kelvin, or 4-wire. This means separate wiring for the positive test current and test current return, and separate wires for the positive and negative sense wires as may be seen on the single channel test validation module. The separate wiring to the validation board will provide the greatest accuracy possible. However, in some cases it is not possible and a very short 2-wire method may be the only means possible of using the test validation module.

For example, when testing pin lead initiators the contact spacing may be on 3mm or closer centers. For such parts the test validation module must provide mating pins to allow equipment validation on the production line that includes test wiring and contacts. Santa Barbara Automation provides Kelvin contacts for test with contact spacing of 5mm, 3mm, 1.5mm and .5mm. We also provide test validation modules that may be used to quickly verify equipment functionality and accuracy for these and other types of applications.

For some types of automation the validation circuitry may be built into production tooling, allowing a fast means of placing the module on the conveyor to circulate just as a normal production cassette would. The validation modules may be identified with a unique marking or anodize color. Machine vision or electrical connections may be used to archive the test validation separately from normal production parts.

Figure 6 below shows a typical unmolded pin lead part in production tooling. To properly test the equipment contacts, wiring and instruments the validation module must be provided with similar pin lead connections.



Figure 6: Unmolded header in production line tooling

For pin lead equipment validation a different module may be required. While the circuitry is similar, the module must fit the conveyor or index table and must present to the production equipment a header body and pins similar to the actual initiator.

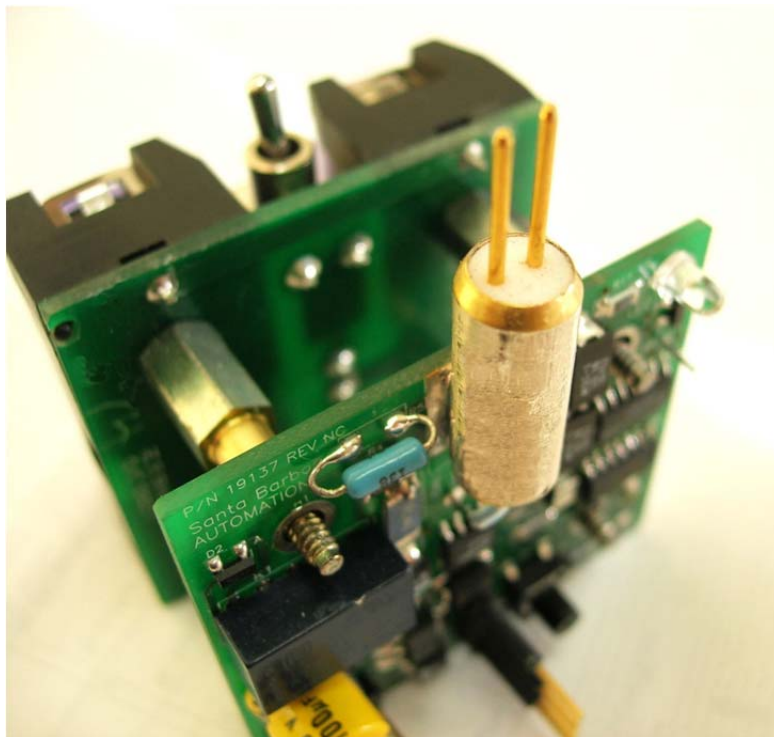


Figure 7: Pin Lead test Validation Module

For higher production speeds multiple parts are often tested together. This may be accomplished with nest cavities or cassettes, depending on the conveyor or index mechanism. Santa Barbara Automation also offers multiple channel tooling to properly validate such equipment.

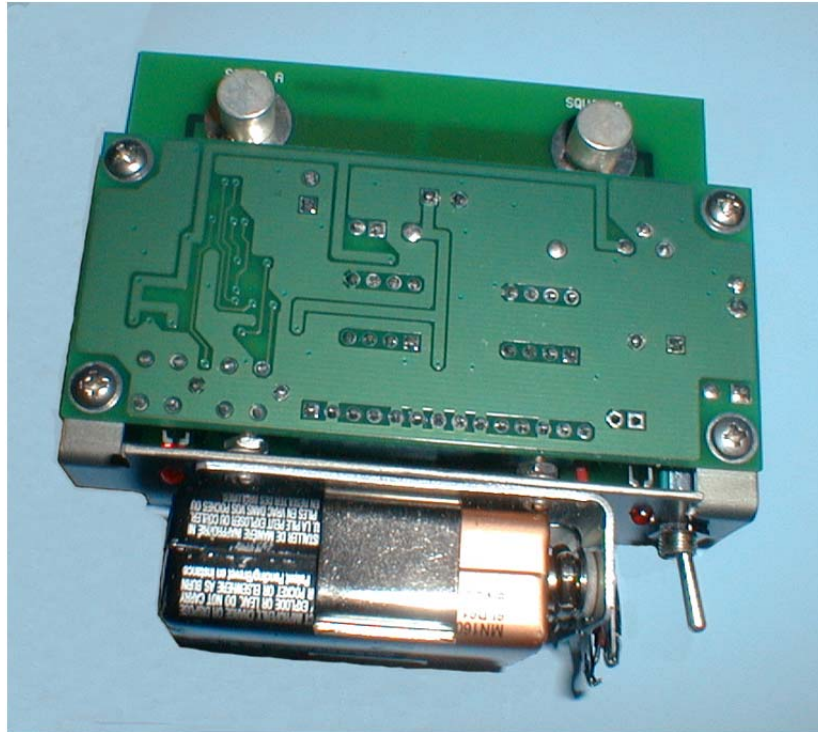


Figure 8: 2-Channel Test Validation Module

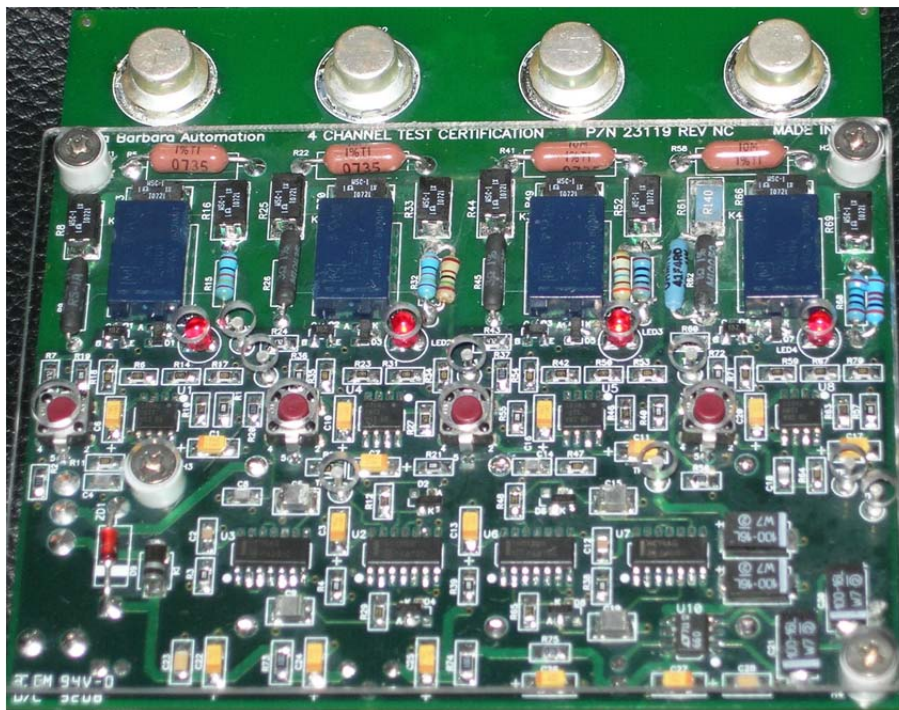


Figure 9: 4 Channel Test Validation Header Side

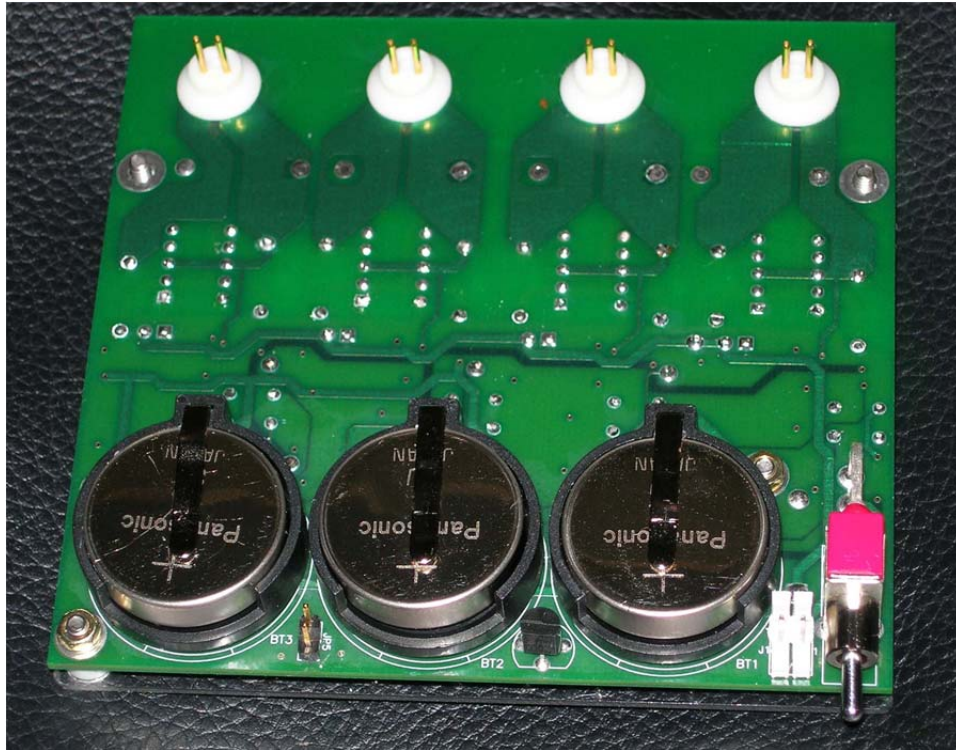


Figure 10: 4 Channel Test Validation Pin Side

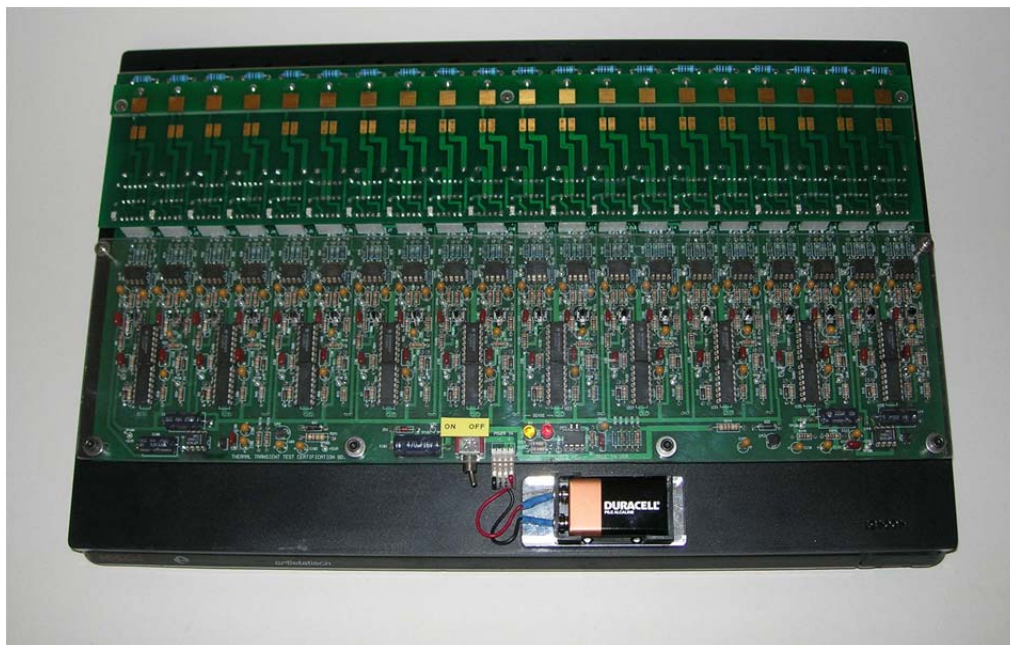


Figure 11: 20 Channel Test Validation