SANTA BARBARA AUTOMATION

Solid State
Test Validation Module
Installation and Operating Manual

Automotive/Aerospace Models

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TEST VALIDATION MODULES

DESCRIPTION

Santa Barbara Automation manufactures a family of Test Validation modules for various industries. These modules are also known as Test Certification modules. This document pertains to our latest version with improved features:

- Calibrated for very low thermal transient reading to comply with current parts.
- Semiconductor switching for more consistent readings.
- Microcontroller controlled test sequence.
- Crystal controlled pulse time control.
- Resistors selected for highest accuracy and virtually no change with temperature.
- Current usage reduced to microamps for longer battery life.

This module allows accurate and repeatable testing for thermal transient instruments. It provides a stable base resistance with a change to a higher resistance when current from a thermal test is detected. The difference between the two resistances is used to validate the performance of test instruments during final electrical testing of automotive or aerospace igniter testing. Typically this involves precision testing for resistance, thermal transient and insulation resistance.

The high accuracy of the Test Validation module allows the pass/fail parameters to be set very close to the expected response. Should the Test Validation module fail the test it serves as an early warning of equipment failure, and will minimize the risk of shipping defective product. 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 initiators is tested or at the beginning of each shift to minimize risk.

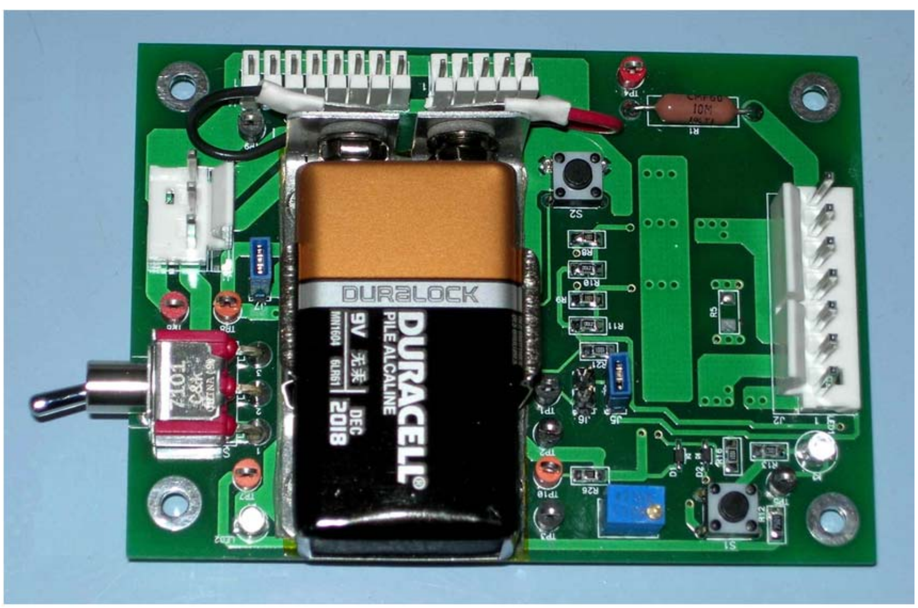

Figure 1: Solid State Test Validation module

For automotive and aerospace testing our test validation modules are offered in single channel, two, three, 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 manually 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 onto 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.

The single channel test validation modules are more typically used for direct connection to the Thermal Transient Test System (15-pin connector), to a thermal transient circuit board (9-pin connector) or to the Kelvin connectors found in many of our test chambers and other products.

Options include resistance standards of 1.000 or 2.000 ohms and thermal response standards of 1/10 or 1/100 the value or test current, in millivolts

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 validation module options include inductance and capacitance.

SOLID STATE TEST VALIDATION FEATURES

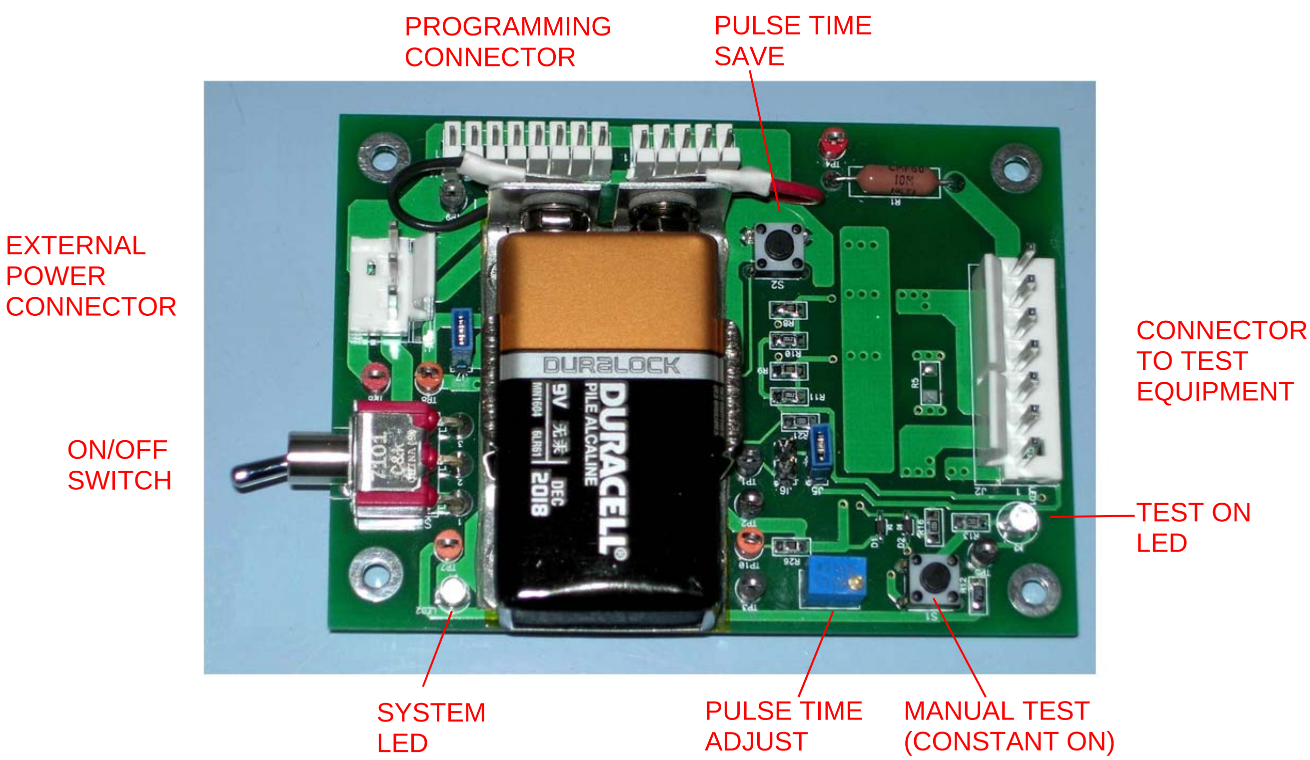

Figure 2: Solid State Test Validation Features

PREPARATION FOR TESTING

When using the Test Validation module with the Santa Barbara Automation equipment a set of test parameters must be created. This file is similar to our 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 1 ohm bridgewire initiators and a thermal transient test current of 500 milliamps;

[TestCert]	File Name
PartName="Single Channel Test Cert"	Part Name
BWRInitial=0.950 1.000 1.050	Initial Resistance Low, Target and High
BWRFinal=0.950 1.000 1.050	Final Resistance Low, Target and High
BWRDelta=-0.05 0 0.05	Difference between Initial and Final Resistance
ThermalResponse= 4 5 6	Thermal Transient Low, Target and High

The validation module should produce results of 1.000 ohms for initial and final resistance and a thermal response of 5.0 millivolts. If the validation module fails the test it signifies that a problem exists that must be corrected before running production parts. The much tighter pass/fail tolerances allow advance warning of wiring and contact problems, instrumentation drift and/or failure.

RUNNING A TEST

Connect the test validation module to your equipment with the proper cable. When using gold-plated connectors to connect to Kelvin contacts, such as those in our test chambers, please note that polarity is important. The leads must be oriented correctly to obtain a thermal transient reading, although resistance readings will be accurate regardless of orientation.

Start the Thermal Transient software application and turn on the test validation module power (Figure 2 on page 4). The green System LED on the Test Validation module will blink several times during initialization (three with the current firmware). You may then press the Manual Test button to confirm that the battery is good. The red Test On LED will illuminate as long as the button is pressed.

Go online with the thermal transient application and select the proper test parameters, or else enter the values manually. For the most accurate results allow sufficient warmup time for the equipment to be tested. The Test Validation module does not require warmup beyond the completion of the initialization process.

Run a thermal test and note the resulting waveform and numerical values received. Our standard test validation modules produce a thermal response of 1/10 the value of the test current, in millivolts. The solid state test validation module produces a thermal response that is 1/100 the value of the test current. For example, a test current of 300mA will produce a value of 3 millivolts, a test current of 600mA a value of 6 millivolts, and 1000mA a value of 10 millivolts.

When the validation module detects the start of a thermal test the red Test On LED will briefly flash. The LED on time is proportional to the thermal pulse duration. If you do not detect a brief flash and no waveform is received please check the battery and connections to the thermal transient equipment.

A record of test results may be maintained to monitor equipment performance over time and for the early detection of problems. The Santa Barbara Automation Thermal Transient application will allow the test results to be saved to a location of your choice for this purpose.

PULSE TIME ADJUSTMENT

Standard times for thermal transient testing range from 10ms to 40ms to 80ms, with 10ms the most common. The solid state test validation module is normally delivered with the pulse width adjusted to 11ms. This may be changed in the field to suit the user. The range of pulse width adjustment is from about 1ms to about 50ms.

The test validation module pulse width should not be confused with the thermal transient pulse duration, which is the time during which current is sourced by the thermal transient circuit board.

Regardless of your test requirements the test validation module must be set for a time greater than the thermal test time, typically about 1ms longer. Note that settings shorter than the thermal transient test will result in a reading of zero, or near zero. This is because the thermal test, by definition, is the difference, in millivolts, between a reading taken at 100us after the start of the test and another at the end of the test.

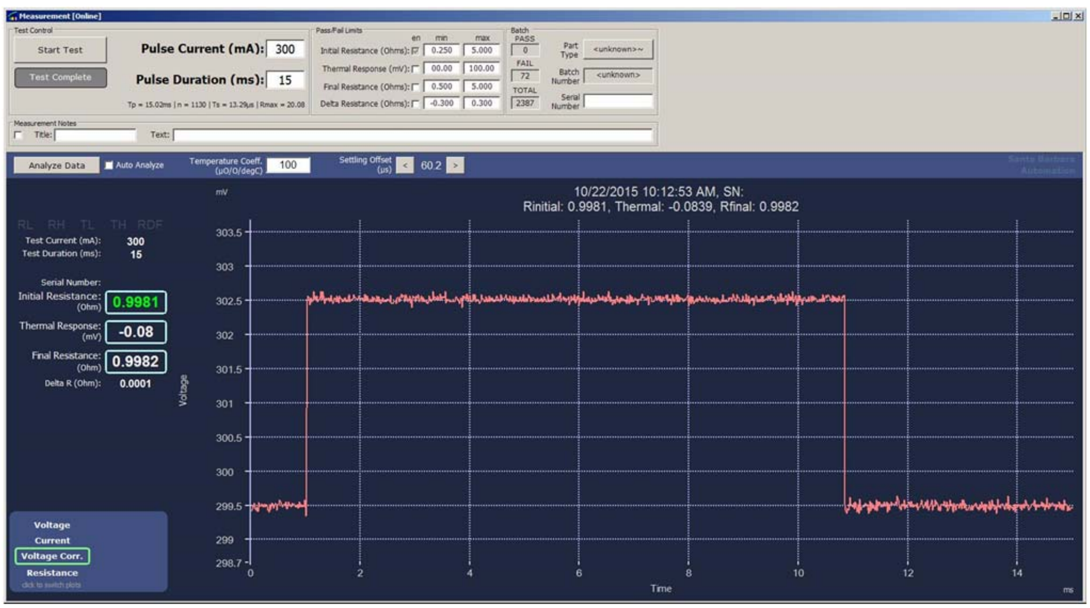

Figure 3: Adjusting the pulse time for a 10ms thermal test

To adjust the test validation pulse width the easiest method is to connect the validation module to a thermal transient test system with the proper cable. A standard thermal transient test may then be run.

For the example above (Figure 3) set the thermal transient pulse duration to a time greater than the required test time. The above waveform would be the result with a thermal transient pulse duration of 15ms, used during the adjustment of the test validation module to a time of 11ms. Use the Test Time trimpot to change the setting, running a thermal transient test after each adjustment.

Please note that changes are not reflected in the thermal waveform and are not saved unless the Pulse Time save button is pressed after each adjustment. Pressing the Pulse Time button will save the setting to non-volatile memory. Repeat the thermal transient test after each adjustment (remembering to press the Pulse Time save button afterwards). Once the waveform shows a pulse time of about 1ms longer than your test requirement the adjustment is compete. Reset the thermal transient pulse duration to 10ms or to your specified duration to run validation tests.

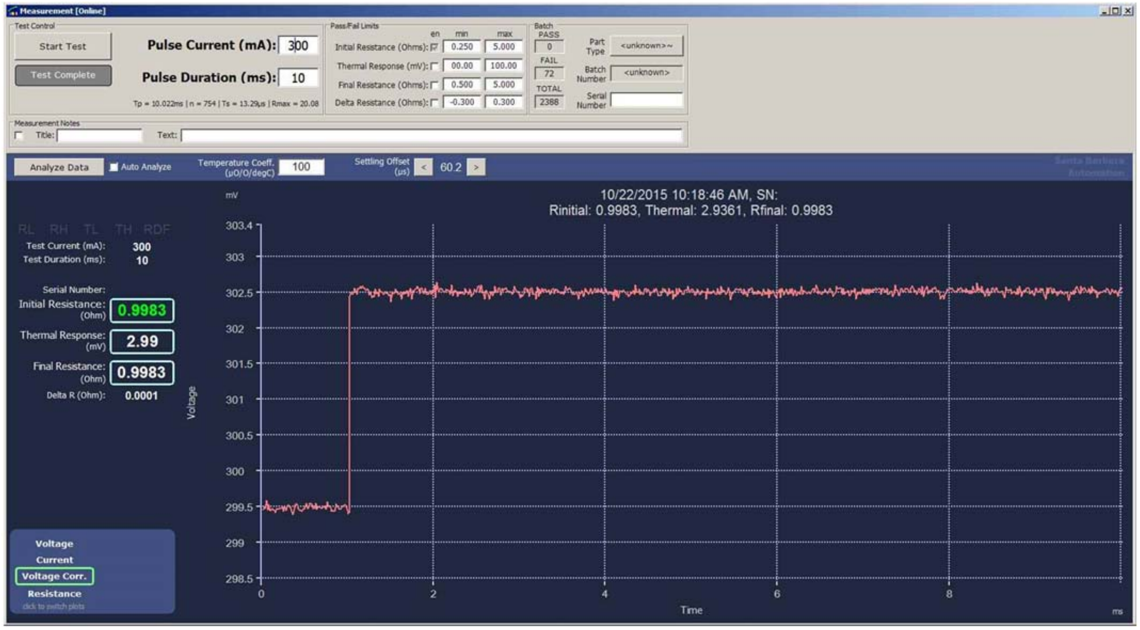

Figure 4: 10ms thermal test after adjustment

When the test validation module has been properly adjusted the waveform will be similar to figure 4, reflecting a very clean change from low to high as the circuitry adjusts the resistance on the board.

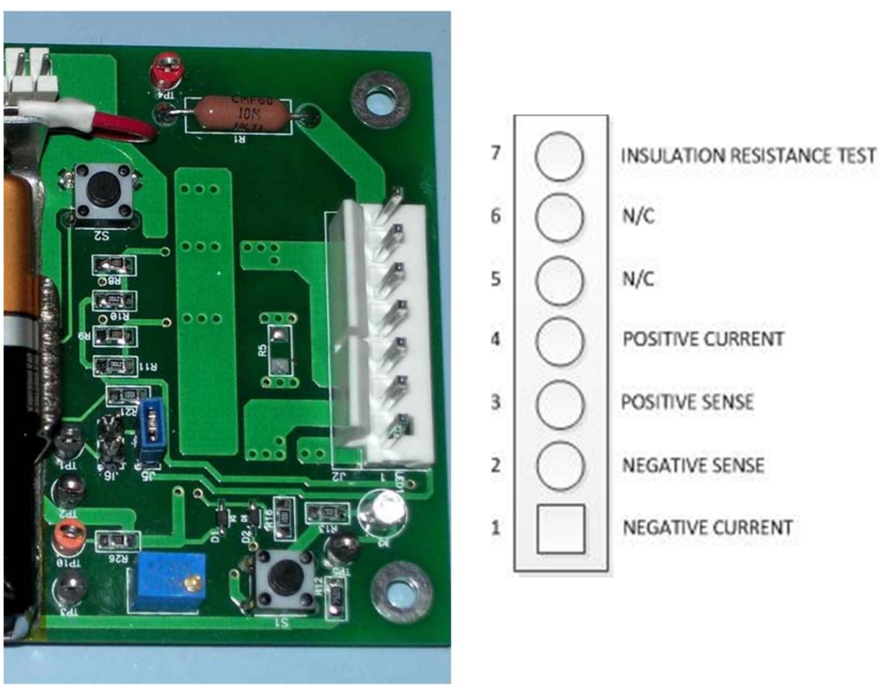

Figure 5: J2: Connections to Test Equipment