

NAVSEA Test Plan

Zachary Pratt (ZP), Logan Miller (LM), Jairo De La Mora (JM)

Version 0.8 from 5/24/2022

Primary Point of Contact: daniel.lowney@navy.mil

Revision History

Revision	Date	Author(s)	Description
0.1	10/24/2021	ZP, LM, JM	Created
0.2	11/7/2021	ZP, LM, JM	Added content to configurations to be tested, schedule, and system diagram to overview.
0.3	11/18/2021	ZP, LM, JM	Added to Test Items, and Roles
0.4	1/17/2022	ZP, LM, JM	Added to requirments and procedures
0.5	2/21/2022	ZP, LM, JM	Added to procedures, schedule
0.6	4/10/2022	ZP, LM, JM	Added to test configurations, procedures, deliverable, schedule
0.7	5/15/2022	ZP, LM, JM	Updated Test Items, Configurations to be Tested, Roles, Schedule, Test Procedures
0.8	5/24/2022	ZP, LM, JM	Testing Deliverables

Contents

1 Overview	4
2 Configurations to be Tested	4
2.1 Digital Simulations	4
2.2 Breadboard Recreation	4
2.3 Alternative Solutions	4
3 Test Items	4
4 Testing Criteria	5
5 Test Procedures	5
5.1 Pass/Fail	5
5.2 Operator Tests	5
6 Testing Deliverables	5
7 Roles	6
8 Schedule	6
8.1 November	6
8.2 December, January	6
8.3 February, March	6
8.4 April	6
8.5 May, June	6
9 Approvals	6

1 Overview

This project entails the recreation of the MK.532, this device has the purpose of testing detonator resistances within the Navy's systems. The preexisting device is considered antiquated, recreating the device is being done to prevent future issues with its use.

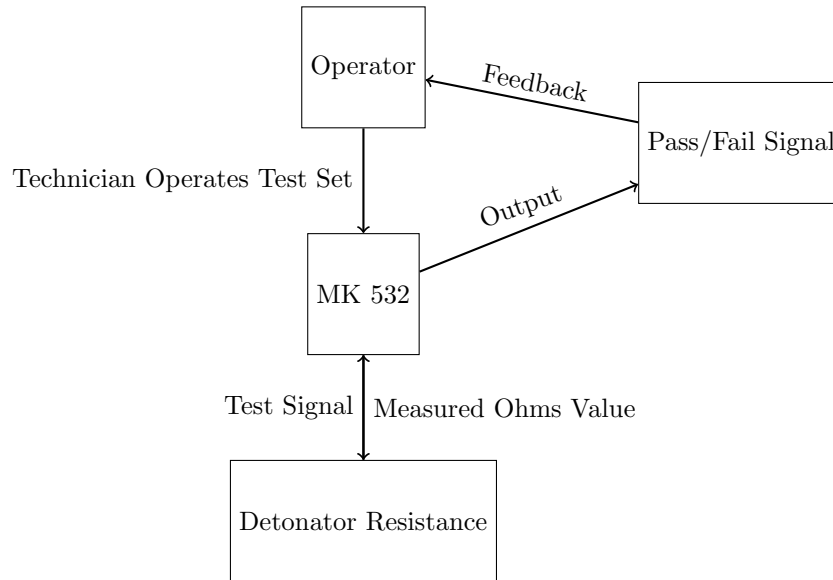


Figure 1: System Diagram

2 Configurations to be Tested

2.1 Digital Simulations

The first test configuration is a digital recreation of the the circuit logic from the test circuit in modeling software LT Spice. This configuration is to be made so that the

2.2 Breadboard Recreation

New, modern parts with a fully integrated PCB unit as a replacement for the current internal electronics. The PCB will need to connect with the existing input dials and switches and produce the same outputs as the current MK 532.

2.3 Alternative Solutions

NAVSEA had reported some errors with their circuits in use. While it was assumed that these errors come from the obsolete components in use, NAVSEA asked we identify some possible alternatives for the MK.532 circuit logic. These alternative solutions are to be made using digital circuit modeling in LT Spice. These models will be validated through the same method as the digital recreations which is ensuring that it mimics the same behavior as the currently existing test equipment.

3 Test Items

The redesigned circuit must follow the expected behavior of the laid out test procedures made by NAVSEA documentation as summarized below

- Low Set/Test Calibration: CIRCUIT BREAKER and POWER in ON position, FUNCTION switch in the LO TEST position. Turn the UPPER LIMIT SET knob fully clockwise. Turn the LOWER LIMIT SET knob fully counter-clockwise. After doing this observe the TEST LED is on. Slowly turn the LOWER LIMIT SET knob clockwise until the test LED extinguishes. Then turn the LOWER LIMIT SET knob counter-clockwise to the value where TEST LED is lit. Place the FUNCTION switch in the DET 1 position, confirm the LED is still lit. This confirms the LED is within range. Repeat this process with the LO SET function position
- Hi Set/Test Calibration: CIRCUIT BREAKER and POWER in ON position, FUNCTION switch in the HI SET position. Turn the UPPER LIMIT SET knob fully clockwise. After doing this observe the TEST LED is on. Slowly turn the UPPER LIMIT SET knob counter-clockwise until the test LED extinguishes. Then turn the UPPER LIMIT SET knob clockwise to the value where TEST LED is lit. Place the FUNCTION switch in the DET 1 position, confirm the LED is still lit. This confirms the LED is within range. Repeat this process with the HI TEST function position
- PCB design would require separate testing as it is a completely new design that would need to function the same as the antiquated MK.532. The PCBs to be tested include three isolated models, each representing the independent circuitry of the three states. Then the complete redesign circuit as a whole. Actual printed PCB testing was not an expected deliverable from the sponsor due to time restraints, thus this is an optional item.

4 Testing Criteria

- The redesigned PCB must meet all requirements laid out by NAVSEA testing documentation on the previous iteration of the MK 532. This primarily includes LED read outs based on the state of the various switches as well as a spreadsheet of point to point values. This is to be done so that future operators of the test set can be used with no change in continuity for their training.

5 Test Procedures

NAVSEA has clarified our expected deliverable is a model of the redesign cards, we are not required to actually build the board if time does not allow it. From this the test procedures have changed to include only simulated tests. We will need to verify that all expected inputs work according to sponsor specifications.

5.1 Pass/Fail

The requirements of this card is to detect any resistances outside the range of 1.0 to 2.25 Ω displayed via the LED. Ensuring the redesign can correctly identify resistors as in or out of range (process described in 3 Test Items) is the main pass/fail requirement for this design.

5.2 Operator Tests

Along with the Low and High test/set calibrations, the redesign must follow the procedures of the user manual to maintain continuity for test equipment operators.

6 Testing Deliverables

The expected deliverables in regards to testing include digital recreations of the circuit that verify the design is functional. This along with a physical recreation on a bread board doing the same will suffice in verifying design. Engineers that follow up on this project will be required to do additional tests with the finished PCB.

7 Roles

- Relaying the allowed details/specifications of the project is the responsibility of Jairo and Logan.
- Final documentation for NAVSEA use will be the responsibility of Jairo and Logan.
- All members will be equally responsible for building the initial test circuits on breadboards and building the model.

8 Schedule

8.1 November

Research different methods of accurately measuring small resistances and needed knowledge of analog circuits.

8.2 December, January

Hands-on access to the MK 532 will be obtained after approvals from the Navy have been met. Testing of the original MK 532 will begin to determine which configuration to pursue.

8.3 February, March

As we have the schematic of the design we have begun recreating the circuit for testing on the breadboard as well as digital recreation for testing purposes. By the end of march we should have a physical test circuit for the design.

8.4 April

Ensure digital and physical recreations of the MK.532 recreate the appropriate behavior through testing. Identify possible alternative solutions for measuring resistance for the system through digital circuit modeling.

8.5 May, June

Finalize breadboard and digital recreations of the MK.532 circuit. Provide updates to documentation to include non-discussable information for NAVSEA use only.

9 Approvals

Ultimately the NAVSEA sponsors will need to verify the testing done with the final deliverables.