Manually Operated RF Shield Box & Universal Test Fixture

User Guide
Notices

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WARNING
A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.
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1 Introduction

This user guide describes the maintenance information, the product specifications, and the Shield Box RF Isolation Test Setup information for the Manually Operated RF Shield Box & Universal Test Fixture.

NOTE

This document is applicable to the following type of shield box

1 N9360A-S01 RF Shield Box
2 N9360A-S02 RF Shield Box with filtered USB port
3 N9360A-S03 RF Shield Box with filtered D-sub 25 pin port
4 N9360A-S04 RF Shield Box with filtered USB and D-sub 25pin port
2

Product Overview

This chapter contains maintenance information for the Manually Operated RF Shield Box & Universal Test Fixture.
Product Overview

This product is made up of two major parts:
- The Shield Box (SB) and
- The Universal Test Fixture (UTF).

There are four types of shield box available:
1. N9360A-S01 RF Shield Box
2. N9360A-S02 RF Shield Box with filtered USB port
3. N9360A-S03 RF Shield Box with filtered D-sub 25 pin port
4. N9360A-S04 RF Shield Box with filtered USB and D-sub 25 pin port

Figure 1 RF shield box (front view) and Universal Test Fixture (UTF)
Shield box - Side view

Figure 2  Shield box side view

Figure 3  Shield box rear view
Shield box Lid operation

1 To open: One hand holds down the handle while the other lifts up the latch clamp flap. Remove the hook from the catch and release the handle so that the gas spring can push open the lid.

2 To close: One hand hold the handle and pull down the lid then the other hand hooks the latch clamp to the catch and push down the flap.

**NOTE**
In order to obtain RF isolation as per specification, ensure that D25 and USB ports are terminated with shielded cable at all time.

**WARNING**
DO NOT LIFT BOX WITH HANDLE
Use both hand to lift the box if required to relocate the box location.
Universal Test Fixture (UTF)

The UTF was designed to fit various sizes of devices by making the position adjustment on the left stopper and bottom stopper.

![UTF top view](image)

**Figure 5** UTF top view

**Table 1** UTF items

<table>
<thead>
<tr>
<th>Items</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Antenna coupler cable</td>
</tr>
<tr>
<td>B</td>
<td>Fixed right stopper</td>
</tr>
<tr>
<td>C</td>
<td>Slide mounting holes</td>
</tr>
<tr>
<td>D</td>
<td>Adjustable left stopper</td>
</tr>
<tr>
<td>E</td>
<td>Viewing slot for antenna</td>
</tr>
<tr>
<td>F</td>
<td>Antenna Coupler (behind)</td>
</tr>
<tr>
<td>G</td>
<td>Adjustable stopper slider</td>
</tr>
<tr>
<td>H</td>
<td>Height adjustable stopper</td>
</tr>
<tr>
<td>I</td>
<td>Adjustable bottom stopper</td>
</tr>
<tr>
<td>J</td>
<td>Thumb screw</td>
</tr>
</tbody>
</table>
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Setup

1. Place the device of interest onto the fixture and aligned it to the right stopper.

2. Adjust the bottom stopper and the left stopper slider such that they are positioned to hold the bottom-half of the device.
There are two positions (upper and lower mounting holes for the slider) on the base to position the left stopper somewhere in the middle or on the bottom-half of the base.

3 Adjust the left stopper (left-right) and the spring loaded stopper by loosening the thumb screws to secure the DUT in its position by pushing the left stopper towards the device until the spring-loaded stopper is slightly compressed. (As shown in the Figure 7)

**NOTE**

If the position of interest cannot be reached, remove the left stopper, unscrew the slider and reposition it. Then screw onto the next fixed position to reach the next range of adjustment.

![Figure 8 UTF bottom view](image-url)
Setup procedure

1. Loosen the two thumb screws and adjust the antenna to the position of interest.
2. If the position of interest cannot be reached, remove the thumb screws and screw onto the next fixed position to reach the next range of adjustment.
3. Place the fixture into the shield box's mounting studs and tighten with the provided nuts.
4. Connect the antenna cable to one of the SMA ports.

![Antenna coupler](image)

Figure 9  Antenna coupler
3 Product Specifications

This chapter contains specifications for the Manually Operated RF Shield Box & Universal Test Fixture.
### Product Specifications

Table 2  Electrical specifications

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>RF Isolation</td>
<td>up to 2.5 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 60 dB</td>
</tr>
<tr>
<td>1.2</td>
<td>RF Connector</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N bulkhead with SMA adaptor</td>
<td>2 units</td>
</tr>
<tr>
<td></td>
<td>N (female) outside-SMA (female) inside</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Filtered Dsub 25 Adaptor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outside (female), Inside (male)</td>
<td>1000pF</td>
</tr>
<tr>
<td>1.4</td>
<td>USB Type A Adaptor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shielded</td>
</tr>
<tr>
<td>1.5</td>
<td>RF Absorber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi-layer of solid, flat-type foam absorbing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>materials made from bulk resistive polyurethane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>foam</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>3.0 cm</td>
</tr>
<tr>
<td></td>
<td>RF Absorption, for &gt; 1GHz</td>
<td>&gt; 25 dB</td>
</tr>
<tr>
<td></td>
<td>Power Handling Capacity</td>
<td>200.0 V/m CW (or 110 Watt/m², 0.1 Watt/in²)</td>
</tr>
<tr>
<td></td>
<td>Fire Retardant</td>
<td>NFL 8093 Tests 1, 2 &amp; 3, DIN 4102-B2 and UL 94</td>
</tr>
<tr>
<td></td>
<td>Maximum service temperature</td>
<td>90 °C (190 °F, continuous)</td>
</tr>
<tr>
<td>1.6</td>
<td>RF Gasket</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SoftShield 5000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RF Attenuation, 20 MHz to 10 GHz</td>
<td>&gt; 80 dB</td>
</tr>
<tr>
<td></td>
<td>Closure force – typical</td>
<td>&lt; 1 lb/in (0.175 N/mm)</td>
</tr>
<tr>
<td></td>
<td>Operating Temperature range</td>
<td>-40 to + 70 °C</td>
</tr>
<tr>
<td>1.7</td>
<td>Antenna Coupler</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency range</td>
<td>0.8 to 2.65 GHz</td>
</tr>
<tr>
<td></td>
<td>Insertion loss</td>
<td>10 to 18 dB</td>
</tr>
<tr>
<td></td>
<td>VSWR</td>
<td>Better than 1:1.7</td>
</tr>
</tbody>
</table>
Table 3 Mechanical Specifications

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Shield box</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Physical dimension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Height</td>
<td>Front (excluding handle height) : Rear 108 : 188 mm</td>
</tr>
<tr>
<td></td>
<td>Width &amp; Depth</td>
<td>300 &amp; 350 mm</td>
</tr>
<tr>
<td></td>
<td>Lid thickness</td>
<td>8 mm</td>
</tr>
<tr>
<td>2.2</td>
<td>Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Body</td>
<td>Steel with powder coating</td>
</tr>
<tr>
<td></td>
<td>Lid</td>
<td>Aluminium with powder coating</td>
</tr>
<tr>
<td>3</td>
<td>Universal Test Fixture</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Physical dimension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base plate</td>
<td>180 x 180 mm</td>
</tr>
<tr>
<td></td>
<td>Minimum/Maximum size of DUT fit-able Width: Min = 22 mm Max = 85 mm</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base plate</td>
<td>Anti-scratch black Delrin</td>
</tr>
<tr>
<td></td>
<td>Adjustable holder</td>
<td>Anti-scratch black Delrin</td>
</tr>
<tr>
<td>3.3</td>
<td>Antenna coupler dimensions</td>
<td>Width = 30 x Length = 50 x Thickness = 8 mm</td>
</tr>
<tr>
<td></td>
<td>RF cable length</td>
<td>25 cm</td>
</tr>
</tbody>
</table>
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4
Maintenance Guide

This chapter contains maintenance information for the Manually Operated RF Shield Box & Universal Test Fixture.
Maintenance Guide

The part that needs regular maintenance is the RF gasket around the lid. As it is an electrically conductive and elastic material, the following should need preventive maintenance:

1. Ensure that the surface of the gasket is free from dust and oil stains that would deteriorate the conductivity.
2. Check that the excess gasket surface above the lid's surface is more than 1.5 mm so that once the lid is closed it would provide a good shielding around the lid. If it is less than 1.5 mm, replace the gasket.

**NOTE**
To ensure a good shielding still exists, perform RF Isolation tests at a regular interval.
5

Shield Box RF Isolation Test Setup

This chapter contains Shield Box RF Isolation Test Setup information for the Manually Operated RF Shield Box & Universal Test Fixture.
Shield Box RF Isolation Test Setup

This setup is meant for a quick verification of the shielding effectiveness of the shield box.

The setup for RF isolation test for the RF Shield Box consists of the following major components:

- Computer controller turn-table
- RF Signal Generator
- RF Spectrum Analyser
- Dipole antennas for 800-900 & 1800-1900 MHz bands

Procedure:

Reference Signal

1. Connect a dipole antenna to a RF Signal Generator (RF SG) and place it at a distance of about 2 m from the turn-table.
2. Connect another antenna to a RF Spectrum Analyzer (RF SA) place it at the position that is about 2 m from the first antenna.
3. Set the RF SG at the frequency of interest and take the readings made by the RF SA while turning the turn-table over 360 degrees.
4. Record the highest signal strength measured by the RF SA. This signal strength will be the reference signal while the antenna is not in a shield box.

NOTE

This is set up in a normal room/lab environment.
Taking The Measurement

Procedure:

1. Connect the antenna on the RF SA in a shield box-under-test and place the shield box on the RF SA.

2. Ensure that the distance of the antenna in the shield box is almost at the same position during the reference signal measurement.

3. Take measurements while the turn-table is turned over 360 degrees. Then, the signal strength at the various azimuth positions will be plotted on a graph.

4. The reference signal strength will be plotted on the same graph for easy analysis.

5. The RF Isolation value is the difference between the reference signal level and the highest RF signal level recorded in the shield box.

**NOTE** This test is performed in a normal room/lab environment.