



VR Surface Reader

Antenna Panel
Test Procedure

Revision 1.0

Venture Research Inc.
3001 Summit Ave, Suite 100
Plano, Texas 75074
469-246-4000

Date	Revision	Author / Reviewer	Description of Change
2/21/2017	1.0	Youhua Chen / Adnan Ali	Initial revision

Table of Contents

Table of Contents	3
1. Introduction	4
1 Test Procedures	4
1.1 Antenna SWR Validation Check	4
1.2 Antenna System Test	6
1.3 Antenna Pre-box Test	8

List of Figures

Figure 1 - Network Analyzer used in Manufacturing	4
Figure 2 - Lin Mag Measurements	5
Figure 3 - VR Hardware Manufacturing Test Program.....	6
Figure 4 - VR Manufacturing Tag Fixture Assembly.....	6
Figure 5 - Test Flowchart of Tower Antenna Panel (16 Antennas)	7
Figure 6 - Sample Test Result Report.....	8
Figure 7 - Sample Final Label	8
Figure 8 - Sample Final Q/A Sheet	9

1. Introduction

Venture Research's manufacturing line conducts a series of tests during the build process to validate the antenna's tuning and ensure proper readability. The test results are recorded in a database along with the serial number of the unit.

Once all the RF components are put together: Antennas, RF Module, Multiplexers, and tuning capacitors or inductors, each antenna assembly is validated for proper RF tuning. Then the antenna assembly will be tested for adequate read performance before it is finished with top and bottom aesthetic plastics. Finally, the assembly will once more get tested for read performance. During each test, the VR serial number is recorded along with the test results in our Manufacturing Database via the Test Software.

1 Test Procedures

Manufacturing tests include:

- Antenna VSWR Validation Check
- Antenna System test
- Antenna Pre-Box test

1.1 Antenna SWR Validation Check

During this test, the SWR and Lin Mag values are measured and validated to be below the approved thresholds. This test is performed using a Network Analyzer that supports frequencies above 850MHz and below 950MHz.

Sample specifications of Network Analyzer:

- Frequency range: 300 kHz to 1.3 GHz
- Measured parameters: S11, S21
- Sweep types: Linear frequency, log frequency, segment, power sweep
- Dynamic range: 130 dB (10 Hz)
- Measurement speed: 150 μ s per point at 95 dB dynamic range
- Output power adjustment range: -55 dBm to +3 dBm
- Up to 16,001 measurement points per sweep



Figure 1 - Network Analyzer used in Manufacturing

For each antenna assembly, the below setup is used:

Test Setup:

- Set Network analyzer frequency range to 902 MHz to 928 MHz
- Set markers to take measurements at the following frequencies:
 - @ 902MHz (Low Frequency)
 - @ 915MHz (Mid Frequency)
 - @ 928MHz (High Frequency)
- Ensure that the analyzer was calibrated for Open, Short, and Through settings

For each antenna assembly, the following measurements are taken and stored in the database with the VR Serial Number.

Measurements:

- Measure Voltage Standing-Wave Ratio: VSWR at each measurement point must be at or below 2.0
- Measure Line Magnitude: Lin Mag at each measurement point must be at or below 0.27

See Figure 2 for an example of Lin Mag measurements at the three selected frequencies: 0.06 @ 902MHz, 0.19 @ 915MHz, and 0.11 @ 928MHz.

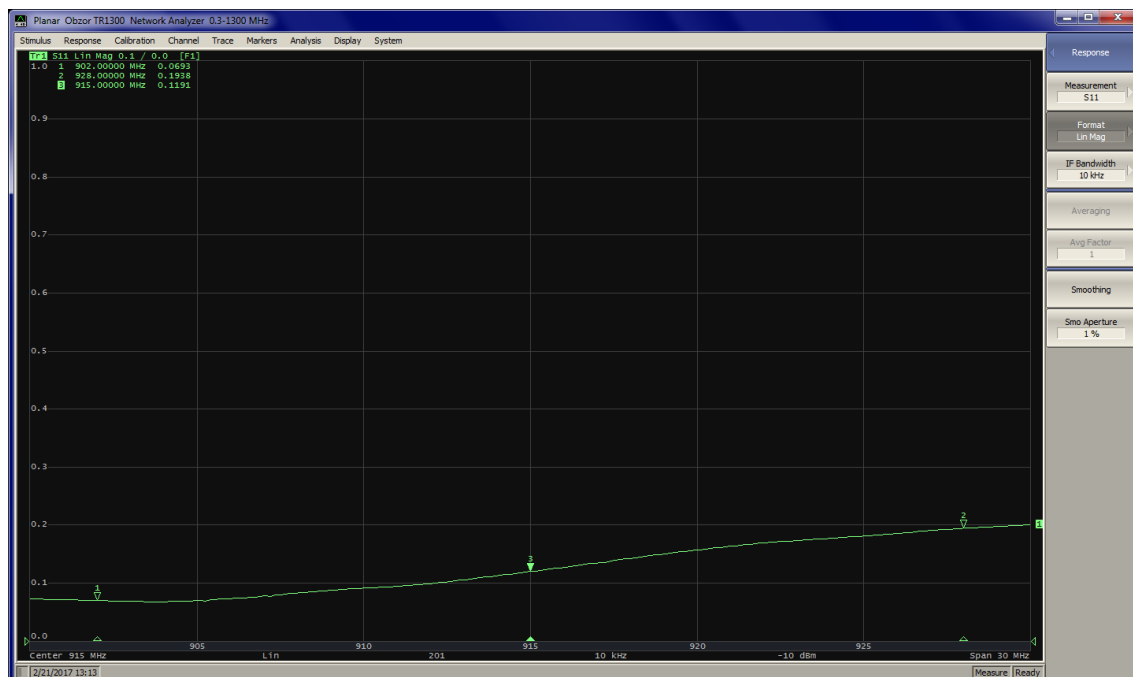


Figure 2 - Lin Mag Measurements

1.2 Antenna System Test

Before the antenna panel is sealed with a top and bottom aesthetic plastic cover, a read performance test is performed. This read test is performed to ensure adequate performance for each antenna.

Test Setup:

- Connect the panel into the Test Controller Setup via Test 10-Pin cable (or connector)
- Load VR Hardware Manager Application and select VR Surface Reader (Carefusion/BD) Backwall System Test. See Figure 3 for a snapshot.
- Place the Test Tag Fixture on the antenna assembly. See Figure 4 for a sample tag fixture.

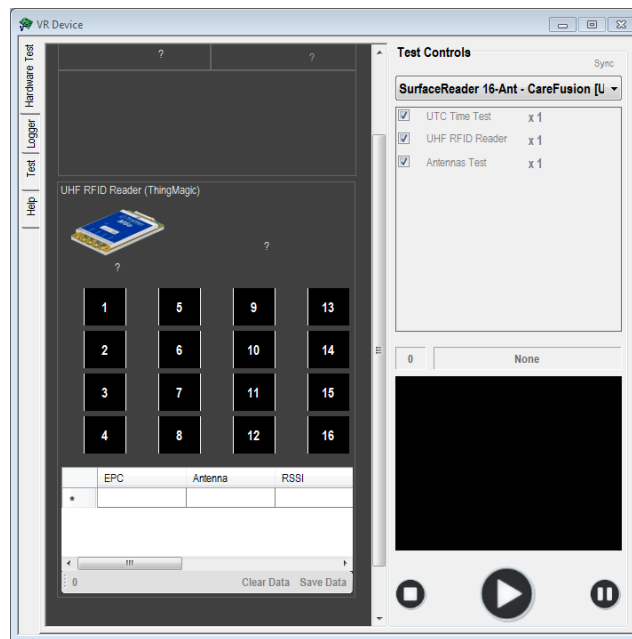


Figure 3 - VR Hardware Manufacturing Test Program



Figure 4 - VR Manufacturing Tag Fixture Assembly

Test Process:

The VR Manufacturing Hardware Test program (see Figure 3) reads on all antennas one at a time. The application ensures that the (designated) tag directly perpendicular to the antenna is read at or above the RSSI threshold. If all reference testing tags are read successfully, the test result is recorded as PASS in the Manufacturing database along with the VR Serial Number of the Antenna Assembly. Figure 5 presents the test flowchart. The resulting report and labels are then printed and recorded with the Quality Sheet for that antenna assembly.

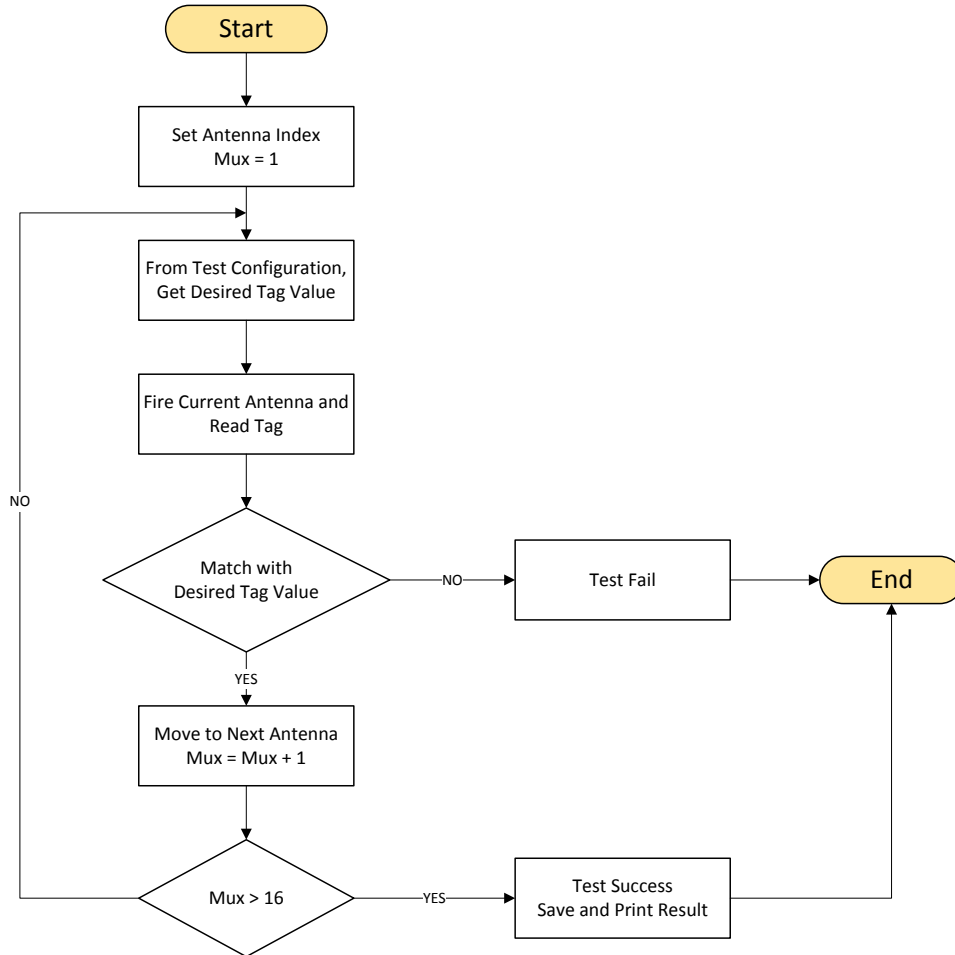


Figure 5 - Test Flowchart of Tower Antenna Panel (16 Antennas)

Coreclusion Support 1/5/17

Surface Reader Pre-Ship Q/A Checklist

VENTURE Research Inc. VR Serial Number VRSN000026355 Date: 1/4/17
 ShellReader Hostname N/A

2 4 5 6 8 10 12 14 16 (Circle One)

Sequence	Initials	Checklist
SWR Test [Before]		
1	<input checked="" type="checkbox"/>	Verify thermal sensor has conformal coating and has been tested.
2	<input checked="" type="checkbox"/>	Verify thermal sensor is installed with thermal tape on the bottom side.
3	<input checked="" type="checkbox"/>	Ensure that any excess milling copper on the antennas is removed.
4	<input checked="" type="checkbox"/>	<i>(If antennas are glued)</i> Ensure that the corners are glued down and mux interface area is glued down with no air gaps.
5	<input checked="" type="checkbox"/>	Verify Qty. 3 #4 screws are used to mount the bottom mux board.
6	<input checked="" type="checkbox"/>	<i>(If more than 10 antennas)</i> Verify Qty. 4 #4 screws are used to mount the top mux board.
7	<input checked="" type="checkbox"/>	Ensure Solder from aluminum backplane has not gotten further than provided exposed ground plane of the mux board.
8	<u>AT</u>	Verify RF cables have been soldered. Center conductor to top pad and Grd shield at two different points (one on bottom ground plane & one on top ground pad)
9	<u>AT</u>	Verify HDPE filaments solder joints are not much bigger than 1/8" and cleaned off.
10	<u>AT</u>	Inspect the MUX to antenna filament wires and make sure they are secure to the Mux board.
11	<u>AT</u>	<i>(If Copper or Aluminum back plane)</i> Perform an ohms test between Mux and end of antenna to insure low resistance.
12	<u>N/A</u>	<i>(During SWR Test)</i> Check to make sure that any unused mux ports are verified to have less than .12db (902-928 MHz)
SWR Test [After] <u>36161</u> ⇨ SWRTest TestID		
SYSTEM Test [Before]		
13	<input checked="" type="checkbox"/>	<i>(If Rev1.0 Linux ShelfBoard)</i> Ensure that the thermal 3.3V mod is performed <i>(See SHELF_BRD_MOD_R001 drawing)</i>
14	<input checked="" type="checkbox"/>	Ensure Qty. 3 #4 screws at each corner are used to install Shelf Reader board. <i>(10 antenna ShelfReader requires Qty. 4)</i>
15	<input checked="" type="checkbox"/>	Ensure RF cable(s), GPIO cable & Thermal-sensor connector are installed securely between Mux and Reader Board.
16	<input checked="" type="checkbox"/>	<i>(If Rev 1.0 MuxBoard)</i> Ensure there is a separator under the upper mux connector so that it cannot ground out the feed line
17	<input checked="" type="checkbox"/>	Verify the RF cable(s), GPIO cable, and all connectors are hot glued down to prevent them sticking from up and disconnecting
SYSTEM Test [After] <u>36186</u> ⇨ SystemTest TestID		
PreBox Test [Before]		
18	<input checked="" type="checkbox"/>	Ensure that the 1/16" thick ABS is used on bottom side of shelf, with grooves lined up to main shelf grooves. <i>(Note: two notches have to be centered to the Connector clips)</i>
19	<input checked="" type="checkbox"/>	Ensure that the 1/8" thick ABS is used on the top side of shelf, with grooves lined up to main shelf grooves. <i>(Note: 10 antenna ShelfReader will have notches cut out for the connector clips)</i>
20	<input checked="" type="checkbox"/>	Ensure that the diagnostic panel is aligned and secured with Qty. 2 #6x1/4" SS PH screws.
21	<input checked="" type="checkbox"/>	Verify that all sides of the shelf are cleanly routed and are glued completely down.
22	<input checked="" type="checkbox"/>	Verify that all sides of the shelf are de-burred.
PREBOX Test [After] <u>N/A</u> ⇨ PreBoxTest TestID		
23	<u>TN</u>	Verify that the VRSerial# label is applied to the diagnostic panel after all tests & assembly is complete.

VENTURE Research Inc. VRSN000026355
 UNIT 2817-91-95
 YC

(Note: Remember to record Asset serial numbers where designated on the back (Page 2) of this sheet.)

ISO-QAC-20 Revision K 8/14/2015 1

Figure 8 - Sample Final Q/A Sheet