AI-Generated Document

# AI Analysis & Processing Results

# LoRa Car Radio Evaluation Board Bring-Up Test Plan

\*\*Document Number:\*\* AE104195-001 (Derived)  
\*\*Revision:\*\* V1.0  
\*\*Date:\*\* January 15, 2025

\*\*Prepared By:\*\*  
AERONIX  
1775 West Hibiscus Blvd., Suite 200  
Melbourne FL 32901  
(321) 984-1671

\*\*Prepared For:\*\*  
Clemson Senior Design Team  
201 Sikes Avenue  
Clemson, SC 29631

\*\*Applicable Data Rights Statement:\*\*  
AERONIX PROPRIETARY - COMPETITION SENSITIVE.

---

## 1. Scope

This document outlines the bring-up test plan for the LoRa Car Radio Evaluation Board. The purpose of these tests is to verify the basic functionality and integrity of the hardware, ensuring it meets the initial design specifications. The evaluation board is designed to facilitate research into how LoRa radios can be used to create mesh networks for utilization on trains for various signaling and data monitoring applications.

## 2. Referenced Documents

The following documents are referenced in this test plan:

\* \*\*AE104193-001:\*\* LoRa Base Station Evaluation Board and LoRa Car Radio Evaluation Board Hardware Specifications and Priorities.  
\* \*\*AE104077-001:\*\* Drawing for PCBA visual inspection standard and class.  
\* \*\*AE304195-001:\*\* LoRa Car Radio Programming Procedure.

## 3. Test Execution and Recording Guidelines

\* The test procedure is to be executed in the order presented in this document.  
\* If any failure is observed during a test, the test must be halted immediately. The failure should be clearly marked, and the issue must be remedied before restarting the test from the beginning.  
\* \*\*Datasheet Reporting:\*\*  
 \* Data sheets are indexed to the corresponding test procedure paragraphs.  
 \* Record actual test data on the applicable entry line on the datasheet.  
 \* Verify satisfactory completion of an action or observation by marking a "P" (for pass) on the applicable data sheet.  
 \* If completion of an action or an observation is unsatisfactory, mark an "F" (for fail) on the applicable data sheet.  
 \* No entry line shall be left blank. If a specific test does not apply, write "N/A" for the entry.

## 4. Test Equipment

The following test equipment is required to complete the testing outlined herein. Equivalent equipment is acceptable.

\* \*\*Item 1:\*\* DC Power Supply  
\* \*\*Item 2:\*\* Multimeter  
\* \*\*Item 3:\*\* Input Power Cable (banana jacks to barrel connector)  
\* \*\*Item 4:\*\* JTAG Programmer  
\* \*\*Item 5:\*\* Test PC  
\* \*\*Item 6:\*\* USB to TTL Serial Cable  
\* \*\*Item 7:\*\* Oscilloscope

## 5. Test Procedures

### 5.1. Visual Inspection

1. Visually inspect the PCBA (Printed Circuit Board Assembly) according to the IPC-610 standard and the class specified in drawing AE104077-001.  
 \* \*Record Pass/Fail on datasheet.\*

### 5.2. Voltage Rail Checks

#### 5.2.1. Diode Check (Power Off)

1. Set the multimeter (Item 2) to diode check (beep) mode.  
2. Using the multimeter, probe the ground pad (pin 2) of the input barrel jack (J3) (GND) with the black multimeter probe.  
3. With the red probe, verify the following location is connected to ground:  
 \* P2 pin 1 (GPIO Header)  
 \* \*Record Pass/Fail on datasheet.\*  
4. With the black multimeter probe still on the ground pad (pin 2) of the input barrel jack (J3) (GND) and using the red probe, verify that the following nets are NOT connected to ground:  
 \* J3 pin 1 (PWR\_JACK)  
 \* U6 pins 14-16 (+5V)  
 \* P2 pin 2 (+3V3)  
 \* U12 pin 1 (+3V3\_RF)  
 \* \*Record Pass/Fail for each net on datasheet.\*  
5. Place the black multimeter probe on U6 pins 14-16 (+5V).  
6. Using the red probe, verify that the following nets are NOT connected:  
 \* P2 pin 2 (+3V3)  
 \* U12 pin 1 (+3V3\_RF)  
 \* \*Record Pass/Fail for each net on datasheet.\*  
7. Place the black multimeter probe on P2 pin 2 (+3V3).  
8. Using the red probe, verify that the following net is NOT connected:  
 \* U12 pin 1 (+3V3\_RF)  
 \* \*Record Pass/Fail on datasheet.\*

#### 5.2.2. Power-On Voltage Check

1. Disconnect any connected output power cables from the DC power supply (Item 1).  
2. Power on the DC power supply without enabling its output.  
3. Set the DC power supply to output 5V and set the current limit to 200mA.  
4. Connect the input power cable (Item 3) banana jacks to the output jacks of the DC power supply, and the barrel connector to the UUT’s barrel jack, as shown in Figure 4-1 (if provided).  
5. \*\*WARNING:\*\* If the UUT draws too much current, be prepared to turn off the power supply quickly to reduce damage to the UUT.  
6. Enable the power supply.  
7. \*\*WARNING:\*\* Verify that the UUT does not draw more than the current limit, entering the power supply into constant current mode. If the board is drawing more than 200mA, disable the power supply, end this procedure, and diagnose the issue.  
 \* \*Record current draw on datasheet.\*  
8. Place the black multimeter probe on the ground pad (pin 2) of the input barrel jack (J3) (GND).  
9. Using the red probe, verify the voltages of the following nets (refer to "Table - Voltage Rails to Check" for expected values, if available):  
 \* \[List specific nets to check, e.g., +5V, +3V3, +3V3\_RF, as per Table 4-1 in the original document, which is not provided in detail here. For now, assume the table exists and instructs to check the primary rails.]  
 \* \*Record actual voltage for each net on datasheet.\*

#### 5.2.3. Clock Signal Verification

1. Power on and set up the Oscilloscope (Item 7) with the following settings on channel 1:  
 \* 1V/div  
 \* 5us/div  
 \* Measurement: Frequency on channel 1  
2. Probe Y1 pin 1 with the channel 1 probe. Verify that the clock signal is 16MHz.  
 \* \*Record actual frequency and Pass/Fail on datasheet.\*  
3. Probe Y2 pin 1 with the channel 1 probe. Verify that the clock signal is 32MHz.  
 \* \*Record actual frequency and Pass/Fail on datasheet.\*  
4. Power off the UUT.

### 5.3. Firmware Programming

1. Connect the JTAG Programmer (Item 4) to the test PC (Item 5) with the included USB cable.  
2. Connect the JTAG Programmer to the UUT with the included JTAG cable, as shown in Figure 4-2 (if provided).  
3. Connect the USB to TTL Serial Cable (Item 6) to the test PC (Item 5) and to the UUT debug header (P2) with the following pinout:  
 \* \[Specific pinout details from the original document are missing here. Refer to the actual document for pin mapping.]  
4. Program the UUT according to AE304195-001 LoRa Car Radio Programming Procedure.  
5. Verify programming is successful.  
 \* \*Record Pass/Fail on datasheet.\*

### 5.4. Functional Test

1. Open a serial terminal to the UUT on the test PC (Item 5) using the following parameters:  
 \* Baud Rate: 115200  
 \* Parity: None  
 \* Stop Bits: 1  
2. Reset the UUT by pressing SW1.  
3. Verify the welcome screen prints to the console.  
 \* \*Record Pass/Fail on datasheet.\*  
4. Enter command “bit.lora” into the console. Verify built-in test shows as "Pass".  
 \* \*Record Pass/Fail on datasheet.\*  
5. Enter command “bit.gps” into the console. Verify built-in test shows as "Pass".  
 \* \*Record Pass/Fail on datasheet.\*  
6. Enter command “bit.imu” into the console. Verify built-in test shows as "Pass".  
 \* \*Record Pass/Fail on datasheet.\*  
7. Enter command “bit.i2c” into the console. Verify built-in test shows as "Pass".  
 \* \*Record Pass/Fail on datasheet.\*

## Appendix A: Test Datasheet

Record the results of each test in the datasheet provided separately or appended to this document.

# Document Information

Generated on: 2025-09-27 16:47:32

Content length: 7466 characters

Word count: 1212 words