

E6950B eCall / ERA-GLONASS / Next Generation eCall Conformance Test Solution

eCall / ERA-GLONASS/ NG eCall Conformance Test

Introduction

Emergency Call (eCall) and ERA-GLONASS are European Union and Russian Federation initiatives, respectively, that combine mobile communication and satellite positioning to provide rapid assistance to occupants in the event of a collision.

An integrated In-Vehicle System (IVS) is a key element in the automobile, triggering an emergency call automatically to the Public Safety Answering Point (PSAP), or manually by the occupants. Once a voice connection is established, the IVS transmits essential data — the Minimum Set of Data (MSD), including the vehicle location and direction of travel — which enables the response team to reach the accident site as soon as possible.

The IVS module continuously monitors the crash sensors and vehicle position via satellite receivers. In 2G or 3G mobile networks, an in-band modem establishes a voice connection to enable data transmission to the nearest PSAP when triggered. A microphone and speaker system enables the driver or passenger to communicate with the PSAP operator.

Each of the components plays an important role. Therefore, the components must be tested for functionality in a real-world environment to ensure overall system performance.

The Keysight E6950B eCall/NG eCall Conformance Test Solution performs the necessary end-to-end functional and standard-compliance conformance testing of the IVS modules, with an optional audio performance analysis.

In the eCall test environment (Figure 1), a signal generator provides Global Navigation Satellite System (GNSS) coordinates, simulating the function of GPS in the real environment. The IVS represents the vehicle, while a wireless test set emulates a cellular network in the real-world.

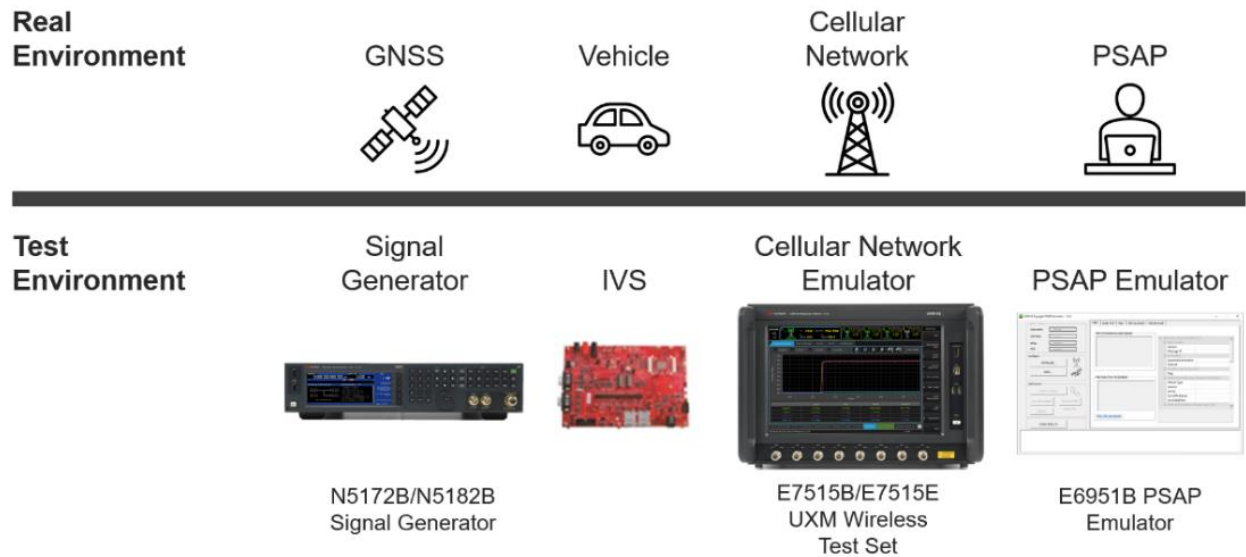


Figure 1. eCall Test Environment

As part of the eCall test environment, the E6951B PSAP Emulator does the following:

- Controls the call box to emulate a cellular network and the signal generator to provide the GNSS coordinates.
- Simulates a PSAP to respond to the IVS under test and decode MSD data.
- Verifies that the IVS modem can trigger an emergency call, send raw MSD data and establish a voice connection with the PSAP.

For information about the Keysight instruments, see:

- www.keysight.com/find/uxm
- www.keysight.com/find/N5172B

eCall Test Configurations

The following examples show the instrument setup and communications paths for various eCall test configurations using the E6951B PSAP Emulator and the following Keysight test instruments:

- E7515B/E UXM Wireless Test Platform
- N5182B/N5172B RF Vector Signal Generator
- U8903B Audio Spectrum Analyzer

Test Setup 1 – Circuit Switched eCall

Test Setup 1 is for testing Circuit Switched (CS) eCall IVSs. In this configuration there will be no Packet Switched (PS) capabilities for testing NGeCall.

This configuration requires the E7515B/E UXM and the N5182B/N5172B RF Vector Signal Generator. The instruments require a network connection via LAN. Either static IP allocation or a DHCP network may be used.

The UXM should be configured with a 2G or 3G capable scenario.

The E6951B PSAP Emulator can be ran on the UXM (Figure 1-2) or an external PC (Figure 1-3) depending upon the user preferences.

Additionally, the E6951B PSAP Emulator can optionally control the IVS via serial.



Figure 1. Test Setup 1A: CS eCall - Internal PSAP

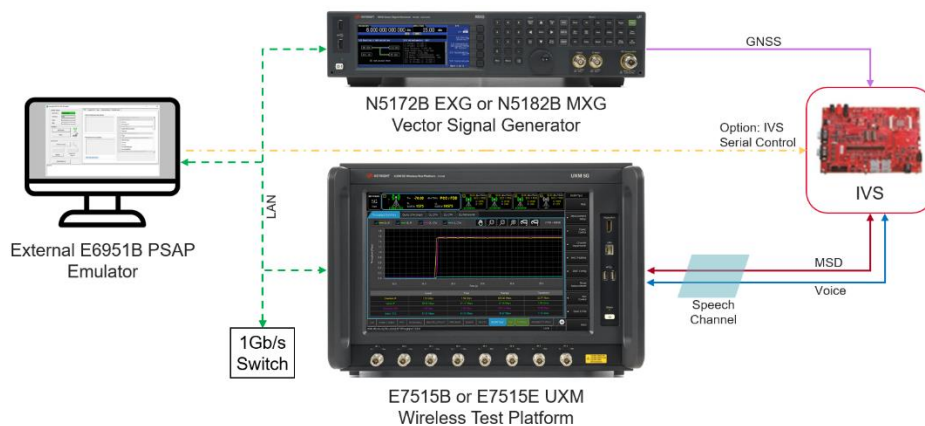


Figure 2. Test Setup 1B: CS eCall - External PSAP

Test Setup 2 – Packet Switched NGeCall

Test Setup 2 is for testing Packet Switched (PS) Next Generation eCall (NGeCall). In this configuration there will be no CS capabilities for testing CS/Legacy eCall or CS Fallback test cases.

This configuration requires the E7515B/E UXM and the N5182B/N5172B RF Vector Signal Generator. The instruments require a network connection via LAN. Either static IP allocation or a DHCP network may be used.

The UXM should be configured with a 4G/LTE or 5G/NR capable scenario.

The E6951B PSAP Emulator can be ran on the UXM (Figure 1-4) or an external PC (Figure 1-5) depending upon the user preferences.

Additionally, the E6951B PSAP Emulator can optionally control the IVS via serial.



Figure 3. Test Setup 2B: PS NGeCall – Internal PSAP

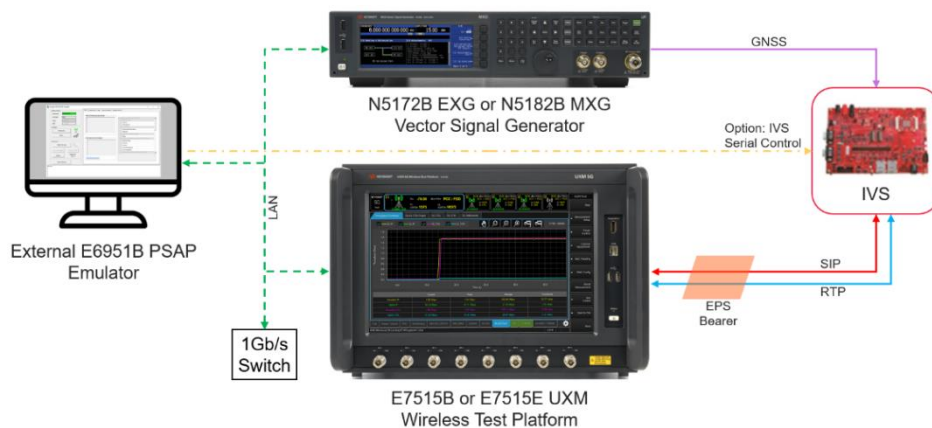


Figure 4. Test Setup 2B: PS NGeCall – External PSAP

Test Setup 3 – CS & PS eCall

Test Setup 3 is for testing both IVSs with both CS and PS capabilities. These test cases can be performed as separate tests or in the case of fallback test cases, as one test.

This configuration requires the E7515B/E UXM and the N5182B/N5172B RF Vector Signal Generator. The instruments require a network connection via LAN. Either static IP allocation or a DHCP network may be used.

The UXM should be configured with a scenario with 2G or 3G AND 4G/LTE or 5G/NR capabilities.

The E6951B PSAP Emulator can be ran on the UXM (Figure 1-6) or an external PC (Figure 1-7) depending upon the user preferences.

Additionally, the E6951B PSAP Emulator can optionally control the IVS via serial.



Figure 5. Test Setup 3A: CS & PS eCall – Internal PSAP

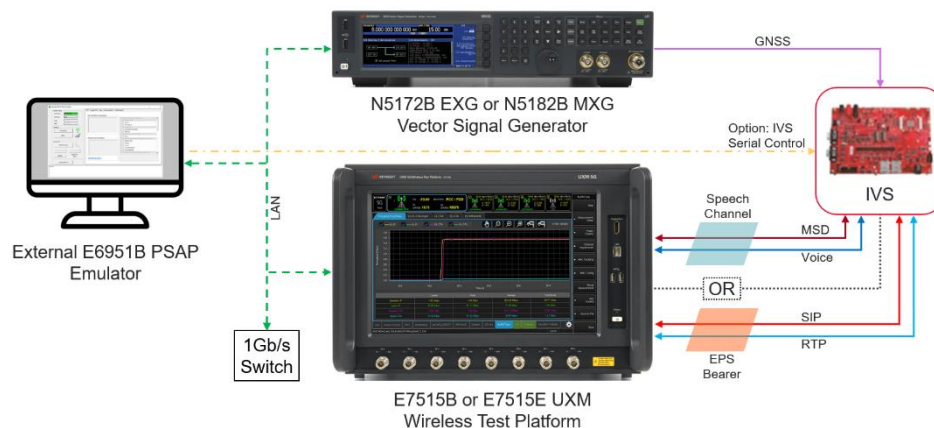


Figure 6. Test Setup 3B: CS & PS eCall – External PSAP

Test Setup 4 – Live Network

Test Setup 4 is for testing CS eCall without the need for instrumentation. This can be a useful setup for drive testing with a complete vehicle or as a low cost, limited functionality test bench. In this configuration there will be no PS capabilities for testing NGeCall.

This configuration does not require the E7515B/E UXM or the N5182B/N5172B RF Vector Signal Generator.

This configuration does require an Android smartphone, with 3.5mm Audio connection and USB for ADB control, a Windows PC for the E6951B PSAP Emulator and a USB DAC (Figure 1-8).

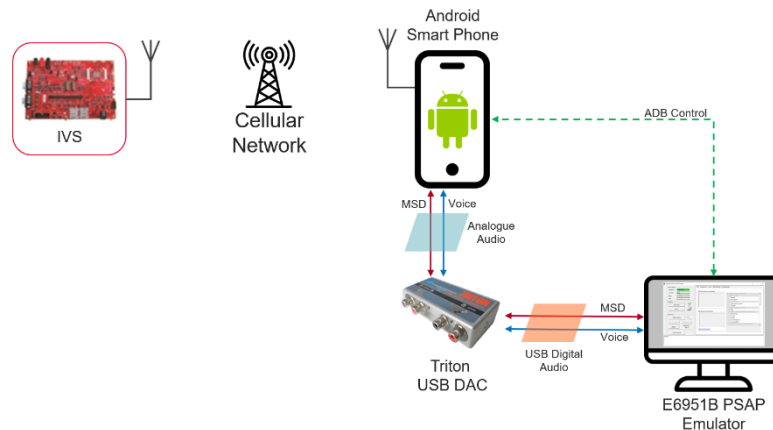


Figure 7. Test Setup 4: Live Network

Test Setup 5 – Audio Quality Testing

Test Setup 5 is for CS and PS eCall Audio Quality testing.

This configuration requires the E7515B/E UXM, the N5182B/N5172B RF Vector Signal Generator and the U8903B Audio Spectrum Analyzer. The instruments require a network connection via LAN. Either static IP allocation or a DHCP network may be used. Additionally, a USB DAC is required to provide an analogue audio signal to the U8903B Audio Spectrum Analyzer (Figure 1-9).



Figure 8. Test Setup 5: Audio Quality Testing

Key features

- Test IVS modules comply with eCall / ERA-GLONASS /NG eCall standards
- Verify the IVS modem is able to trigger an emergency call – both automatically and manually
- Send MSD data and establish a voice connection with the PSAP
- Compare received MSD data with expected values
- Test Audio Quality of voice connection
- Logs of ACK/NACKS/Timers allow detailed troubleshooting
- Remove 8960 and UXM-A support
- Updates for NG eCall and simultaneous 2G/3G
- Support for additional GNSS emulators
- Model Number roll E6951A to E6951B
- NG eCall Test Automation for CEN 17240 and ETSI 103 683 specifications
- Supports E6951B PSAP Emulator