Software Enables New-Age, Flexible Test Solution for Analog and Digital Radios
Radios are a staple of naval operations, but their standards must change to keep up with the times. Moving from an analog to digital format allows radios to be more flexible and dynamic. The use of software and an open hardware architecture makes radios faster, better, and more secure.

A major lab in a naval department performs test validation of analog and digital radios and receivers. These testing tools must work in both lab and field environments. Apart from validation, the customer does basic radio repair work. The radios include traditional very-high-frequency and ultra-high-frequency analog models that work on different modulation schemes. With the evolution of communication technologies, the customer began validating digital radios, working on complex commercial or custom modulation schemes.

### Organization
- Naval customer

### Challenges
- complicated test setup for radios
- multiple manual adjustments for running test procedures

### Solutions
- Keysight M8920A
- Keysight PathWave Test Automation Platform

### Results
- achieved extended automated measurement capability
- reduced radio test times by 50% using flexible plug-ins
- provided support for evolving digital standards
Challenge: Complicated, Manual Test Setup for Radios

The HP8920A radio-frequency (RF) communication test set was a key test instrument in the organization's labs. It offered all the specifications and functionality required for traditional analog radios. This one-box test set included features found in multiple instruments, making it an industry standard for service and repair needs.

But as the technology evolved, some components in this instrument became obsolete, with no alternatives. This left a gap in the industry, and users shifted to a multibox test bench — a combination of signal generators, analyzers, and audio analyzers / generators — and other test platforms.

While a multibox test platform works well in the lab, it is not ideal for field or mobile scenarios. Users shared this feedback and wanted Keysight to introduce an alternative that would meet and even exceed the HP8920A's features.

Solution: M8920A with PathWave Test Automation Platform Plug-Ins

The Keysight team introduced the customer to the M8920A radio test set. It combines PXIe hardware with application-specific software in a single flexible and scalable chassis, providing broad multiformat coverage for next-generation radio testing. The M8920A has the scalable modular architecture needed for efficient and complete test development and execution in the manufacturing and radio maintenance environment. It also supports general-purpose measurements and commercial standards (LTE, WLAN, and Bluetooth®) for next-generation radio tests.
The platform differed from the HP8920A one-box tester with an integrated display, so users hesitated. They wanted a thorough demonstration and evaluation using their radios. The test parameters included frequency accuracy, transmitted power, receiver sensitivity, signal-to-noise and distortion ratio level, and automatic gain control (AGC). And because most users were from semitechnical backgrounds, they needed an easy-to-use, automated test environment. The M8920A works with Keysight’s N9093A radio test software, which lets users access and control multiple instruments on one screen while viewing critical measurements. Users appreciated the software but wanted some additional test cases and procedures, per their requirements. This extra functionality was required during the validation of multiple radios before field deployment.
The requirement was to develop an automated software application to measure frequency error, AGC, line output, and provision to set audio levels in decibel-milliwatts on the M8920A PXIe platform.

**Figure 3.** Keysight M8920A block diagram

Keysight PathWave Test Automation Platform plug-ins provide extended automated measurements on the M8920A.

**KS83120A analog radio test plug-in overview**

The analog land mobile radio (LMR) plug-in allows PathWave Test Automation Platform users with no programming knowledge to automate M8920A radio test sets. Test automation occurs seamlessly; users do not need to worry about which SCPI commands to use. Users can focus on manipulating test parameters and test flow control for intended tests. A Result Listener automatically stores results for further analysis.

**KS83122A digital radio test plug-in overview**

The digital plug-in lets users generate and analyze LMR formats APCO-25 P1 / P2, DMR, TETRA I, and dPMR with the Keysight N9093EM1E software application on the M8920A.
KS83123A tracking generator plug-in overview

Keysight tracking generator software plug-ins let users build test sequences to characterize and evaluate the performance and integrity of DUT RF cables. Characterize RF paths through the test fixture. Sweep frequencies from 100 kHz to 3.8 / 6 GHz with a generator output level of up to +3 dBm or +13 dBm with Option M8920A-1EA.

Figure 4. Keysight KS83120A analog radio test plan

Result: Automated Software Plug-Ins with Modular Hardware Offer Flexible Test Platform

Keysight’s M8920A with PathWave test plug-ins offered the flexibility to test analog and digital radios in the lab and the field. The automated test setup reduced test time by almost 50% with minimal manual intervention. The easy-to-use software graphical user interface and modular hardware architecture provide the upgradeability to support evolving radio standards and associated test needs.