Keysight Technologies
Remote Language Compatibility (RLC) X-Series Measurement Application N9061A

Technical Overview and Demo Guide

- Seamless ATE system migration to next generation
- Reduce ATE system cost with X-Series analyzers
- Run legacy programming codes using newer SCPI-based instruments without code modification

KEYSIGHT TECHNOLOGIES

RLC Measurement Application

In addition to a superior combination of speed, accuracy, flexibility, and dynamic range, the Keysight Technology, Inc. X-Series signal analyzers offer the broadest set of measurement applications. The RLC measurement application is an ideal tool for seamlessly evolving your ATE system to the next generation.

The RLC measurement application is just one in a common library of more than 25 measurement applications in the Keysight X-Series, an evolutionary approach to signal analysis that spans instrumentation, measurements, and software. The X-Series analyzers and MXE EMI receiver, with upgradeable CPU, memory, removable solid-state drive, and I/O ports, enable you to keep your test assets current and extend instrument longevity. Proven algorithms, 100% code-compatibility, and a common UI across the X-Series create a consistent measurement framework for signal analysis that ensures repeatable results and measurement integrity so you can leverage your test system software through all phases of product development. In addition to fixed, perpetual licenses for our X-Series measurement applications, we also offer transportable licenses which can increase the value of your investment by allowing to you transport the application to multiple X-Series analyzers.

Try Before You Buy!

Free 30-day trials of X-Series measurement applications provide unrestricted use of each application's features and functionality on your X-Series analyzer. Redeem a trial license on-line today: www.keysight.com/find/X-Series_trial

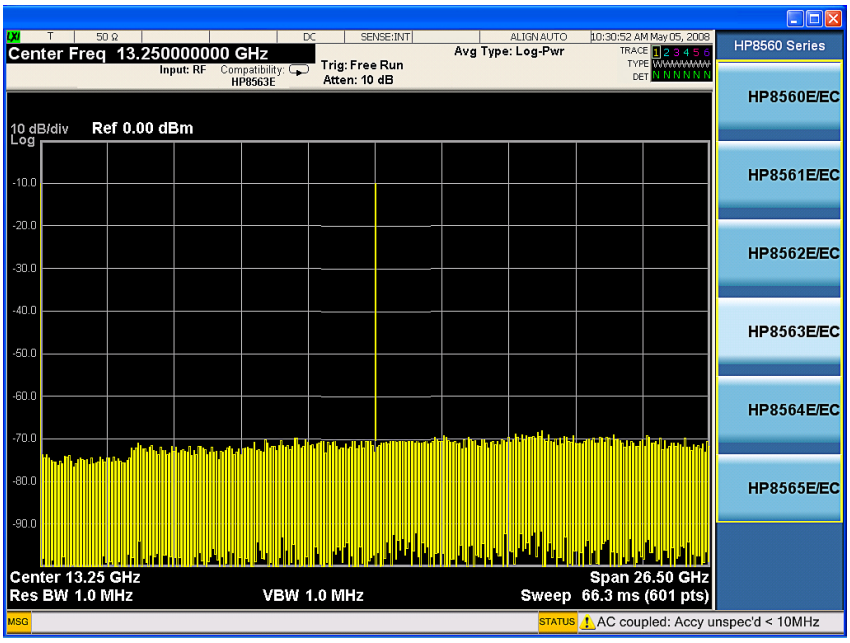

Figure 1. The N9061A GUI allows users to select the 856x model they would like to emulate.

RLC Overview

You selected HP/Keysight's legacy spectrum analyzers, such as the 856xE/EC or 8566/68 family, for your automatic test equipment (ATE) systems. After decades of success, you are probably considering transitioning your ATE system to the next generation, and, as your partner, Keysight is here to help make that transition as seamless as possible—so you can focus on achieving new successes in mission-critical tasks.

We understand the problems you are facing when evolving ATE systems. Some or all of the instruments in your ATE system racks become obsolete and some of them are no longer supported. Those instruments have to be replaced with the modern ones. However, ATE systems are very expensive to develop and certify. Once the remote test program sets for these ATE systems have been certified, changes require recertification which is expensive and time-consuming.

Finding modern replacement instruments with comparable performance to the legacy ones may not be so difficult. However, finding the instruments that can be placed in an ATE system with minimal disruption to test program sets, while still meeting the required specifications, can be a real challenge.

The X-Series signal analyzers (PXA/MXA/EXA), Keysight's next-generation signal analyzers and the fastest signal analyzers in the industry, offer a remote language compatibility (RLC) application (N9061A-2FP) with the legacy HP/Keysight 856xE/EC spectrum analyzers and N9061A-1FP for the 8566/68 spectrum analyzers. This application is an excellent solution to help you upgrade old ATE systems, which include 856xE/EC spectrum analyzers, to those including Keysight's next-generation X-Series signal analyzers. The X-Series N9061A-2FP RLC application currently provides as many as 164 supported programming commands from 856xE/EC for the most frequently used spectrum analysis functions in ATE systems.

Gain competitive edge with innovative X-Series signal analyzers

The HP 856xE was launched 16 years ago and the 856xE family was very well received because of its unprecedented RF performance and features. Emerging in the pre-SCPI (standard commands for programming instruments) era, when an electronic memory device used inside the instrument was prohibitively expensive, the 856xE employed a very instrument-specific command set for remote programming.

Eight years later, HP/Keysight introduced the 856xEC family, which replaced the spectrum analyzer's monochrome CRT tube with a color LCD display while sharing the same remote programming language with its predecessor, the 856xE.

Today, the Keysight X-Series signal analyzers drive signal analysis to the next level, with a combination of Keysight's technological innovations and decades of spectrum analyzer design and manufacturing experiences. The X-Series' excellent performance provides an ideal hardware replacement for the 856xE/EC and 8566/68. By replacing your legacy 856xE/EC with an X-Series, you will take full advantage of the technology breakthroughs in the X-Series signal analyzers:

Speed

The X-Series are the industry's fastest signal analyzers in their class. At up to 300% faster than other signal and spectrum analyzers, the X-Series signal analyzers help you to significantly reduce test time and increase your manufacturing throughput.

Performance

The X-Series signal analyzers deliver outstanding performance. For example, the MXA signal analyzer offers 0.23 dB of typical absolute amplitude accuracy—over 3 times better than the 856xE/EC accuracy. The improvement in amplitude accuracy enables you to set more stringent test criteria to increase your manufacturing yields.

Cost

The X-Series signal analyzers are significantly less expensive than the 856xEC. A 26.5 GHz MXA is about 24% less expensive than the 8563EC, and a 3.6 GHz MXA is about 37% less. And if the economy-class EXA can meet your test requirements, you can save even more.

Like all other modern signal/spectrum analyzers, the X-Series signal analyzers use SCPI commands for remote programming. Therefore, a bridge between the legacy 856xE/EC or 8566/68 remote language and the SCPI language that Keysight X-Series uses becomes necessary when migrating the 856xE/EC to the X-Series analyzer in your ATE system. The X-Series RLC application (N96061A-2FP/1FP) is that bridge. It enables an X-Series analyzer to run most customers' 856xE/EC or 8566/68 programming codes without modification.

Measurement Application Demonstration Guide

How the X-Series RLC application works

Figure 2 shows a simplified working block diagram for the X-Series RLC application, specifically for the N9061A-2FP/1FP. The X-Series signal analyzer, using the SCPI commands for remote user interface (RUI), is unable to understand the legacy remote program commands. Likewise, the instrument-specific, legacy remote program will not recognize the responses returned from X-Series signal analyzers in the form of SCPI commands.

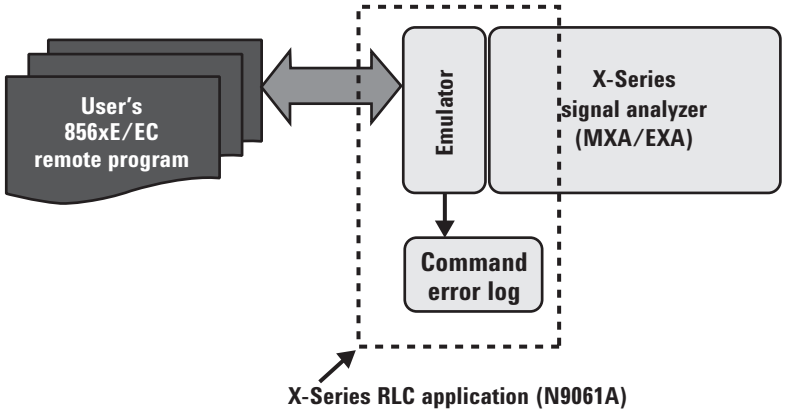

Figure 2. A simplified working block-diagram for X-Series RLC application

The N9061A X-Series RLC application provides an emulation process that enables the user's legacy program and X-Series signal analyzer to understand each other. As shown in the simplified block diagram below, the RLC application installed on the X-Series signal analyzer, emulates the behaviors of the legacy spectrum analyzer (such as the 856xE/EC or 8566/68). As a result, the user's legacy program considers the X-Series signal analyzer to be a legacy spectrum analyzer and controls the X-Series signal analyzer just the way it did before the migration.

It is important to point out that the emulation processes, as shown in the block diagram, are bidirectional. The purpose of an RLC application is to enable the X-Series signal analyzer to emulate the legacy analyzer. Therefore, not only does the RLC application make the X-Series understand the legacy commands for correct implementations, but it also makes the responses from the X-Series signal analyzer, such as measurement results and query results, understandable to the legacy remote program.

Depending on use cases, some legacy commands may not technically be possible for the emulation due to the substantial differences in the architecture and implementation between the legacy and X-Series analyzers. In these instances, the legacy commands that can't be emulated are logged to a command error log. This error log helps users understand which legacy commands are not emulated by the RLC application, and an appropriate workaround may be required.

Starting the RLC application and selecting the appropriate legacy model to emulate

After the RLC application has been activated, the Remote Language Compatibility soft key is added to the Mode menu that allows the user to switch into an RLC application (see Figure 3). The specific instrument to be emulated is selected under the Mode Setup menu (shown in Figure 4).

The X-Series RLC application can be accessed in two ways: 1) from the front-panel user interface (FPUI), or 2) via remote user interface (RUI). In the following demo procedure for FPUI, keystrokes surrounded by [ ] indicate front-panel hard keys, whereas those surrounded by { } indicate soft keys on the display of the X-Series signal analyzers to be a legacy spectrum analyzer and controls the X-Series signal analyzer just the way it did before the migration.

1) FPUI access:
   X-Series: **[MODE], {Remote Language Compatibility}; [Mode Setup], {HP8560 series}, {HP856xE/EC}** where x = 0 to 5 (for example, if the 8563EC is to emulate, then select **{HP8563E/EC}**)

While all the 856xE and 856xEC share a common set of remote commands, each model may respond to the commands quite differently. For example, when responding to a FS (Full Span) command, an 8560EC sets its frequency span to 2.9 GHz, whereas an 8563EC sets its span to 26.5 GHz.

2) RUI access:
   INSTrument:SELect
   SYSTem:LANGuage

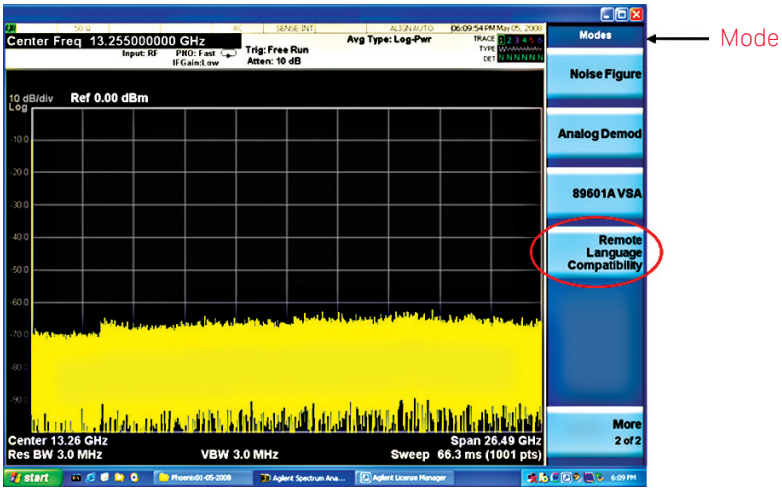

Figure 3. RLC is accessed under the Mode menu, just like other applications

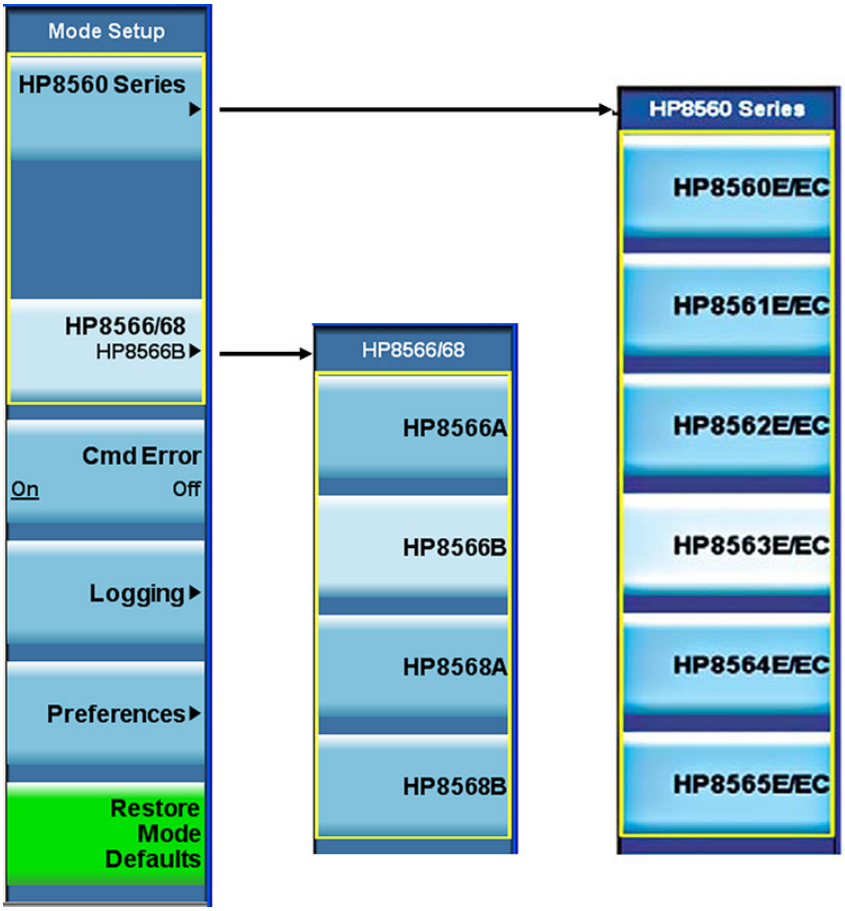

Figure 4. Mode Setup menu when selecting the legacy model number to emulate

Troublshooting when the legacy command is not supported or has syntactic errors

Rather than hiding the unsupported legacy commands, the X-Series RLC application allows you to display the CMD ERR error messages, which will appear in the Message bar as an advisory message. It shows the error format as: **CMD ERR, <string>.** This will occur upon receipt of a recognized legacy command that is not supported by the RLC application, or if either the command syntax or any of its parameters are incorrectly formed.

By toggling the **CMD Error** soft key, you can enable or disable the display of the error message.

Furthermore, the Logging menu allows the user to scroll the log window (Previous Page/Next Page), to refresh and clear the RLC command error log (Refresh/Clear Log)—see Figure 5. The logging menu is only accessible from the FPUI.

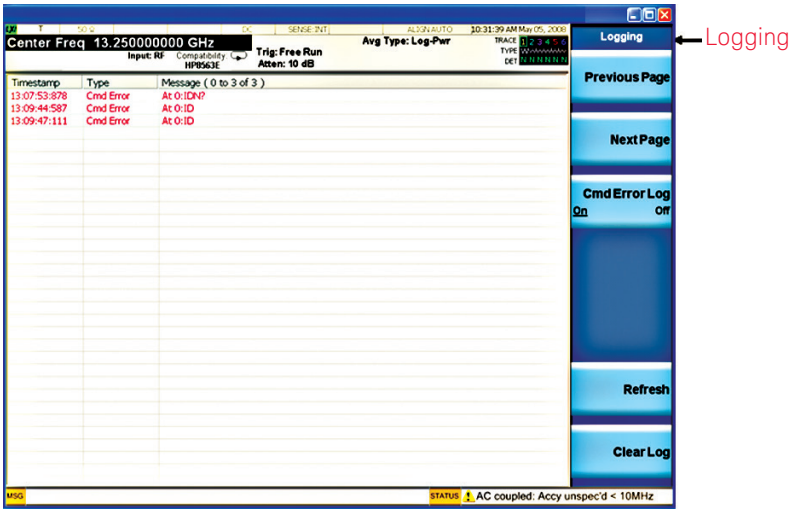

Figure 5. The Logging menu

Selecting preferences for your emulation

Preferences allow the user to change the emulation behavior to gain usability, speed, or measurement accuracy. However, the default value for each parameter in the Preference menu is the closest emulation of legacy behavior.

In RLC mode, each preference is a configurable feature. They can be selected either via the FPUI or RUI. Preference settings are persistent. If they are changed by the user, they are unaffected by mode switching, language switching, mode preset, or even power on. They are only preset to their default state using the Restore Mode Defaults key in the Mode Setup menu via FPUI, or using the commands, INST:DEF or SYST:PRES:PERS.

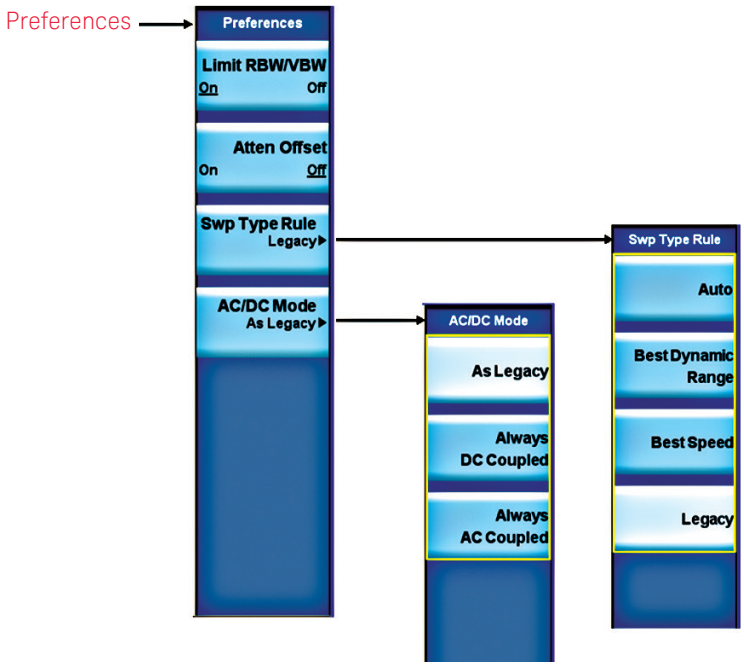

Figure 6. Setting preferences for the emulation behavior via the Preferences menu

Let's look at two examples for the preferences setting:

1) Limit RBW/VBW

2) Sweep type rules

Limit RBW/VBW can be used for limiting the valid resolution bandwidth (RBW) and video bandwidth (VBW) values to those appropriate for the currently selected remote language. In the case of the 856xE/EC emulation, setting the RBW/VBW to ON limits the RBW and VBW values to what the 856xE/EC can have. Setting it to OFF causes the RBW/VBW filters to use the X-Series range of values. To activate this feature:

1) FPUI Access:
   [Mode Setup], {Preferences}, {Limit RBW/VBW}

2) RUI Access:
   [;SENSe]:RLC:BANDwidth:LIMit ON|OFF|1|0

Sweep type rules determines when the instrument uses FFT vs. Swept mode. The FFT mode offers substantially faster measurements in some cases. The 856xE/EC family switches between the FFT and swept mode based on the RBW setting—FFT mode when RBW ≤ 100 Hz, and Swept mode when RBW ≥ 300 Hz. By contrast, in the X-Series signal analyzers, users can select between **Best Dynamic Range** (Swept) and **Best Speed** (FFT) to fit their measurement applications. Once the **Legacy** is selected, the sweep mode will be determined by the RBW selected. To activate this feature:

1) FPUI Access:
   [Mode Setup], {Preferences}, {Sweep type rules}

2) RUI Access:
   [:SENSe]:RLC:SWEep:RULes SPEed|DRANge|LEGACY

For a list of supported commands for the 856xE/EC and 8566/68, refer to the N9061A Remote Language Capability User's and Programer's Reference at

http://cp.literature.keysight.com/litweb/pdf/N9020-90091.pdf

Ordering Information

Software licensing and configuration

Choose from two license types:

- **Fixed, perpetual license:** This allows you to run the application in the X-Series analyzer in which it is initially installed.

Try Before You Buy!

Free 30-day trials of X-Series measurement applications provide unrestricted use of each application's features and functionality on your X-Series analyzer. Redeem a trial license on-line today: www.keysight.com/find/X-Series_trial

The table below contains information on our fixed, perpetual licenses. For more information, please visit the product web pages.

N9061A remote language compatibility X-Series measurement application

	Model-Option	
Description	**PXA, MXA, EXA**	**Additional information**
Remote language compatibility for 856xE/EC	N9061A-2FP	No charge if ordered with a new instrument
Remote language compatibility for 8566/68	N9061A-1FP	No charge if ordered with a new instrument

Hardware configuration

N9030A PXA signal analyzer

Description	Model-Option	Additional information
3.6, 8.4, 13.6, 26.5, 43, 44, or 50 GHz frequency range	N9030A-503, -508, -513, -526, -543, -544, or -550	One required

N9020A MXA signal analyzer

Description	Model-Option	Additional information
3.6, 8.4, 13.6, or 26.5 GHz frequency range	N9020A-503, -508, -513, or -526	One required

N9010A EXA signal analyzer

Description	Model-Option	Additional information
3.6, 7.0, 13.6, 26.5, 32, or 44 GHz frequency range	N9010A-503, -507, -513, -526, -532, or -544	One required

For a complete list of specifications refer to the appropriate specifications guide.

PXA: www.keysight.com/find/pxa_specifications
MXA: www.keysight.com/find/mxa_specifications
EXA: www.keysight.com/find/exa_specifications

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