
S9110A 5G Multi-Band Vector Transceiver

Notices

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Where to Find the Latest Information

Documentation is updated periodically. For the latest information about this instrument, including firmware upgrades, application information, and product information, click the website link below.

<https://www.keysight.com/us/en/product/S9110A/s9110a-wideband-transceiver-test-solution.html>

To receive the latest updates by email, subscribe to Keysight Email Updates at the following URL:

<http://www.keysight.com/find/MyKeysight>

Information on preventing analyzer damage can be found at:

www.keysight.com/find/PreventingInstrumentRepair

Is your product software up-to-date?

Periodically, Keysight releases software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, go to the Keysight Technical Support website at:

<http://www.keysight.com/find/techsupport>

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1 Quick Start

The following topics can be found in this section:

“Initial Inspection” on page 10

“Purpose and Function” on page 12

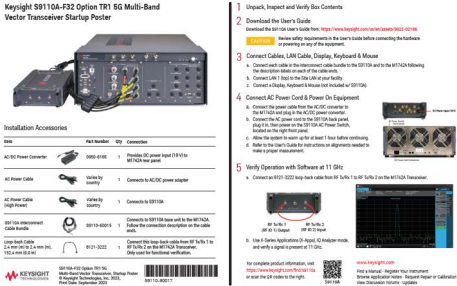





“Options” on page 14

Initial Inspection





Inspect the shipping container and the cushioning material for signs of stress. Retain undamaged shipping materials for future use, as you may wish to ship the system to another location or to Keysight Technologies for service. Verify the contents of the container against the table below.

WARNING

Refer to **“Safety & Environmental Information” on page 139** before proceeding with the installation.

Item	Deliverable	Description
Startup poster		Provides first-time power on instructions and general hardware information.
Keysight S9110A 5G Multi-Band Vector Transceiver		S9110A-TR1 S9110A-TR2 S9110A-BK1
AC/DC power converter Part# 0950-6166		Provides DC power input (19 V) to instrument-facing panel of M1742A/M1749B. Quantity of 1 for TR1/BK1 Quantity of 2 for TR2
AC power cable for M1742A/M1749B		Cord type varies by country. Quantity of 1 for TR1/BK1 Quantity of 2 for TR2
AC power cable (High Power)		Cord type varies by country. Quantity of 1 for S9110A
Loop-back cable 8121-3222		For connecting from RF Tx/Rx 1 to RF Tx/Rx 2 on the M1742A/M1749B Transceiver. Only used for functional verification.

The shipping items in the list above are standard items. The following items vary according to the transceiver frequency range option you purchased.

Option	Item	Deliverable	Description
Transceiver frequency range option S9110A-F32	M1742A Transceiver 10 GHz - 32 GHz		Quantity of 1 for TR1 Quantity of 2 for TR2
	RF Cables S9110-60015 for S9110A and M1742A		For connecting the S9110A to the M1742A. Quantity of 1 for TR1 Quantity of 2 for TR2
Transceiver frequency range option S9110A-F43/F49	M1749B mmWave Transceiver		Quantity of 1 for TR1/BK1 Quantity of 2 for TR2
	RF Cables S9110-60013 for S9110A and M1749B		For connecting the S9110A to the M1749B. Quantity of 1 for TR1/BK1 Quantity of 2 for TR2

Shipping Problems?

If the shipping materials are damaged or the contents of the container are incomplete:

- Contact the nearest Keysight Technologies office.
- Keep the shipping materials for the carrier's inspection.
- If you must return the S9110A to Keysight Technologies, use the undamaged original or comparable shipping materials. See **“Returning the S9110A for Service” on page 136.**

Purpose and Function

The S9110A-F32 supports RF testing, with up to two transmit/receive modules (each driving an M1742A remote radio head to interface with RF devices under test). The second TRX unit is included only with Option S9110A-TR2).

The S9110A-F43/F49 system supports mmWave testing, with up to two transmit/receive modules (each driving an M1749B remote radio head to interface with millimeter-wave devices under test). The second TRX unit is included only with Option S9110A-TR2).

Each TRX unit in the S9110A system supports an IF output port, an IF input port, and an LO input port powered by an external power supply and driven by a USB control signal.

Figure 1-1 Functional blocks of the S9110A and M1742A

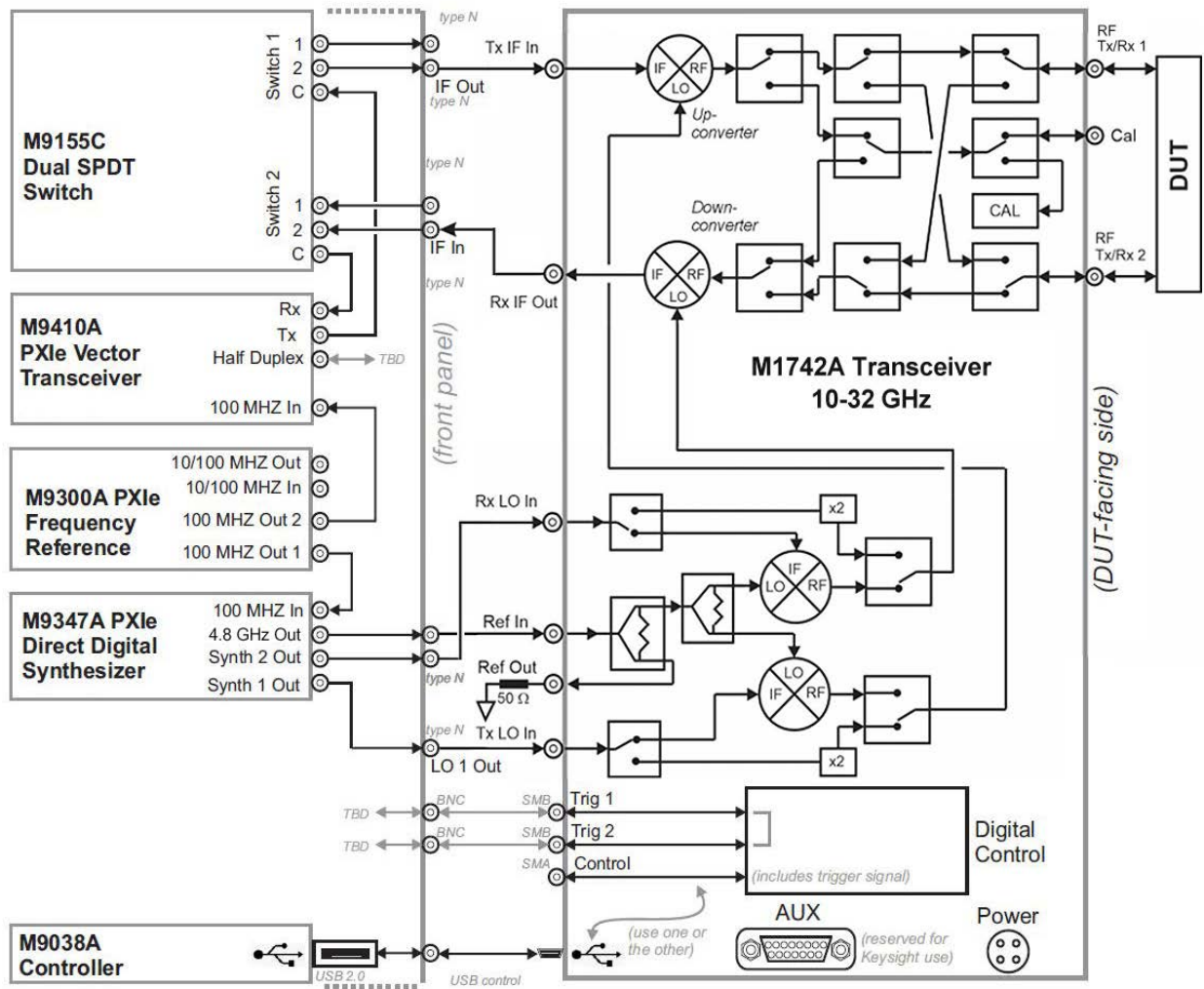
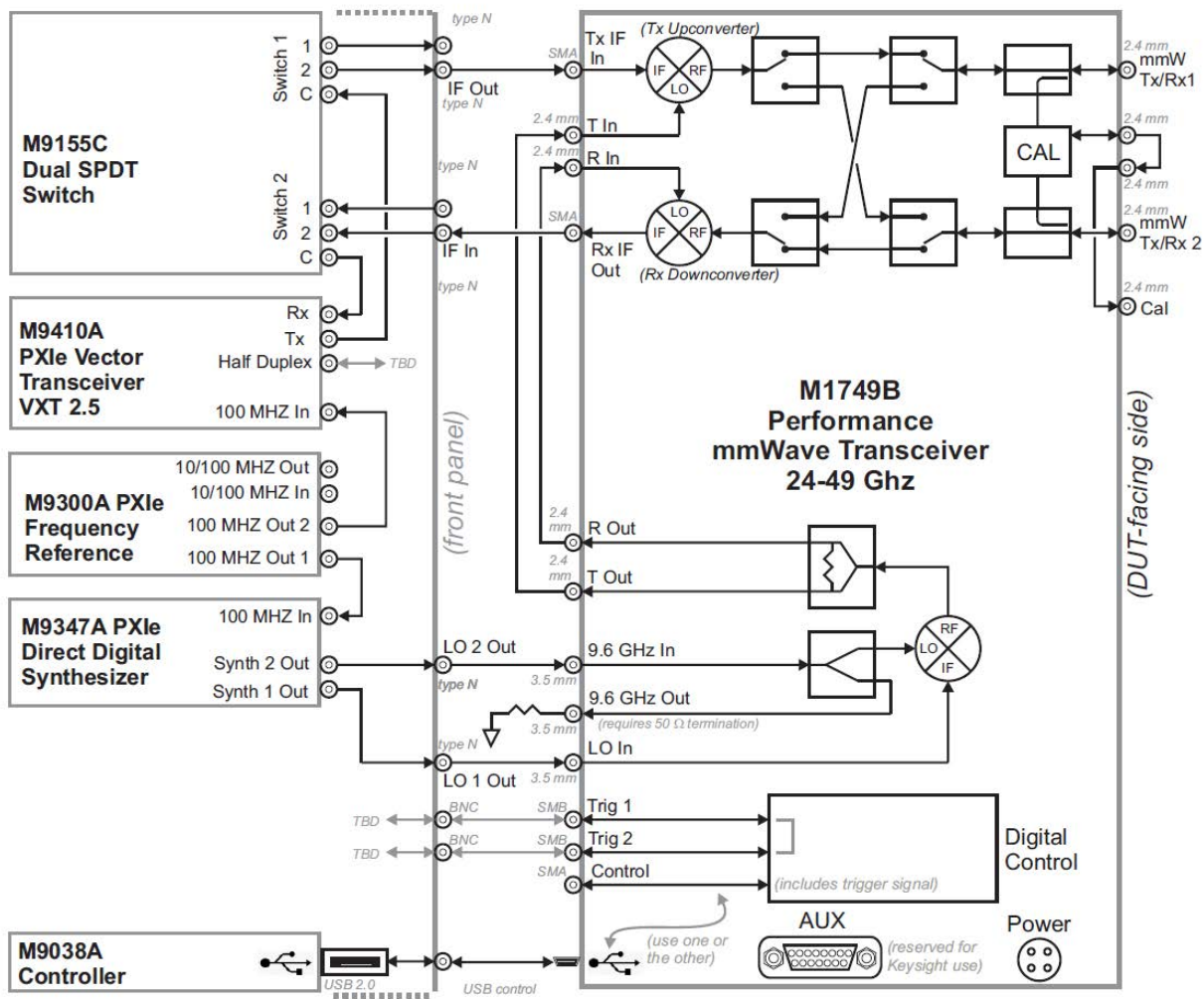


Figure 1-2 Functional blocks of the S9110A and M1749B



Options

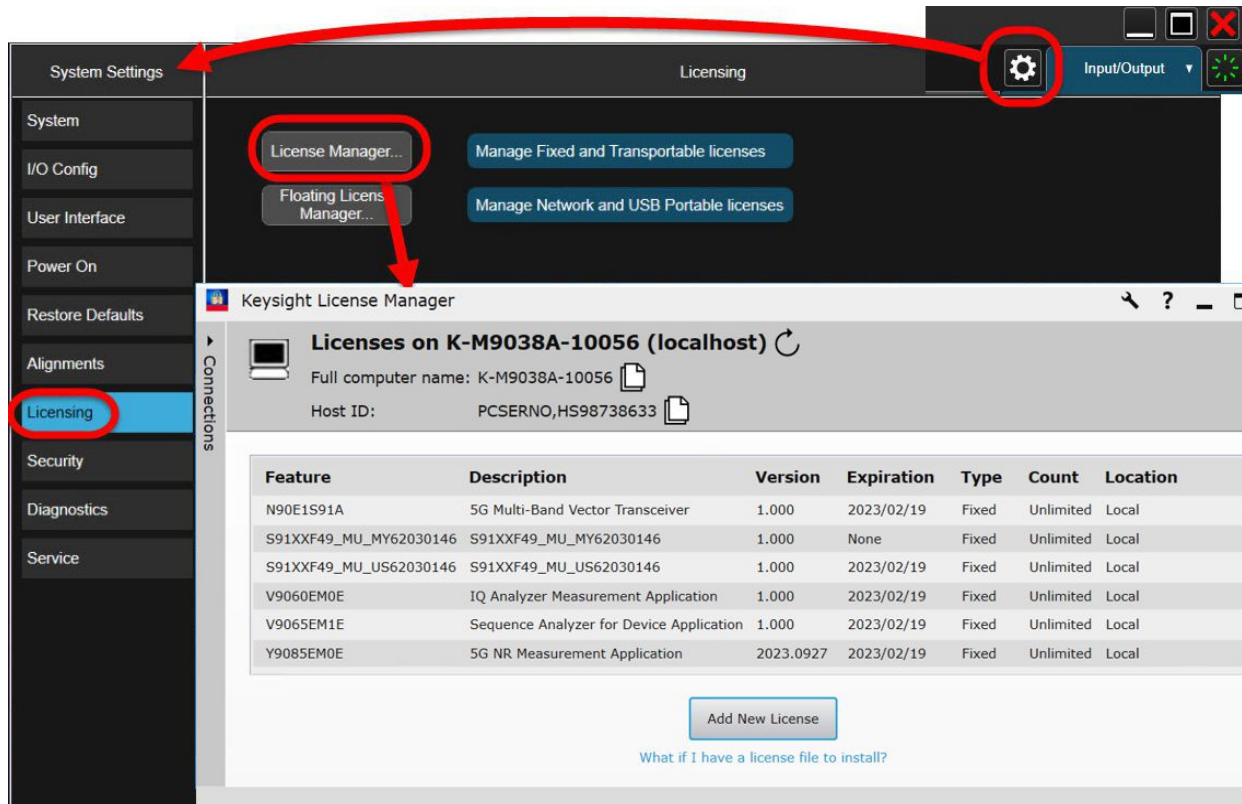
S9110A Hardware Options

Designation	Description
S9110A	5G Multi Band Vector Transceiver
S9110A-TR1	One RF and mmWave Transceiver Channel, Base Box, 380 MHz to 6 GHz
S9110A-TR2	Two RF and mmWave Transceiver Channels, Base Box, 380 MHz to 6 GHz
S9110A-BK1	One RF and mmWave Transceiver Channel with Blocker, Base Box, 380 MHz to 6 GHz
S9110A-F32	RF Transceiver Freq Range, 10 to 32 GHz
S9110A-F43	mmWave Transceiver Freq Range, 24 to 43.5 GHz
S9110A-F49	mmWave Transceiver Freq Range, 24 to 49 GHz
S9110A-HD1	Adds Half Duplex port to RF transceiver one
S9110A-HD2	Adds Half Duplex port to RF transceiver two
S9110A-HD2	Adds Half Duplex port to RF Blocking transceiver

Application Licenses

The licenses for various applications that are installed on the controller in the S9110A are listed in the Keysight License Manager, which can be launched from the **Windows Start** menu, or from the **Licensing** window under **System Settings** as illustrated below:

Figure 1-3 Keysight License Manager



Quick Start
Options

2 Exterior Features

The following topics can be found in this section:

[“Front Panel Features” on page 18](#)

[“Rear Panel Features” on page 25](#)

[“M1742A and M1749B Connectors” on page 26](#)

[“Cabling the M1742A/M1749B” on page 30](#)

[“Standard Configurations” on page 31](#)

[“Labels and Symbols” on page 33](#)

Front Panel Features

The S9110A front panel and two sides of the M1742A/M1749B are illustrated below (the S9110A-facing side of the M1742A/M1749B is shown bottom left, and the DUT-facing side is shown bottom right).

Figure 2-1 S9110A, M1742A and M1749B exterior panels



The photo below shows the various sections of the front panel of the S9110A.

Figure 2-2 S9110A front panel



These sections of the front panel are described separately, as follows:

1. See “Controller interface” on page 20.
2. See “TRX connectors” on page 21.
3. See “Reference” on page 23.
4. See “System status” on page 24.

Controller interface

Figure 2-3 Controller interface



Connector	Description
(1) SSD/Power/User	<ul style="list-style-type: none"> –SSD: When the Solid State Drive is active, the LED will flash –POWER: If the LED is on, the power supply to the controller is good and the system should boot –USER: Not used
(2) LAN 10G	TCP/IP Interface connectors that are used for remote operation
(3) Monitor DisplayPort	This connector supports a connection to a monitor with a DisplayPort input
(4) USB 2.0	Two USB 2.0 interface ports are provided
(5) LAN 1G	TCP/IP Interface connector used for remote operation
(6) USB 3.0 (SS)	Two USB 3.0 interface ports are provided

TRX connectors

The picture below illustrates only TR1; TR2, if installed, has the same components and layout. A BK1 system will be similar to TR1 with an additional Half Duplex port and triggers for the Blocking TRX.

Figure 2-4 TRX connectors



Connector	Description
(1) RF In	Type N connector which receives the RF signal from 380 MHz to 6 GHz. Intended for using the transceiver without the M1742A/M1749B remote radio head.
(2) RF Out	Type N connector which transmits the RF signal from 380 MHz to 6 GHz. Intended for using the transceiver without the M1742A/M1749B remote radio head.
(3) Half Duplex	Type N connector which transmits the Half Duplex signal from 380 MHz to 6 GHz. For instruments with option HD1/HD2.
(4) Trig 1/Trig 2	These BNC connectors are for triggers (configurable as input or output triggers). They can be setup as source triggers or receiver triggers.
(5) IF Out	This Type N connector transmits the test signal to the M1742A/M1749B Transceiver, which upconverts the test signal to the frequency range of the DUT. (The connected port on the M1742A/M1749B is called Tx IF In .)
(6) IF In	This Type N connector receives the signal from the DUT which has been downconverted by the M1742A/M1749B Transceiver. (The connected port on the M1742A/M1749B is called Rx IF Out .)
(7) Aux In/Aux Ctrl	These connectors are reserved for future use.

Exterior Features
Front Panel Features

Connector	Description
(8) LO 1 Out	Type N connector which provides an LO signal to the M1742A/M1749B Transceiver. (The connected port on the M1742A is called Tx LO In . The connected port on the M1749B is called LO In .)
(9) LO 2 Out	Type N connector which provides a 9.6 GHz CW to the M1742A/M1749B Transceiver. (The connected port on the M1742A is called Rx LO In . The connected port on the M1749B is called 9.6 GHz In .)
(10) USB Control	This USB provides control signals for the M1742A/M1749B Transceiver. (The connected port on the M1742A/M1749B has the USB symbol)
(11) 4.8 GHz Out	Type N connector which provides a 4.8 GHz CW to the M1742A Transceiver. (The connected port on the M1742A is called Ref In .)

Reference

Figure 2-5 Reference connectors and backplane trigger connectors



Connector	Description
(1) 10 MHz Ref In	This BNC connector allows you to synchronize to another instrument by inputting a 10 MHz reference signal.
(2) 10 MHz Out	This BNC connector provides a 10 MHz reference signal for synchronizing other instruments.
(3) 100 MHz Ref Out	This BNC connector provides a 100 MHz reference signal for synchronizing other instruments.
(4) PXI Backplane Triggers (Trig 1/2)	These BNC connectors route to the PXI backplane triggers and can be used for triggering with any of the modules in the PXI chassis.

System status

Figure 2-6 System status



Connector	Description
(1) Temp	This amber LED is off when chassis temperature is in the normal operating range. The LED flashes to indicate the chassis is overheated. (It is never on continuously.)
(2) Fan	This green LED is off when the chassis is turned off. It is on continuously when the fans are running normally. The LED flashes whenever a fan is stopped or running too slowly.
(3) Power	This blue LED is off when the chassis is turned off. It is on continuously when all supply voltages are normal. The LED flashes whenever a supply voltage is outside its normal range.
(4) On/Standby Pushbutton	This pushbutton is used to turn chassis power on and off.

Rear Panel Features

Figure 2-7 S9110A rear panel



Number	Item Name	Description
1	Line power input	The AC power connection. See the product specifications for more details.
2	POWER SYNCH IN/OUT	Reserved for future use.
3	FAN	Fan speed control (settings are HIGH and AUTO).
4	INHIBIT	Inhibit switch. The settings are DEF (default) and MAN (manual). –When the switch is in the default position, the chassis is powered up by the front panel ON/Standby pushbutton. This is the recommended setting. –When the switch is in the manual position, the chassis is powered up by the Inhibit input signal on the rear panel INHIBIT/VOLTAGE MON DB-9 connector.
5	INHIBIT/VOLTAGE MON	This DB-9 connector provides access for testing of internal power supply voltages. The voltages (by Pin #) are: (1) Logic Gnd, (2) +5 VDC, (3) Rsrvd, (4) +3.3 VDC, (5) Inhibit [Low], (6) +12 VDC, (7) Rsrvd, (8) -12 VDC, (9) Logic Gnd.
6	10 MHz REF OUT	This BNC connector is not used by the S9110A. The front panel 10 MHz OUT connector should be used instead.
7	10 MHz REF IN	This BNC connector is not used by the S9110A. The front panel REF IN connector should be used instead.

M1742A and M1749B Connectors

Figure 2-8 M1742A rear connectors



Connector	Description
(1) Rx LO In	This 3.5 mm connector which receives an LO signal from the S9110A. (The connected port on the S9110A is called LO 2 Out.)
(2) Ref In	This 3.5 mm connector receives a 4.8 GHz CW to the M1742A Transceiver. This input is mixed with LO In to generate the LO input to the Transmitter Upconverter and the Receiver Downconverter (The connected port on the S9110A is called 4.8 GHz Out.)
(3) Ref Out	This 3.5 mm connector provides an output of the same signal which is received at the Ref In port. It can be used to synchronize other equipment. When it is not connected, this port should be given a 50Ω termination.
(4) Tx LO In	This 3.5 mm connector which receives an LO signal from the S9110A. (The connected port on the S9110A is called LO 1 Out.)
(5) Rx IF Out	This 3.5 mm connector provides an IF output from the receiver downconverter after it is downconverted in the M1742A. (The connected port on the S9110A is called IF In.)
(6) Tx IF In	This 3.5 mm connector receives the IF signal to be upconverted in the M1742A. (The connected port on the S9110A is called IF Out.)
(7) Aux	This multi-pin auxiliary interface is used only by Keysight, for purposes of testing and repair.
(8) USB Control	This micro USB port receives control signals for the M1742A Transceiver. (The connected port on the S9110A is called USB Control.)
(9) Trig 1/Trig 2	These connectors carry trigger inputs and outputs to the external controller.
(10) Control	This SMA port accepts a combined signal which includes both a modem control signal and trigger signals; it is an alternative to the USB control port. This connector is not used in this system.
(11) Power	This 4-pin connector accepts a 19-volt DC power input from the AC/DC converter accessory.

Figure 2-9 M1742A front connectors



Connector	Description
(1) Cal	SMA 2.4 mm connector used for calibrating the M1742A.
(2) RF Tx/Rx 1	SMA 2.4 mm connector can be configured to transmit or receive the upconverted RF signal. The LED is lit when the named port is in use.
(3) RF Tx/Rx 2	SMA 2.4 mm connector can be configured to transmit or receive the upconverted RF signal. The LED is lit when the named port is in use.
(5) Status	This LED is lit to indicate the M1742A is in an active state.
(4) RF Tx/Rx 1	Those LEDs are lit when the named port is in use.
(6) RF Tx/Rx 1	

Figure 2-10 M1749B rear connectors



Connector	Description
(1) Rx IF Out	This SMA connector provides an IF output from the Receiver downconverter after it is downconverted in the M1749B. (The connected port on the S9110A is called IF In .)
(2) Tx IF In	SMA connector which receives the RF signal to be upconverted in the M1749B. (The connected port on the S9110A is called IF Out .)
(3) LO In	SMA connector which receives an LO signal from the S9110A. (The connected port on the S9110A is called LO 1 Out .)
(4) 9.6GHz In	SMA connector which provides a 9.6 GHz CW to the M1749A mmWave Transceiver. This input is mixed with LO In to generate the LO input to the Transmitter Upconverter and the Receiver Downconverter (The connected port on the S9110A is called LO 2 Out .)
(5) 9.6GHz Out	SMA 3.5 mm connector provides an output of the same signal which is received at the 9.6 GHz In port. It can be used to synchronize other equipment. When it is not connected, this port should be given a 50Ω termination. The M1749B is shipped with a terminating cap in place on the connector
(6) Aux	This multi-pin auxiliary interface is used only by Keysight, for purposes of testing and repair.
(7) USB Control	This micro USB port receives control signals for the M1749B mmWave Transceiver. (The connected port on the S9110A is called USB Control .)
(8) Trig 1/Trig 2	These connectors carry trigger inputs and outputs to the external controller.
(9) Control	This SMA port accepts a combined signal which includes both a modem control signal and trigger signals; it is an alternative to the USB control port. This connector is not used in this system.
(10) Power	This 4-pin connector accepts a 19-volt DC power input from the AC/DC converter accessory.

Figure 2-11 M1749B front connectors



Connector	Description
(1) Cal	SMA 2.4 mm connector used for calibrating the M1749B.
(2) RF Tx/Rx 1	SMA 2.4 mm connector can be configured to transmit or receive the upconverted RF signal. The LED is lit when the named port is in use.
(3) RF Tx/Rx 2	SMA 2.4 mm connector can be configured to transmit or receive the upconverted RF signal. The LED is lit when the named port is in use.
(4) Status	This LED is lit to indicate the M1749B is in an active state.

Cabling the M1742A/M1749B

Use the following procedure to attach cables to the M1742A/M1749B. For more information about the M1742A/M1749B connectors, refer to their Getting Started Guide.

CAUTION

Threaded connectors can be damaged when cables are connected to them, particularly if they are over-tightened (this could break the signal path entirely, making the M1742A/M1749B non-functional)
When attaching cables to threaded connectors, use a torque wrench to apply the proper torque, 90 N-cm (8 in-lb).

Use the following procedure to attach cables to the M1742A.

1. Turn the M1742A on its side, with the **Power** connector at the top.
2. Loosen and remove the 50 ohm terminator from **Ref Out**.
3. Connect two LO input cable to **Rx LO In** and **Tx LO In**.
4. Connect the 4.8 GHz input cable to **Ref In**.
5. Replace the 50 ohm terminator onto **Ref Out**.
6. Connect the IF output cable to **Tx IF Out**.
7. Connect the IF input cable to **Rx IF In**.
8. Connect the Control USB cable to **USB Control**.
9. Connect the Power cable to **Power**.
10. Return the M1742A to its normal position with the bottom side down.

Use the following procedure to attach cables to the M1749B.

1. Turn the M1749B on its side, with the **Power** connector at the top.
2. Loosen and remove the 50 ohm terminator from **9.6 GHz Out**.
3. Connect the LO input cable to **LO In**.
4. Connect the 9.6 GHz input cable to **9.6 GHz In**.
5. Replace the 50 ohm terminator onto **9.6 GHz Out**.
6. Connect the IF output cable to **Rx IF Out**.
7. Connect the IF input cable to **Tx IF In**.
8. Connect the Control USB cable to **USB Control**.
9. Connect the Power cable to **Power**.
10. Return the M1749B to its normal position with the bottom side down.

Standard Configurations

The S9110A is available in three standard configurations:



Keysight S9110A-TR1 5G Multi-Band Vector Transceiver, single channel configuration, consists of one RF transceiver and one transceiver providing one Tx channel and one Rx channel, operating in one frequency range at a time:

- FR1 frequencies ranging from 380 MHz to 6 GHz
- FR2 banded frequencies from 10 to 32 GHz (with option F32); 24.25 to 43.5 GHz (49 GHz with option F49)



Keysight S9110A-BK1 5G Multi-Band Vector Transceiver TR1 with Blocker, one-channel configuration, with Blocker signal capability, consists of two RF transceivers and one mmWave transceiver providing one Tx channel and one Rx channel, operating in one frequency range at a time:

- FR1 frequencies ranging from 380 MHz to 6 GHz
- FR2 banded mmWave frequencies from 24.25 to 43.5 GHz (49 GHz with option F49)

This configuration is only available for option F43/F49. It provides the capability to perform Rx tests with a blocking signal (interfering signal). It can generate a wanted signal and at the same time generate a blocking signal; a wanted signal (produced from the RF Out of a primary M9410A VXT) is

Exterior Features
Standard Configurations

combined with a blocking signal (produced from the RF Out of a 2nd M9410A VXT). The combined wanted and blocking signals are available in both the FR1 or FR2 frequency ranges.
























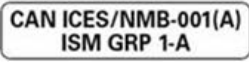


Keysight S9110A-TR2 5G Multi-Band Vector Transceiver, two channel configuration, consists of two RF transceivers and two transceivers providing two channels of Tx and Rx capabilities. Each channel of Tx and Rx operates in one frequency range at a time:

- FR1 frequencies ranging from 380 MHz to 6 GHz
- FR2 banded frequencies from 10 to 32 GHz (with option F32);
24.25 to 43.5 GHz (49 GHz with option F49)



Labels and Symbols

Labels and symbols which may be shown on the S9110A (mainly on the rear panel of the chassis) are described in the table below.

Marking	Description
	This symbol marks the standby position of the power line switch.
	This symbol marks the ON position of the power line switch.
	This symbol marks the OFF position of the power line switch.
	This symbol indicates that the input power required is AC.
	This symbol indicates DC voltage
	This symbol indicates a three-phase alternating current.
	This symbol indicates Frame or chassis Terminal.
	The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instruction in the documentation.
	This symbol indicate the presence of a Laser device.
	This symbol indicates the surface can be hot.
	This symbol indicated the product is sensitive to electrostatic discharge.
	This symbol identifies the Protective Conductor terminal.
	This symbol indicates the equipment is protected throughout by double or reinforced insulation.

Marking	Description
	The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven). It indicates that the product complies with all the relevant directives.
	The UK conformity mark is a UK government owned mark. Products showing this mark comply with all applicable UK regulations.
	The Keysight email address is required by EU directives applicable to our product.
	The CSA mark is a registered trademark of the CSA International.
	Two person lift required.
CAN ICES/NMB-001(A)	Canada EMC label. Interference-Causing Equipment Standard for industrial, scientific and medical (ISM) equipment. Matériel industriel, scientifique et médical (ISM).
	CE/ICES/ISM label. (Old mark for reference only.) This is a space saver label that combines three markings - CE with CAN ICES and ISM (see above) and ISM (see below).
	This is a space saver label that combines three markings - CE with CAN ICES and ISM (see above) and ISM (see below).
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
	This is a space saver label that combines two markings - CAN ICES and ISM.
ISM 1-A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 5).
	South Korean Certification (KC) mark. It includes the marking's identifier code.
	The crossed-out wheeled bin symbol indicates that separate collection for waste electric and electronic equipment (WEEE) is required, as obligated by the EU DIRECTIVE and other National legislation. Please refer to www.keysight.com/go/takeback to understand your trade-in options with Keysight, in addition to product takeback instructions.

Exterior Features
Labels and Symbols

Marking	Description
	China Restricted Substance Product Label. The EPUP (environmental protection use period) number in the center indicates the time period during which no hazardous or toxic substances or elements are expected to leak or deteriorate during normal use and generally reflects the expected useful life of the product.
	Universal recycling symbol. This symbol indicates compliance with the China standard GB 18455-2001 as required by the China RoHS regulations for paper/fiberboard packaging.
IP x y	This mark indicates product has been designed to meet the requirements of "IP x y", where "x" is the solid particle protection and "y" is the liquid ingress protection.

Exterior Features
Labels and Symbols

3 Graphical User Interface

The following topics can be found in this section:

“Launching the Measurement Software” on page 38

“Screen Interface” on page 42

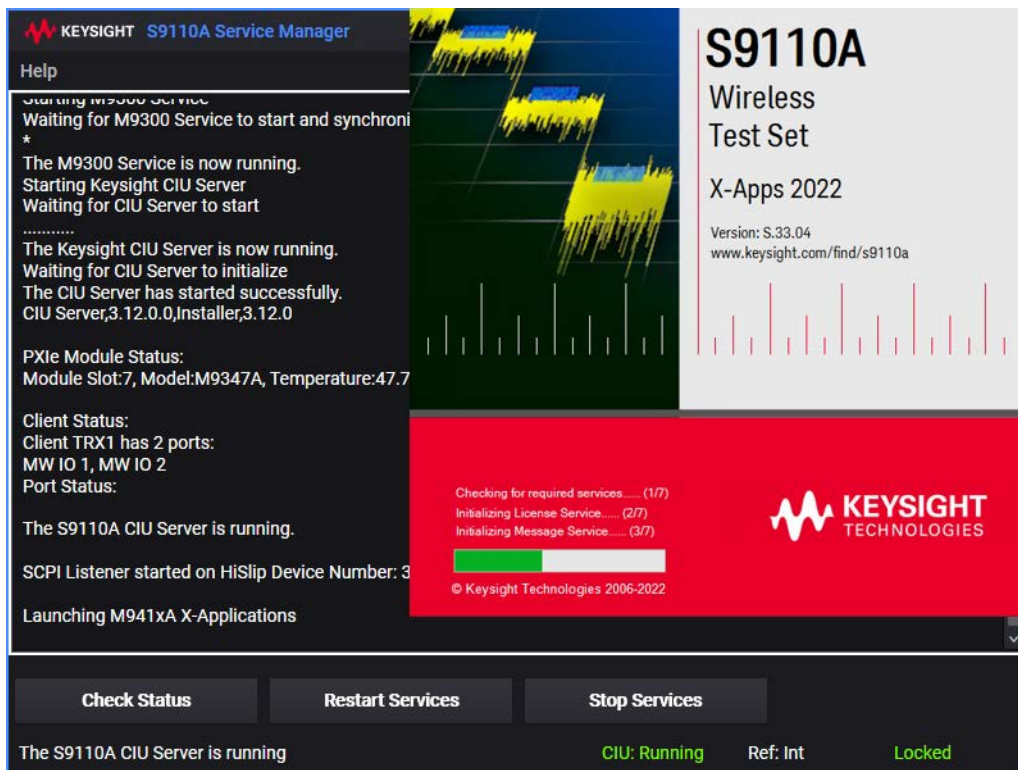
“Command Interface” on page 54

“SCPI Programming Commands” on page 56

Launching the Measurement Software

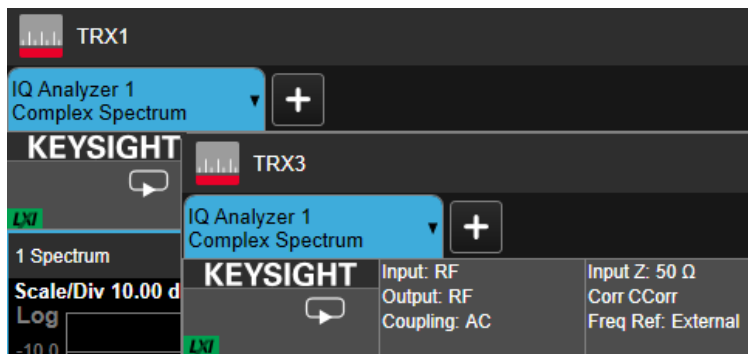
At bootup, the S9110A launches the **S910xA Service Manager** automatically, and the Service Manager automatically launches the measurement software.

Figure 3-1 Automatic launching of the Service Manager and measurement software



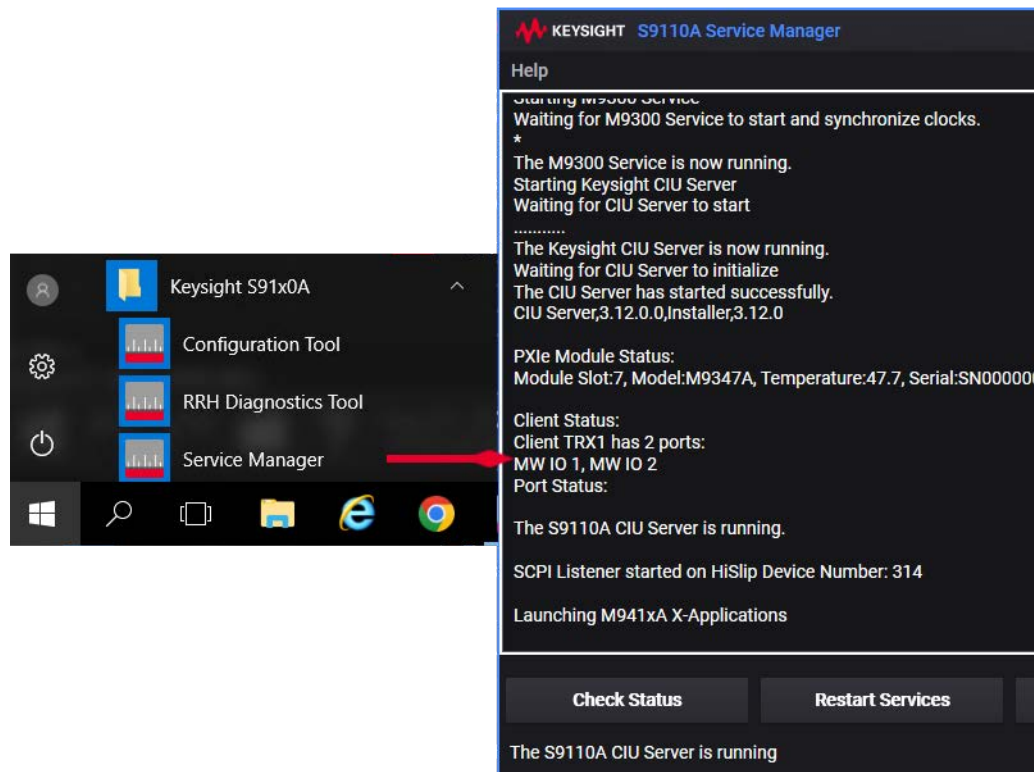
After the software is finished loading, it runs the measurement applications for TRX1 and TRX2 in separate windows (assuming both TRXs are installed).

Figure 3-2 Separate measurement windows for the TRXs



If the Service Manager has been shut down, it can be launched (without rebooting) by going to the Windows **Start** menu and selecting **Service Manager** under the **Keysight S910xA** folder.

Figure 3-3 Re-launching the Service Manager from the Start Menu



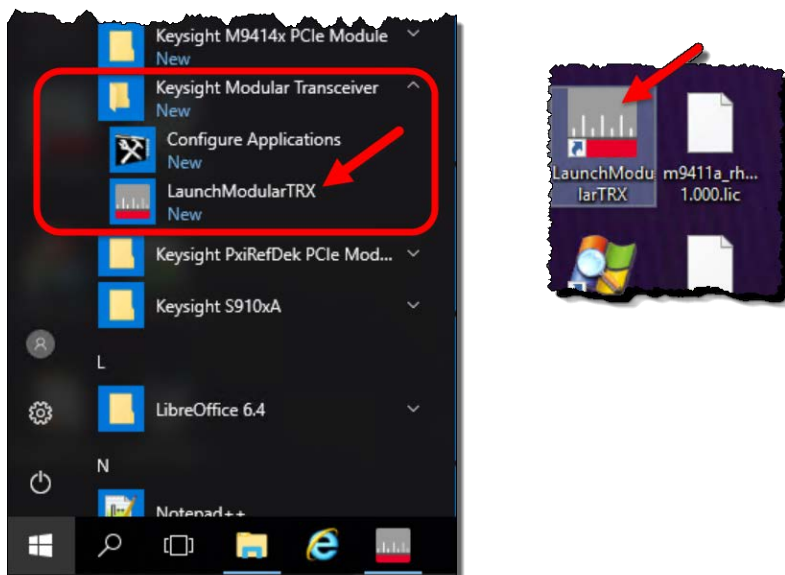
NOTE

The **Configuration Tool** in the **Keysight S910xA** folder is used by Keysight for factory configuration and field service purposes; it is usually not needed for customer operation of the S9110A. However, it may be needed during software upgrades, as described in **“Instrument software installation” on page 120**.

Restarting measurement applications (two methods)

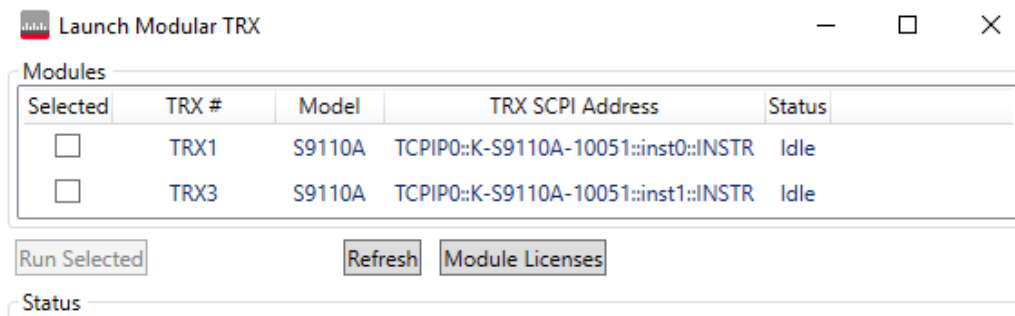
If you close the TRX measurement windows and want to reopen them without rebooting, there are two ways to do this. The simplest way is to click **Restart Services** at the bottom of the Service Manager window (see [Figure 3-1](#) on page 38). However, this is not the quickest method, because restarting the Service Manager will repeat some startup tasks needlessly. To save time, go to the Windows **Start** menu and select **LaunchModularTRX** under the **Keysight Modular Transceiver** folder. (Or use the desktop icon for this, if an optional desktop icon was created for it during the software installation process.)

Figure 3-4 LaunchModularTRX (from Windows Start menu or desktop icon)



In the window which opens, the TRXs are listed under **Status** as "Running" or "Idle". To activate one or both idle TRXs, check the appropriate box under **Selected**, and then click **Run Selected**:

Figure 3-5 Selecting one of two TRXs



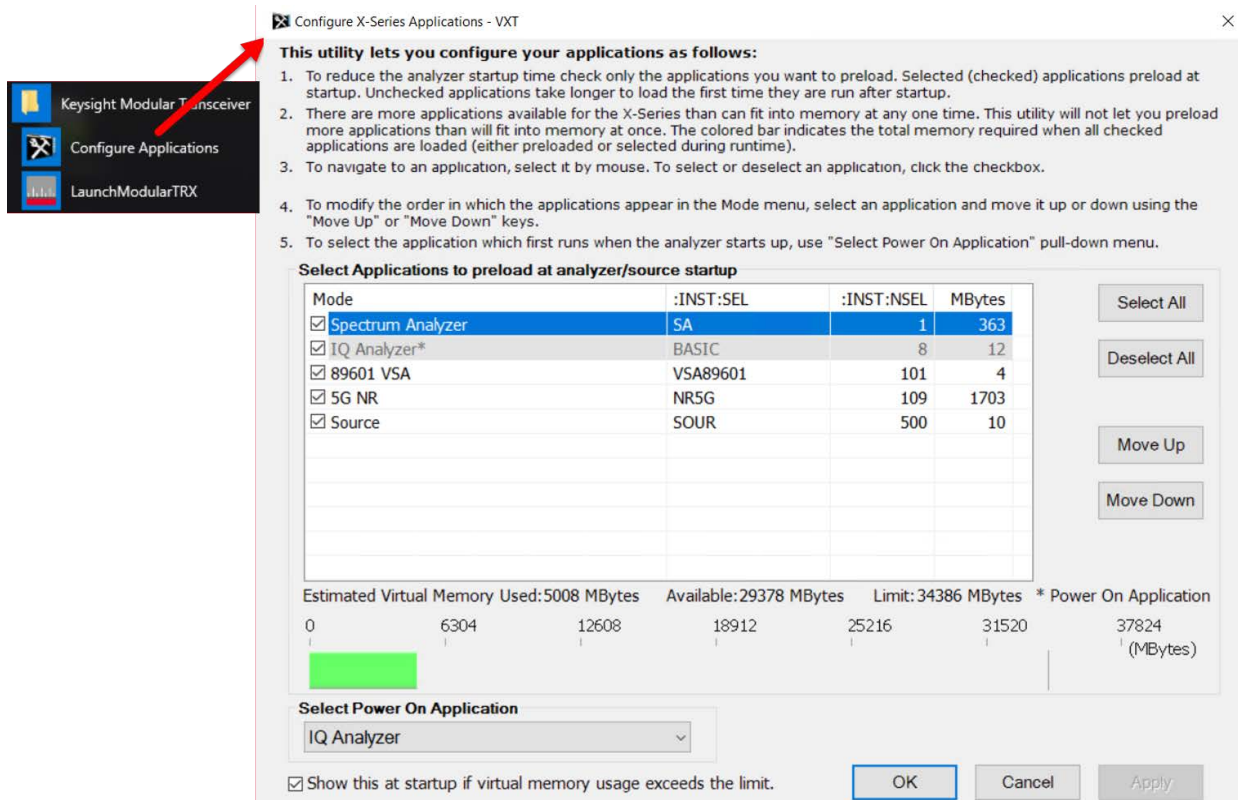
NOTE

Do not run **LaunchModularTRX** if the **Service Manager** has been shut down; that would cause communication problems between the S9110A and the M1742A/M1749B. Relaunch the **Service Manager** from Windows Start instead.

Configure applications

You can reduce unnecessary startup time for the S9110A, by limiting the number of measurement applications which are loaded automatically at bootup. Go to the Windows **Start** menu and select **Configure Applications** under the **Keysight Modular Transceiver** folder. Use the checkbox selector to choose only the applications you want loaded automatically at startup, and click **OK**.

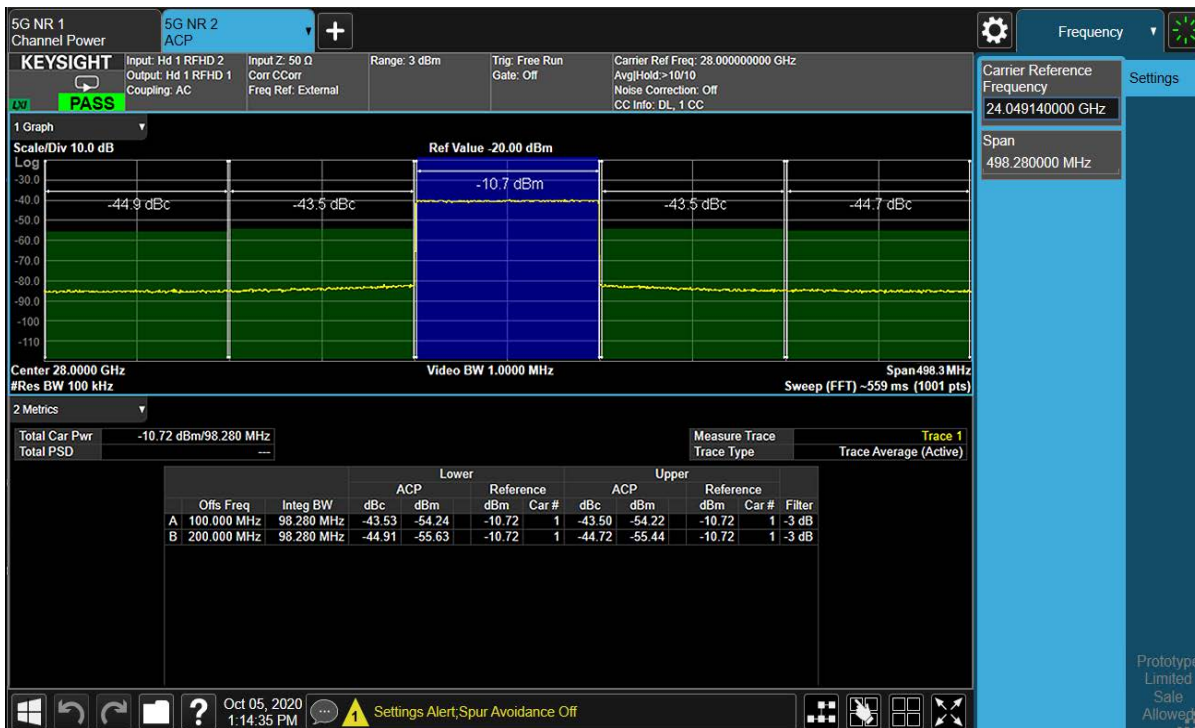
Figure 3-6 Launching Configure X-Series Applications utility from Windows Start menu



Screen Interface

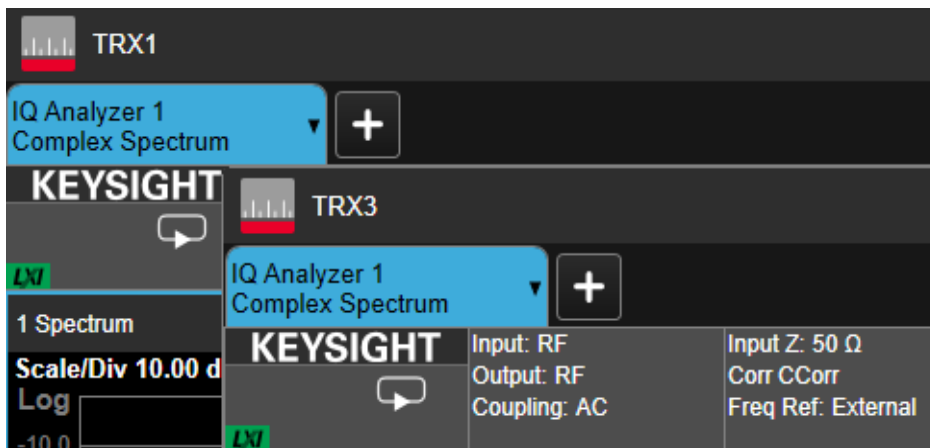
The overall appearance of the display interface is illustrated below. Different parts of it are discussed in more detail in the following sections.

Figure 3-7 Application display interface (with results window for ACP measurement)



If a second TRX unit is installed, it is represented by a separate window:

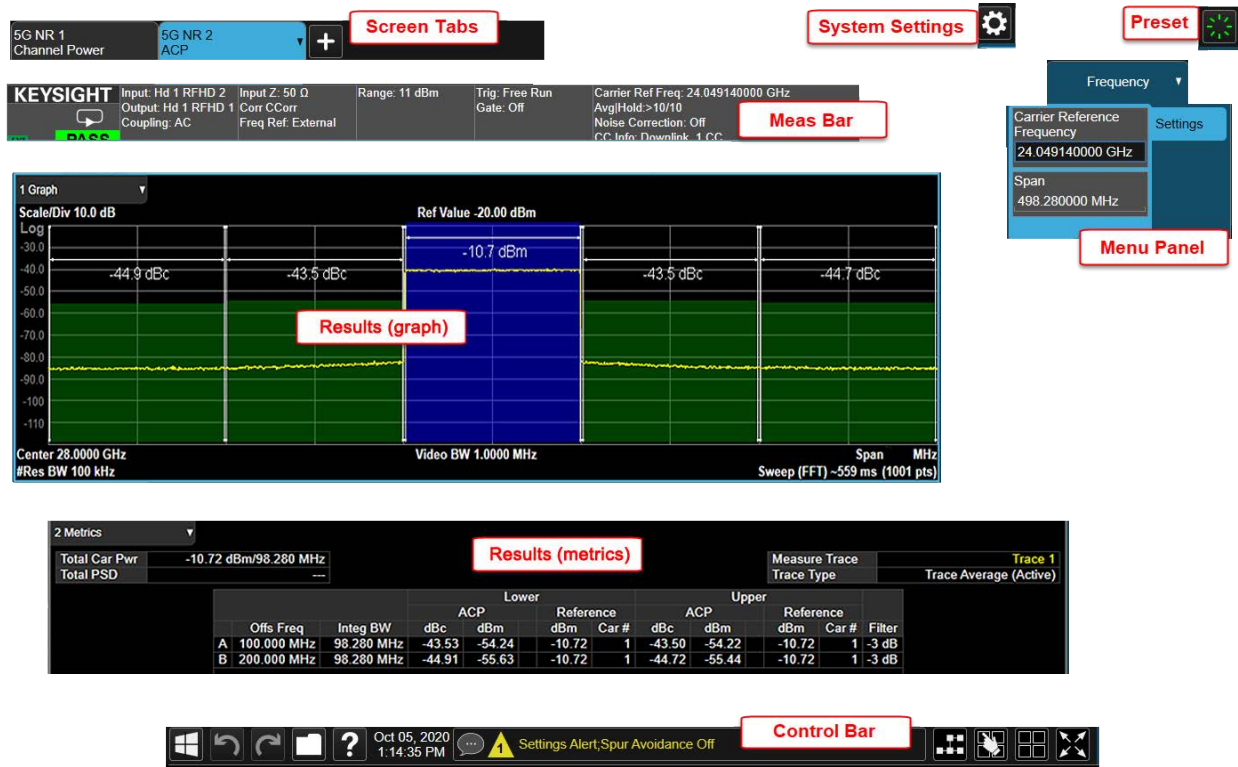
Figure 3-8 Separate display windows for TRX1 and TRX2



Elements of the interface are discussed in more detail in the following sections.

Graphical User Interface
Screen Interface

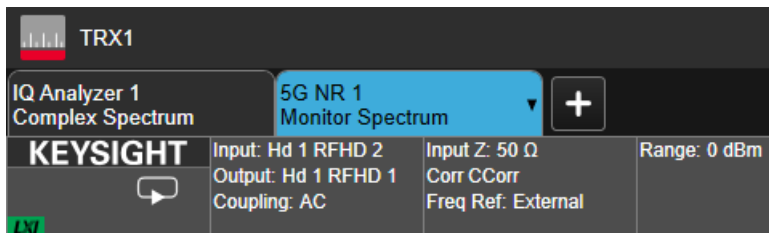
Figure 3-9 Elements of the display interface



Screen Tabs

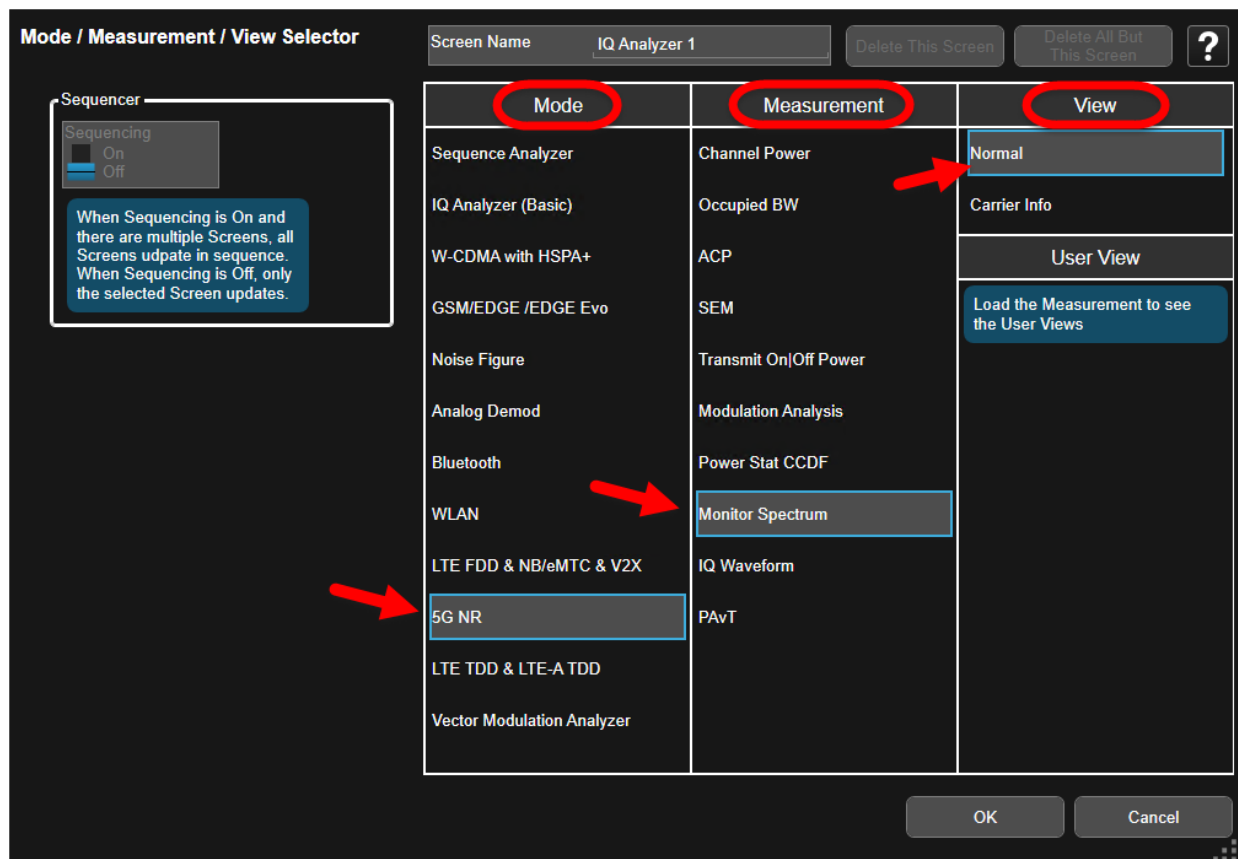
These are used to select a measurement screen for viewing and configuration (to add another screen, click the + button at the right of the existing tabs).

Figure 3-10 Screen tabs



Clicking on the currently selected tab brings up the **Mode/Meas/View** dialog, to change settings for that screen.

Figure 3-11 Mode/Meas/View dialog



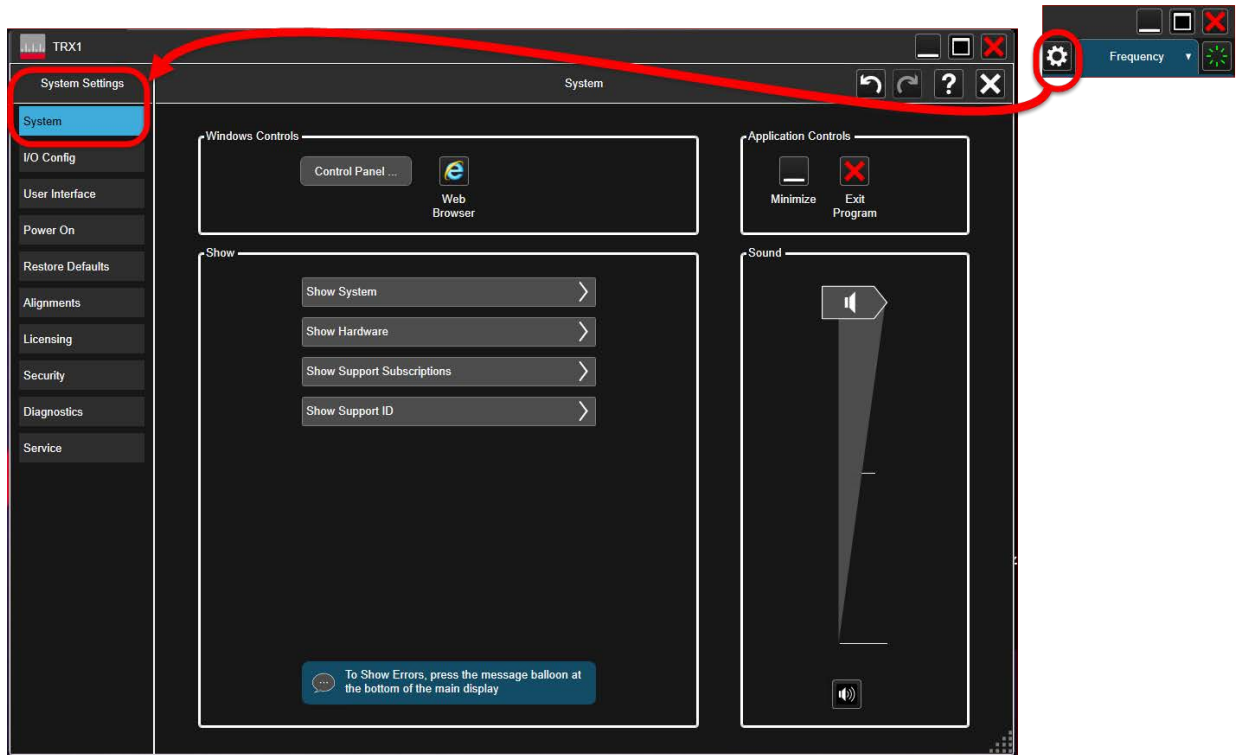
NOTE

The **Sequencer** feature at the left side of the dialog is not related to List Sequencer mode. This selection only determines how multiple measurement screens are displayed and updated.

System Settings

Clicking the "gear" icon opens the System Settings dialog, which allows you to access various information screens and settings interfaces. The tabs on the left side let you access various configuration screens.

Figure 3-12 System Settings



The System Settings screens include:

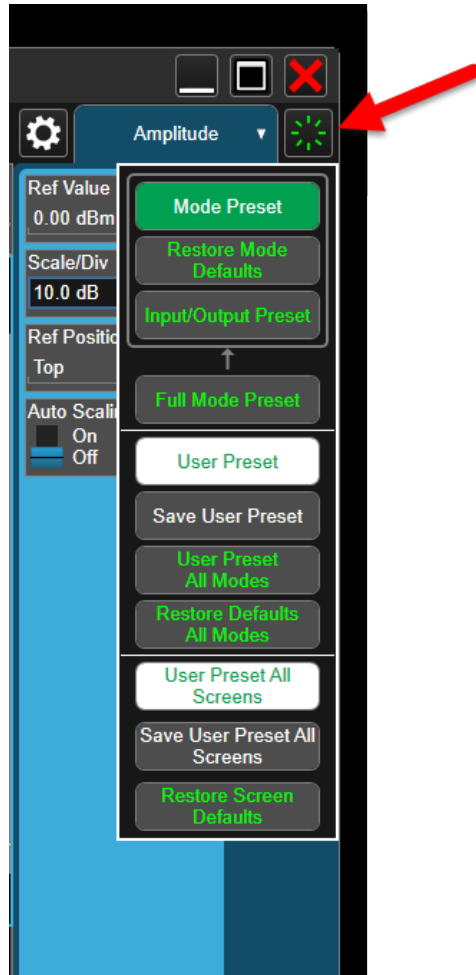
- System
- I/O Config
- User Interface
- Power On
- Restore Defaults
- Alignments
- Licensing
- Security
- Diagnostics
- Service

Preset

Clicking this icon opens a menu which provides access to the various ways in which settings can be restored to a default condition or a condition you defined earlier.

Figure 3-13

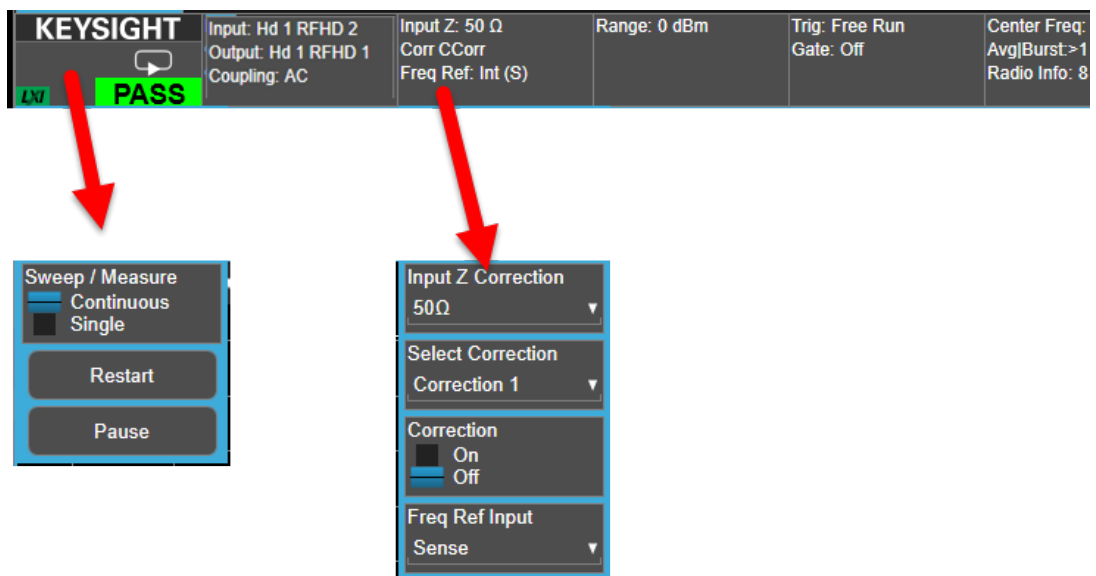
Preset



Meas Bar

This bar displays important settings for the measurement, in a series of annotation panels which can be selected to reveal menu choices for them. The panel at the far left, for example, allows you to toggle between continuous and single measurement modes, and also to restart or pause a measurement.

Figure 3-14 Meas Bar

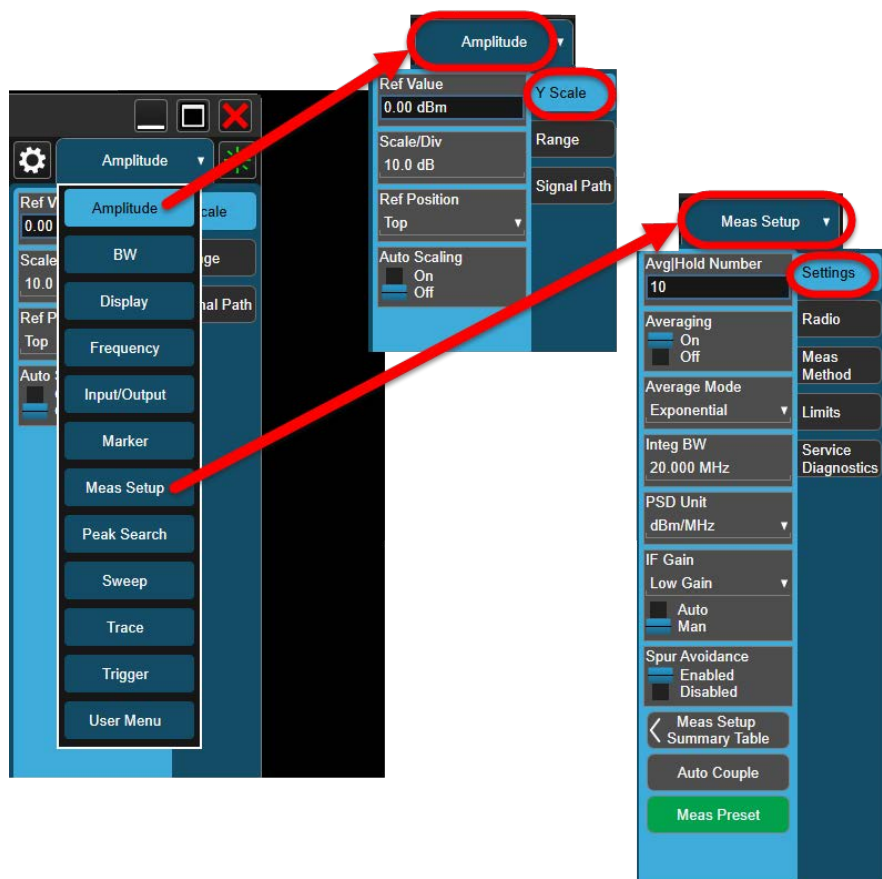


Menu Panel

Clicking on the name at the top of the menu offers the available menus (**Amplitude**, **BW**, and so on) for selection. The selected menu is usually divided into separate sub-menus, any of which can be selected by clicking on the tabs to the right (for example, the tabs on the right of the **Amplitude** menu represent the **Y Scale** and **Range** sub-menus). Which items are included on a menu depend on which measurement is currently active, and sometimes on how other settings have been configured.

Figure 3-15

Menus (and sub-menus)



Measurement Display

The interface is centered around the display windows, which show the results of a measurement. The number of windows and the type of information displayed in them varies from measurement to measurement. For example, the Channel Power measurement example below shows a spectrum display and a table of numerical data. More complex measurements often show multiple graphs and tables.

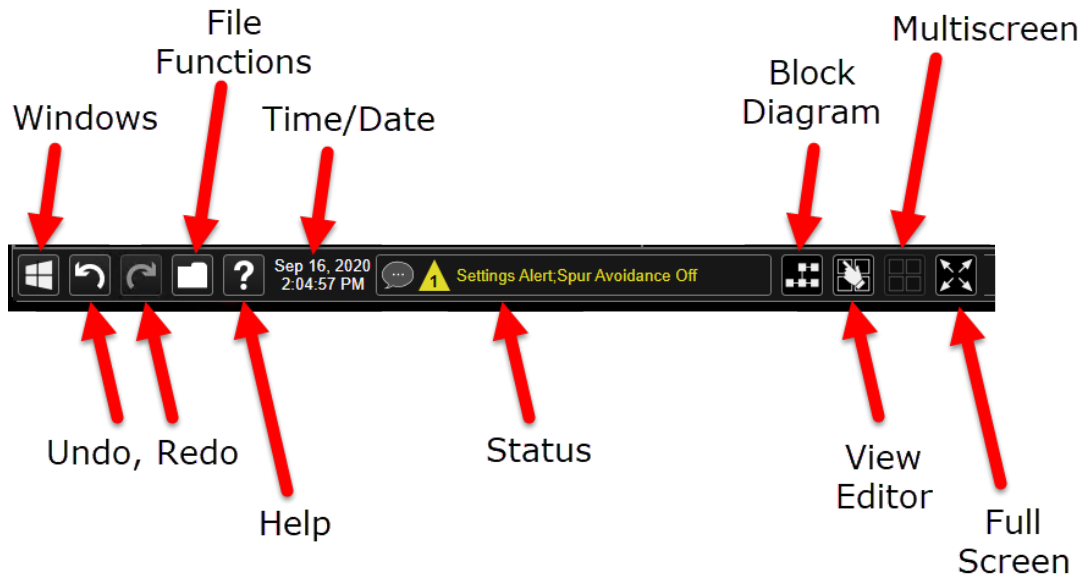
Figure 3-16 Measurement display for Channel Power



Control Bar

This provides controls and information displays related to various instrument functions that are independent of the current measurement.

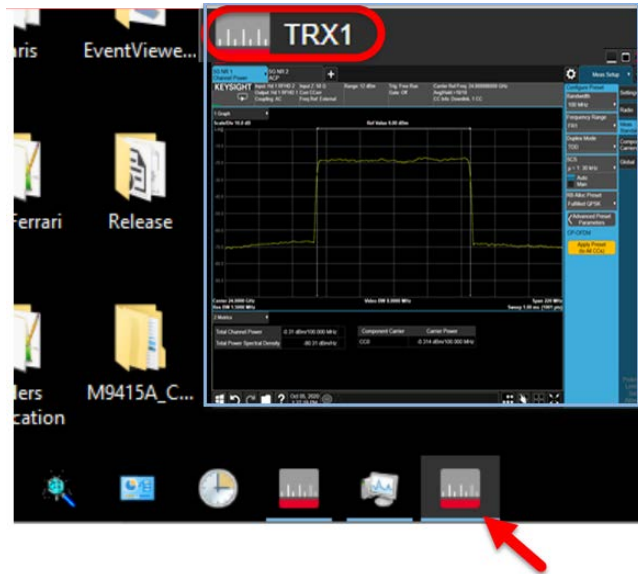
Figure 3-17 Control Bar



Minimized window

A minimized window can be brought back up by finding the icon representing it in the Windows taskbar. Although the graphics for any two Keysight applications may look alike (as in the illustration below), hovering the mouse over one of them will display its Slot number and a small graphic representation of its measurement screen.

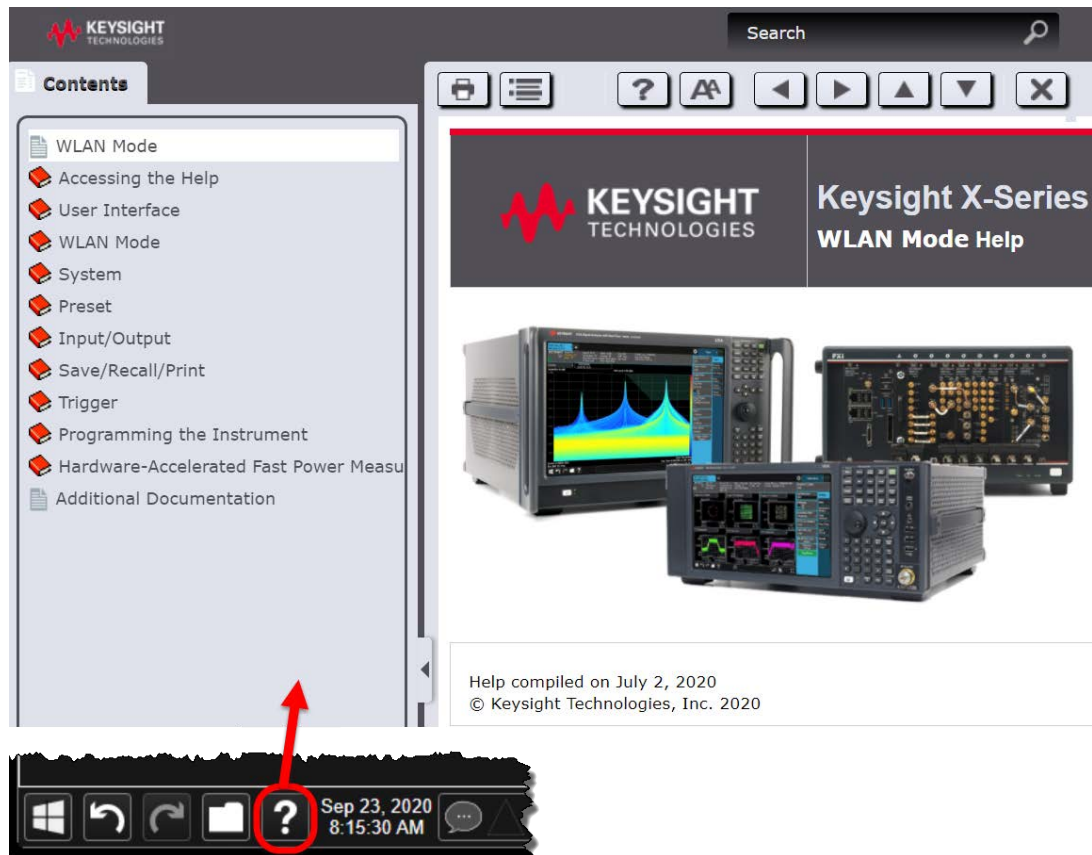
Figure 3-18 Reopening minimized windows



Help System

Detailed information about all features of the test software is available from the help system. To open the help content for the mode currently running, click the question-mark icon at the bottom of the screen. Because menus and features differ between (for example) the WLAN mode and the 5GNR mode, separate help systems for these modes are installed on the system.

Figure 3-19 Opening the help content



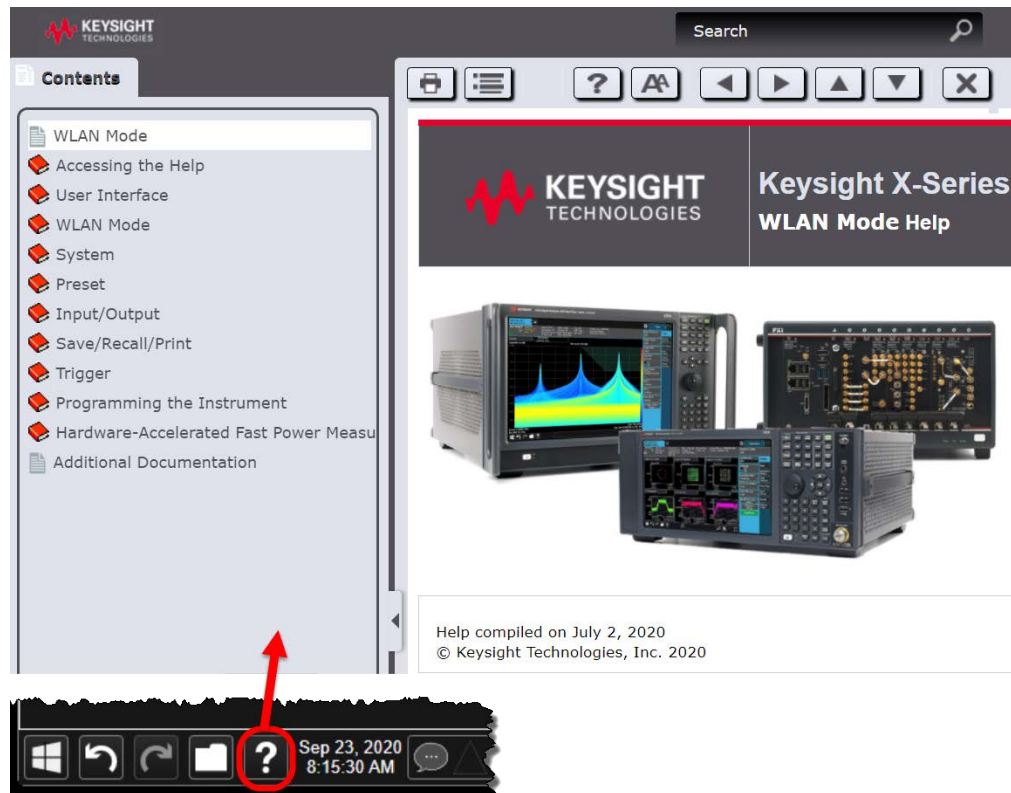
Within the help system, information can be found either by using the **Search** window at the upper right or by navigating the **Contents** tab at the left.

However, when you are looking for information specific to a menu selection or other feature of the user interface, it is easier to find it by using the context-sensitive help system described on the following page.

Context-sensitive help

To access information about a particular feature of the user interface, right-click on that feature; a popup menu appears which shows **Help on this setting** as a selection. This selection opens the help content to a page which is specific to that feature. For example, the help page for **AvgHold Number** in the **Meas Setup > Settings** menu explains the feature, provides the syntax for the equivalent SCPI commands (in complete and abbreviated forms), and specifies the default value (**Preset**) and range (**Min/Max**) of the possible settings.

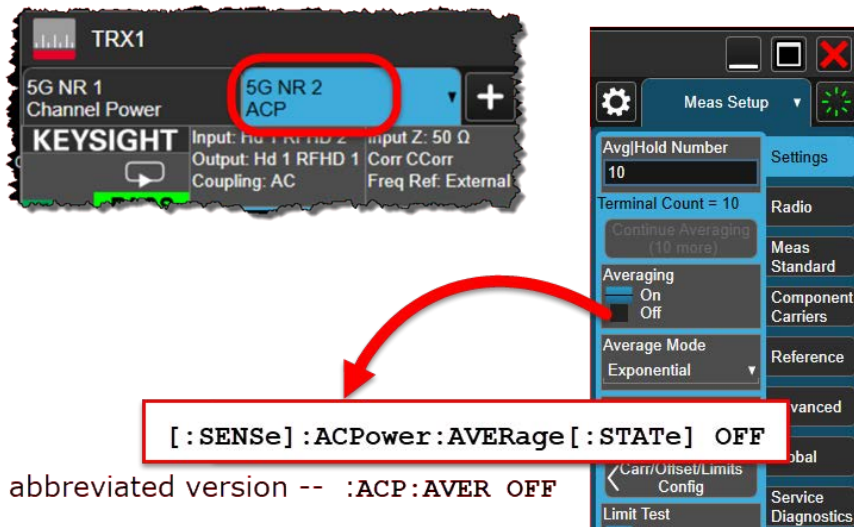
Figure 3-20 Accessing help for a particular feature



Command Interface

In addition to being controlled and monitored by way of the screen interface, the instrument can be controlled and monitored by means of SCPI commands. For example, averaging can be disabled for the ACP measurement screen by changing the **Averaging** setting to **Off** in the **Meas Setup > Settings** menu. The same thing can be done by sending the command
`[:SENSe]:ACPower:AVERage:[STATE] OFF`

Figure 3-21 Screen interface setting vs. SCPI command



In the SCPI command syntax, variables are indicated by angled brackets; for example, a parameter specifying an amplitude in dBm might be represented in the command syntax by the variable `<amp1>`, but in an actual command this variable will be replaced by an actual value, such as `-10`.

Where a command parameter must be one of a limited set of choices, the alternatives are listed, with vertical lines separating the choices: `OFF|ON|0|1`.

The SCPI syntax allows for certain elements of a command to be omitted for brevity. Where a command name is given in a mixture of upper-case and lower-case letters, the lower-case letters are optional (for example, **AVERage** can be shortened to **AVER**). Also, any element that is enclosed in brackets is optional (however, if you do include the optional element, omit the brackets).

This command:

`[:SENSe]:ACPower:AVERage:[STATE] OFF`

can be sent in its long format:

`:SENSe:ACPower:AVERage:STATe OFF`

Or it can be shortened by omitting lower-case characters:

`:SENS:ACP:AVER:STAT OFF`

Or it can be shortened further by omitting the bracketed elements:

`:ACP:AVER OFF`

To take another example, the command which sets the measurement center frequency has the following syntax:

```
[ :SENSe ] :FREQuency:CENTer <freq>
```

This command can be sent in its long form:

```
:SENSe:FREQuency:CENTer 16 GHz
```

However, it can also be shortened to:

```
:FREQ:CENT 16 GHz
```

NOTE

There is not always a command equivalent for a function of the screen interface (some functions which relate only to the display do not need a command). Also, there is not always a screen interface equivalent for a command (some commands perform functions which aren't available from the screen interface).

Detailed information about the SCPI commands and how they are used is provided in the help file for the measurement application you are running.

SCPI Programming Commands

The Keysight S9110A supports a SCPI service that provides programming features for the following:

- Control the Frequency Reference for 10 MHz internal or 10/100MHz external reference signal.
- Query the 'locked' state of the Frequency Reference.
- Route the PXI Chassis Front Panel triggers to PXI Backplane Triggers.
- Setup Conformance Test configurations on appropriately configured solutions with a BLK license.

NOTE

By default, the SCPI service will be reached via hislip address 314, for example: "tcpip0::localhost::hislip314::instr"

IEEE 488.2 Common Commands

*IDN?

The identification (IDN) query outputs an identifying string. The response will show the information like this in a comma delimited format:

Keysight Technologies,S9110A,,CIU Server,3.12.31.0,Installer,3.13.1

Fields:

- Manufacturer: Keysight Technologies
- Model Number: S9110A
- Empty string
- "CIU Server", Version string
- "Installer", Version string

*RST

The reset (RST) command will reset conformance test properties back to their default values. Also, the connections to M941X XApps instances used for conformance test will also be closed and reopened.

This command will not change the Frequency Reference or PXI trigger routings.

System Subsystem

:SYSTem:ERRor[:NEXT]?

The System Error query will return the next error from the SCPI error queue. If there are no error messages, the query returns the following output:

+0,"No Error"

When there is more than one error message, the query will need to be sent for each message.

:STATus:OPERation:ROSCillator?

This query will return the status bit for the register for the reference. If the reference module is unlocked, this will return a 1, otherwise 0 if the reference is locked.

Display Subsystem

:DISPlay:ENABle 0|1|OFF|ON :DISPlay:ENABle?

The Display Enable command will enable or disable the display of conformance property values for debugging purposes that are set through the SCPI commands. The property information is displayed in the S9110A Service Manager window. Leaving this enabled has a performance penalty due to the overhead of writing the information to the user interface as the properties are set on hardware.

Default: OFF (0)

Service Subsystem

:SERvice:PATH:IFLoopback[:STATe] 0|1|OFF|ON :SERvice:PATH:IFLoopback[:STATe]?

The IF Loopback command allows the source to loopback the signal from the M941X Transceiver through the IF section of the RRH and back into the M941X. This is useful for debugging purposes only.

Default: OFF (0)

Reference Oscillator Subsystem

:ROSCillator:SOURce INTernal | EXTernal :ROSCillator:SOURce?

The source command will permit changing the reference frequency source to the internal clock or to use the front panel external reference.

Default: INTernal

:ROSCillator:FREQency:EXTernal <value> : ROSCillator:FREQency:EXTernal?

The external frequency command allows changing the frequency to match the external clock signal. The only supported frequencies are 10e6 and 100e6.

Default: 10e+6

:ROSCillator:LOCKed[:STATe]?

The locked query will return a 0 (not locked) or 1 (locked) to indicate the state of the frequency reference module. This works when using either the internal or external source.

Chassis Subsystem

:CHASsis:TRIGger:ROUTe TRIG1|TRIG2,NONE,PXI0...PXI7 :CHASsis:TRIGger:ROUTe? TRIG1|TRIG2

The trigger routing command will permit routing either front panel trigger 1 or 2 to one of the eight PXI trigger lines, numbered PXI0 to PXI7. The query command will return the current routing from front panel trigger 1 or 2.

Example: :CHASsis:TRIG:ROUT TRIG1,PXI0

Routes front panel trigger 1 to PXI0.

By convention the front panel triggers are set on bus segment 2. To forward the triggers between bus segments within the PXI chassis, the Keysight Connection Expert should be used to make persistent bus segment routes on a per trigger line basis. These routings can be saved to the firmware in the chassis and will be restored on power cycles.

Source Subsystem

NOTE

All of the source subsystem commands are only available when a BLK license is present on the system and all required hardware is present.

In conformance test systems there are two sources; referred to as “primary” and “secondary”. The primary source is the intended signal of interest and the secondary source is the “blocking” signal that could possibly interfere with the signal of interest.

[:SOURce]:CONFigure[:STATe] 0|1|ON|OFF [:SOURce]:CONFigure[:STATe]?

The state command allows for enabling or disabling the conformance test. As the configuration is enabled the conformance properties are set on the primary and secondary M941X sources.

Default: OFF (0)

**[[:SOURce]:CONFigure:PORT[:OUTPut] RRH1RFHD1|RRH1RFHD2|IFIO1
[:SOURce]:CONFigure:PORT[:OUTPut]?**

The port configuration command allows for setting the which port will be used to output the combined signal for conformance testing. Ports are restricted by available hardware in the system.

Default: RRH1RFHD1

**[[:SOURce]:CONFigure:PRIMary:FREQuency <num>[<freq_suffix>]
[:SOURce]:CONFigure:PRIMary:FREQuency?**

The primary frequency command will set the output frequency of the intended signal. The frequency is restricted by the port being that was set by the :CONFigure:PORT[:OUTPut] command.

Default: 28.0e+9

**[[:SOURce]:CONFigure:PRIMary[:POWer]:AMPLitude
<num>[<dbm_suffix>]
[:SOURce]:CONFigure:PRIMary[:POWer]:AMPLitude?**

The primary amplitude command will set the intended signal output power.

Default: -100 dBm

**[[:SOURce]:CONFigure:SEConDary:FREQuency <num>[<freq_suffix>]
[:SOURce]:CONFigure:SEConDary:FREQuency?**

The secondary frequency command will set the output frequency of the blocking signal. The frequency is restricted by the port being that was set by the :CONFigure:PORT[:OUTPut] command.

Default: 28.0e+9

**[[:SOURce]:CONFigure:SEConDary[:POWer]:AMPLitude
<num>[<dbm_suffix>]
[:SOURce]:CONFigure:SEConDary[:POWer]:AMPLitude?**

The secondary amplitude command will set the output power of the blocking signal.

Default: -100 dBm

**[[:SOURce]:CONFigure:SEConDary:BANDwidth <num>[<freq_suffix>]
[:SOURce]:CONFigure:SEConDary:BANDwidth?**

The secondary bandwidth command will set the bandwidth of the blocking signal. Note that this property isn't actually set on the hardware, but is used as error checking setting up the conformance test configuration.

Default: 50e+6

**[[:SOURce]:CONF[:POWer]:OFFSet <num>
[:SOURce]:CONF[:POWer]:OFFSet?**

The power offset command will set the loss between the source output port and the DUT input port. This value ends up being set as the power offset on the primary source for the intended signal. A loss between the source output port and the DUT input port would be entered as a negative number. For example, with an over the air loss of 50 dB, a value of -50.0 should be entered.

Default: 0 dB

4 Operating Tasks

The following topics can be found in this section:

[“TRX Selection” on page 62](#)

[“Receiver Setup” on page 64](#)

[“Source Setup” on page 69](#)

[“Port Configuration” on page 72](#)

[“Blocker Configuration” on page 80](#)

[“Alignments” on page 82](#)

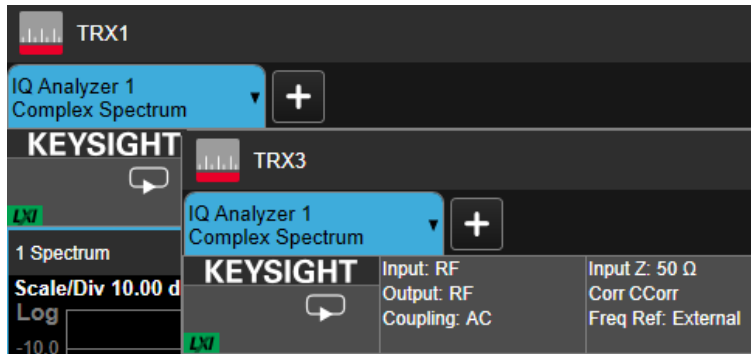
[“LAN Address Configuration” on page 95](#)

[“Managing Licenses” on page 97](#)

TRX Selection

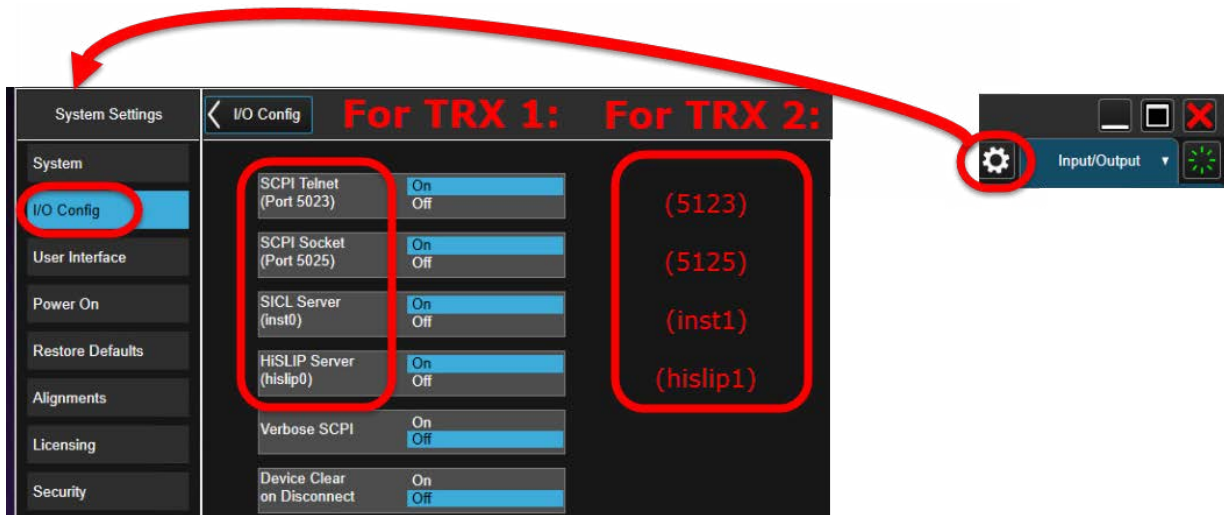
On the monitor or remote desktop view of the S9110A, each TRX is represented by a separate XSA window. You can identify which TRX a window controls by looking for the identifier at the top left corner of the window. (The TRXs are named based on the Slot # in the PXIe chassis)

Figure 4-1 Identifying application windows for different TRXs



Although the S9110A as a whole is assigned only one IP address for the entire PXIe chassis, the individual TRXs within the chassis can be differentiated in network communication with the system. The means of identifying a TRX depends upon the connection method, as outlined below. (You can also verify the connections for any TRX from the **System Settings > I/O Config** menu.)

Figure 4-2 SCPI LAN on I/O Config Menu



Using HiSLIP

NOTE

HiSLIP (High-Speed LAN Instrument Protocol) is the recommended interface for connection to the S9110A, because of its superior performance characteristics.

Use hislip0 or hislip1:

- **TRX1:**
TCPIP0::::hislip0::INSTR
- **TRX2:**
TCPIP0::::hislip1::INSTR

Using Socket Ports

Use socket 5025 or 5125:

- **TRX1:**
5025
- **TRX2:**
5125

Using VXI-11/SICL

Use inst0 or inst3:

- **TRX1:**
TCPIP0::::inst0::INSTR
- **TRX2:**
TCPIP0::::inst1::INSTR

Using Telnet Connection

Use telnet port 5023 or 5123:

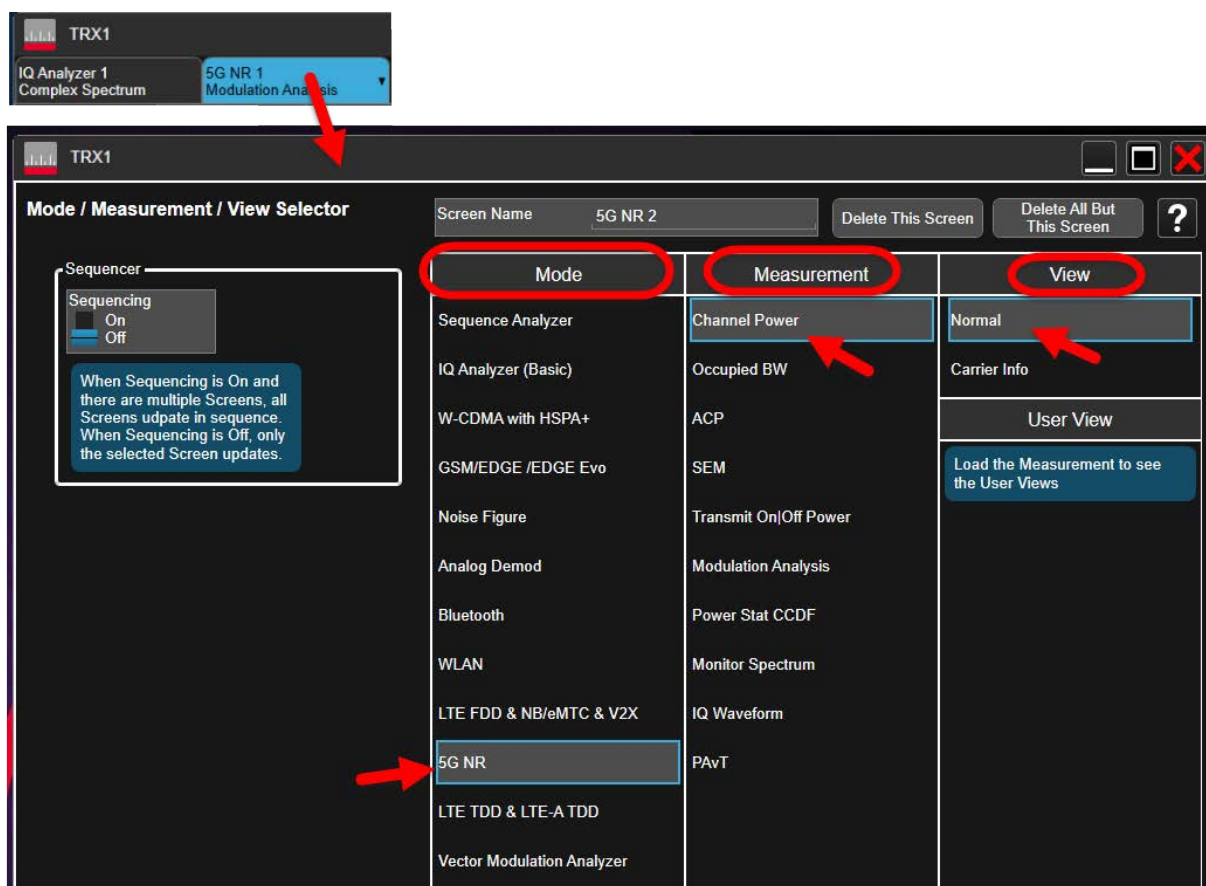
- **TRX1:**
5023
- **TRX2:**
5123

Receiver Setup

The analyzer/receiver function of the S9110A relates to measurement of signals received from the DUT.

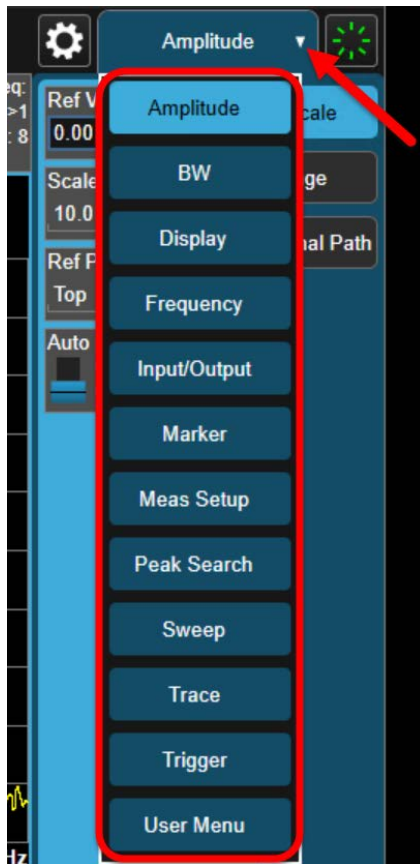
Clicking on the measurement tab at the upper left corner of the display opens the **Mode/Measurement/View Selector**, which you can use to select a particular kind of measurement. In this example, **5G NR** has been selected under **Mode**, and the selections under **Measurement** are the measurements available in that mode. (For some measurements, there are also selections to be made under **View**.) In the example illustrated below, the **Channel Power** measurement is selected. Click **OK** to run this mode/measurement selection.

Figure 4-3 Selecting Mode/Measurement



Most measurement settings are made from the menu, which can be accessed by selecting the dropdown button near the upper right of the display.

Figure 4-4 Accessing Menus

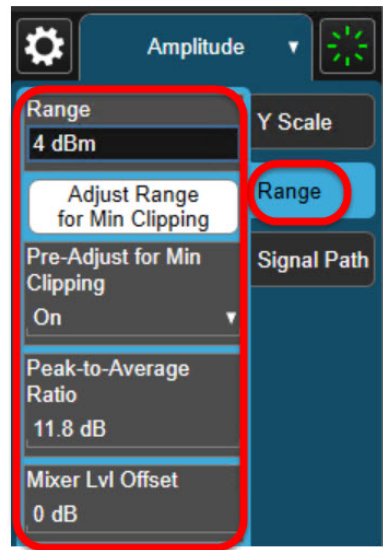
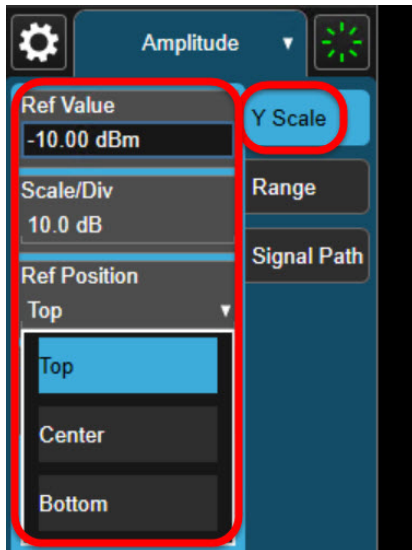


Selecting a menu from the dropdown list displays the menu selections (usually the selections are indented under multiple tabs shown at the right).

For example, the **Amplitude** menu has three tabs; the selections under the **Y Scale** and **Range** tabs are shown below.

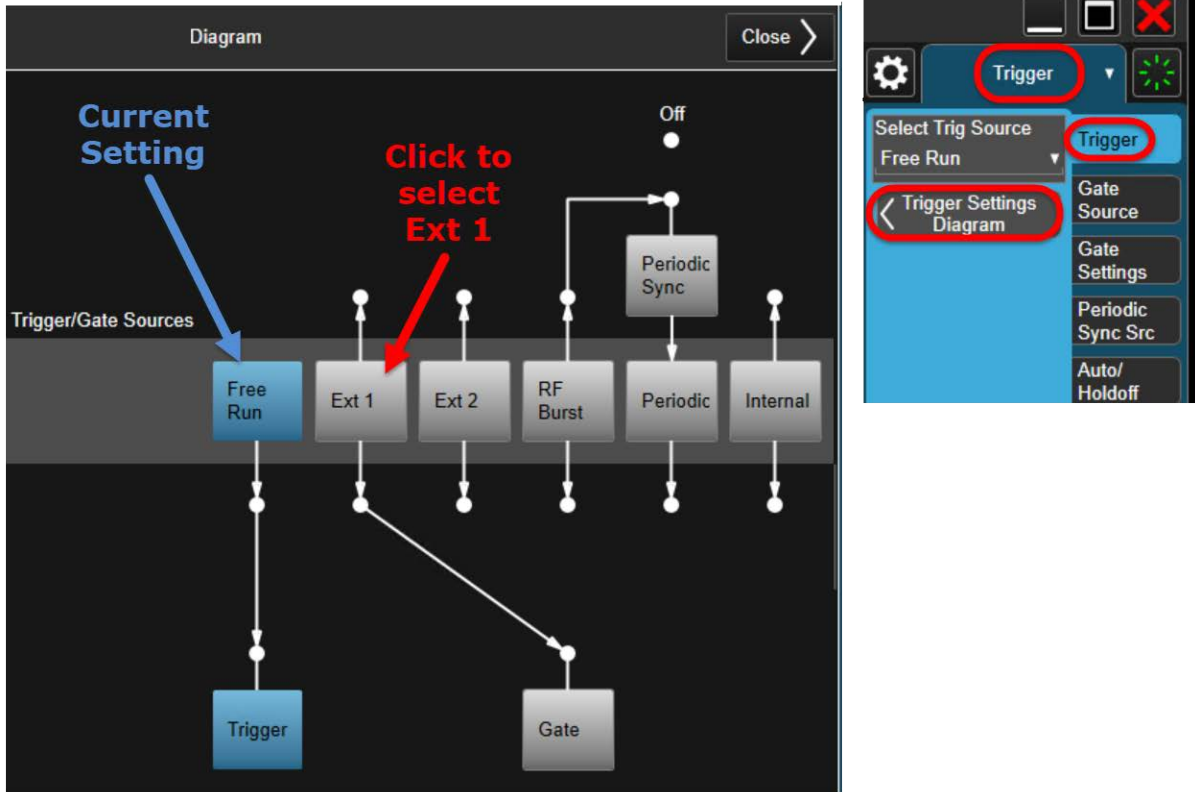
Figure 4-5

Measurement Menus



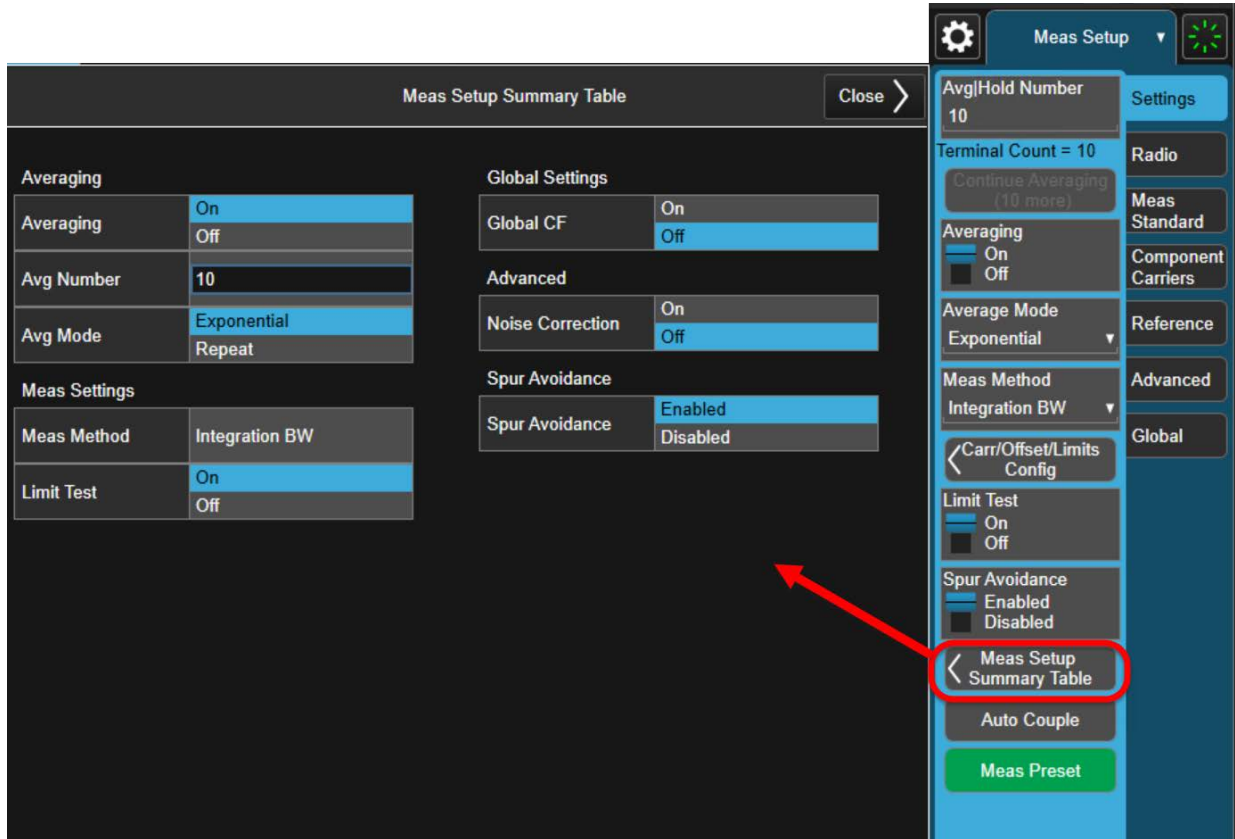
Although some menu choices involve only a simple selection (**On | Off**) or a value to be entered (**17 GHz**), some choices cause a more elaborate selection screen to appear in the display. In the example illustrated below, **Trigger > Trigger Settings Diagram** opens an interactive display (the trigger source can be changed from **Free Run** to **Ext 1** by clicking on the graphic).

Figure 4-6 Trigger Settings Diagram



Another type of complex screen which some menu selections open is a configuration window such as the **Meas Setup Summary Table**, which gathers together multiple settings on one screen to make it easier to review them.

Figure 4-7 Meas Setup Summary Table



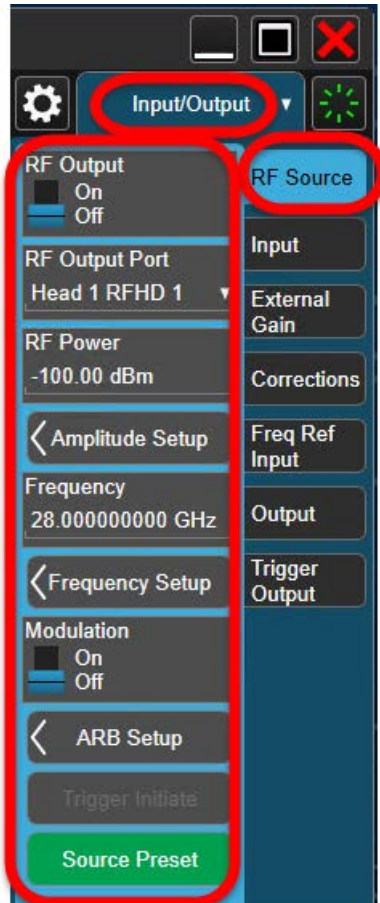
The menu choices are different for each measurement. For more detailed information, see the help file for the 5G application.

Source Setup

The source function of the S9110A relates to generation of test signals to be transmitted to the DUT. (Not all measurement scenarios require these signals, but many do.)

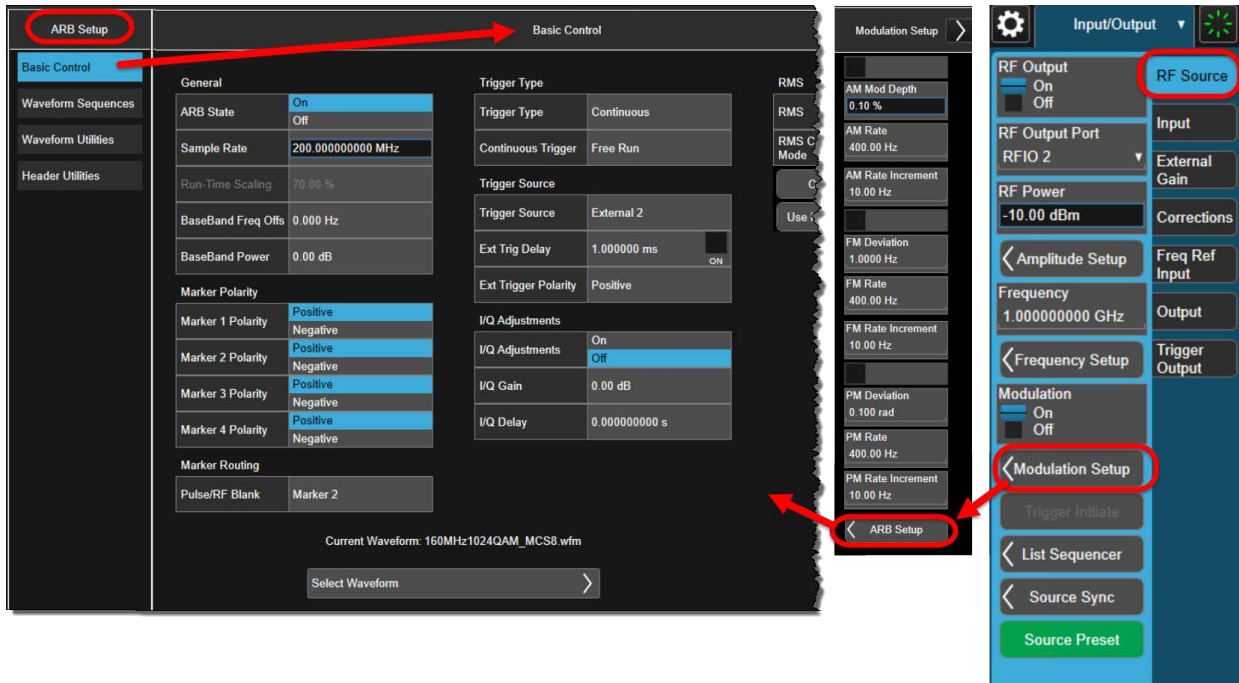
Most source settings are made from the **Input/Output > RF Source** menu, illustrated below.

Figure 4-8 RF Source Menu



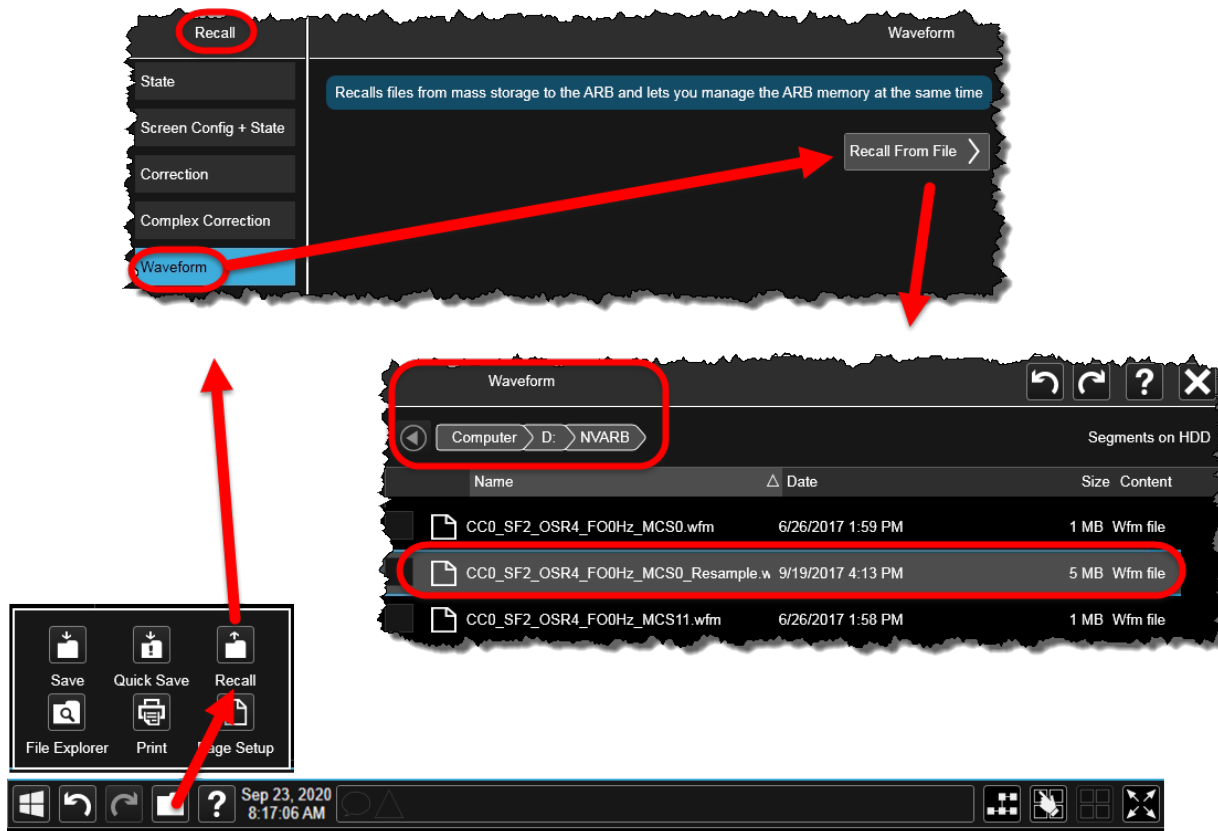
The **Modulation Setup > ARB Setup** window can be used to configure various functions of the arbitrary waveform generator.

Figure 4-9 ARB Setup Window



The source employs a user-defined waveform file for modulation (typically such a file would be created in Keysight Signal Studio software). To load a waveform file that is saved in a location on the disk drive, click the **File** icon at the bottom of the screen, and click the **Recall** icon which appears. This opens the **Recall** window; from there, select **Waveform** and **Recall From File**, and navigate to the appropriate file path to load the file.

Figure 4-10 Recalling an ARB file



For more detailed information about source setup, see the help file for the 5G application.

Port Configuration

The ports referred to in the Input/Output menus are the DUT-facing ports of the M1742A/M1749B, not the ports on the front panel of the S9110A. The diagram below shows the names of ports, as they appear on the M1742A/M1749B (black titles), and also as they are named in the user interface (blue titles) and in the SCPI commands (red titles).

Figure 4-11 S9110A-F32 Port nomenclature (in labels, menus, & commands)

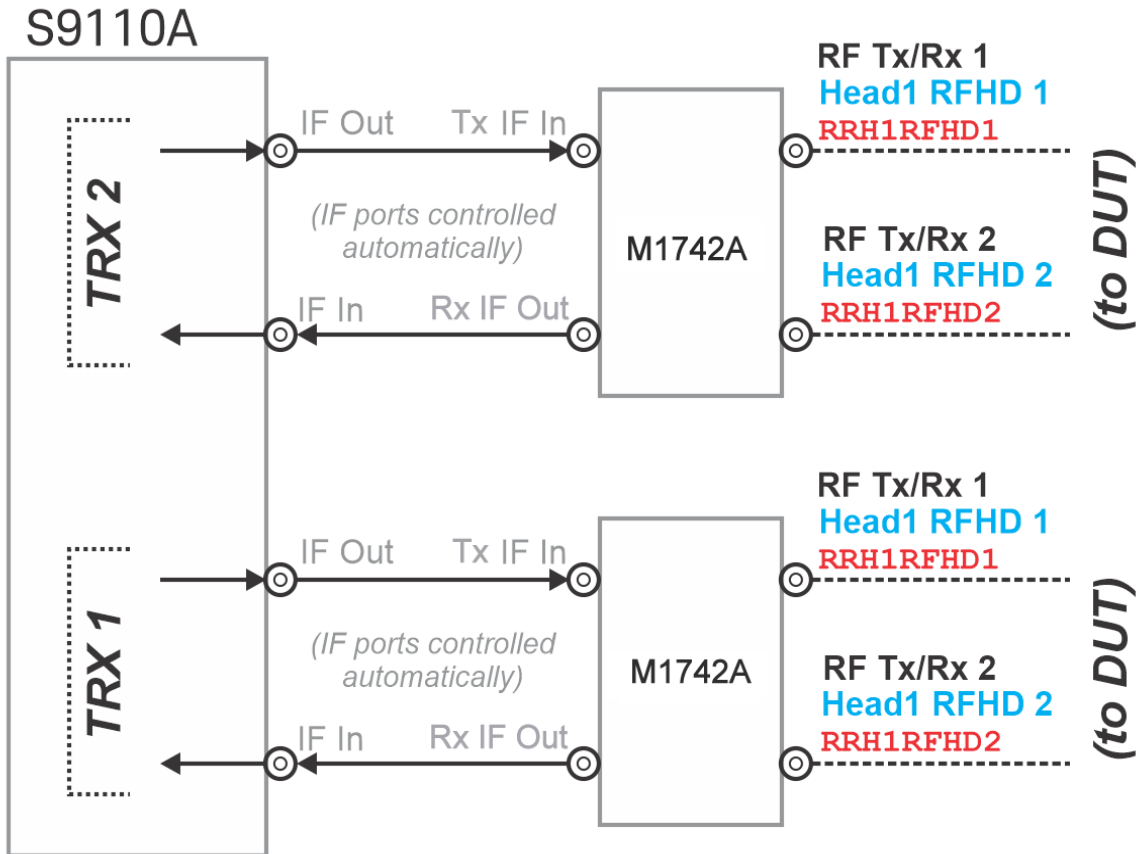
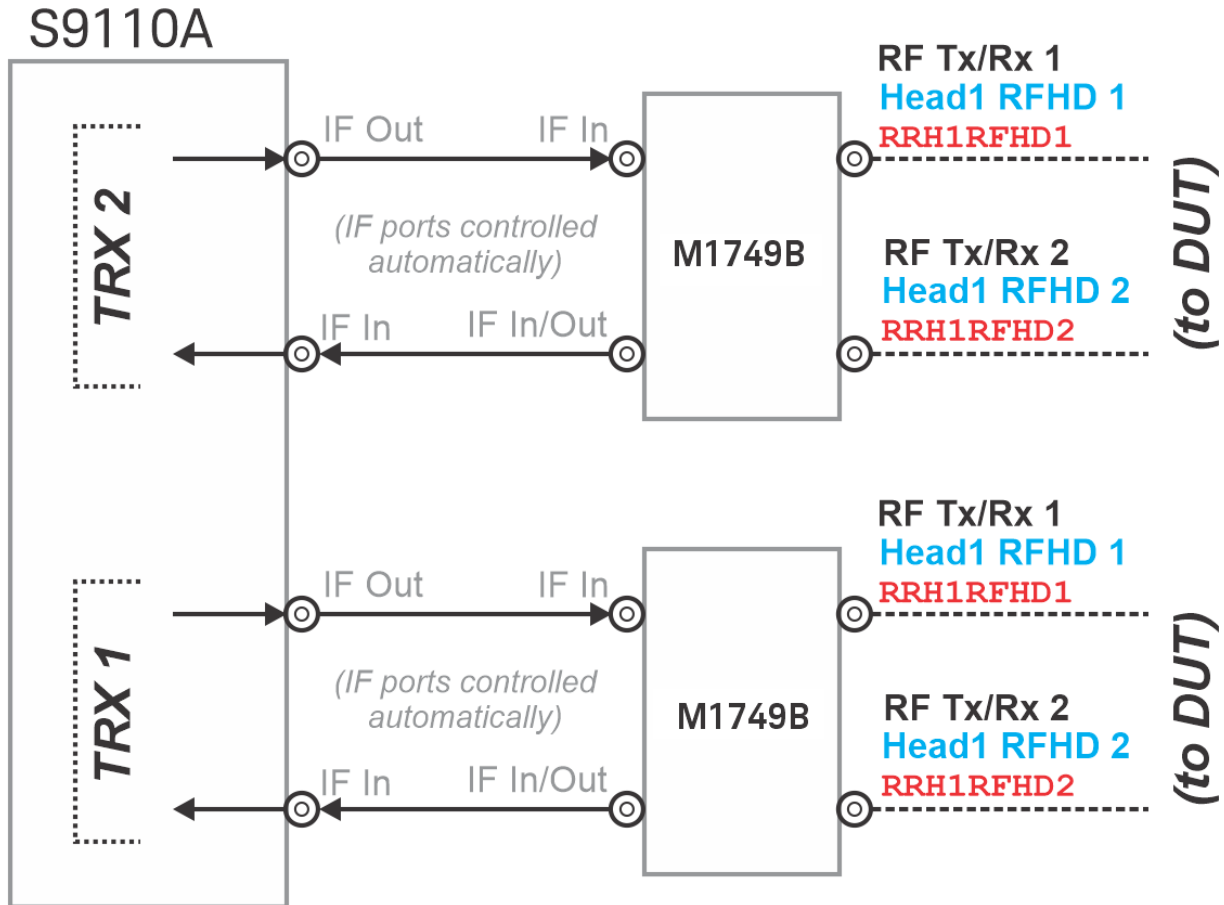


Figure 4-12 S9110A-F43/F49 Port nomenclature (in labels, menus, & commands)



The DUT-facing ports of the M1742A/F1749B can be configured as inputs or outputs (one of each). Path-switching within the M1742A/M1749B is configured automatically to support the chosen port settings.

Because each TRX is controlled independently (that is, by menus in separate windows, or by means of SCPI commands sent to different addresses), the menu settings and their equivalent commands are the same for both TRX1 and TRX2.

Because it is never permitted to set the same port as both input and output, swapping the current input/output status of the two ports requires an intermediate step, in which one of the ports is temporarily set to "None".

Port Selection

Setting the output port

To set the Tx (output) port, go to the menu **Input/Output > RF Source** menu, and select a port name from the **RF Output Port** dropdown list.

- **Head 1 RFHD 1** means the M1742A/M1749B **RF Tx/Rx 1** port.
- **Head 1 RFHD 2** means the M1742A/M1749B **RF Tx/Rx 2** port.
- **None** (used temporarily during port setup changes, to avoid creating a settings conflict by choosing one port as output and input simultaneously).

Figure 4-13 Output port selections



The equivalent SCPI command to set the output port is:

```
:FEED:RF:PORT:OUTP <port name>
```

where the available port names are:

```
RRH1RFHD1 | RRH1RFHD2 | NONE
```

Example:

```
:FEED:RF:PORT:OUTP RRH1RFHD1
```

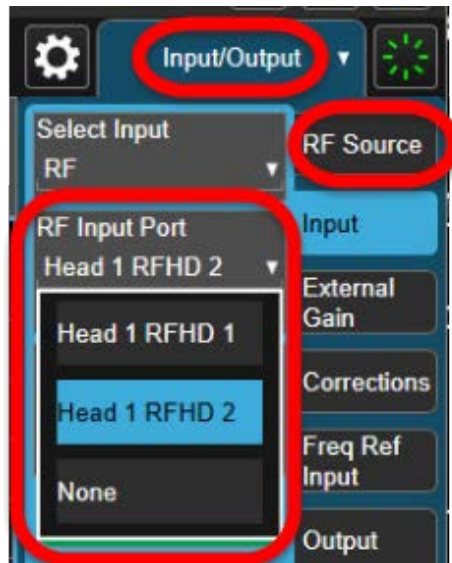
Setting the input port

To set the Rx (input) port, go to the menu **Input/Output** > **Input** menu, and select a port name from the **RF Input Port** dropdown list.

- **Head 1 RFHD 1** means the M1742A/M1749B **RF Tx/Rx 1** port.
- **Head 1 RFHD 2** means the M1742A/M1749B **RF Tx/Rx 2** port.
- **None** (used temporarily during port setup changes, to avoid creating a settings conflict by choosing one port as output and input simultaneously.)

Figure 4-14

Input port selections



The equivalent SCPI command to set the input port is:

```
:FEED:RF:PORT <port name>
```

where the available port names are:

```
RRH1RFHD1 | RRH1RFHD2 | NONE
```

Example:

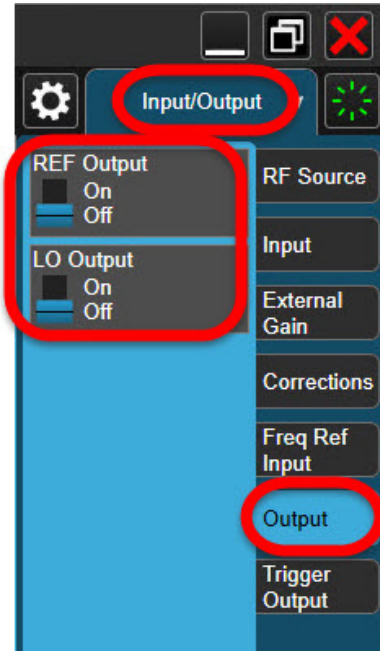
```
:FEED:RF:PORT RRH1RFHD1
```

"Output" menu

Two settings are visible on the menu **Input/Output** > **Output** menu (**REF Output** and **LO Output**). These actually relate to signals within the S9110A, and are not used in connection with features that are currently available. They are reserved for use with possible future enhancements. Leave these menu items set to their default values (**Off** in both cases).

Figure 4-15

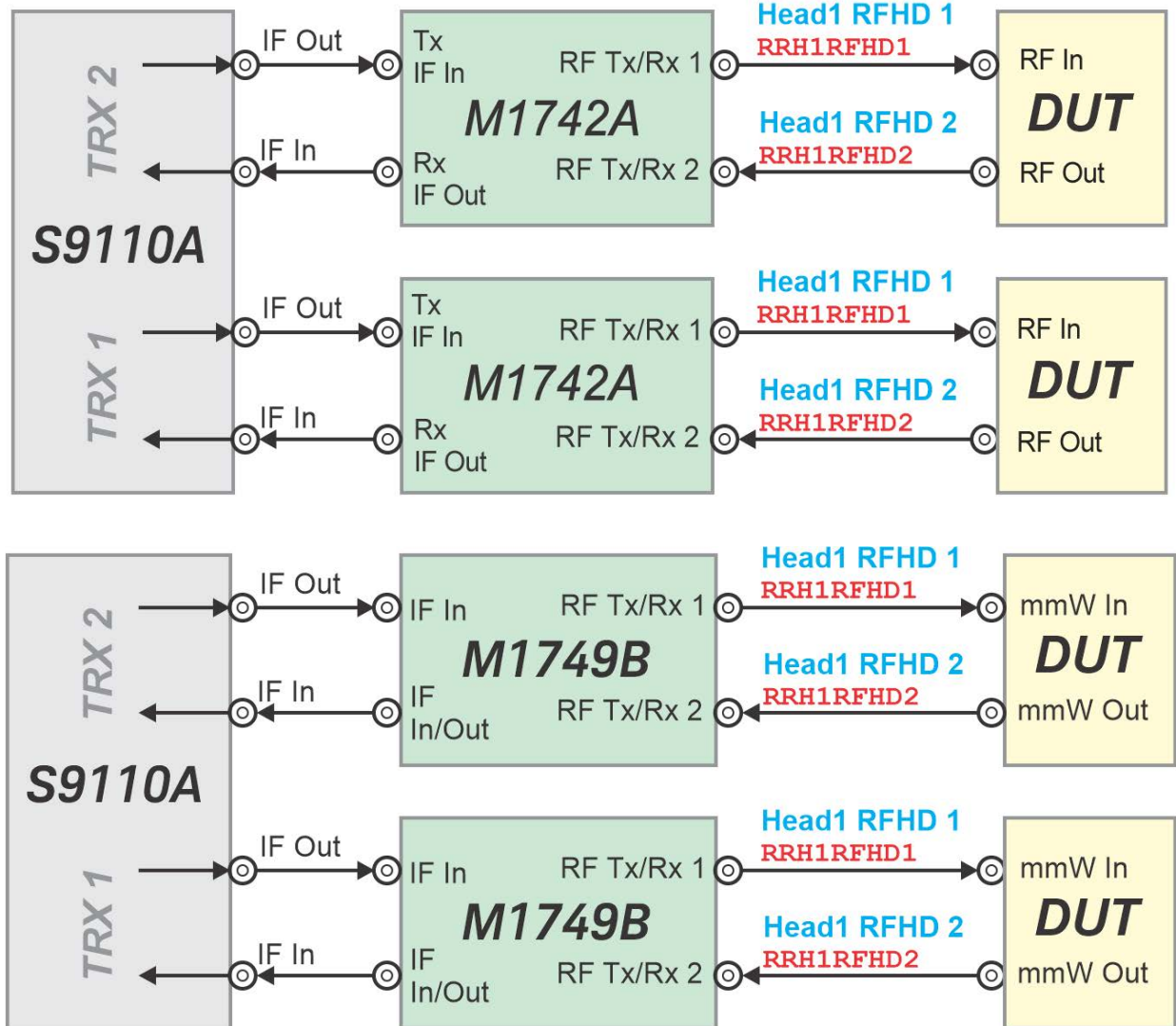
"Output" menu



Configuration Example

In the example below, the **RF Tx/Rx 1** port on the M1742A/M1749B transmits a signal to the DUT, and the **RF Tx/Rx 2** port receives a signal from the DUT.

Figure 4-16 Example: two TRXs, Tx/Rx1 as output, Tx/Rx2 as input



Set up the RF Input using this menu setting or its equivalent command:

Input/Output > Input > RF Input Port > Head1 RFHD 2

Command:

:FEED:RF:PORT RRH1RFHD2

Then set up the RF Output using this menu setting or its equivalent command:

Input/Output > RF Source > RF Output Port > Head1 RFHD 1

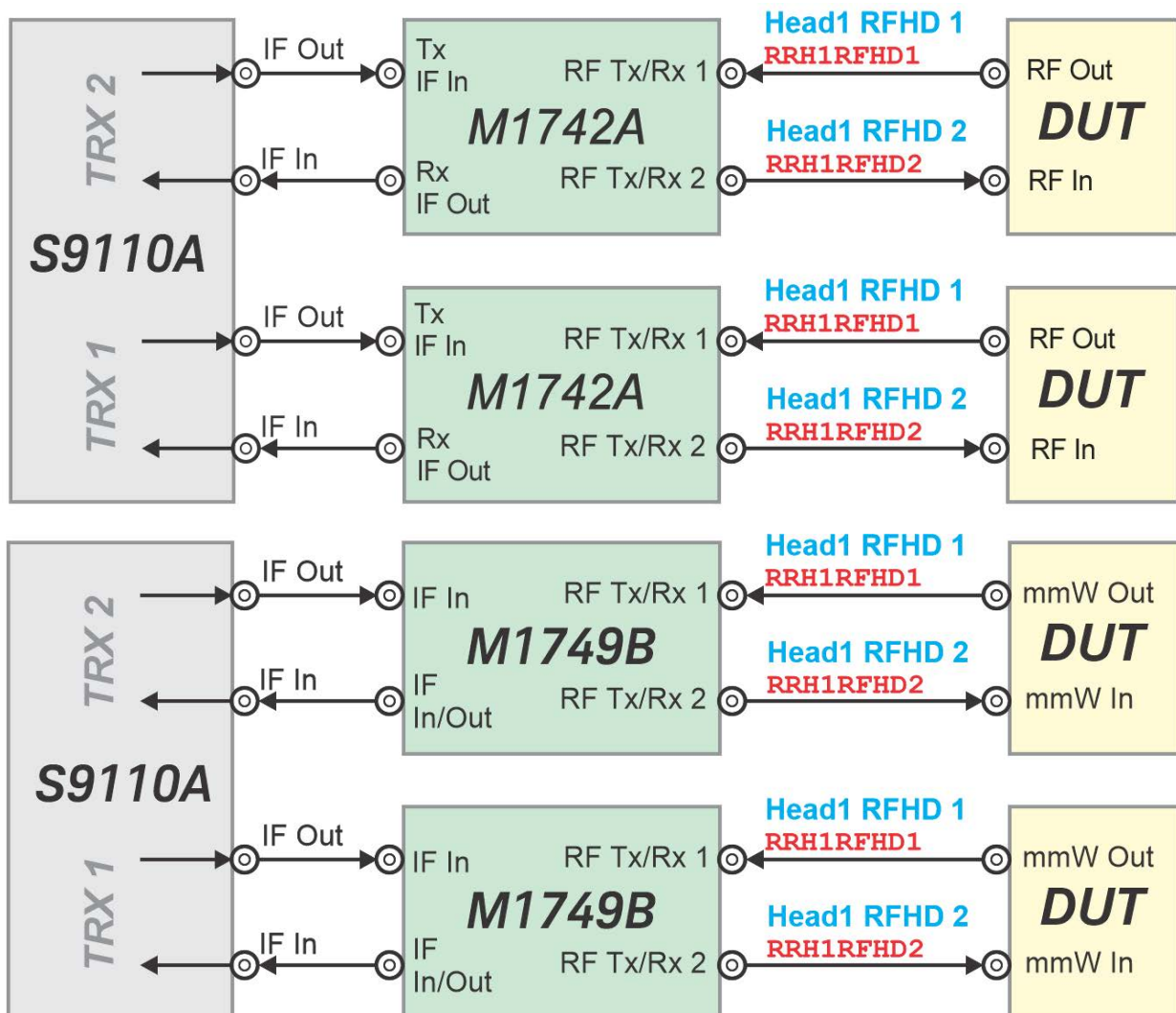
Command:
:FEED:RF:PORT:OUTP RRH1RFHD1

NOTE

If the RF Output port is already set to **Head1 RFHD HD2** but you want to set the *Input* port to **Head1 RFHD HD2**, you must first set the **RF Output Port to None** (command :FEED:RF:PORT:OUTP NONE)

The port settings in the previous example can be reversed, so that the **RF Tx/Rx 2** port on the M1742A/M1749B transmits a signal to the DUT, and the **RF Tx/Rx 1** port receives a signal from the DUT.

Figure 4-17 Example: two TRXs, Tx/Rx1 as input, Tx/Rx2 as output



Set up the RF Input using this menu setting or its equivalent command:

Input/Output > Input > RF Input Port > Head1 RFHD 1

Operating Tasks
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Command:
:FEED:RF:PORT RRH1RFHD1

Then set up the RF Output using this menu setting or its equivalent command:

Input/Output > RF Source > RF Output Port > Head1 RFHD 2

Command:
:FEED:RF:PORT:OUTP RRH1RFHD2

NOTE

If the RF Output port is already set to **Head1 RFHD HD1** but you want to set the *Input* port to **Head1 RFHD HD1**, you must first set the **RF Output Port** to **None** (command :FEED:RF:PORT:OUTP NONE)

Blocker Configuration

For instruments with a BK1 license, SCPI commands can be used to turn on a system configuration with a secondary transceiver source used as a blocker (The blocking signal can also be referred to as the “interfering” signal). This can only be done after both the primary signal and interfering signal have been loaded and are playing on the individual transceivers.

NOTE

Because `:SOUR:CONF:STAT 1` changes the behavior of the system to support an interfering signal, it should be followed with `:SOUR:CONF:STAT 0` when the use of the secondary source is complete.

Below is an example showing the SCPI commands used to set up the blocker. For this example, INST #1 refers to the primary transceiver, INST #2 refers to the secondary transceiver used as the blocker, and INST #3 refers to the S9110A Service Manager.

NOTE

The SCPI addresses for the primary and secondary transceivers can be found by navigating to **System Settings > I/O Config** in XApps. By default, the primary transceiver will be on `hislip0`, the secondary transceiver will be on `hislip1`, and the Service Manager will be on `hislip314`.

1. Load the primary signal onto the primary transceiver and play it.

```
INST #1: SOUR:RAD:ARB:LOAD  
"C:\Keysight\Waveforms\Uplink\ARB\FR2_UL_100M_G_FR2_A1_3_66RB  
S_CID2_FREQ27950.04MHz.wfm"
```

```
INST #1: SOUR:RAD:ARB:WAV  
"FR2_UL_100M_G_FR2_A1_3_66RBS_CID2_FREQ27950.04MHz.wfm"
```

2. Load the interfering/blocking signal onto the secondary transceiver and play it.

```
INST #2: SOUR:RAD:ARB:LOAD  
"C:\Keysight\Waveforms\Uplink\ARB\FR2_UL_100M_ACS_NBB_50MHz_I  
nterferer.wfm"
```

```
INST #2: SOUR:RAD:ARB:WAV  
"FR2_UL_100M_ACS_NBB_50MHz_Interferer.wfm"
```

3. Use the Service Manager to set the conformance state to off, then configure the port setup.

```
INST #3: SOUR:CONF:STAT 0
```


4. Set the primary source frequency, offset, and amplitude.

```
INST #3: SOUR:CONF:PRIM:FREQ 27950040000.0  
INST #3: SOUR:CONF:POW:OFFS -50  
INST #3: SOUR:CONF:PRIM:POW:AMPL -81
```

5. Set the interfering source frequency and amplitude.

```
INST #3: SOUR:CONF:SEC:FREQ 27875770000.0  
INST #3: SOUR:CONF:SEC:POW:AMPL -65
```

6. Turn on the conformance state to enable the configuration.

```
INST #3: SOUR:CONF:STAT 1
```

For more information about SCPI commands, refer to [“SCPI Programming Commands” on page 56](#).

Alignments

Alignments are internal calibration adjustments which the transceiver must make to ensure that internal signal levels are properly maintained.

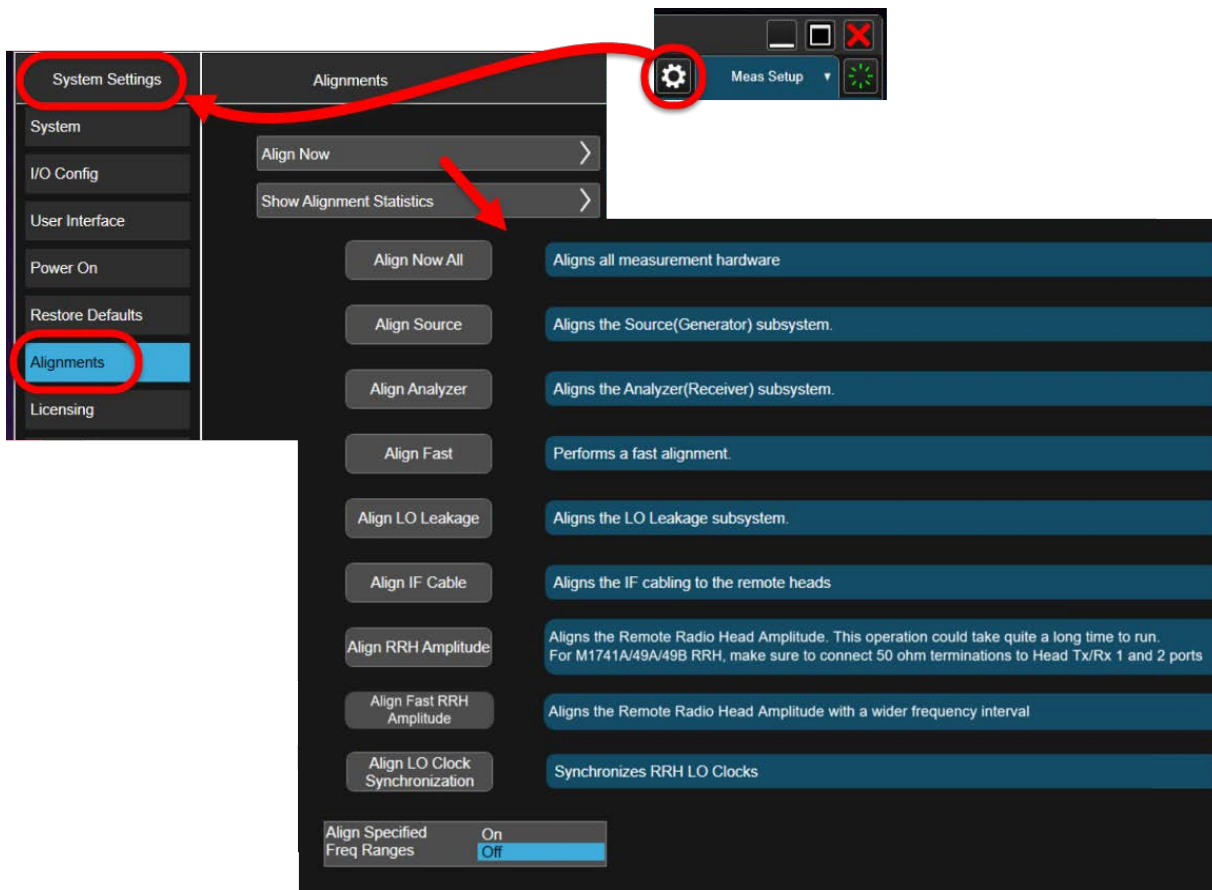
NOTE The alignment process covers the S9110A and its cable connections to the IF ports of the M1742A/M1749B remote radio head. Level correction for the M1742A/M1749B itself is accomplished using a separate process.

Alignments menu

To avoid interruptions, the alignments are not run automatically, either at startup or afterward; you must run them explicitly, using the **Alignments** menu (or sending equivalent SCPI commands).

The **System Settings > Alignments > Align Now** menu is illustrated below (the **System Settings** menus are accessed by clicking on the "gear" icon).

Figure 4-18 Alignments menu



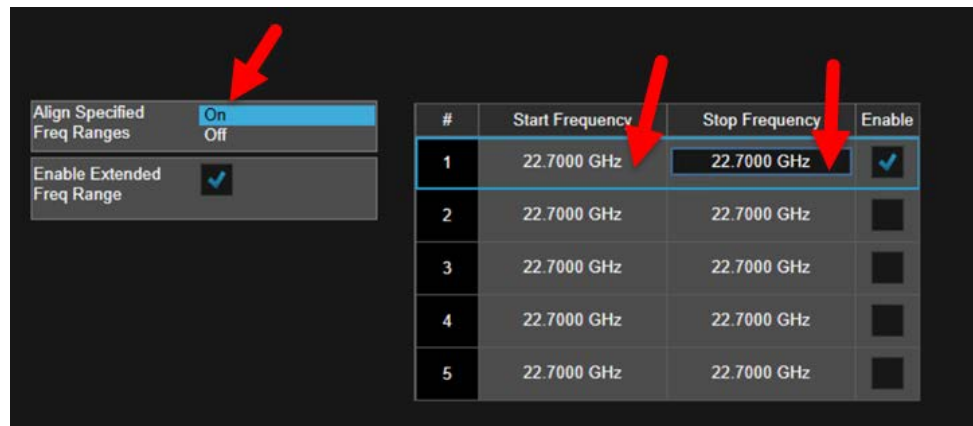
Alignment ranges

Because alignments are time-consuming, it can be useful to limit alignment to a specified frequency range (or a set of specified ranges), so that the alignment is performed only at frequencies which will actually be used in measurement operations. This reduces the overall time required to complete any alignment.

Set **Align Specified Freq Ranges** to **On**. In the frequency table, click on the currently displayed **Start** and **Stop** frequencies to edit them, and click **Enable** next to the frequency ranges you have entered. (You may need to click **Enable Extended Freq Range** to see the frequencies of interest.)

Figure 4-19

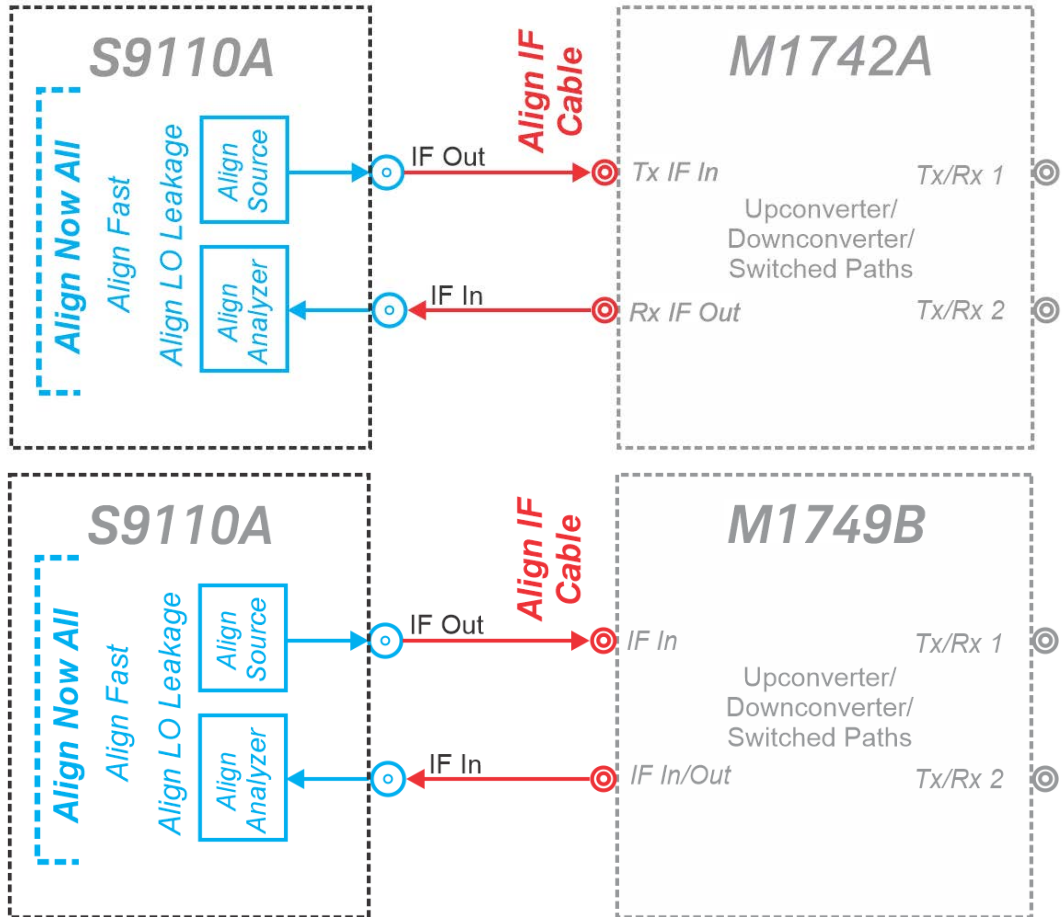
Alignment frequency ranges



Comparing alignment types

The color-coded illustration below shows which parts of the system are covered by different alignment types.

Figure 4-20 Types of alignment



The standard **Align Now All** option (blue in the illustration) is for internal alignment of the S9110A; it assures proper signal levels at the **IF In** and **IF Out** connectors on the S9110A front panel. (See **“All” alignment (weekly use)** on page 85.) Subsets of the **All** alignment can be run, to save time in situations where some signal paths are not used. (See **“Subsets of Align Now All”** on page 86.)

NOTE

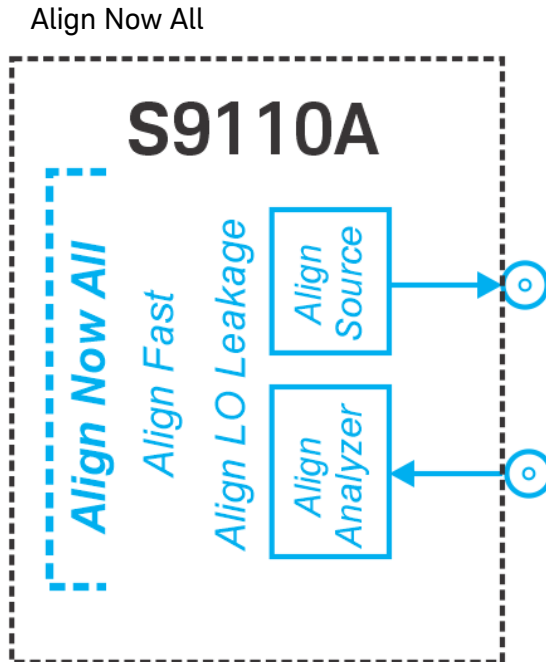
"All" refers to all subsystems within the S9110A itself; the "All" alignment does not encompass the alignment for IF cables to the M1742A/M1749B remote radio head.

The remaining three alignments relate to the M1742A/M1749B.

Align IF Cable (red in the illustration above) includes the IF cables from the S9110A to the M1742A/M1749B; it assures proper signal levels at the **IF In** and **IF In/Out** ports of the M1742A/M1749B.

“All” alignment (weekly use)

Figure 4-21



This alignment of all RF subsystems in the TRX needs to be performed whenever any of the following statements is true:

1. The TRX's internal temperature has drifted more than 5° C since the previous "All" alignment (see [“Checking Temperature and Status” on page 94](#))
2. More than 7 days have elapsed since the previous “All” alignment
3. More than 8 hours have elapsed since the previous "Fast" alignment (or "All" alignment).

The “All” alignment typically takes less than 15 minutes to run.

NOTE

The alignment process requires a 45-minute preliminary warm-up period, after applying power or after restarting the XSA application (when the application is not running, power is not applied to the TRXs; therefore an application shutdown has the same effect on alignment as a power shutdown).

To run the alignment, select **System Settings > Alignments > Align Now > Align Now All**, or send the SCPI command:
:CAL

For M1742A, after the "All" alignment has been run, "Align LO Clock Synchronization" should be run as well (see [“Align LO Clock Synchronization \(S9110A-F32\)” on page 94](#)).

For M1749B, after the "All" alignment has been run, "Align IF Cable" should be run as well (see [“Align IF Cable” on page 88](#)).

Subsets of Align Now All

"Fast" alignment (daily use)

This partial alignment saves time by omitting some of the finer adjustments (such as IF Response Alignments) of the "All" alignment process. "Fast" alignment needs to be performed when any of the following statements is true:

1. The TRX's internal temperature has drifted more than 5° C since the previous "All" alignment (see ["Checking Temperature and Status" on page 94](#))
2. More than 7 days have elapsed since the previous "All" alignment
3. More than 8 hours have elapsed since the previous "Fast" alignment (or "All" alignment).

The "Fast" alignment typically takes less than 9 minutes to run.

NOTE

The alignment process requires a 45-minute preliminary warm-up period, after applying power or after restarting the XSA application (when the application is not running, power is not applied to the TRXs; therefore an application shutdown has the same effect on alignment as a power shutdown).

To run the alignment, select **System Settings > Alignments > Align Now > Align Fast**, or send the SCPI command:
:CAL:INT:FAST

Other partial alignments (rarely used)

The only partial alignment which is run routinely is the "Fast" alignment. However, it is sometimes appropriate to run some other subset of the processes included in **Align Now All**.

This need typically arises when a previous alignment was partly successful, but an error message such as "Align Analyzer skipped" was displayed. You can correct the problem which caused the alignment failure (typically an interfering RF signal applied to an RFIO port) and then run only the part of the "All" alignment that was skipped.

1. Select **System Settings > Alignments > Align Now > Align Source**, or send the SCPI commands:
:CAL:INT:SOUR
*WAI
2. Select **System Settings > Alignments > Align Now > Align Analyzer**, or send the SCPI commands:
:CAL:INT:REC
*WAI
3. Select **System Settings > Alignments > Align Now > Align LO Leakage**, or send the SCPI commands:
:CAL:INT:LOL
*WAI

NOTE

Any alignment process requires a 45-minute preliminary warm-up period, after applying power or after restarting the XSA application (when the application is not running, power is not applied to the TRXs; therefore an application shutdown has the same effect on alignment as a power shutdown).

Align IF Cable

This alignment includes the IF cables from the front panel of the PXIe Subsystem to the instrument-facing side of the M1742A/M1749B remote radio head transceiver; it assures proper signal levels at the **Tx IF In** and **Rx IF Out** ports of the M1742A/M1749B.

This alignment needs to be run whenever the cables are reconnected (or have been subject to significant moving or bending of the cables).

For M1742A, whenever **Align LO Clock Synchronization** is run, **Align IF Cable** should be run following it. For M1749B, whenever **Align Now All** is run, **Align IF Cable** should be run following it.

This alignment typically takes 7 to 10 minutes to run.

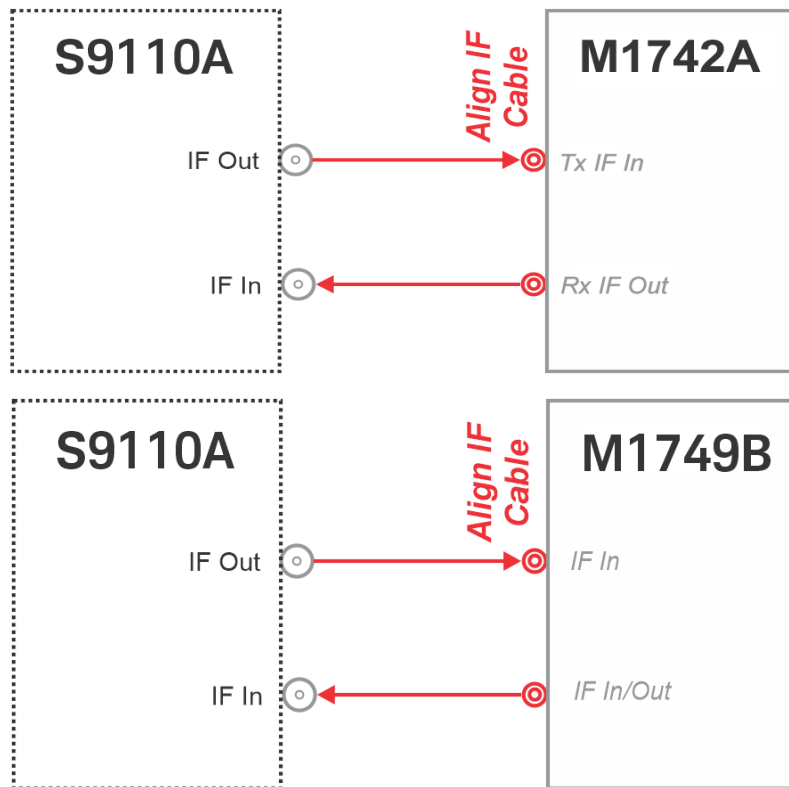
The IF cables must be fully connected to the M1742A/M1749B while running this alignment. (DUT facing connections on the other side of the M1742A/M1749B don't have an effect on this alignment.)

NOTE

The alignment process requires a 45-minute preliminary warm-up period (with the XSA application running).

Figure 4-22

Align IF Cable



Operating Tasks
Alignments

To run the alignment, select **System Settings > Alignments > Align Now > Align IF Cable**, or send the SCPI command:
:CAL:INT:IFC

NOTE

The alignment plane for this process stops at the IF ports of the M1742A/M1749B remote radio head. Level correction for the M1742A/M1749B itself is accomplished using a separate process.

Align RRH Amplitude (S9110A-F32)

The **Align RRH Amplitude** option includes all switched signal paths through the M1742A transceiver; it assures proper signal levels at the **RF Tx/Rx** ports on the DUT-facing side of the M1742A. (This alignment depends on the Align IF Cable alignment being valid.)

The alignment must be run under these circumstances:

1. Upon first use of the S9110A after it arrives from the factory.
2. When more than 7 days have elapsed since the last Align RRH Amplitude.
3. Whenever the internal temperature has changed more than 5°C since the last Align RRH Amplitude.
4. Whenever IF cables have been disconnected, reconnected, replaced, moved, or visibly bent.

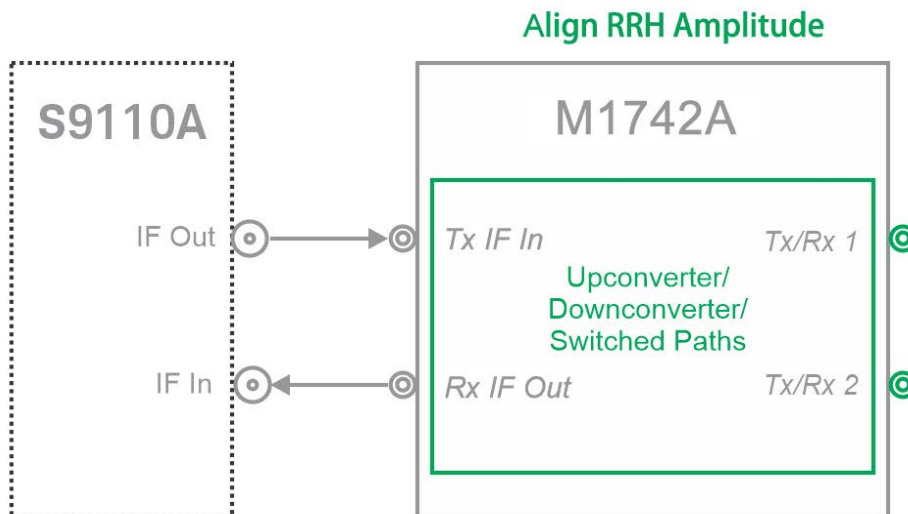
This alignment typically takes 15 minutes to run.

NOTE

When this alignment is run, you must run **Align Now All** first, then **Align LO Clock Synchronization**, then **Align IF Cable**, then **Align RRH Amplitude**.

Figure 4-23

Align RRH Amplitude



To run the alignment, select **System Settings > Alignments > Align Now > Align RRH Amplitude**, or send the SCPI command:

```
:CAL:INT:RRH:AMPL
```

NOTE

The alignment process requires a 45-minute preliminary warm-up period (with the XSA application running).

Align RRH Amplitude (S9110A-F43/F49)

The **Align RRH Amplitude** option includes all switched signal paths through the M1749B transceiver; it assures proper signal levels at the **RF Tx/Rx** ports on the DUT-facing side of the M1749B. This alignment requires 50 ohm terminations on those Tx/Rx ports. (This alignment depends on the Align IF Cable alignment being valid.)

The alignment must be run under these circumstances:

1. Upon first use of the S9110A after it arrives from the factory.
2. When more than 30 days have elapsed since the last Align RRH Amplitude.
3. Whenever the internal temperature has changed more than 5°C since the last Align RRH Amplitude.
4. Whenever IF cables have been disconnected, reconnected, replaced, moved, or visibly bent.

This alignment typically takes 25 minutes to run.

NOTE

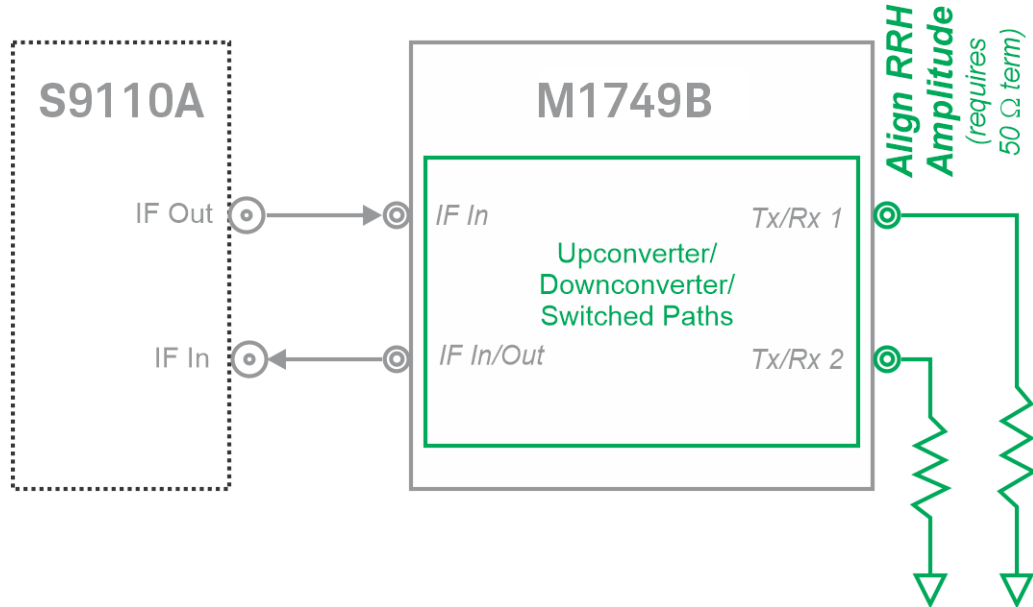
When this alignment is run, you must run **Align Now All** first, then **Align IF Cable**, then **Align RRH Amplitude**.

CAUTION

TERMINATION IS CRITICAL!

This alignment requires that **Keysight 85138A Coaxial Terminations** be connected to the M1749B **Tx/Rx** ports. If the alignment is run without terminations in place, or with a loopback cable connecting the two **Tx/Rx** ports, subsequent measurements may be severely inaccurate.

Figure 4-24 Align RRH Amplitude



To run the alignment, begin by verifying that the terminations are in place on the **Tx/Rx ports**. Then, select **System Settings > Alignments > Align Now > Align RRH Amplitude**, or send the SCPI command:

```
:CAL:INT:RRH:AMPL
```

NOTE

The alignment process requires a 45-minute preliminary warm-up period (with the XSA application running).

Align Fast RRH Amplitude (S9110A-F32)

The **Align Fast RRH Amplitude** option includes all switched signal paths through the M1742A transceiver; it assures proper signal levels at the **RF Tx/Rx** ports on the DUT-facing side of the M1742A. (This alignment depends on the Align IF Cable alignment being valid.)

The alignment must be run under these circumstances:

1. Upon first use of the S9110A after it arrives from the factory.
2. When more than 8 hours have elapsed since the last Align Fast RRH Amplitude.
3. Whenever the internal temperature has changed more than 5°C since the last Align Fast RRH Amplitude.
4. Whenever IF cables have been disconnected, reconnected, replaced, moved, or visibly bent.

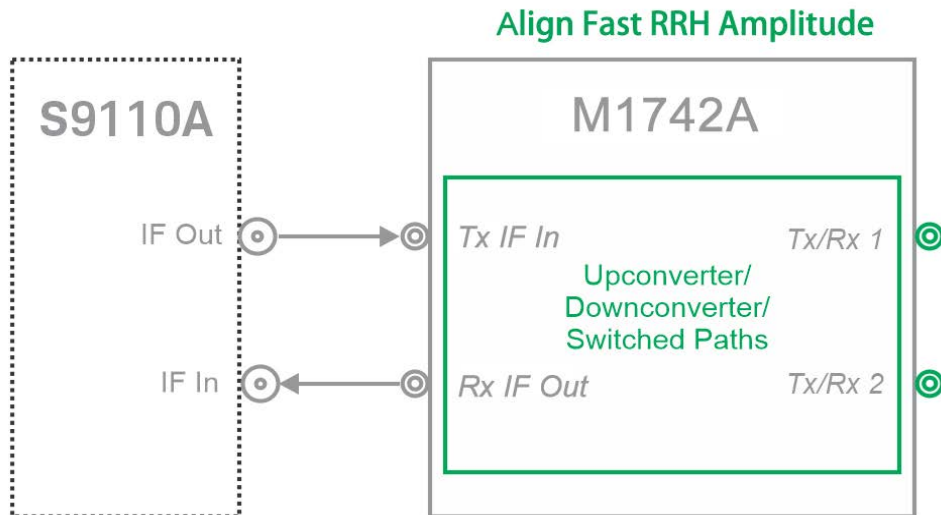
This alignment typically takes 1 minutes to run.

NOTE

An **Align Fast RRH Amplitude** alignment is required for every 8 hours.

Figure 4-25

Align Fast RRH Amplitude



To run the alignment, select **System Settings > Alignments > Align Now > Align Fast RRH Amplitude**, or send the SCPI command:
`:CAL:INT:RRH:AMPL:FAST`

NOTE

The alignment process requires a 45-minute preliminary warm-up period (with the XSA application running).

Align LO Clock Synchronization (S9110A-F32)

This alignment synchronizes the RRH LO clocks. It relates to the **LO 1 Out** and **LO 2 Out** port.

This alignment needs to be run whenever the internal temperature has changed more than 5°C since the last LO clock synchronization alignment. Also, whenever **Align Now all** is run, **Align LO Clock Synchronization** should be run following it.

To run the alignment, select **System Settings > Alignments > Align Now > Align Lo Clock Synchronization**, or send the SCPI command:
`:CAL:INT:RRH:LOS`

Align LO Clock Synchronization (S9110A-F43/F49)

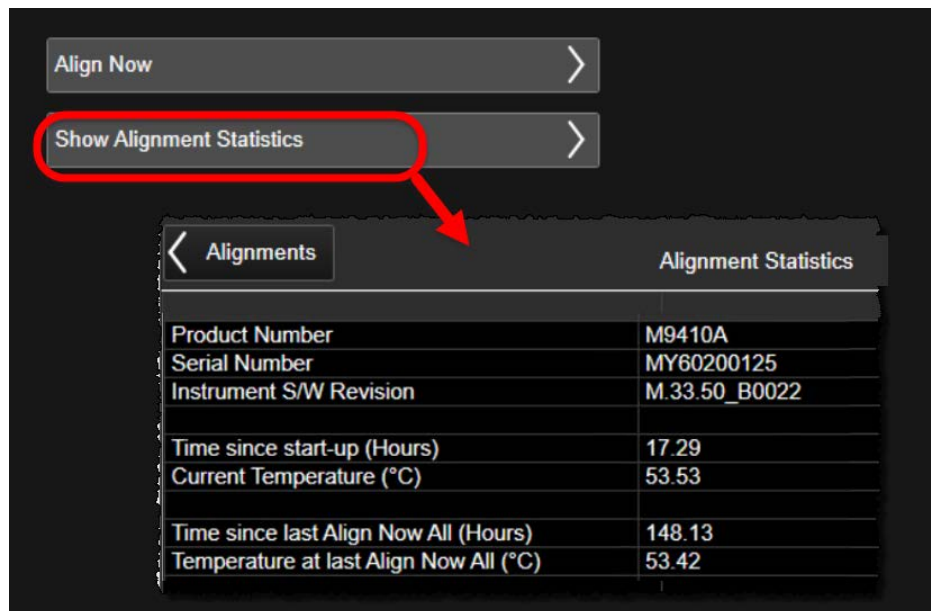
This alignment is reserved for future use. It relates to the **LO 2 Out** port, which is not currently used by the system. (However, accidentally running this alignment does no harm.)

Checking Temperature and Status

The PXIe subsystem's internal temperature and the time since the most recent alignment can be checked by selecting **System Settings > Alignments > Show Alignment Statistics**, as illustrated below.

Figure 4-26

Show Alignment Statistics



LAN Address Configuration

The S9110A supports both dynamic and static assignment of its IP address, using ports LAN 1 and LAN 2.

The LAN 1 port is designed for dynamic IP addressing, using the Dynamic Host Configuration Protocol. If your site network supports DHCP, the S9110A will be assigned an IP address automatically when it is connected to the LAN. Once the address is assigned, it is listed, along with the computer name, under **System > Show > System**. The address or computer name can be used to find the S9110A on the LAN. However, to see the **System > Show > System** screen and find this information, it is necessary either to connect a monitor to the front panel monitor port, or else to use the LAN 2 port to connect to a PC directly.

Figure 4-27 Checking the LAN address

System Settings	System Information		
System	Keysight Technologies	Keysight VXT Vector Transceiver	
	Keysight VXT	M9410A	
	Product Number	M9410A	
	Serial Number	MY60200138	
	S/W Release Name	2022	
	Instrument S/W Revision	S.33.01_B0003	
	Revision Date	9/22/2022 1:33:12 PM	
	Computer System	Windows 10	
	Computer Name	K-M9038A-10056	
	LAN Port1	---	
	LAN Port2	---	
	IP Address	141.121.93.159	
	IPv6 Address	---	
	Link-Local IPv6 Address	fe80::a063:647b:cc43:8865%12	
	Host ID	PCSERNO,HS98738633	
	mDNS Enabled	No	
	Option	Name / Description	Option Version
	M9410A-1EA		---
	M9410A-B12		---
	M9410A-EP6		---
	M9410A-F06		---
	M9410A-M05		---
	M9410A-RCV		---
	M9410A-RH1		---
	M9410A-SRC		1.3.63222.24381
	N90E1S91A	5G Multi-Band Vector Transceiver	---
	S91XXF49_MU_MY62030146		---
	S91XXF49_MU_US62030146		---
	V9060EM0E	IQ Analyzer Measurement Application	---
	V9065EM1E	Sequence Analyzer for Device Application	---
	Y9085EM0E	5G NR Measurement Application	1.3.63222.24381

Using the LAN ports to connect the S9110A directly to the public LAN is potentially insecure, because the S9110A does not provide anti-virus protection. Connecting the system to the public LAN by way of a PC with antivirus protection is the preferred solution.

To find the S9110A on the LAN, you will need to know its IP address or computer name. If you cannot easily obtain a monitor view of **System > Show > System**, you can determine the computer name using the instrument serial number. The computer name is in the format **K-M9038A-xxxxx**, ending in the last five digits of the serial number.

Configuring the LAN

Hostname

The Computer Name, or hostname, is pre-configured from the factory. It must be a unique name so that it does not conflict with other equipment on your LAN. The pre-configured Computer Name is K-M9038A-xxxxx, where xxxxx represents the last 5 digits of the S9110A serial number.

To change the Computer Name consult the Microsoft Windows Help and Support Center.

IP Address & Gateway

The S9110A is pre-configured to obtain an IP Address using DHCP. The IP Address and Gateway can be changed. Consult the Microsoft Windows Help and Support Center to configure the LAN.

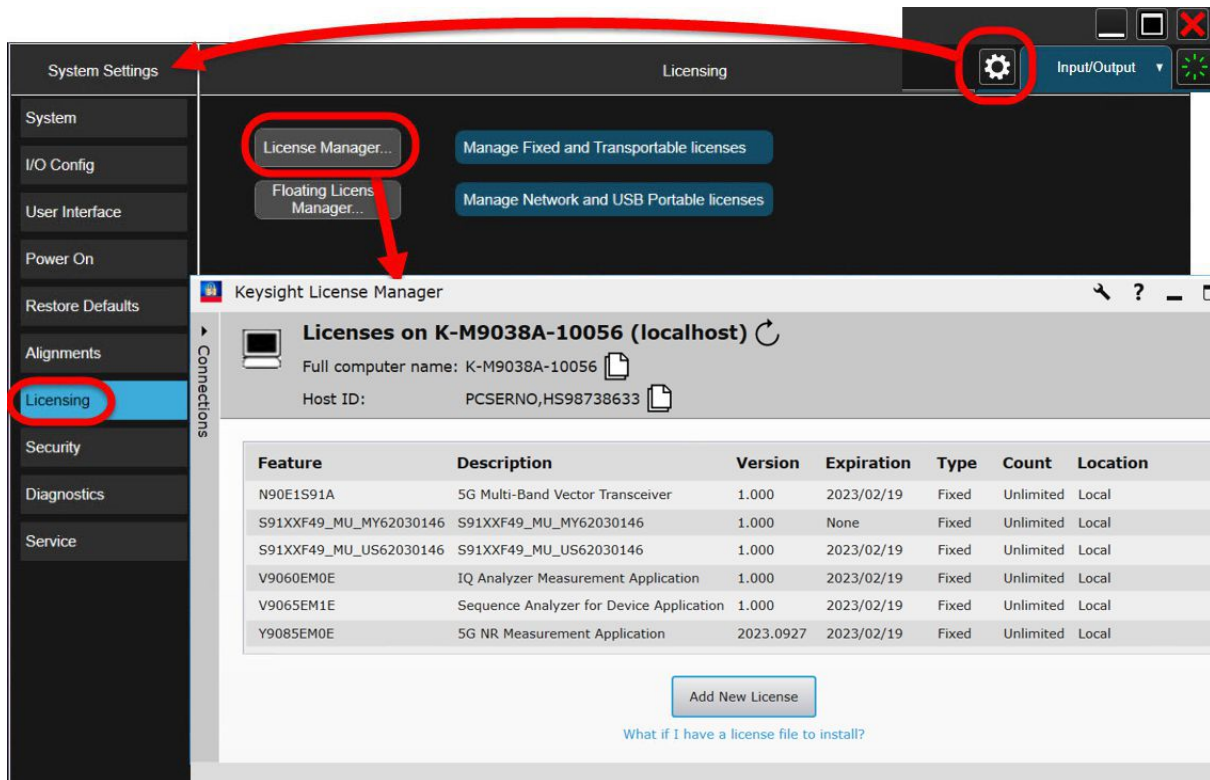
Managing Licenses

Licenses can be tied to a particular instrument, or transferable from one instrument to another by various means.

Licenses can be either time-based or perpetual (the latter have no expiration date).

To verify which licenses are installed, open the Keysight License Manager from the Windows **Start** menu. (It can also be opened by clicking the "gear" icon at the upper left to open the **System Settings** screen, and clicking **Licensing > License Manager**.) The licenses installed on the S9110A are listed, with information provided about license types and expiration dates (in the illustrated example, "Fixed" indicates a node-locked license).

Figure 4-28 Installed licenses (as displayed in Keysight License Manager)



Node-locked License

A node-locked license is a license which permits the licensed software to run on one particular machine. Each node-locked license is locked to an instrument or computer; the license is resident on the hard disk of the system it is locked to, and that system runs the licensed feature or product.

Trial licenses, which are sometimes provided by Keysight so that customers can try out a product, are node-locked, time-based licenses. Trial licenses are issued for a particular instrument or computer, and have an expiration date.

Transportable License

A transportable license is a type of node-locked license which is not tied permanently to a single instrument: it can be unlocked from one client host and then locked to another client host (however, it can only be assigned to one instrument at a time).

A transportable license is installed on an instrument by copying the contents of a license file into the Keysight License Manager application (KLM), either manually (copy and pasting file contents) or by placing the license files on a USB memory device (KLM automatically takes in any license files detected on the memory device). KLM can also be used to delete a license, or transport it to a different instrument.

Unlike permanently node-locked licenses, which are pre-installed at the factory with new instrument purchases, transportable licenses require redemption and installation of the license before the first use. This allows the user to determine on which instrument to initially install the application license.

Transportable licenses require a connection to the Keysight Software Manager (KSM) web site:

<https://ksm.software.keysight.com/ASM/External/>

However, the connection to KSM is needed only for managing the check-in or check-out of the license. KSM also provides for storage of unused licenses which have been transported off instruments but are awaiting assignment to new instruments. The server will limit the number of transports per 30 day period per application license to 10.

Keysight recommends that instruments use the same instrument software release to ensure the latest code is available on each instrument, so that the user experience is identical between instruments. This is particularly important when transporting the license for a newly-released application which may only be available in the latest software release.

After initial installation of the license, when you want to transport a license, run Keysight License Manager on the host that currently has the license, and transport the license. (Select **Help > Keysight License Manager Help** and search for “transport” to find detailed instructions.)

NOTE

Transportable licenses for the S9110A allow you to transport licenses up to 30 times within 10 days.

Other related topics for managing your software and licenses can be found by reviewing the Keysight License Manager Help available by clicking **"?"** icon in the KLM window.

USB-Portable License

A USB portable license is another type of transferable license, in which the license is tied to a dongle which can be plugged into the instrument's USB port.

A USB-portable license is a version of a transportable license, in which the license is locked to a USB dongle rather than to an instrument. An instrument that runs the licensed feature or product must have the license file resident on its disk drive, and have the dongle connected to one of its USB ports when it runs the licensed feature or product. Transporting the license, in this case, becomes a simple matter of plugging the USB device into a different instrument.

Floating License

A floating license (sometimes referred to as a network license) is another type of transferable license, in which the license is assigned temporarily by a designated license server. Setup your license server by installing Keysight License Manager 6.

Floating licenses reside on the license server and are checked out for use by Keysight products (instruments or applications), then returned (checked in), when no longer needed, so that they can be used on another computer or instrument.

Floating licenses can also be borrowed for a specified number of days. Once you have borrowed a license, you can disconnect the licensed instrument or computer from the license server and continue to use the license offline for the duration of the borrow period.

Installing a floating license

Server setup:

1. Install Keysight License Server or Keysight License Manager on the server machine.
2. Obtain a license file.
3. Save the license file.
4. Use manual process or Keysight License Manager to add the license file and start the server process.

Client setup:

1. Install the Keysight product/software to be licensed.
2. Install Keysight License Manager.
3. Use Keysight License Manager to specify license server (provides access to licenses).
4. Start the product.

NOTE

The Keysight implementation of FlexNet Publisher floating licensing requires the FlexNet Publisher license server manager (*lmgrd*) and Keysight vendor daemon (*agileesofd*) to run on any local computer used as a license server system.

5 S9110A Operating System

The following topics can be found in this section:

[“Keysight Software Installed” on page 102](#)

[“User Accounts” on page 103](#)

[“Licensing New Application Software - After Initial Purchase” on page 105](#)

[“Transporting a License Between Systems” on page 107](#)

[“Windows Security” on page 110](#)

[“System Maintenance” on page 113](#)

[“Instrument software installation” on page 120](#)

Keysight Software Installed

Use of the S9110A measurement applications requires appropriate licenses. Whichever licenses were purchased with the instrument are installed at the factory (see **“Application Licenses” on page 15**). Other licenses can be purchased and installed later (including transportable licenses). For more information, see:

<https://www.keysight.com/us/en/product/S9110A/s9110a-wideband-transceiver-test-solution.html>

Customer Installation of Software

3rd Party software verified by Keysight

Keysight has verified that the following program is compatible with the S9110A applications: Symantec AntiVirus™ Corporate Edition version 10.

Installation of other 3rd party software

The S9110A platform is an open Windows environment, so you can install non-approved software on the system. However, installation of non-approved software may affect performance. Keysight does not warrant the performance of the system with non-approved software installed.

NOTE

Before installing any additional programs on the system, you should exit the S9110A Application.

Also, you must not remove any applications or programs that are installed on the S9110A when it was shipped from the factory.

If you install programs other than those that Keysight has tested, it could cause problems with the S9110A applications. If this happens, you should try uninstalling the program that has caused the problem, or try changing the program's configuration. If this does not correct the problem, you may have to use the Keysight Recovery system to reinstall the S9110A system software.

Installation of additional or updated Keysight software

See **“Instrument software installation” on page 120**.

User Accounts

Administrator login

The Administrator account ships from the factory with the password “Keysight4u!”. Using the Administrator account you can perform the following operations:

- Install software
- Configure network and printer access
- Access all files on the S9110A
- Add or change user accounts and passwords
- Change Firewall settings
- Change Windows settings
- Change the time and date
- Run any application

User login

The default user account that ships from the factory is “Instrument” with the password “measure4u”. This user is a member of the Standard Users group. Using the Instrument account you can perform the following operations:

- Access files on the S9110A that are accessible to the Standard Users group
- Run applications that are accessible to the Standard Users group

Customer creation of accounts

You can create additional user accounts and decide on the level of security granted to any new user accounts created. For example, the level of security can be assigned as administrator, power user, user, backup operators. User names are not case sensitive but passwords are case sensitive.

NOTE

For the S9110A software to operate, the user account executing the software must be assigned Administrator or Power User privileges. Otherwise, the software will not operate correctly.

It is Keysight's expectation that each user's My Documents folder is mapped to the D: drive. This is to avoid overwriting the user's data in the event the Keysight Recovery must be performed. Also, this facilitates convenient backup by copying the contents of the D: drive to external media. All users accounts created by the factory already have My Documents mapped to the D: drive. Please map all new users My Documents folders to the D: drive.

Licensing New Application Software - After Initial Purchase

Additional measurement application software can be ordered after your initial purchase of the S9110A. Software upgrades are provided in a kit that includes an option based Entitlement Certificate. The licenses are downloaded from the license Web site onto a storage device so they can be loaded into the instrument.

If you do not want to wait for your upgrade kit to arrive, licenses can be installed using any available USB storage device. If you choose to do this, we recommend that the latest version of the instrument software be installed. This ensures that the measurement application being licensed and installed matches the most current version of the instrument software.

The latest revision of the software may be downloaded from:

<https://www.keysight.com/us/en/product/S9110A/s9110a-wideband-transceiver-test-solution.html>

A license key is usually for one instrument model and serial number combination. The license key will only install itself on that instrument.

NOTE

No calibration is required after a S9110A application installation.

The installation procedure is as follows:

Step	Action	Notes
1. Redeem the Option Upgrade Entitlement Certificate	Follow the instructions on the certificate.	Log into MyKeysight at http://www.keysight.com/my and go to the Keysight Software Manager to redeem your entitlement certificate. After redeeming your Option Upgrade Entitlement Certificate you will receive an e-mail with a License Certificate (.lic file).
2. Save the license file	Save the .lic file to the root directory of a USB storage device.	
3. Load the license file	Connect the USB storage device to one of the S9110A USB ports.	Windows will detect the new hardware and may display the configuration menu. The S9110A automatically loads the license file. (This may take a few minutes) Upon completion, the Keysight License Manager displays a "Successful License Installation" message.

NOTE

Alternatively the license file can be manually installed over USB or LAN by placing the license file in the following folder on the S9110A.
C:\Program Files\Agilent\licensing

S9110A Operating System
Licensing New Application Software - After Initial Purchase

Step	Action	Notes
4. Verify installation	The S9110A automatically loads the license file. (This may take a few minutes). Upon completion, the Keysight License Manager displays a "Successful License Installation" message.	On the License tab of the System > System Information window, verify that the new license is listed.
5. Restart the S9110A Application	Close the S9110A Application and re-launch it, to activate the new license.	

Transporting a License Between Systems

Transportable licenses are identified as such in the **Type** column of Keysight License Manager.

To transport a license from one system to another, Keysight recommends that both systems be at the same instrument software release. This ensures that the user experience is identical between instruments.

As a minimum, the instrument software release in the S9110A that will receive the transportable license (the "target instrument") must at least be able to support the desired application.

The S9110A supports several ways of transporting licenses. The procedure below will focus on the most common procedure, where neither of the systems has access to an internet connection. For this procedure to work, a PC with an internet connection is required.

You will need the following:

- USB flash drive
- USB keyboard
- USB mouse

We will refer to the system from which the transportable license will be removed as the "source instrument". We will refer to the system which will receive the transportable license as the "target instrument".

The installation procedure is as follows:

Step	Action	Notes
1. Connect the USB devices to the source instrument	Connect the USB flash drive, USB keyboard, and USB mouse to the USB ports on the source instrument.	It will be necessary to use one or more of the rear panel ports to connect the USB devices.
2. Verify software version in each instrument	For each instrument, select System > System Information > System and make note of the Instrument S/W Revision on each.	Ideally, the revisions will be the same. But at least, both versions should be able to support the application whose license is being transported.
3. Obtain the Host ID from the Target Instrument	On the target instrument, select System > System Information > System and make note of the Host ID.	This information will be needed to issue the license for the target instrument. The Host ID is the model number, followed by a comma, followed by the serial number.

Step	Action	Notes																																																	
<p>4. Start the License Manager on the Source Instrument</p>	<p>Using the Windows Start menu on the source instrument, open Keysight License Manager. It may take a minute for the Keysight License Manager screen to be fully populated with all the installed licenses:</p>																																																		
	<table border="1"> <thead> <tr> <th>Feature</th> <th>Description</th> <th>Version</th> <th>Expiration</th> <th>Type</th> <th>Count</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>N90E1S91A</td> <td>5G Multi-Band Vector Transceiver</td> <td>1.000</td> <td>2023/02/19</td> <td>Fixed</td> <td>Unlimited</td> <td>Local</td> </tr> <tr> <td>S91XXF49_MU_MY62030146</td> <td>S91XXF49_MU_MY62030146</td> <td>1.000</td> <td>None</td> <td>Fixed</td> <td>Unlimited</td> <td>Local</td> </tr> <tr> <td>S91XXF49_MU_US62030146</td> <td>S91XXF49_MU_US62030146</td> <td>1.000</td> <td>2023/02/19</td> <td>Fixed</td> <td>Unlimited</td> <td>Local</td> </tr> <tr> <td>V9060EM0E</td> <td>IQ Analyzer Measurement Application</td> <td>1.000</td> <td>2023/02/19</td> <td>Fixed</td> <td>Unlimited</td> <td>Local</td> </tr> <tr> <td>V9065EM1E</td> <td>Sequence Analyzer for Device Application</td> <td>1.000</td> <td>2023/02/19</td> <td>Fixed</td> <td>Unlimited</td> <td>Local</td> </tr> <tr> <td>Y9085EM0E</td> <td>5G NR Measurement Application</td> <td>2023.0927</td> <td>2023/02/19</td> <td>Fixed</td> <td>Unlimited</td> <td>Local</td> </tr> </tbody> </table>	Feature	Description	Version	Expiration	Type	Count	Location	N90E1S91A	5G Multi-Band Vector Transceiver	1.000	2023/02/19	Fixed	Unlimited	Local	S91XXF49_MU_MY62030146	S91XXF49_MU_MY62030146	1.000	None	Fixed	Unlimited	Local	S91XXF49_MU_US62030146	S91XXF49_MU_US62030146	1.000	2023/02/19	Fixed	Unlimited	Local	V9060EM0E	IQ Analyzer Measurement Application	1.000	2023/02/19	Fixed	Unlimited	Local	V9065EM1E	Sequence Analyzer for Device Application	1.000	2023/02/19	Fixed	Unlimited	Local	Y9085EM0E	5G NR Measurement Application	2023.0927	2023/02/19	Fixed	Unlimited	Local	
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Y9085EM0E	5G NR Measurement Application	2023.0927	2023/02/19	Fixed	Unlimited	Local																																													
<p>5. Transport the Transportable License from Source Instrument</p>	<p>Follow these steps:</p> <ol style="list-style-type: none"> 1. On the source instrument, locate the desired license to be transported in the KLM window and click on it to highlight it. Its option designator should include the letters "TP" or "TY". 2. Right-click on the mouse and select Delete. 3. Click Yes in the License Deletion Confirmation dialog box. 4. After a few seconds, a Transport License dialog box will appear. Click OK and save the *.url file on the USB flash drive, with a name such as "5G_license.url" 	<p>Be sure you are selecting a transportable license and not a node-locked (perpetual) license.</p> <p>Although you are "deleting" the transportable license, the ultimate action will be to transport it.</p> <p>The information in this dialog box will be used to issue a new license for the target instrument.</p>																																																	
<p>6. Get New License from KSM Transportation Web page</p>	<p>Follow these steps:</p> <ol style="list-style-type: none"> 1. Insert USB flash drive into PC that is connected to the internet. 2. On the PC, locate the *.url file on the USB flash drive that was saved in the previous step and click on it. 3. After a few seconds, the KSM Transportation Web page will appear. One field, the New Host ID, will be empty. 4. Enter the Host ID of the target instrument (step 3 above) into the field marked New Host ID. 5. Click Submit. 	<p>The PC must have an internet connection and an available USB port.</p> <p>Most of the fields have been populated from the information in the *.url file.</p> <p>Be very careful when entering the New Host ID. A mistake made in entering the New Host ID will result in an invalid license being issued. Be sure there is a comma between the model number and serial number. There should be no spaces in the Host ID.</p>																																																	

Step	Action	Notes
7. Save License File to USB Flash Drive	Follow these steps: 1. The KSM Transportation Web page will indicate that a license file is available and display two links to the license file. Right-click on the license file and select Save Target As... 2. Save the license file to the root level of the USB flash drive, keeping the ".lic" file extension. 3. Close the Save dialog and exit the KSM Transportation Web page.	Either link can be used to either display or save the license file. The license file must be saved to the root level of the USB flash drive for it to be recognized by the target instrument.
8. Install License File in Target Instrument	Follow these steps: 1. With the target instrument running, insert the USB flash drive into one of the front panel USB ports. After a few minutes, you should see a message saying "Successful License Installation". 2. Cycle power on the target instrument. 3. Once the system has re-booted, the application should be ready to use on the target instrument.	The Keysight License Services running on the target instrument looks for *.lic files whenever it detects a USB device has been inserted. If the contents of the *.lic file are appropriate for the instrument, the license will be installed automatically. Newly-installed licenses are only recognized by the instrument software on power-up.

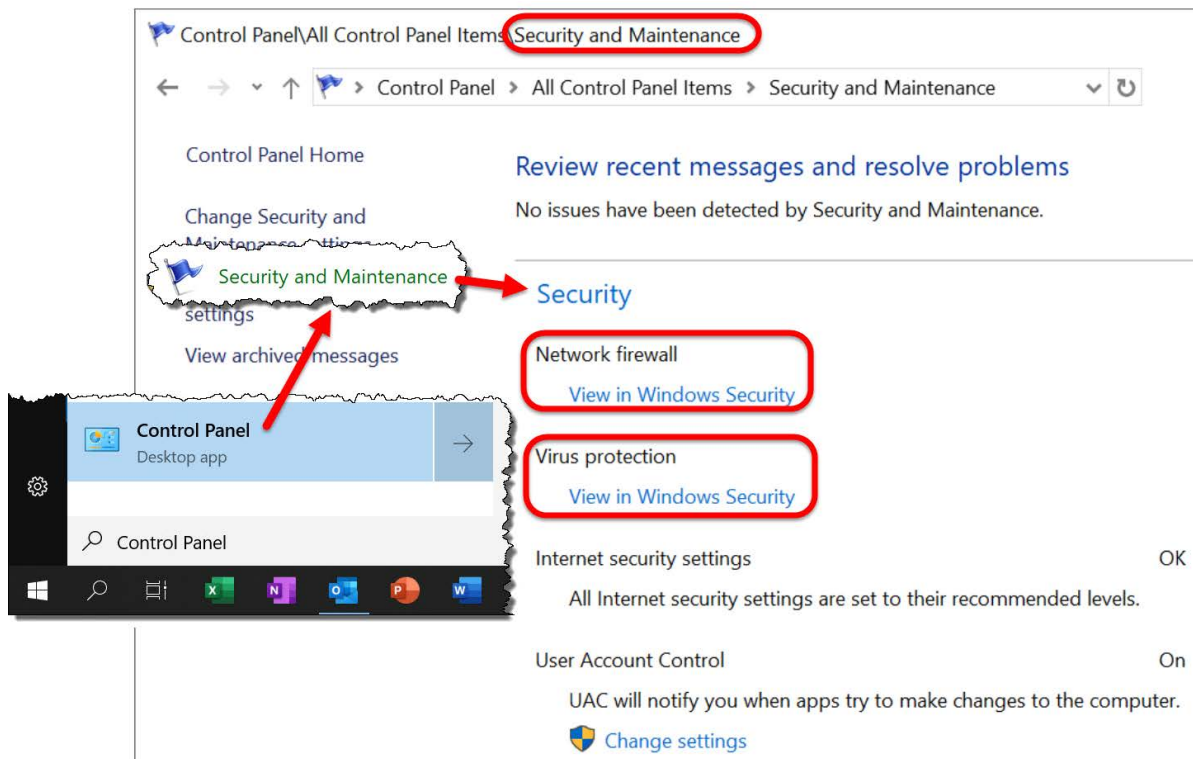
Windows Security

Microsoft recommends the following to ensure the S9110A Windows operating system is protected:

- Use an Internet firewall.
- Get the latest critical Windows updates.
- Use up-to-date antivirus software.

To check the status or make changes in the security settings for your system, click **Start, Control Panel**, and then **Security and Maintenance**. The following window appears:

Figure 5-1 Security and Maintenance



Windows Firewall

Click **Windows Firewall** in the System and Security window to check the firewall status of your system. The system is shipped with the Windows Firewall enabled.

Figure 5-2

Windows Firewall

🔒 Firewall & network protection

Who and what can access your networks.

🏢 Domain network

Status unavailable, open Symantec Endpoint Protection for information.

[Open Symantec Endpoint Protection](#)

🏠 Private network

Status unavailable, open Symantec Endpoint Protection for information.

[Open Symantec Endpoint Protection](#)

🌐 Public network

Status unavailable, open Symantec Endpoint Protection for information.

[Open Symantec Endpoint Protection](#)

Windows Firewall exceptions for programs and ports have been added to allow proper operation of the system over a network. Modifying these settings may prevent the system from operating properly.

Virus protection

Under **Action Center** in the **System and Security** window, click **Review your computer's status and resolve issues** to check the status of virus protection on your system. There is no antivirus software included with your S9110A. Antivirus application software has been tested to be compatible with the system. See the section on **“3rd Party software verified by Keysight” on page 102** for anti-virus software that has been tested by Keysight.

NOTE

Having antivirus software installed may have a slight impact on the S9110A performance.

Figure 5-3

Virus protection

Virus & threat protection

Protection for your device against threats.

Symantec Endpoint Protection

Symantec Endpoint Protection is turned on.

Current threats

Status unavailable, open Symantec Endpoint Protection for information.

Protection settings

Status unavailable, open Symantec Endpoint Protection for information.

Protection updates

Status unavailable, open Symantec Endpoint Protection for information.

[Open app](#)

[Windows Defender Antivirus options](#)



Spyware protection

The **Review your computer's status and resolve issues** window described above also shows the status of spyware protection. There is no anti-spyware software installed on the system. This should not be a problem if you do not use the S9110A for a lot of internet browsing. Having spyware in the system could have an impact on the S9110A performance.

System Maintenance

Back-up

It is recommended that you have a regular back-up strategy for all files which you create (these will be on the **D:** drive). Your IT department may already have a back-up strategy in place which is suitable for the S9110A and its data.

The Windows operating system has a Backup utility that you can use to archive files and folders in case of a hard disk drive failure. See the Microsoft Windows Help and Support Center for more information on this utility.

When performing back-ups, we recommend that you back-up the data to an external storage device connected to your company's internal network or one of the S9110A's USB connectors. Also, you should perform back-ups at times when the Server PC is not being used for normal operations as it may impact the system's overall performance.

System Restore

The Windows operating system has the capability to restore the system to a previous point in time. System Restore is enabled with default settings as provided by Microsoft. However, System Restore is not 100% successful. Therefore, it is not the recommended method to back-up the instrument. System Restore has not been tested to verify successful restoration on this instrument.

Disk defragmenting

Over time the hard disk on the S9110A controller becomes fragmented. Windows has a Disk Defragmenter utility that you can use to defragment the hard disk. See the Microsoft Windows Help and Support Center for more information on this utility.

NOTE

Running Disk Defragmenter should be done when the measurement application is not running. Measurement throughput is significantly impacted while disk defragmentation is in process.

USB Connections

The instrument provides USB 2.0 ports on the front panel and rear panel (see **“Front Panel Features” on page 18** and **“Rear Panel Features” on page 25**). These can be connected to USB mass storage devices and to accessories such as printers and keyboards. The system USB Host support includes the standard Microsoft Windows USB class drivers for human interface, mass storage, printing, scanning, and imaging devices.

In addition, the Keysight IO Libraries software that was included with your S9110A contains USB Host drivers that allow control of other instruments connected to the USB bus.

Keysight Technologies does not support or warrant correct operation if additional USB drivers from third parties are installed in the S9110A. It is possible that additional drivers could break the normal USB operation. If USB operation is broken, recovery might require reinstalling the S9110A application using the hard drive recovery process.

Hard Drive Partitioning and Use

The drive is partitioned into 3 sections: **C:**, **D:**, and **E:**

- The **C:** partition contains the Windows operating system and software installed by Keysight. This is an Open System which means you can install additional software. However, only a limited set of software applications are tested for use with the Keysight measurement software. The installation and/or use of other software is not warranted and could interfere with the operation of the measurement software. If instrument repair is ever needed, the Keysight version of the **C:** drive is the only part of the instrument software that is restored by the Instrument Image Recovery System. You must reload any other software that you have added in the instrument.
- The **D:** partition is reserved for data storage. The User Accounts that are configured by Keysight have their Users folder mapped to the **D:** drive. This is for the convenience of backing-up the S9110A measurement data. You should always back-up the data on the **D:** drive to an external device. This enables you to restore the data should the hard drive need to be replaced.
- The **E:** partition is reserved for Keysight’s use. The primary use of the **E:** drive is for storing the Calibration and Alignment data. Do not change or overwrite the files on this drive. This could cause your instrument to not meet specifications, or even to stop functioning correctly. Do not use this drive for data storage.

Hard Drive Recovery Process

The Keysight Recovery System can be used to repair errors on the S9110A's **C:** drive partition, or to restore the original factory configuration of the system software. The Keysight Recovery System is stored in a separate hidden hard disk drive partition.

Repairing errors on the hard disk drive may result in loss of data or files. If you need more information about the Windows “chkdsk” error repair process, see the chkdsk documentation in the Microsoft Windows Help and Support Center.

Restoring the original factory system software does not restore any of the following items:

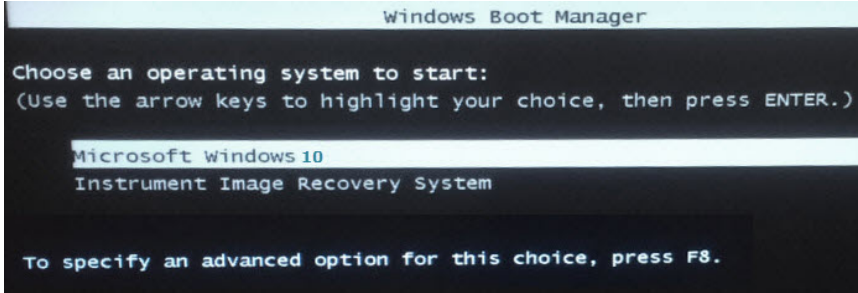
- Windows system configurations that were made after the system was shipped from the factory. For example, Windows and Service Pack updates, user accounts, and Windows configuration settings. After an Keysight Recovery, these configurations need to be redone.
- Additional software that was installed after the system was shipped from the factory. After an Keysight Recovery, that software needs to be re-installed.
- Any data or programs saved on the **D:** or **E:** drives.
- Any upgrades that were made to the Keysight measurement application software.

Restoring the original factory system software will not synchronize the code in the Field Programmable Gate Arrays (FPGAs) on the various hardware assemblies. As a result, you may see an error dialog box appear during the final boot-up at the end of the recovery process. This typically occurs when there are significant differences between the software version installed prior to performing the recovery and the version restored by the recovery. In these situations, upgrade the software to the latest version.

NOTE

It is recommended that you use a regular back up strategy. Your IT department may already have a back up strategy in place which is suitable for the S9110A and its data. See **“Hard Drive Partitioning and Use” on page 114**. Using the Keysight Recovery System in conjunction with a regular back up strategy should allow you to fully recover the S9110A software and data.

It is recommended that routine backups of the S9110A information be performed to keep current archives of the system information. This allows a full recovery of the S9110A information after the recovery system operations are performed. See **“Hard Drive Partitioning and Use” on page 114** for more details.

Step	Notes
1. Make sure the S9110A is turned off.	
2. Turn S9110A power on.	After the Keysight Technologies screen is displayed, the Windows Boot Manager screen is displayed for five seconds. 
3. When the Keysight Recovery System has booted, follow the on-screen instructions to recover the image of the C: drive.	Follow these steps: 1.Press 2, then press Enter to select the recovery. 2.Press 1, then press Enter to continue. 3.Press 1, then Enter to confirm.
4. Wait for the reboot	After exiting the Keysight Recovery System, the S9110A reboots.

NOTE

Additional recovery steps may be required to fully recover the system to a more current working state. This could involve restoring your own backups of the S9110A configuration, including re-installing applications, data, and performing system customizations.

Updating the software

The purpose of this update is to ensure that the S9110A's software, its measurement mode applications, and the FPGA content of its PC boards are all current and up to date.

NOTE

An update to the instrument software revision does not require a new license key for the measurement applications, so long as the applications were licensed prior to the update.

NOTE

This procedure will only update the instrument software that currently resides on the C: drive of the instrument. It will not update the version that exists on the recovery partition. Because of this, if the recovery process is performed, the instrument will revert back to the instrument software revision that was originally shipped from the factory.

Determining the current software revision

To determine what revision of instrument software is currently installed, select **System > System Information**. On the window which opens, look for the "Instrument S/W Revision" entry on the "System" tab. If the installed revision is the same as the latest revision on the web, there is no need to update the instrument software.

Requirements

The following requirements must be met to use this procedure:

- The S9110A must be functioning properly before the update is attempted.
- You must have a USB keyboard and mouse.
- You must be able to log in to the instrument as the administrator.
- You must be able to transfer a large file (~.6 MByte) to the S9110A being updated.

File Download

1. Go to <https://www.keysight.com/us/en/product/S9110A/s9110a-wideband-transceiver-test-solution.html> and go to the Technical Support section; select the Driver, Firmware & Software tab.
2. Download the executable file by clicking on the file link. Save the file to a location of your choice. If you do not have the ability to download files directly to the C: drive of the S9110A being updated, store the file on a large capacity USB storage device for transfer to the instrument. (The file size is ~.6 MByte.)

User account and log-in

The default user account is Instrument, which does not have the required permissions to install the instrument software updates. For the process outlined below, the user must be logged in as Administrator.

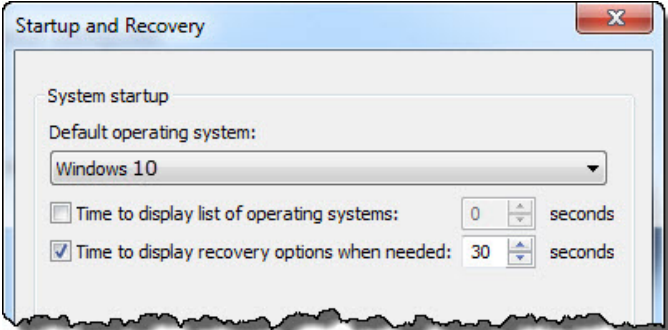
The automated instrument software upgrade process has an install wizard which removes the old software version and installs new software version without manual steps. The removal of the old software version and the installation of the new software version completes in approximately 15 minutes.

1. Connect a USB keyboard and mouse to the S9110A.
2. If the S9110A is not already running, power it up and allow it to boot up completely.
3. Close the S9110A measurement application if it is running. Right-click in the application window, and select **Utility > File** from the right-click menu; select the **Exit** softkey and click **OK** in the confirmation window.
4. Log out as the default user (Instrument). Click the Start icon at the lower left corner of the screen, and select **Log Off**.
5. Select the Administrator icon on the Windows desktop, to log in as follows:
User Name: administrator
Password: Keysight4u!
6. If a “Found New Hardware” wizard window pops up, select “No, not at this time” to bypass the activity.

Configuring recovery prompt timing

You can configure the time at which the S9110A power-up process waits for the selection of the recovery process by performing the following steps:

Step	Notes
1. From the Windows Start menu, right-click Computer and click Properties.	This opens the System window.
2. Click Advanced System Settings in the left pane.	This opens the System Properties window.
3. In the Startup and Recovery section, click Settings.	This opens the Startup and Recovery window.

Step	Notes
4. Under the System Startup section, uncheck the "Time to display a list of operating systems" checkbox, or select the "Time to display recovery option when needed" checkbox and change the number of seconds to delay for it.	

NOTE

You must be logged in as an administrator to change these settings. See ["User Accounts" on page 103](#) for more information.

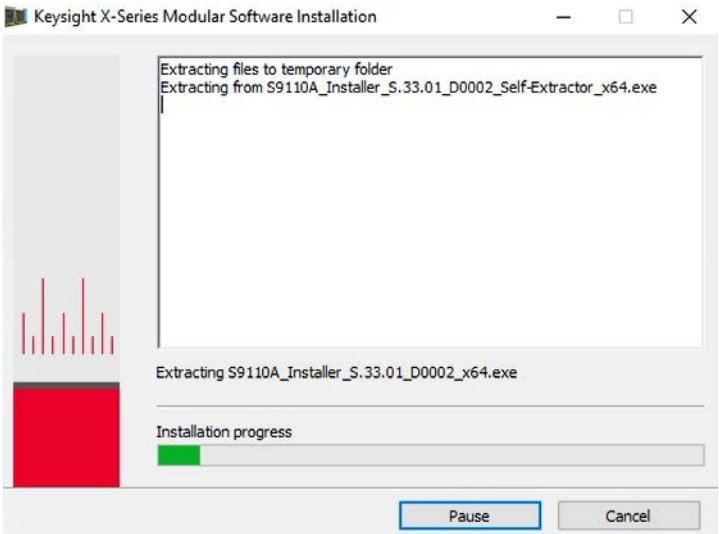
Instrument software installation

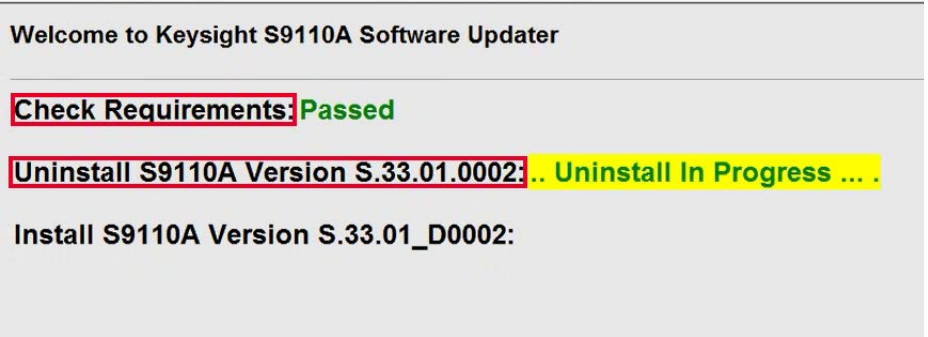
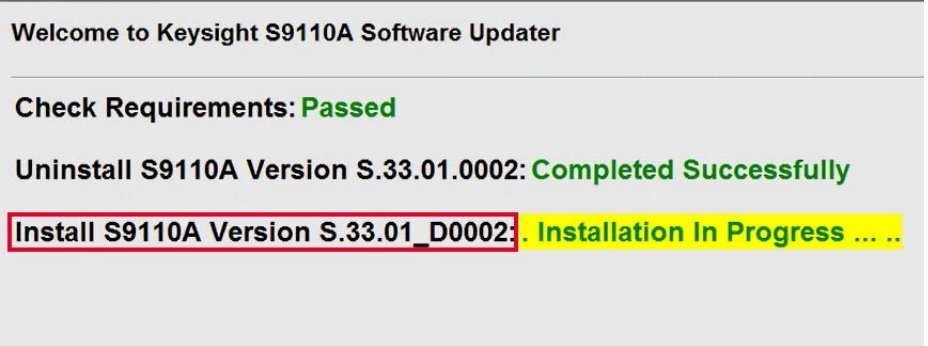
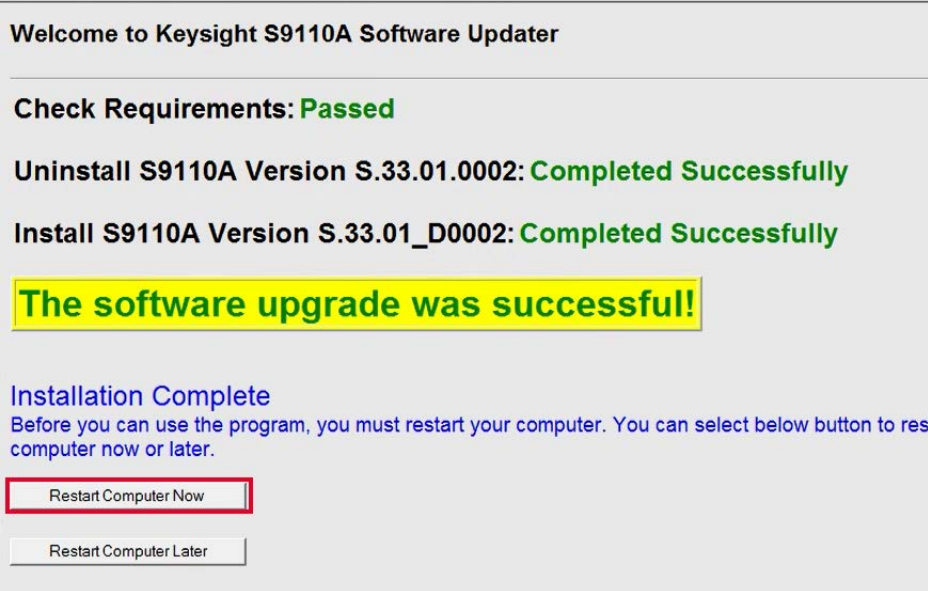
If you downloaded the instrument software update file to the instrument via LAN, access that file from the location that it was stored and proceed to step 1.

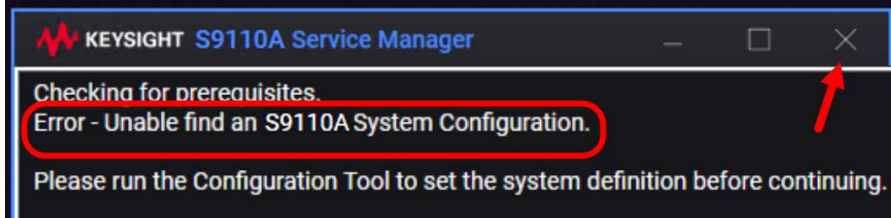
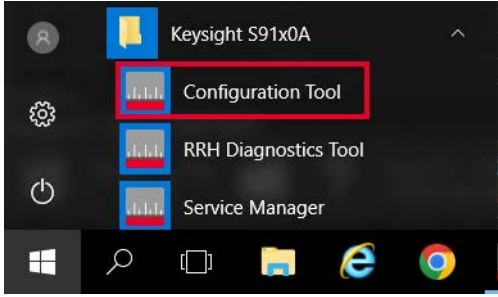
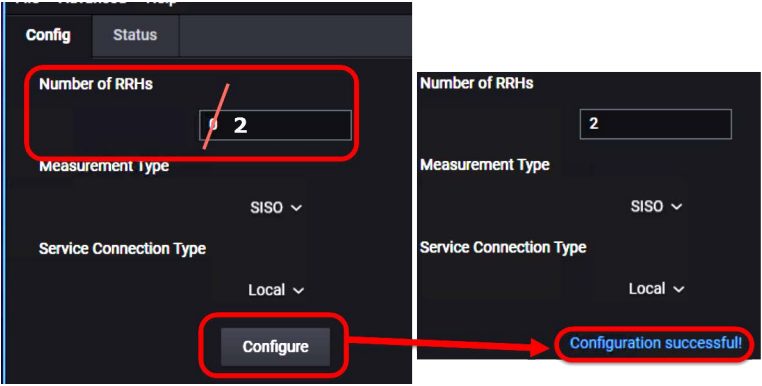
If you downloaded the instrument software update file to a USB storage device, plug that into one of the USB ports on the front of the instrument. Access the file for the removable drive, then proceed to step 1.

CAUTION

This installation may involve updating of FPGA devices within the S9110A. During the installation, DO NOT power off the S9110A for ANY reason! Interrupting the FPGA update process can place the instrument in an unusable state, requiring it to be returned to Keysight for repair.

Step	Notes
1. Double-click on the installer file, and click "Yes" in the confirmation window that appears.	The installer is an executable file with a name in the format: S9110A_Installer_S.xx.xx_xxxx_Self-Extractor.exe
2. A window appears showing the extraction of the software installer.	A confirmation window will ask for your permission to continue the installation process after the installer has been extracted. 

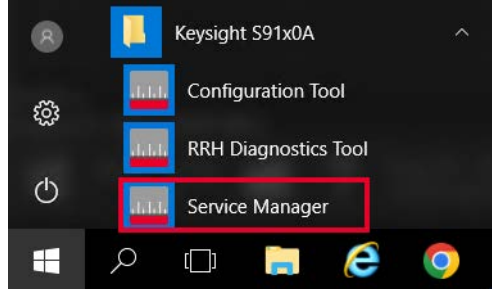
Step	Notes
<p>3. Wait while the system checks for required updates, and uninstalls the previous version of the software.</p>	<p>KeysightSoftwareUpgrade</p>  <p>KeysightSoftwareUpgrade</p> <p>Welcome to Keysight S9110A Software Updater</p> <p>Check Requirements: Passed</p> <p>Uninstall S9110A Version S.33.01.0002: .. Uninstall In Progress ...</p> <p>Install S9110A Version S.33.01_D0002:</p>
<p>4. Wait while the new version of the software is installed.</p>	<p>During installation, you may see additional windows open briefly, showing that FPGA changes or other changes are being made. These can be ignored.</p> <p>KeysightSoftwareUpgrade</p>  <p>KeysightSoftwareUpgrade</p> <p>Welcome to Keysight S9110A Software Updater</p> <p>Check Requirements: Passed</p> <p>Uninstall S9110A Version S.33.01.0002: Completed Successfully</p> <p>Install S9110A Version S.33.01_D0002: Installation In Progress ...</p>
<p>5. After installation is completed, an instrument restart is required. Click Restart Computer Now.</p>	<p>KeysightSoftwareUpgrade</p>  <p>KeysightSoftwareUpgrade</p> <p>Welcome to Keysight S9110A Software Updater</p> <p>Check Requirements: Passed</p> <p>Uninstall S9110A Version S.33.01.0002: Completed Successfully</p> <p>Install S9110A Version S.33.01_D0002: Completed Successfully</p> <p>The software upgrade was successful!</p> <p>Installation Complete</p> <p>Before you can use the program, you must restart your computer. You can select below button to restart computer now or later.</p> <p>Restart Computer Now</p> <p>Restart Computer Later</p>

Step	Notes
<p>6. Reboot manually if necessary.</p>	<p>If the instrument shuts down but does not reboot automatically, remove the USB storage device and cycle power. The boot order for the instrument may have been changed in the instrument BIOS previously, and the instrument may be instructed to boot from USB first, and the internal drive second. If this is the case, failure to remove the USB device will result in an error, as the instrument attempts to boot from it.</p>
<p>7. After reboot, allow Service Manager to configure the system and open the TRX measurement applications. Watch for a configuration error, and close the window if it appears. (If it doesn't, skip the next three steps).</p>	<p>The Service Manager may show a message saying that it is unable to find an S9110A System Configuration. If this occurs, close the Service Manager window by clicking the close icon at the upper right corner of the window.</p>  <p>If you fail to close the Service Manager at this point, updating the configuration (as described below) may result in confusing error messages. A restart of the Service Manager should clear these errors.</p>
<p>8. To clear the configuration error described in the previous step, open the Configuration Tool from the Windows Start menu.</p>	<p>The Configuration Tool is found under the Keysight S910xA folder.</p> 
<p>9. In the Configuration Tool, enter the correct number of installed TRX modules in the Number of RRHs field (it may have reset to zero during software installation).</p>	<p>After updating the Number of RRHs field, click Configure. When the Configuration successful message appears, close the Configuration Tool.</p> 

Step	Notes
------	-------

10. Restart the **Service Manager** from the **Windows Start** menu.

Re-launch the **Service Manager** from the **Start** menu, in the **Keysight S910xA** folder.



11. The **Service Manager** will automatically open the TRX measurement applications.

Be patient during this step: the startup process for the **Service Manager** takes about 4 minutes (with pauses which may make it appear to have stopped working), and after that point the measurement applications must load, which adds additional minutes to the wait. The process isn't complete until the measurement application window appears on the screen (two windows, if two TRXs are installed).

12. Verify that the correct software version is installed.

Within the measurement application, select **System > System Information**. On the window which opens, look for the Instrument **S/W Revision** entry on the **System** tab, and verify that it matches the revision of the installer.

System Settings		< System	
System	Keysight Technologies	Keysight VXT	Keysight VXT Vector Transceiver
	Product Number		M9410A
I/O Config	Serial Number		MY60200125
	S/W Release Name		2023
User Interface	Instrument S/W Revision		M.33.50 B0022
	Revision Date		8/15/2022 9:23:12 AM
	Computer System		Windows 10

6 Troubleshooting

The following topics can be found in this section:

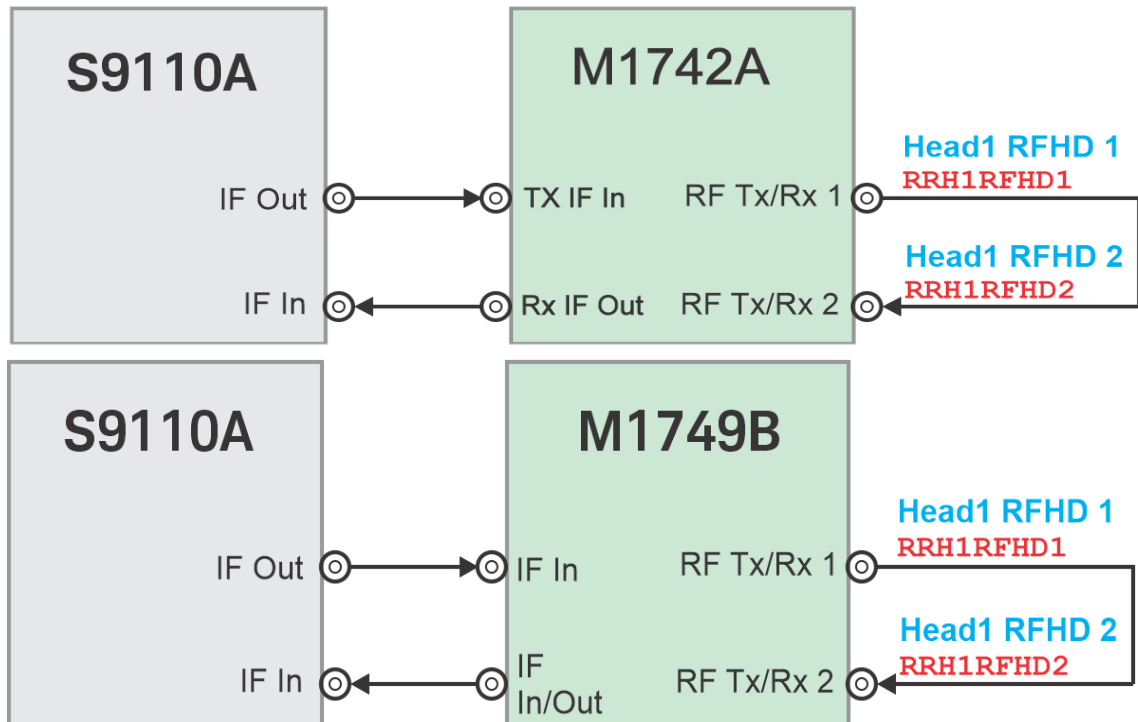
- [“Basic Operational Check” on page 126](#)
- [“Identifying Problems” on page 132](#)
- [“System Components” on page 133](#)
- [“Where to get technical help” on page 135](#)
- [“Returning the S9110A for Service” on page 136](#)

Basic Operational Check

This procedure can be used to establish proper functioning of the system, or to identify specific areas in which there is a problem.

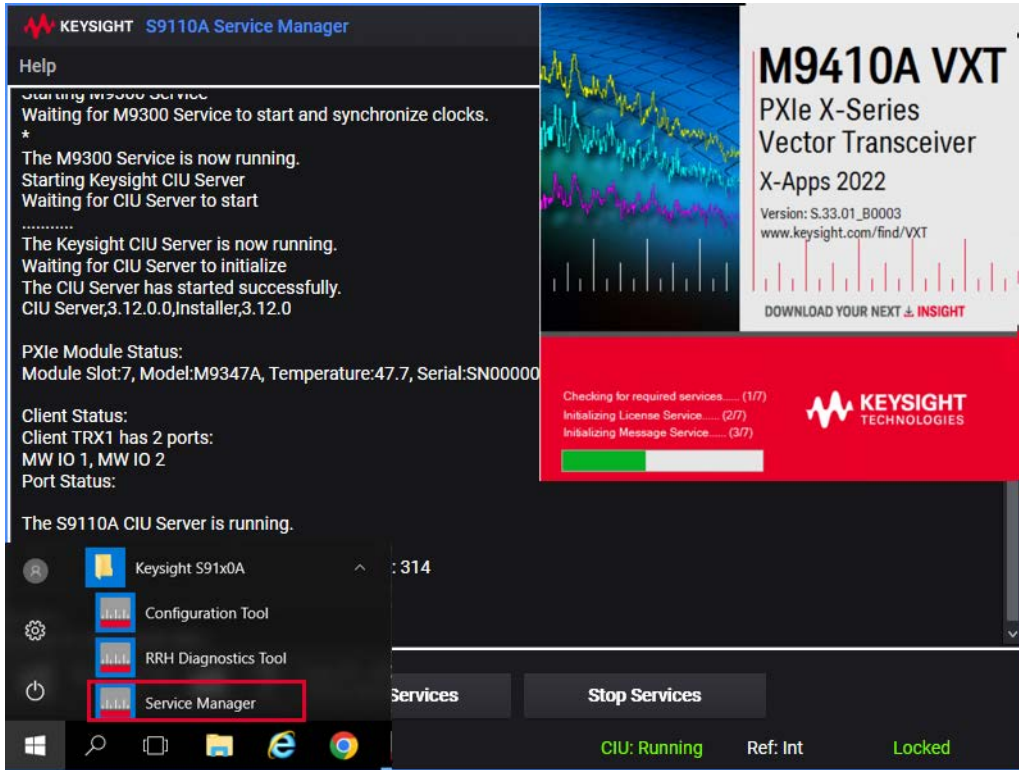
- Step 1.** Attach a loop-back cable between the ports **RF Tx/Rx 1** and **RF Tx/Rx 2** on the M1742A/M1749B remote radio head.

Figure 6-1 Making the loop-back connection



Step 2. Launch the measurement application (if it is not already running).

Figure 6-2 Launching the application



The application begins with an IQ analyzer measurement window displayed.

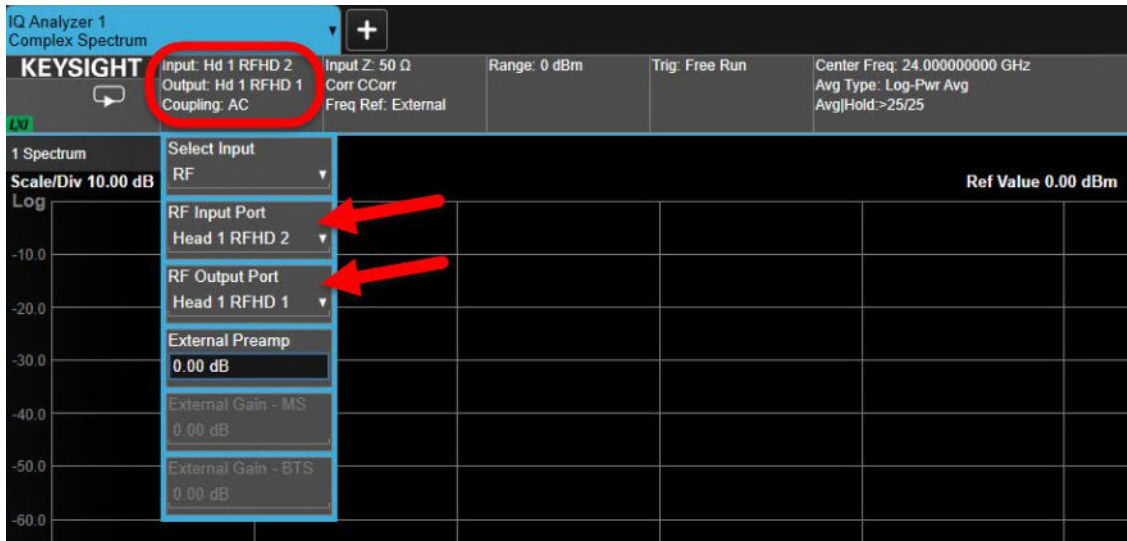
Figure 6-3 Measurement window at startup



Step 3. Select RF Output and RF Input ports.

In this procedure the M1742A/M1749B remote radio head is used, so the Head 1 ports need to be used. These settings can be set from the **Input/Output** menu, but a quicker method is to click on the **Input/Output** column at the top of the measurement screen to open a menu below it. Set **RF Input Port** to **Head 1 RFHD2** (using the dropdown selector if a different port is currently set as the input). Set **RF Output Port** to **Head 1 RFHD1**.

Figure 6-4 Selecting output and input ports

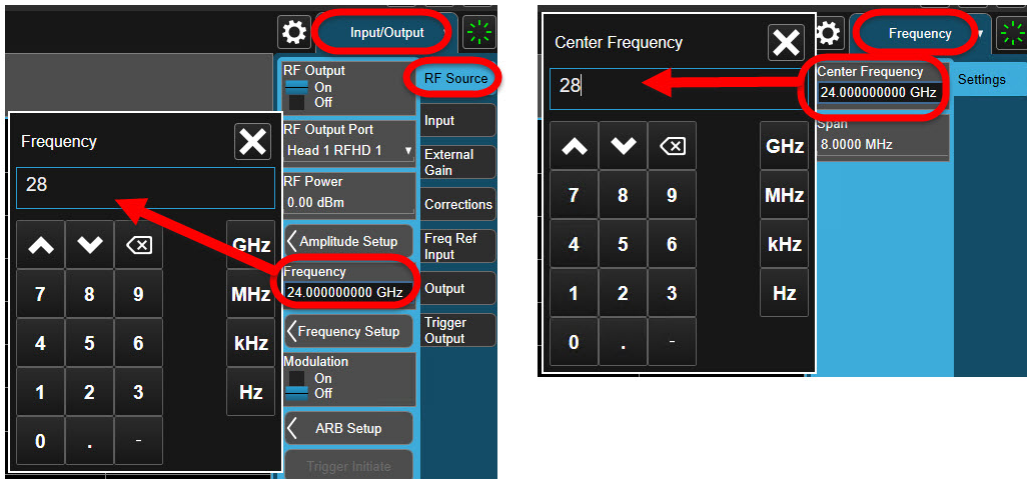


Step 4. Set the source and measurement frequencies.

Go to **Input/Ouput** > **RF Source** and set **Frequency** to 28.0 GHz. This is the output (source) frequency.

Go to the **Frequency** menu and set **Center Frequency** to 28.0 GHz. This is the input (measurement) frequency.

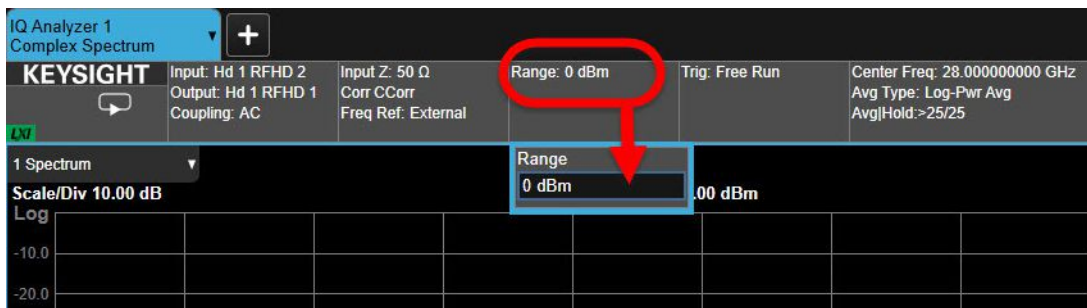
Figure 6-5 Setting the source frequency (left) and measurement frequency (right)



Step 5. Set the power range.

As illustrated below, set the Range to 0 dBm.

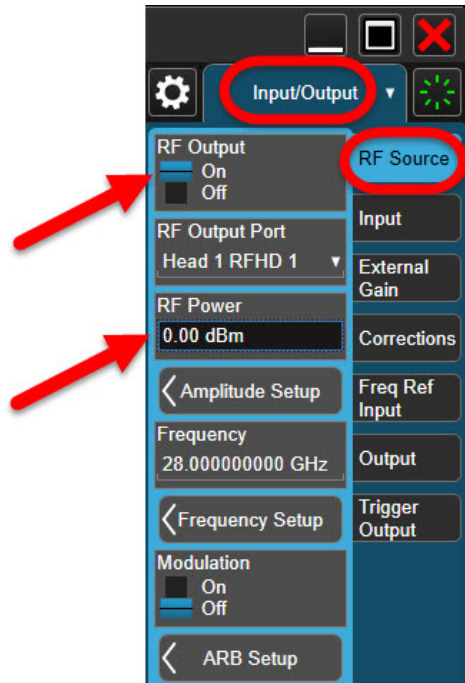
Figure 6-6 Setting the range



Step 6. Set up power & modulation for the source.

Go to **Input/Output** > **RF Source**. Set **RF Output** to **On**. Set **RF Power** to **0 dBm**.

Figure 6-7 Setting source power/modulation



Step 7. Verify received signal power.

With **RF Output** set to **On**, you should see a signal on the display corresponding to the frequency and power level that were set. (Although the frequency should be an exact match, cable loss will cause the received signal to show a slightly lower power level than was set for the transmitted signal.) If you don't see this signal, make sure that both the input and output are set to the same frequency (28 GHz).

Figure 6-8 Checking the signal



Identifying Problems

WARNING

No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

If the status indicator on the M1742A/M1749B is not lit, or if it appears that signals are not being exchanged with the Device Under Test check the following:

1. Are the RF cables connected appropriately between the S9110A and the measurement instrument? (See [“Cabling the M1742A/M1749B” on page 30.](#))
2. Is the S9110A powered on?
3. Is the PXIe chassis (and its measurement instruments) powered on?
4. Is the measurement application properly configured (for example, are the input and output ports selected appropriately for your test setup?).

If no obvious problem in the test setup can be found, contact Keysight Technologies to ask for technical support.

System Components

WARNING

No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

Because instruments interior to the S9110A are sometimes referred to in the Service Manager, the System menus, and in error messages, the diagrams below are provided to indicate what these system components are and how they interface with exterior connectors.

Figure 6-9 S9110A with 1 M1742A TRX module

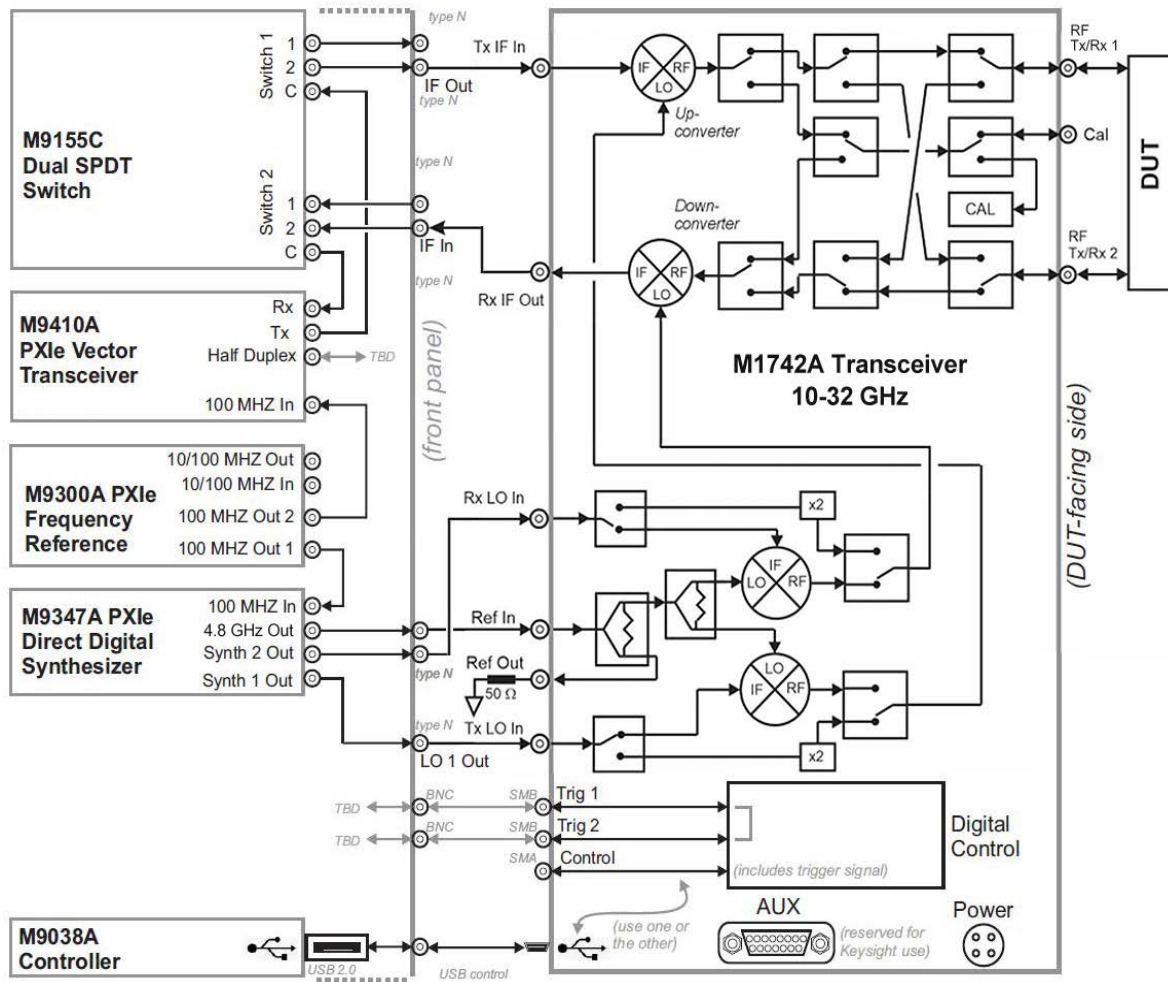
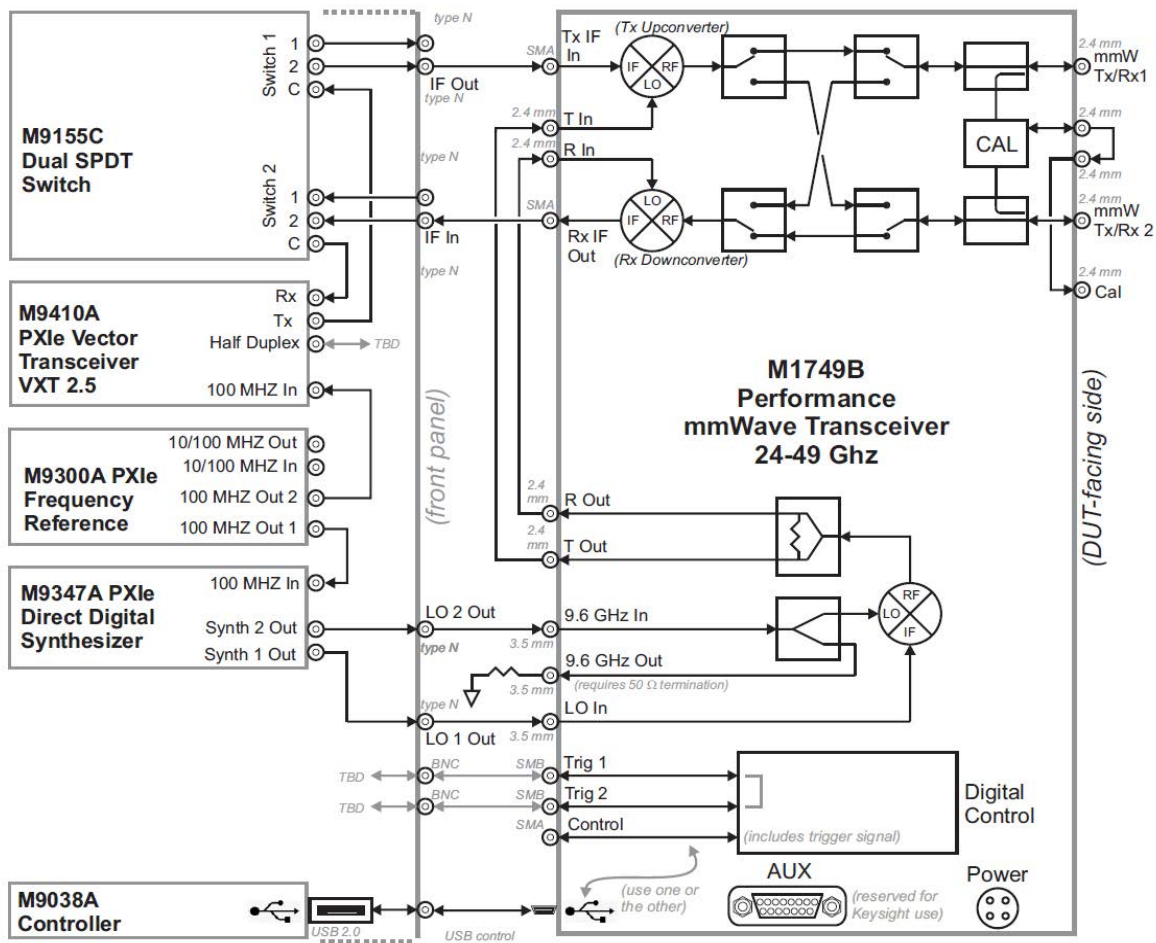


Figure 6-10 S9110A with 1 M1749B TRX module



Where to get technical help

For online assistance: <http://www.keysight.com/find/assist>

To contact Keysight Technologies: <http://www.keysight.com/find/contactus>

Also, see **“Locations for Keysight Technologies” on page 137.**

Returning the S9110A for Service

Use original packaging, or comparable packaging, when returning the S9110A for service.

Calling Keysight Technologies

Keysight Technologies has offices around the world to provide you with complete support for the S9110A. To obtain servicing information, or to order replacement parts, contact the nearest Keysight Technologies office listed under **“Locations for Keysight Technologies” on page 137**. In any correspondence or telephone conversations, refer to your S9110A by its product number and full serial number.

Locations for Keysight Technologies

For online assistance: <http://www.keysight.com/find/assist>

To contact Keysight Technologies: <http://www.keysight.com/find/contactus>

Alternately, contact the nearest Keysight sales office:

Americas		
Canada (877) 894 4414	Brazil 55 11 3351 7010	Mexico 001 800 254 2440
United States (800) 829 4444		
Asia & Pacific		
Australia 1 800 629 485	China 800 810 0189	Hong Kong 800 938 693
India 1 800 112 929	Japan 0120 (421) 345	Korea 080 769 0800
Malaysia 1 800 888 848	Singapore 1 800 375 8100	Taiwan 0800 047 866
Other Asia-Pacific countries: (65) 6375 8100		
Europe & Middle East		
Austria 0800 001122	Belgium 0800 58580	Finland 0800 523252
France 0805 980333	Germany 0800 6270999	Ireland 1800 832700
Israel 1 809 343051	Italy 800 599100	Luxembourg +32 800 58580
Netherlands 0800 0233200	Russia 8800 5009286	Spain 0800 000154
Sweden 0200 882255	Switzerland 0800 805353 Opt. 1 (DE), Opt. 2 (FR), Opt. 3 (IT)	United Kingdom 0800 0260637

Troubleshooting
Returning the S9110A for Service

7 Safety & Environmental Information

The following topics can be found in this section:

- “Warning Statements and Symbols” on page 141
- “Safety” on page 142
- “Environmental Conditions (Operating)” on page 143
- “EMC (Electromagnetic Compatibility)” on page 144
- “Ventilation” on page 145
- “Power Requirements (S9110A)” on page 146
- “Power Requirements (M1742A/M1749B)” on page 146
- “Using Accessories” on page 148
- “Location and Mounting” on page 148
- “Weight and Dimensions” on page 148
- “Electrical Safety” on page 149
- “Protecting against electrostatic discharge” on page 150
- “Instrument Maintenance” on page 151

Elements of the System

The three main elements of the S9110A 5G Multi-Band Vector Transceiver will be referred to in this guide as follows:

- **S9110A** (source/analyzer instruments enclosed in PXIe chassis)
- **M1742A/M1749B** (the M1742A/M1749B Transceiver, which is used by the PXIe Subsystem as a Remote Radio Head to test DUT devices; two M1742A/M1749Bs may be connected, if the S9110A includes two TRX units)
- **RF Cables** (supplied cables designed to connect the S9110A with the M1742A/M1749B)

Figure 7-1 Three main elements of S9110A 5G Multi-Band Vector Transceiver



Warning Statements and Symbols

Caution and Warning notices are used in this document are described below.

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING denotes a hazard. It calls attention to an operating procedure, practice or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

NOTE

A NOTE calls the user's attention to an important point or special information in the text.

See also: [“Labels and Symbols” on page 33.](#)

Safety

NOTE

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Safety Compliance

This product complies with the essential requirements of the European Low Voltage Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity):

- IEC/EN 61010-1
- Canada: CSA C22.2 No. 61010-1
- USA: UL std no. 61010-1

Acoustic statement (European Machinery Directive)

Acoustic noise emission
LpA <70 dB
Operator position
Normal operation mode per ISO 7779

General Safety Notices

WARNING

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

WARNING

No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

WARNING

Safety of any system incorporating the equipment is the responsibility of the assembler of the system.

Environmental Conditions (Operating)

This product is designed for use in the following conditions:

- For indoor use only
- Altitude up to 2000 m
- Temperature 10°C to 40°C
- Maximum Relative Humidity (non-condensing): 85% RH up to 40°C, decreases linearly to 45% RH at 45°C. (From 40°C to 45°C, the maximum % Relative Humidity follows the line of constant dew point.)

CAUTION

This product is designed for use in INSTALLATION CATEGORY II and POLLUTION DEGREE 2.

Environmental Information

Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of Storage, Transportation and End-use; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power line conditions.

Test Methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.

EMC (Electromagnetic Compatibility)

This product complies with the essential requirements of the European Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity):

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11
- CAN ICES/NMB-001(A)
This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme a la norme NMB-001 du Canada.

CAUTION

This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

South Korean Class A EMC declaration

This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

A 급 기기 (업무용 방송통신기자재) 이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다 .

Declaration of Conformity

The Declaration of Conformity for any Keysight product can be found on the website:

<http://www.keysight.com/go/conformity>

Ventilation

CAUTION

VENTILATION REQUIREMENTS: When installing the instrument(s) into a cabinet, consideration shall be given to the convection flow into and out of the cabinet. Consideration shall also be given to the individual instruments to avoid having the heated discharge of one instrument, now becoming the cooling intake air for another instrument.

Do not place the S9110A against any surface in such a way as to block its ventilation openings. Interfering with ventilation airflow can cause the system to overheat.

Another area of concern is verification that the maximum ambient operating temperature of the instrument(s) is not exceeded by cabinet installation.

Keysight recommends forced air convection whenever an instrument(s) are installed in a cabinet and further recommends that the maximum operating temperature of the cabinet be reduced 10°C from the lowest, of the maximum operating temperature of a single instrument.

If there are any concerns or special requirements an Keysight Field Engineer should be consulted to assure instrument(s) temperature compliance and performance.

Power Requirements (S9110A)

100/120V, 1200W MAX
220/240V, 1300W MAX

50/60 Hz

The input terminals for this product are classified as Measurement Category None.

NOTE

The instrument can operate with mains supply voltage fluctuations up to $\pm 10\%$ of the nominal voltage.

NOTE

The main power cord is the system disconnecting device. It disconnects the mains circuits from the mains supply.

WARNING

This is a Safety Protection Class I Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

CAUTION

This instrument has auto-ranging line voltage input. Be sure the supply voltage is within the specified range, and that voltage fluctuations do not to exceed 10 percent of the nominal supply voltage.

Power Requirements (M1742A/M1749B)

19 VDC, 6 A

The M1742A/M1749B does not have an AC power connection. It is powered by a 19 Volt DC input from an AC/DC converter. This input does not represent a risk of personal injury.

CAUTION

Do not remove the DC input plug from the M1742A/M1749B while it is in an active state. Make sure the Status LED on the DUT-facing side of the M1742A/M1749B is dark before disconnecting the DC input.

Power Requirements of the AC adapter

- Input: 100–240VAC, 50–60 Hz, 2.5 - 1 A
- Input power stability: the AC-DC adapter is certified and can operate with mains supply voltage fluctuations up to $\pm 10\%$ of the nominal voltage.
- Output: 19VDC, 6A

Safety & Environmental Information
Power Requirements (M1742A/M1749B)

The main power cord is the system disconnecting device. It disconnects the mains circuits from the mains supply

WARNING

This is a Safety Protection Class I Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

CAUTION

This instrument has auto-ranging line voltage input. Be sure the supply voltage is within the specified range, and that voltage fluctuations do not to exceed 10 percent of the nominal supply voltage.

Using Accessories

Only Keysight approved accessories shall be used.

Use the AC-DC power adapter and power cord which is supplied with the product.

NOTE

Proper ergonomics should be considered when using accessories such as a keyboard or a mouse.

Location and Mounting

CAUTION

Install the instrument so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

Weight and Dimensions

The weight and dimensions of the S9110A are as follows:

- Weight: 23 kg (24 kg with option BK1)
- Height: 197.8 mm
- Width: 449.5 mm
- Length: 578.9 mm

The weight and dimensions of the M1742A/M1749B are as follows:

- Weight: 3.5 kg
- Height: 70 mm
- Width: 175 mm
- Length: 345 mm

Electrical Safety

WARNING

This is a Safety Class 1 Product (provided with a protective earth ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.

WARNING

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only. Install the instrument so that the detachable power cord is readily identifiable and easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

CAUTION

This instrument has an auto-ranging line voltage input. Ensure the supply voltage is within the specified range and voltage fluctuations do not exceed 10 percent of the nominal supply voltage.

CAUTION

When installing the product in a cabinet the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4° C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used. It is your responsibility to ensure the ambient temperature does not exceed the rated ambient temperature stated in the specification.

WARNING

The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure, to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.

CAUTION

Use the Keysight supplied power cord or one with the same or better electrical rating.

Protecting against electrostatic discharge

Electrostatic discharge (ESD) can damage or destroy electronic components (the possibility of unseen damage caused by ESD is present whenever components are transported, stored, or used).

Test equipment and ESD

To help reduce ESD damage that can occur while using test equipment:

WARNING

Do not use these first three techniques when working on circuitry with a voltage potential greater than 500 volts.

- Before connecting any coaxial cable to a S9110A connector for the first time each day, momentarily short the center and outer conductors of the cable together.
- Personnel should be grounded with a 1 M Ω resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the S9110A.
- Be sure that all instruments are properly earth-grounded to prevent build-up of static charge.
- Perform work on all components or assemblies at a static-safe workstation.
- Keep static-generating materials at least one meter away from all components.
- Store or transport components in static-shielding containers.
- Always handle printed circuit board assemblies by the edges. This reduces the possibility of ESD damage to components and prevent contamination of exposed plating.

Additional information about ESD

For more information about ESD and how to prevent ESD damage, contact the Electrostatic Discharge Association (<http://www.esda.org>). The ESD standards developed by this agency are sanctioned by the American National Standards Institute (ANSI).

Instrument Maintenance

Cleaning the Instrument

WARNING

To prevent electrical shock, disconnect the instrument from mains before cleaning. Use a dry cloth slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

Cleaning the connectors

WARNING

Cleaning connectors with alcohol shall only be done with the instrument's power cord removed, and in a well-ventilated area. Allow all residual liquid alcohol to evaporate and the fumes to dissipate prior to energizing the instrument.



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