Keysight M9410A/M9411A/M9415A VXT PXIe Vector Transceiver

Getting Started Guide

KEYSIGHT TECHNOLOGIES

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Warranty

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Safety Notices

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** 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 personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

In This Guide...

The scope of this Getting Started Guide is to detail the processes of receiving and installing the modules of the Keysight M9410A/M9411A/M9415A VXT Vector Transceiver.
Additionally, installing the required software is documented. If you have any questions after reviewing this information, please contact your local Keysight Technologies Inc. representative or contact us through our website.

1 Unpack and Verify the Shipment Contents

This chapter provides the process to unpack and verify the contents of the signal transceiver.

2 Installing Hardwares

Refer to this chapter to install all the needed hardwares in a PXI Express chassis.

3 Installing the Software and Licensing

This chapter guides you to install the Modular TRX software and redeem application license in Microsoft Windows 10.

4 Launching Modular TRX Application

This chapter describes the process to launch a modular TRX application in Microsoft Windows 10.

5 Running Modular TRX Application

This chapter provides some guidelines for using the transceiver.

6 Service information

This chapter details some basic service information and how to return a transceiver for service.

Where to Find the Latest Information

Documentation is updated periodically. For the latest information about the product, including instrument software upgrades, application information, and product information, browse to one of the following URLs:

http://www.keysight.com/find/m9410a

http://www.keysight.com/find/m9411a

http://www.keysight.com/find/m9415a

The documentation associated with this product is available at the M9410A/M9411A/M9415A product pages on keysight.com (go to **Document Library > Manuals**).

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

http://www.keysight.com/find/emailupdates

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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Contents

1 Unpack and Verify the Shipment Contents

This section explains how to verify the shipment contents when you receive the shipment.

The following topics can be found in this section:

"Initial Inspection" on page 10

"Verify M9410A/M9411A/M9415A Shipment Contents" on page 11

"Instrument Symbols" on page 12

Initial Inspection

Inspect the shipping container and the cushioning material for signs of stress. Retain the shipping materials for future use, as you may wish to ship the unit to another location or to Keysight Technologies for service.

Electrostatic Discharge Protection

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).

CAUTION **The modules are shipped in materials which prevent damage from static. The modules should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken. Store all modules in anti-static envelopes when not in use.**

WARNING **Do NOT use these techniques for a static-safe work station when working on circuitry with a voltage potential greater than 500 volts.**

Inspect for Damage

After unpacking a module, inspect it for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty.

CAUTION **To avoid damage when handling a module, do not touch exposed connector pins.**

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 a transceiver to Keysight Technologies, use the original (or comparable) shipping materials.

CAUTION **Transceiver damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the equipment or prevent it from shifting in the carton. They cause equipment damage by generating static electricity and by lodging in the transceiver, blocking airflow.**

Verify M9410A/M9411A/M9415A Shipment Contents

Please verify the standard shipment contents according to the table below.

Qty	Part Number	Description
1	9230-0333	Envelope-calibration certificate
1	5061-7383	South Korean Class A EMC Declaration
1	9320-6698	China RoHS Addendum
1	9320-6797	Keysight Safety Leaflet
1	M9410-90014	M9410A/M9411A/M9415A Addendum
1	M9410-90013	M9410A/M9411A/M9415A Startup Quick Reference
1	M9410-60009	Cable Assembly-MMPX to SMB
1	M9410A/M9411A/ M9415A	M9410A/M9411A/M9415A VXT Vector Transceiver

The optional cables are listed as below:

Qty	Part Number	Description
1	Y1810A	Cable, MMPX male to SMB male, 260 mm
1	Y1811A	Cable, MMPX male to MMPX male, 200 mm
1	Y1812A	Cable, MMPX male to SMB male, 500 mm
1	Y1813A	Cable, MMPX male to SMB male, 1000 mm
1	Y1814A	Cable, SMA male to SMA male, 1220 mm
1	Y1815A	Cable, MMPX male to BNC male, 1500 mm

NOTE

All the manuals and software are available from
www.keysight.com/find/m9410a
www.keysight.com/find/m9411a
www.keysight.com/find/m9415a

Instrument Symbols

The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to instructions in the documentation.

The CE mark is a registered trademark of the European Community.

All Level 1, 2 or 3 electrical equipment offered for sale in Australia and New Zealand by Responsible Suppliers must be marked with the Regulatory Compliance Mark.

This is a marking of a product in compliance with the Canadian Interference-Causing Equipment Standard (ICES-001). This is also a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).

This symbol indicates separate collection for electrical and electronic equipment mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive 2002/96/EC).

Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.

This hot surface symbol is to remind users not to touch hot surfaces of the module when the chassis is just powered off.

South Korean Class A EMC Declaration
A 급 기기 (업무용 방송통신기자재)
이 기기는 업무용 (A 급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주 의하시기 바라 며 , 가정외의 지역에서 사용하는 것을 목적으 로 합니다 .

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

2 Hardware Installation

This chapter describes the preparation of hardware for M9410A/M9411A/M9415A VXT Vector Transceiver.

"Chassis and Controller Preparation" on page 14

"Install Modules" on page 16

"M9410A/M9411A/M9415A Front Panel Overview" on page 19

"M9300A Reference Preparation" on page 21

Chassis and Controller Preparation

Before installing the M9410A/M9411A/M9415A software, some preparation work is needed. Please refer to the sections below to be familiar with those requirements.

Hardware Requirement

To successfully install and run M9410A/M9411A/M9415A software, the chassis and controller/PC with the configuration as below is required:

Topic	Requirements
Chassis	PXIe or PXI-H chassis slot (Keysight M9018B/M9019A PXIe chassis is recommended)
Controller	**Embedded controller** Keysight M9037A or an equivalent embedded controller that meets the following requirements: ▪ A PXIe system controller (PXI-1 embedded controllers are not compatible). ▪ Utilizes a 2x8, 4x4, or 1x8 PXIe system slot link configuration. ▪ Runs one of the operating systems listed in Controller System Requirement. **Or remote controller** A PC running one of the operating systems listed in Controller System Requirement and a Keysight M9021A/22A/23A Cable Interface with the following PC interface configuration: ▪ Keysight M9048B PCIe Desktop Adapter x8, with Y1202A PCIe cable (for a desktop PC).

Please refer to *M9410A/M9411A/M9415A Configuration Guide* for further description of hardware configuration.

Controller System Requirement

To successfully install and run M9410A/M9411A/M9415A software, the controller/PC with the configuration as below is required:

Topic	One Module
Operating system	Window 7/10 (64-bit), English Version
Processor	Single Core with hyper threading, 1.86 GHz minimum
Available memory for each module	8 GB minimum, 16 GB or greater recommended
Available disk space for each modular on Drive C:	8 GB minimum, 40 GB recommended for multiple applications

NOTE To use multiple applications for some specific measurement such as 4x4 MIMO measurement, please ensure the system drive (C:) have 40 GB free space or greater and the paging file size is set properly.

To set the paging file size of your controller system properly, please refer to "Set the Paging File Size for Multiple Applications" on page 74 for details.

Power Up the Controller

If you are using a remote controller, perform the following steps:

1. Install a PCIe cable interface between the remote controller and the chassis.
2. Power up the chassis after all the modulars are installed properly.
3. Power up the PC.

CAUTION If you are using a remote controller and you have installed the interface cable, you must power up the chassis BEFORE you power up the PC.

When you power down your system, shut down the PC BEFORE you power down the chassis.

If you are using an embedded controller, perform the following steps:

1. Refer to "Install Modules" on page 16 to Install the embedded controller module into a compatible chassis.
2. Connect peripherals (mouse, keyboard, monitor).
3. Power up the chassis after all the modulars are installed properly.

Install Modules

Before installing a M9410A/M9411A/M9415A module and an embedded controller module into a PXI express chassis, please read all the safety information carefully and make sure the chassis is in a proper condition as below.

- Ensure proper chassis air flow is maintained. The chassis has multiple air intakes located on the lower sides, lower front and bottom front of chassis.

Air Intake

FAN Exhuast

- Select a chassis that provides thermal protection if fans become inoperable or forced air cooling is obstructed
- Use slot blockers and EMC filler panels in empty module slots to ensure proper operating temperatures. Keysight chassis and slot blockers optimize module temperature performance and reliability of test.
- Set chassis fans to high or auto. Do not disable fans.
- Position chassis to allow plenty of space around chassis air intake and fan exhaust.
- At environment temperatures above 45°C, set chassis fan speed to high.

WARNING Keysight Technologies does not warrant third-party system-level (combination of chassis, controllers, modules, etc.) performance, safety, or regulatory compliance, unless specifically stated.

CAUTION PXI hardware does not support "hot-swap" (changing modules while power is applied to the chassis) capabilities. Before installing or removing a module to/from the chassis, power off the chassis to prevent damage to the module.

CAUTION Lack of airflow may cause module creates a hazard, it relies on the chassis for protection.

NOTE

The module can be installed in any PXIe or hybrid PXIe slot marked with a peripheral slot compatibility image (solid black circle for PXIe, or solid black circle with the letter -H- for hybrid).

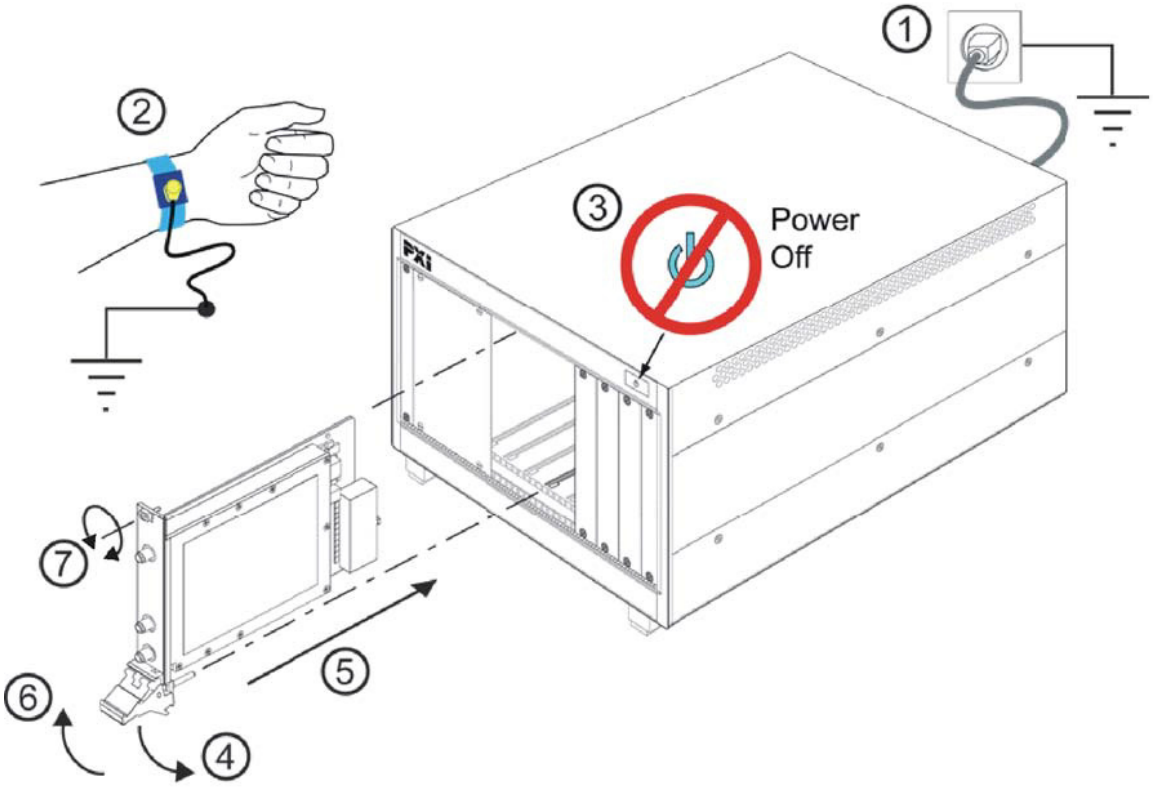
Please refer to the chassis documentation for further information about how to use the chassis.

Perform the following steps to install a module in a chassis:

1. Make sure the line cord is plugged in to establish earth ground and the chassis power switch is in the Off (Standby) position.
2. Wear a grounded wrist strap for this procedure.
3. If the chassis has multiple fan speed settings, ensure the fans are set to automatic. Do not set the fan speed to low or turn it off.
4. Position the chassis so that there is ample space between the chassis fan intake and exhaust vents. Blockage by walls or obstructions affects the air flow needed for cooling.
5. Before inserting the module into the chassis, back the mounting screws out to assure that there is no interference between the screws and the mounting rails. Inspect the chassis slot to ensure there are no bent pins on the slot connectors.
6. Holding the module by the injector/ejector handle, slide it into a slot, as shown in callouts 4 – 6 in the following figure.

   a. Install the module into the slot of the chassis by placing the module card edges into the front module guides (top and bottom).

b. Slide the module to the rear of the chassis and ensure that the injector/ejector handle is pushed down in the unlatched (downward) position.

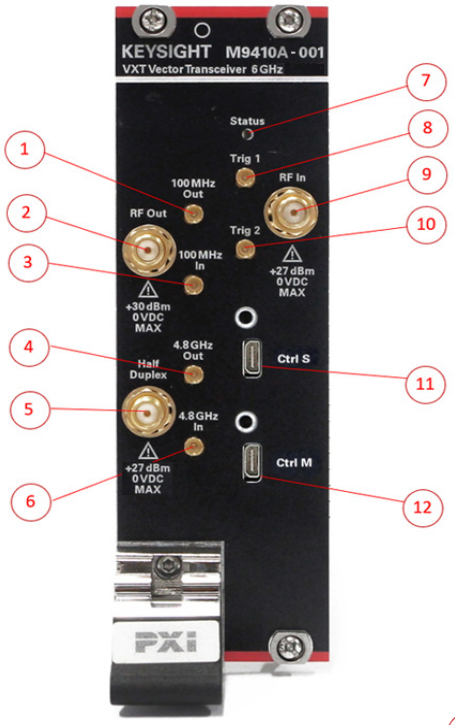


c. Slide the module completely into the chassis. When you begin to feel resistance, pull up on the injector/ejector handle to fully inject the module into the chassis.

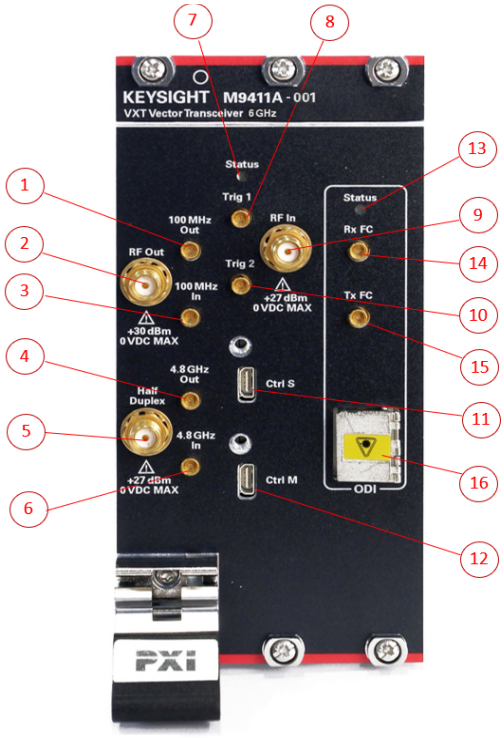
7. Repeat for other modules, if present.
8. Tighten the top mounting screw (see callout 7 in Figure above) and the bottom mounting screw (located below the injector/ejector handle) on the module(s) using a Phillips #1 torque drive set to 4 in-lbs (0.45 N.m). Performance may suffer if the screws are not tightened properly.
9. Verify the PXI chassis fans are operable and free of dust and other contaminants that may restrict airflow.
10. Install filler panels and slot blockers after installing the modules. Missing filler panels or slot blockers may disrupt air circulation in the chassis. The leftmost slot does not accept a slot blocker.
11. If you are using a PCIe Cable Interface, such as the Keysight M9021A/22A/23A, connect the Cable Interface in the chassis to the PC host per the instructions that came with the Cable Interface.
12. Plug in and power on the chassis.
13. If you are using a remote controller, reboot the remote controller.

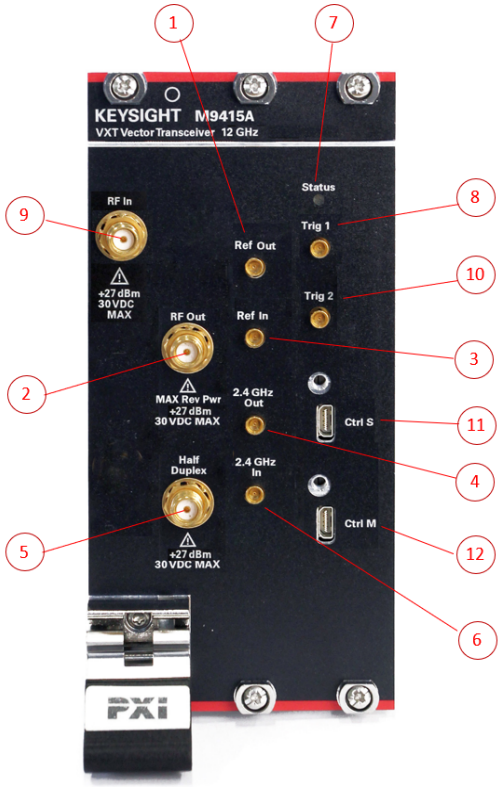
M9410A/M9411A/M9415A Front Panel Overview

M9410A



M9411A





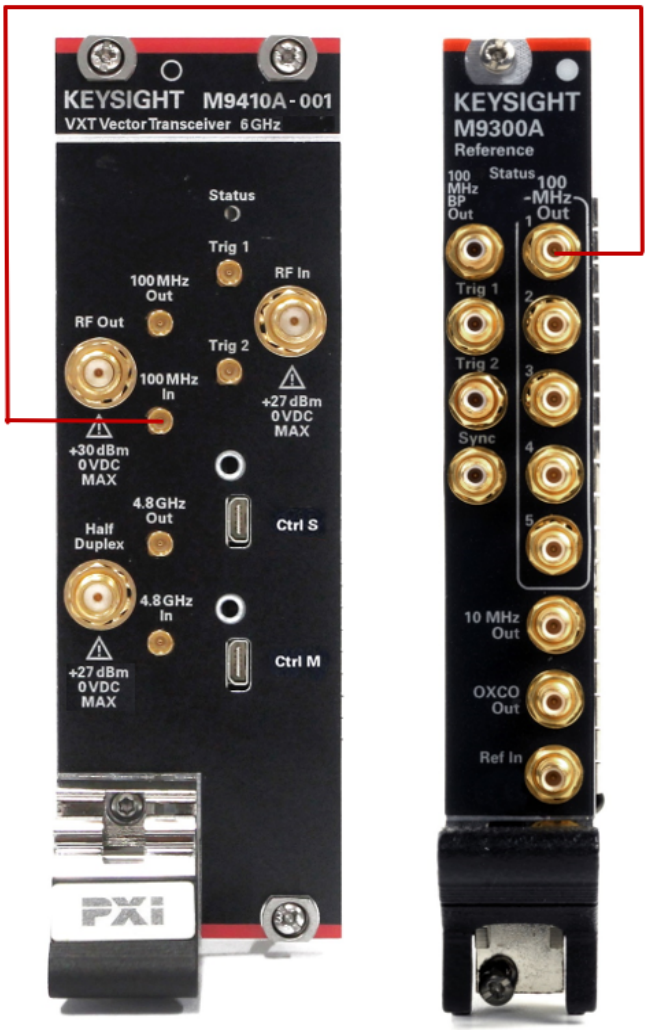
M9415A

Item		Description	Remark
#	Port Name		
1	100 MHz Out/Ref Out	100 MHz reference output	MMPX female connector, 50 Ω nominal
2	RF Output	RF output port	SMA female connector, 50 Ω nominal **Maximum reverse input power**: +30 dBm
3	100 MHz In/Ref In	100 MHz reference input	MMPX female connector, 50 Ω nominal
4	2.4/4.8 GHz Out	2.4/4.8 GHz timebase output	MMPX female connector, 50 Ω nominal
5	Half Duplex	Half duplex port for RF Input or RF Output (Option HDX)	**Maximum safe input power:** +27 dBm
6	2.4/4.8 GHz In	2.4/4.8 GHz timebase input	MMPX female connector, 50 Ω nominal
7	Status LED	LED indicator of the module status	**Green:** Modular TRX application is running normally. **Red**: Modular TRX application has been invoked with error, error message has been logging into event viewer. **Blink**: if blink red, it means FPGA is updating on the module. If blink green, it means operation of flash access. The frequency of blink is about 1 Hz. **Off**: The module is not in above situations.
8	Trig 1	Receiver or Source Trigger port	MMPX female connector Input or Output, selectable Input impedance: 1 kΩ or 50 Ω nominal Input level range: -3.3 V to +3.3 V Output impedance: 50 Ω nominal Output level range: 3.3 V LVTTL
9	RF Input	RF Input port	**Maximum average input power**: +27 dBm
10	Trig 2	Receiver or Source Trigger port	MMPX female connector Input or Output, selectable Input impedance: 1 kΩ or 50 Ω nominal Input level range: -3.3 V to +3.3 V Output impedance: 50 Ω nominal Output level range: 3.3 V LVTTL
11	Ctrl S	Subordinate uHDMI	Subordinate uHDMI female connector
12	Ctrl M	Main uHDMI	Main uHDMI female connector
13	Status (ODI)	LED for indicating the ODI status	
14	RX FC	RX Flow Control	Rx Flow Control over SMB connector
15	TX FC	TX Flow Control	Tx Flow Control over SMB connector
16	ODI	ODI connector	24-fiber optical cable with ODI connector (Reserved for future extension)

M9300A Reference Preparation

An external 100 MHz reference signal is required to input into M9410A/M9411A/M9415A module. Make sure a proper 100 MHz reference signal input is present to M9410A/M9411A/M9415A **100 MHz In** port before starting the transceiver software. Keysight M9300A Reference module is recommended for inputting the reference signal.

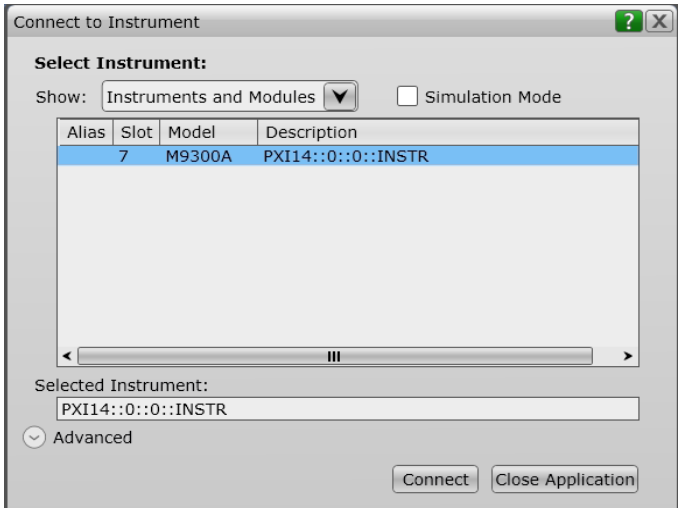
Refer to "Install Modules" on page 16 to install a M9300A Reference module into the chassis and connect one of M9300A Reference **100 MHz Out** port to M9410A/M9411A/M9415A **100 MHz In** port with SMB to MMPX cable like following.



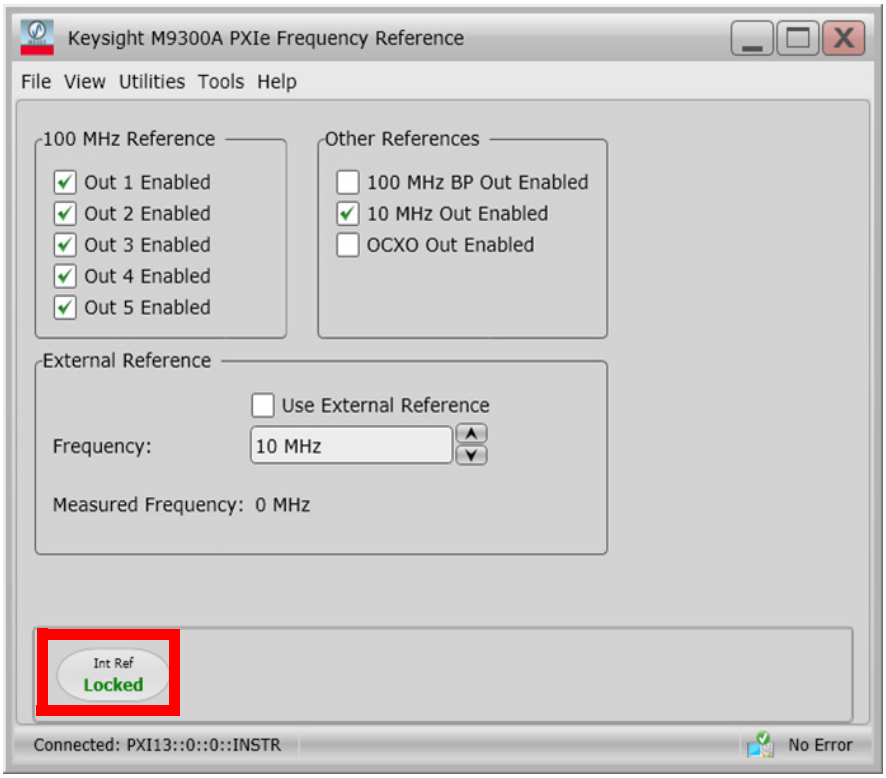
Follow the procedures below to run the M9300A software and enable the output reference signal correctly.

1. Click

to run the M9300A Soft Front Panel software. The connection window below will pop up.

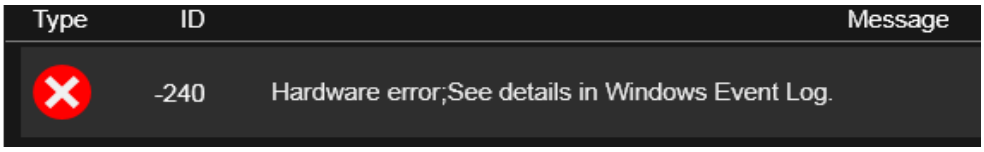


2. Click **Connect**. The soft front panel window will pop up as below.



The indicator "*Int Ref Locked*" on the lower left corner indicates the 100 MHz signal outputs properly.

If reference signal is not connected before the Application is started, an error "-240 Hardware error; See details in Windows Event Log" is display in history error message window (double click the status bar to show history error message window).



If the reference signal input is not detected correctly, there will be a warning as following on status bar of Modular TRX application window.

Check the reference signal input and make sure the correct reference signal is connected. Once the M9410A/M9411A/M9415A module detects the correct reference sigal input, the error message on status bar will be cleared.

For more information about M9300A module, please refer to following web page:

http://www.keysight.com/find/m9300a

3 Software Installation and Licensing

This chapter describes how to install the M9410A/M9411A/M9415A TRX application software in Microsoft Windows operating system.

The software installation also includes the following sub-components installation:

- IO libraries suite
- HPP
- License manager
- License service
- LXI server

The M9410A/M9411A/M9415A software offers a standard IQ analyzer measurement application and some additional measurement applications. Each application requires a license to execute the software. You may purchase additional licenses at a later date.

The following topics can be found in this chapter:

"Get the M9410A/M9411A/M9415A software" on page 26

"Software Installation" on page 27

"Keysight M9410A/M9411A/M9415A Signal Transceiver Licensing Options" on page 34

"Licensing Measurement Application Software - After Initial Purchase" on page 38

"Transporting a License" on page 42

Get the M9410A/M9411A/M9415A software

The M9410A/M9411A/M9415A software is available for downloading at the Keysight website:

www.keysight.com/find/m9410a

www.keysight.com/find/m9411a

www.keysight.com/find/m9415a

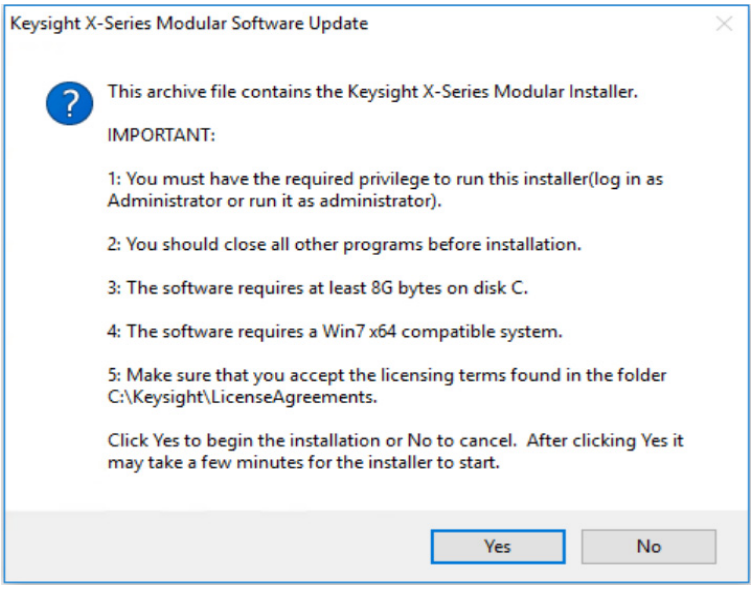
click the **Support** tab, and then **Drivers, Firmware & Software** icon to find the latest version of software for your model.

Software Installation

To install the application software, please make sure the operating system on your controller is Windows 7/Windows 10 (64-bit).

Follow the procedures below to install the M9410A/M9411A/M9415A application software in Windows 7/Windows 10 system.

1. Login the windows as administrator.
2. Right click *VXT_Installer_M.XX.XX_Self-Extractor_x64.exe*, then select "Run as administrator" to start the installation. The Installation file will be extracted first as following:



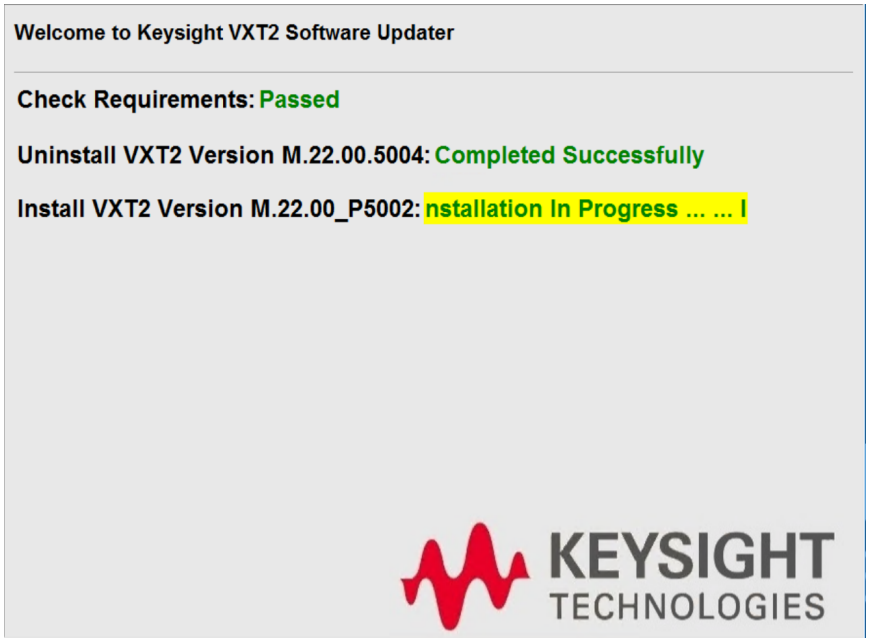
3. Click Yes to continue the installation after confirming the requirements. The installation file will be extracted.

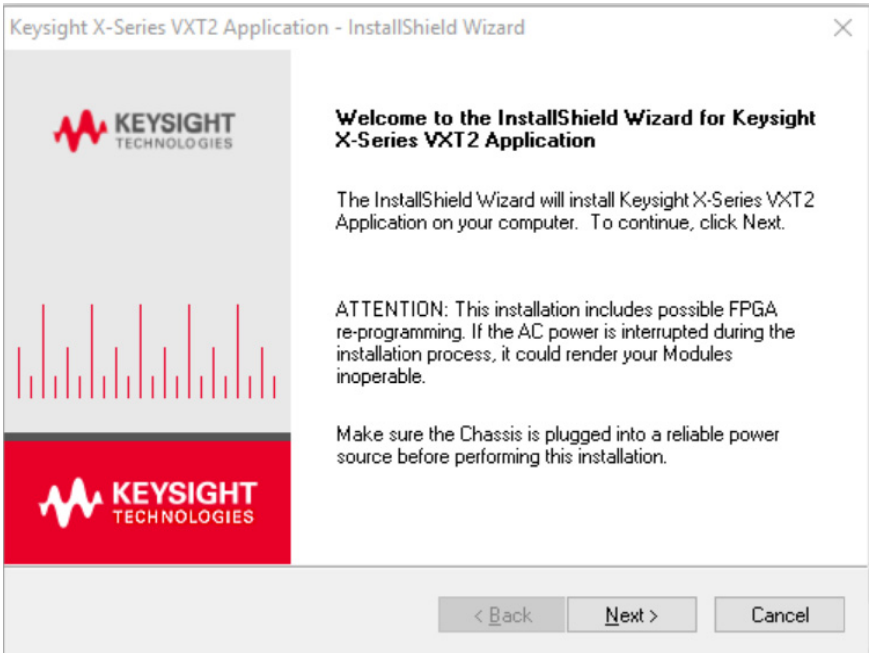
NOTE **The installer will perform requirements check after extracting. 8G Bytes free space on Drive C: is required for software installation. If there is not enough space, the requirements check will be failed. Please exit the installation, clean up your disk and try again.**

4. After passing the requirements check, if a modular TRX application has been installed on the controller, the installer will uninstall the earlier version of the application first.

   If there is not any earlier version of the modular TRX application installed, this step will be skipped.

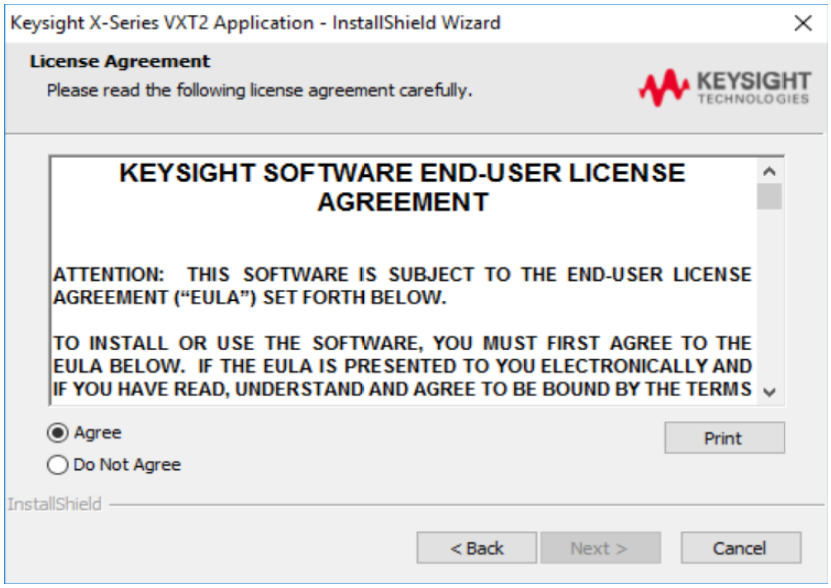
5. After uninstalling successfully, an instruction of installing modular vector signal transceiver application will be shown as following:



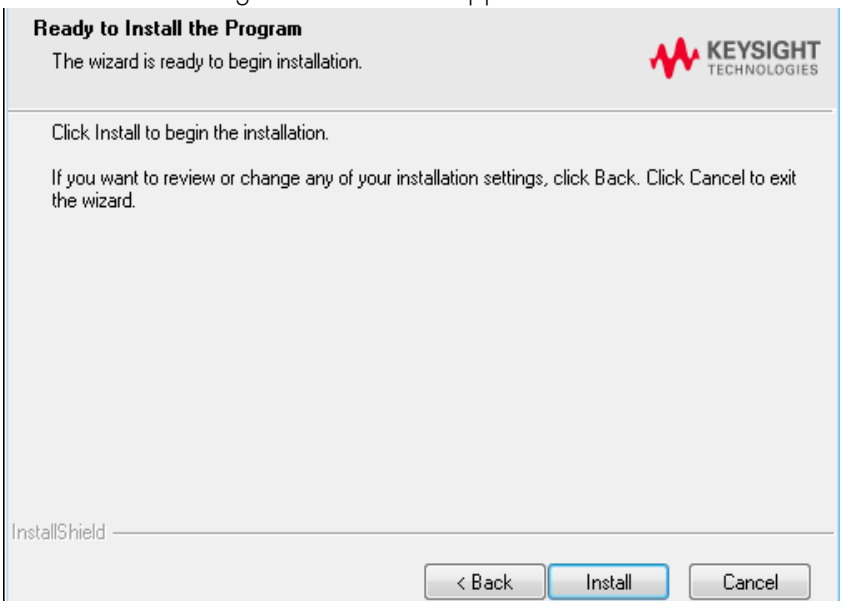


CAUTION The installation includes possible FPGA re-programming. If the AC power is interrupted during installation process, it could render your instrument inoperable. Please make sure the chassis is plugged into a reliable power source before performing the installation.

6. Click "Next", a window of License Agreement will be shown as below. Please read the license agreement carefully and click *I accept the term of the license agreement* and click *Next* to continue the installation.



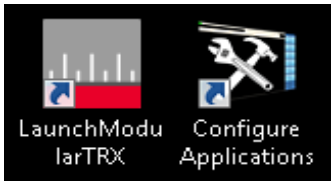
7. After selecting the setup type ("Typical" as default) and shortcuts configuration, click "Next" to continue the installation.
8. InstallShield Wizard is ready to begin installation, click "Install" to install the Modular Vector Signal Transceiver Application:



NOTE During installation process, some prompt boxes and windows will pop up. If any FPGA version on installed module is different with the version required by current Modular TRX, FPGA on that module will be updated during the installation process. If FGPA is updated by installation process, please power off the chassis and then power on to make the FPGA update take effects.

NOTE If the installation is failed, a window will pop up with possible root causes information. Please check the message and follow the instruction to recover the installation accordingly.

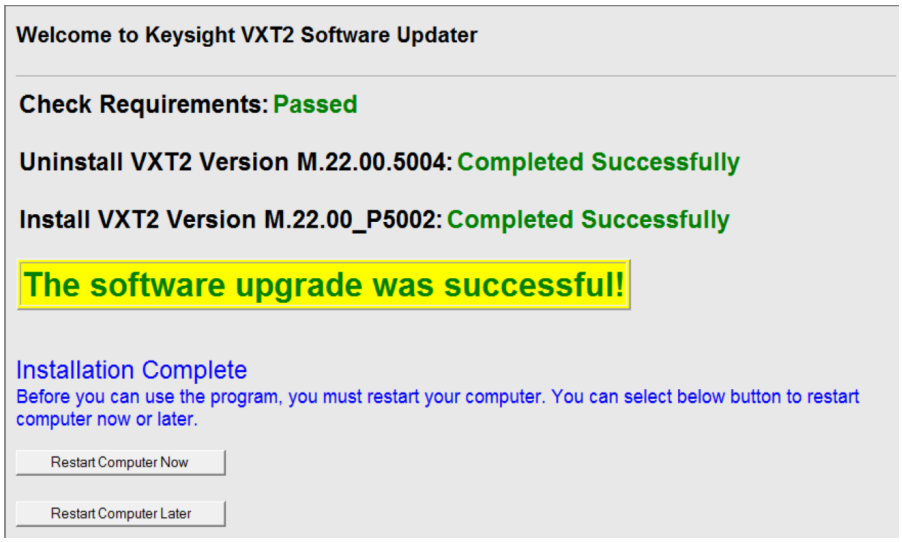
At the end of installation, if "Yes" is selected in shortcuts configuration of step 7, two shortcuts of the applications will be created at the desktop.



LaunchModularTRX.exe is used to launch Modular SA applications on M9410A/M9411A/M9415A module. Please refer to "Application Launcher" on page 45 for further information.

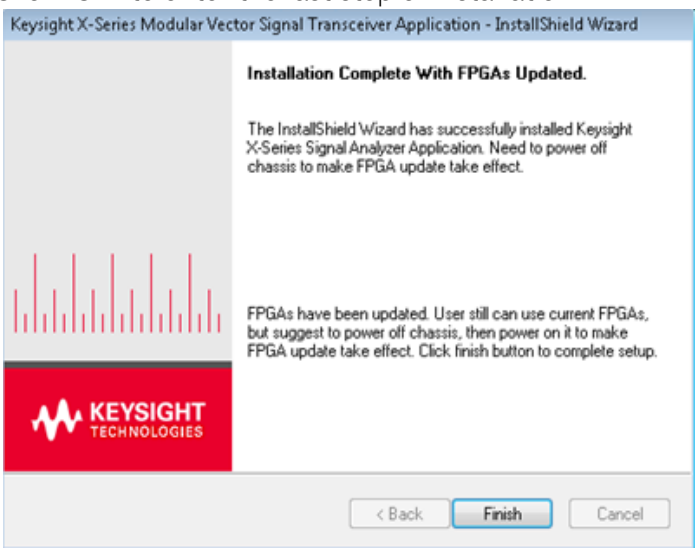
ConfigureApplications.exe is used to configure the applications that will be loaded when the application is launching. Please refer to "Configure Application Tool" on page 44 for further information.

- If there is no FPGA update during installation process, a prompt box will pop up to ask you to restart computer/controller now or later.



- If FPGA is updated successfully during installation process, a prompt box will pop up to inform user to power off the chassis and then power on to make FPGA update take effect.

Click "OK" to enter the last step of installation:



Click "Finish" to complete the installation process. You should power off and then power on the chassis to make the FPGA update take effect.

The software installation is complete. Please refer to "Launching Modular TRX Application" on page 43 to launch the modular TRX application and refer to "Function Verification - Making a Basic Measurement" on page 72 to verify the function.

Uninstalling the Software

You can uninstall the software from the *Uninstall or change a program* window. Click *Control Panel -> Programs and Features* to show the window, and select *Keysight X-Series Modular Vector Signal Transceiver Application* and click *Uninstall* to start the process.

The following items will not be removed after the uninstallation is completed.

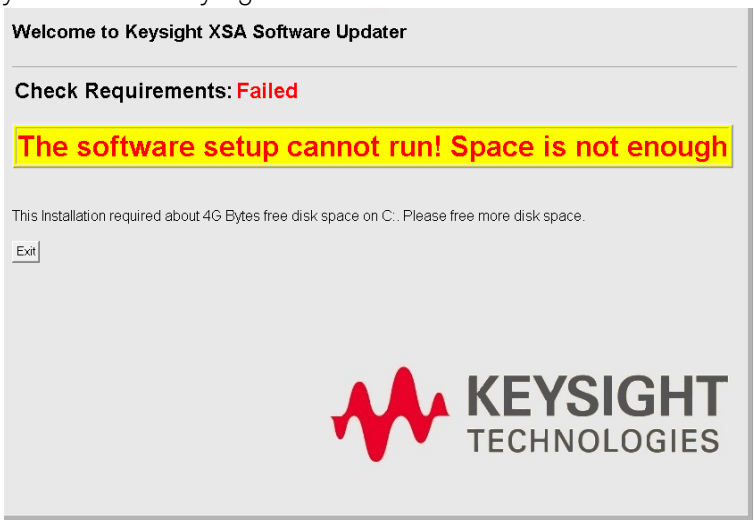
- User saved files
- FPGA

If Installation Fails

If anyone of the following conditions are not met, the software installation will be failed.

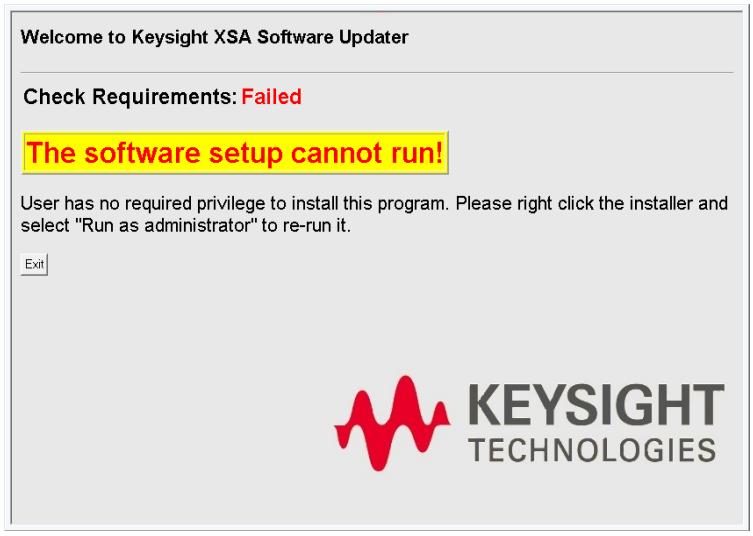
- Disk space is not enough

8 GB free space on drive C: is required for software installation. If there is not enough space, the requirements check will be failed. Please clean up your disk and try again.

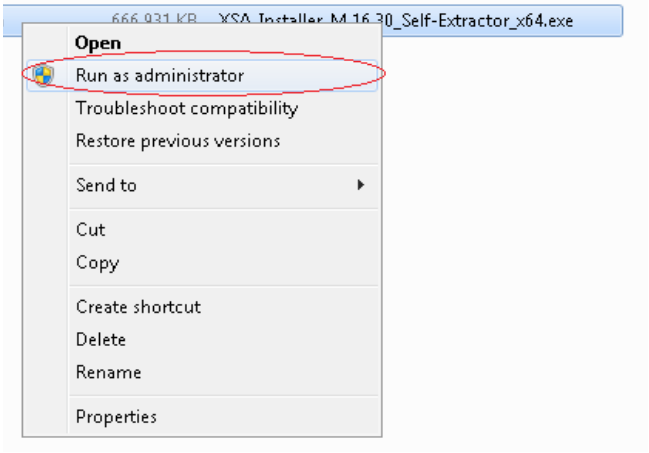


- Not run as administrator

  The message below will pop up if you do not run the program as administrator.



Please right-click on the program icon, select "Run as administrator" as below.



- Components installation failure

  Software installation includes the following sub-components installation:

  - IO libraries suite
  - HPP
  - License manager
  - License service
  - LXI server

  If the components is not installed properly, the failure message will be shown for issue tracking. Please restart the controller and re-install the software.

Keysight M9410A/M9411A/M9415A Signal Transceiver Licensing Options

There are two types of licenses for Keysight M94210A/M9411A Vector Signal Transceiver: Hardware license and software license. The License Manager is needed to install both of the two licenses on the controller.

Hardware license is the module hardware related license that need be installed on the module and only works with the module in which the hardware license is installed on. For example: F06, B6X and M05.

Software license is the software related license that is only installed on controller and can be shared among M9410A/M9411A/M9415A modular TRX application instances running on the controller, such as the measurement application licenses.

The Keysight M9410A/M9411A/M9415A Vector Signal Transceiver uses four licensing types for measurement applications.

F - Fixed licenses

T - Transportable licenses

N - Network licenses

U - USB Portable licenses

And there are 5 terms attached to the license to indicate the license effective time.

P - Perpetual

F - 6 months

L - 1 year

X - 2 years

Y - 3 years

These licensing types and terms are available on all existing measurement applications except the IQ Measurement Application, which requires a fixed perpetual license (shipped Standard). Fixed Perpetual licenses are also required to enable hardware options.

Fixed Licenses

Fixed licenses are the traditional license type with the same duration that have been available for all features since the introduction of the X-Series analyzers.

Fixed licenses are identified by the “F” in the second character and a “P/F/L/X/Y" in the third character of the option designator:

Example: N9073EM0E-1FP or N9073EM0E-1FX

A license key is instrument model and serial number dependent. You can only install the license key on the specific instrument for which it was created.

Transportable Licenses

Transportable Perpetual licenses are an optional license type offering deployment duration which is not fixed to a specific product model and serial number. Transportable licenses are identified in the product structure by a “T” in the second character and “P/F/L/X/Y" in the third character of the option designator:

Example: N9073EM0E-1TP or N9073EM0E-1TL

Transportable licenses require a connection to the Keysight server only for managing the check-in/out of the license. The Keysight licensing server 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.

Transportable Perpetual 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.

Keysight recommends that instruments be at 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.

Network Licenses

Transportable Perpetual licenses are an optional license type offering deployment duration which is not fixed to a specific product model and serial number. Transportable licenses are identified in the product structure by a “T” in the second character and “P/F/L/X/Y" in the third character of the option designator:

Example: N9073EM0E-1NP or N9073EM0E-1NL

The server has a count for each license and will only allow instruments to “check-out” a license up to that count. Once the count is reached for a specific license, further check-outs fail until one of the licenses is checked back in to the server. Therefore, it is possible for an instrument to have different features available to it based on what licenses are available on the server when it tries to get the licenses.

Setting up network licenses is done via the *Keysight Floating License Manager*. Refer to the Installation Guide that can be downloaded from the web page:

http://www.keysight.com/find/floatinglicensemanager

Application License

Application licenses (like N9073EM0E-1NP) are automatically checked out when entering the mode that uses them, and they are automatically checked-in when leaving that mode. Because the server may have already checked out the last license for the application to another instrument, there is a possibility that a mode switch will fail because a required license could not be checked out from the server. If the server has a limited number of licenses compared to the number of users desiring to use that license, this may mean that switching from mode A to mode B then back to mode A may fail when returning to mode A because another instrument checked out the last available license while the user was in mode B. Also, for modes with multiple licenses for different features (like Multi-Standard Radio), the features available may also change when switching out of the mode and back into it.

USB Portable Licenses

The USB Portable license is implemented with a physical dongle that is a USB device like a USB thumb drive. It has a Host ID fixed in the dongle hardware. It does not contain any writable data and so is acceptable to high security A/D customers. Transporting licenses from one instrument to another just requires moving the dongle and license files to the desired instrument. The license files can be installed on many instruments, but they will only be valid on the one instrument that has the dongle.

USB Portable licenses are identified in the product structure by an "U" in the second character and “P/F/L/X/Y" in the third character of the option designator:

Example: N9073EM0E-1UP

With USB portable licenses, the pre-installed Keysight Floating License Manager is used to add licenses to the instrument’s server.

USB Portable licenses with a limited count are checked out and in like Network licenses. Because the licenses are local, there will be no network latency involved in the check-out/check-in, but there can still be a slight performance degradation compared to Fixed and Transportable licenses.

USB Portable licenses that are "uncounted", will perform comparably to the Fixed and Transportable licenses.

Plugging/un-plugging the dongle is equivalent to transporting a license to/from the controller, however, the TRX application must be restarted whenever the dongle is plugged in.

Configuring Network and USB Licenses

The Keysight Floating License Manager must be used to configure the Network or USB Portable licenses before the licenses can be used. A controller can be configured for Network or USB Portable licenses or both. To set up USB Portable licenses, in the Keysight Floating License Manager select “Start a floating license server with a license file” and add files containing the USB Portable licenses desired. To set up Network licenses, in the Keysight Floating License Manager select “Connect to a floating license server” and enter the network server’s name preceded by the “@” character (example: “@myserver”). To set up both Network and USB Portable license, first configure the USB Portable license, then configure the Network licenses, but append “;@localhost” to the server name (example: “@myserver;@localhost”). Whenever the configuration is changed, the TRX application software must be restarted.

Licensing Measurement Application Software - After Initial Purchase

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

For all software upgrades, we recommend that the latest version of the software be installed. This ensures that the measurement application being licensed and activated is installed and is the most current version.

A license key is usually for one Host ID only. The Host ID for Fixed and Transportable is the instrument model and serial number, for Network it is the server's MAC address, and for USB Portable it is the USB Dongle's number (printed on the dongle).

NOTE No calibration is required after a measurement application installation.

Install License by Using a USB Storage Device

Please refer to the procedures below to install a measurement application fixed license with a USB storage device on the controller:

Step	Action	Notes
1.Redeem the Option Upgrade Entitlement Certificate	Follow the instructions on the Certificate	After redeeming your Option Upgrade Entitlement Certificate you will receive an e-mail with an attached License 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 the USB ports of controller/computer. Make sure Keysight License Manager is running on your controller.	The controller will automatically load the license file. (This may take a few minutes) Upon completion, the Keysight License Manager will display 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 controller/computer. C:\Program Files\Keysight\licensing	
4. Verify installation	Launch Modular TRX application. Click **>System>Show System.** Verify that the new application appears in the list.	This displays the list of installed applications. If you require further assistance, please refer to the link below to get Online assistance: http://www.keysight.com/find/assist

NOTE

For other license types:

-Transportable licenses use the Keysight License Manager to perform a transport.

-Network licenses are loaded on the server and set up with the Keysight Floating License Manager.

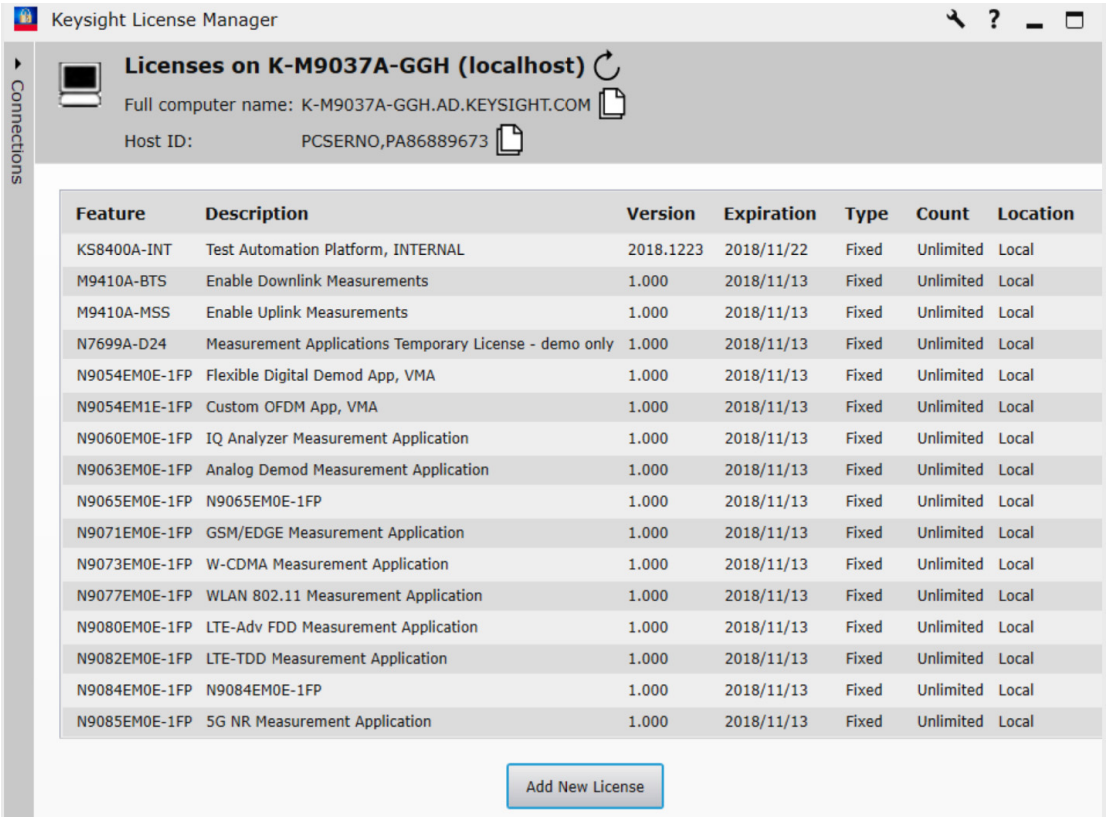
-USB Portable licenses are loaded onto the controller and configured with the Keysight Floating License Manager.

Install License by Using License Manager

For the user who is not available to use the USB storage device, the license manager can be used to install the license through network. The License Manager is installed while the M9410A/M9411A/M9415A software is installed. Please follow the following steps to install the license with License Manager:

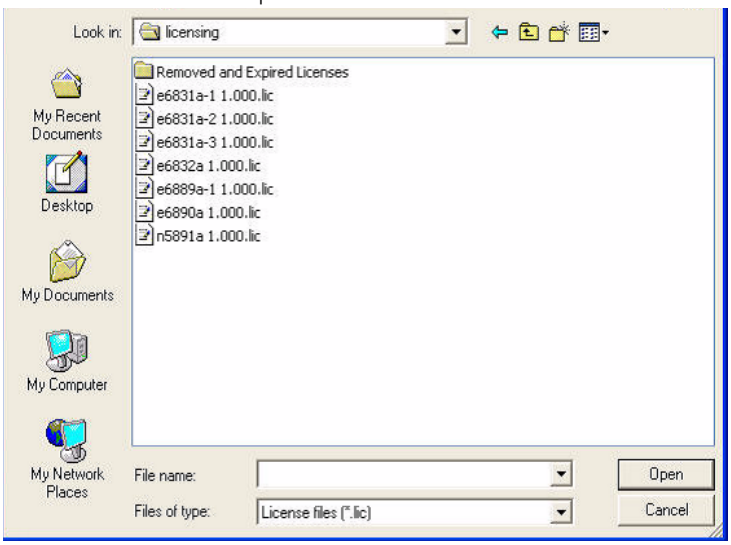
1. Follow the instructions on certificate to redeem the license.
2. Place the license file either on a network-connected driver or any other place where the controller can access it.
3. Starting License Manager.

   To start Keysight License Manager from the Windows Start menu, click the Windows Start button, and then select: *All Programs* > *Keysight License Manager* > *Keysight License Manager*. Refer to the following figure for overview of License Manager GUI.



   Keysight License Manager provides a graphical user interface (GUI) that gives you a visual representation of the installed licenses on your controller.
4. Select the target system's node in the tree view.
5. Click File menu in License Manager, and then select Install License(s). An Install License File(s) window pops up.

6. In this window, browse to the license file location, select the license file(s), and then click the Open button.



   The license is automatically installed (from the previously selected license file) and now appears in the license list as an installed license under the system. Note that the install operation takes some time to complete (up to 30-40 seconds).

To complete hardware licensing, please refer to "Hardware License Installation" on page 53.

Transporting a License

Transportable licenses can be identified by the letters "TP" in their option designator. For example, N9073EM0E-1TP indicates the license is transportable and perpetual. To transport this license from one controller to another, Keysight recommends that both controllers be at the same software release. This ensures that the user experience is identical between controllers. As a minimum, the target system must at least be able to support the desired application.

The M9410A/M9411A/M9415A vector signal transceiver support several ways of transporting licenses. The procedure below will focus on the most common procedure, where neither of the controller has access to an Internet connection. We will refer to the controller from which the transportable license will be removed as the "source system/controller". We will refer to the controller which will receive the transportable license as the "target system/controller".

Keysight recommends that the system running Keysight License Manager is connected to the Internet, and connected to both the source system and target system, which are connected to a LAN. If you do not have this recommended network configuration, see the Keysight License Manager Help for details on how to transport a license.

If you have the recommended network configuration implemented, you can easily transport a transportable license by performing the following procedure:

1. In Keysight License Manager, have both the source system and target system connected and visible in the Tree View.
2. In the Tree View, expand the source system's Installed Licenses node so that all installed licenses are visible.
3. In the Tree View, drag the transportable license from the source system to the target system's IP address/hostname node.

The license is automatically transported from the source system to the target system, and it now appears under the target system's installed licenses in the Tree View. Note that the transport operation takes some time to complete (up to 60-90 seconds) due to the Internet activity with the Keysight software-license- redemption procedure.

If either the source system or the target system is not visible in the Tree View because the Tree View's displayed area is too small to contain both systems, you can transport a license by cutting and pasting the transportable license. (That is, cut the license from the source system, scroll to the target system, and then paste the license into the target system.

4 Launching Modular TRX Application

This chapter provides the information on how to launch a Modular TRX application with topics below.

"Configure Application Tool" on page 44

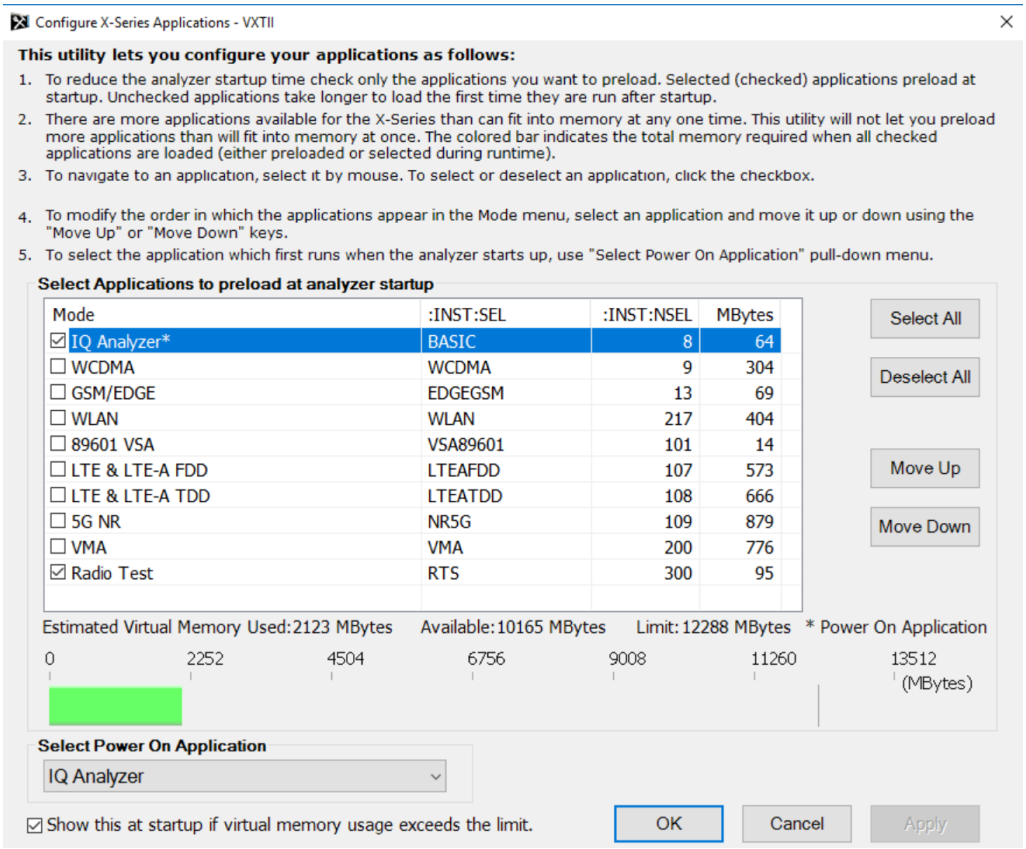
"Application Launcher" on page 45

"Launching Modular TRX Application with Launcher" on page 54

Configure Application Tool

The program *ConfigureApplications.exe* on the desktop allows you to configure certain behaviors of the applications (Modes). When this program runs, it affects the behavior at Modular TRX application startup. If you run this program while the Modular TRX application is running, it will take effect the next time the Modular SA application starts up.

Double-click on this icon *Configure Applications.exe*. If there are multiple modular products installed, the modular product selection window will pop up. Please select the wanted modular and the following window will pop up:



Follow the instructions in this dialog to configure your applications as desired.

For multiple instances of the Modular TRX applications on the same computer/controller, the same Configure Applications Utility is shared between all the instances, the same application configuration will be used on each application instance. The required memory shown on the panel is just for one Modular TRX Application instance.

NOTE The IQ Analyzer measurement application is standard for M9410A/M9411A/M9415A without license required. The additional measurement applications are available. Each application requires a license to execute the software.

Application Launcher

The M9410A/M9411A/M9415A launcher is a tool for invoking the Modular TRX applications for one or multiple modules. It is also used to update the FPGA and install module hardware license.

Before launching any application, install the M9410A/M9411A/M9415A module into the chassis.

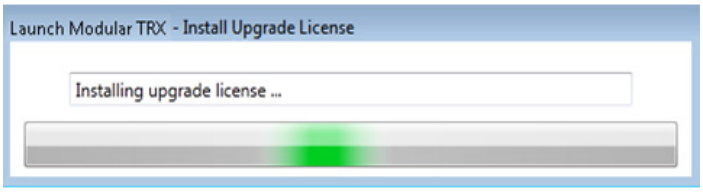
Start Launcher

Please click

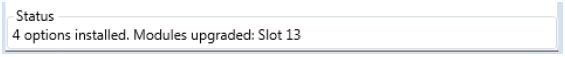
start Launcher from desktop, or start it from *Windows Start* > *All Programs* > *Keysight Modular Transceiver* > *LaunchModularTRX*.

Hardware License Installation

Launcher starting process will check if there is any hardware license available for the installed modules. If there is any hardware license installed In License Manager but not upgraded to module hardware, the launcher will check the hardware license and update the license to the module. A prompt box will be shown as below when hardware license is upgrading:

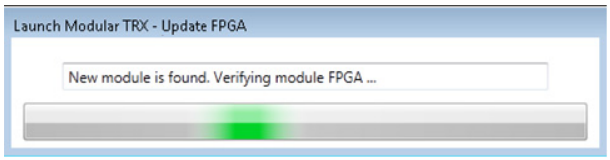


After hardware license upgrades successfully, it will be removed by License Manager. After the Launcher UI is displayed, the installed option number and on which module will be displayed on status bar:

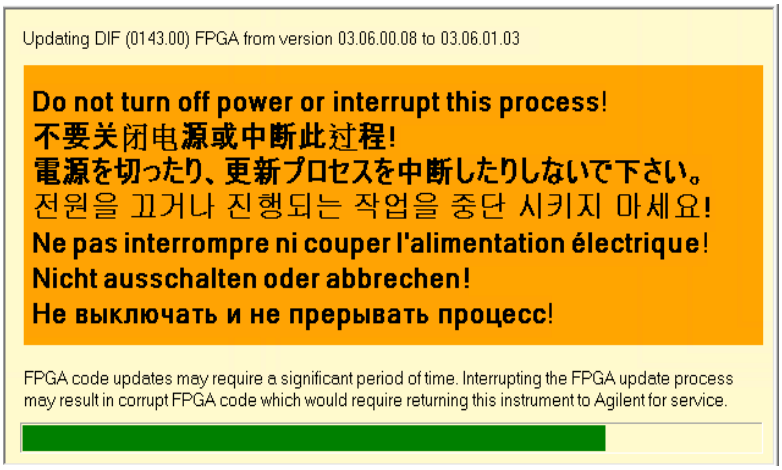


FPGA Updating

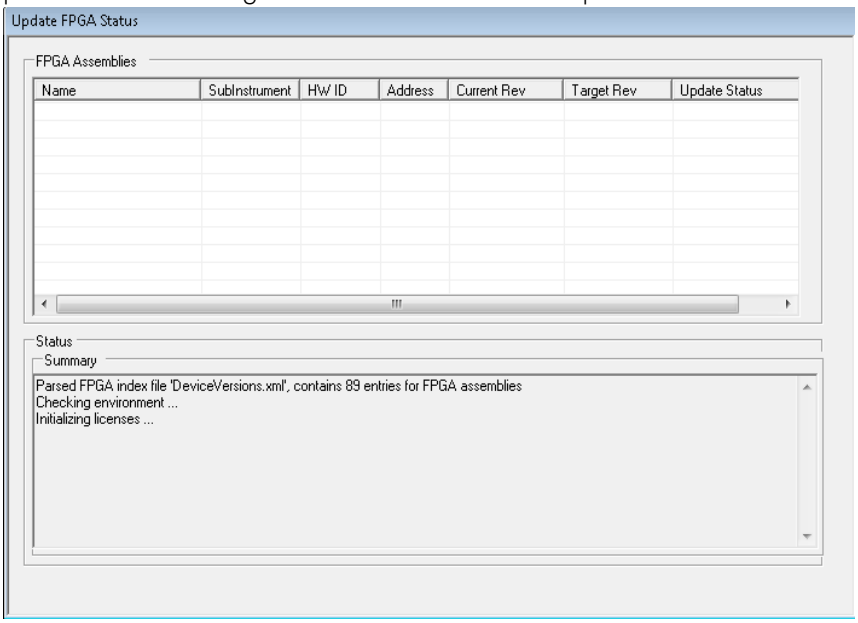
Launcher will check the FPGA versions on all the installed modules. The following message box will pop up when Launcher is verifying FPGA on new found module.



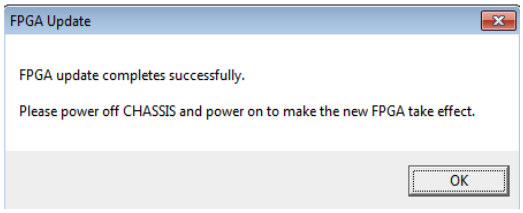
If the FPGA version is different with the version required by current Modular TRX, the FPGA on this module will be updated automatically. During the FPGA updating, a message box will be shown as following and the LED on the module will be in Fast Blink mode.



A window of "Update FPGA Status" will be shown during the FPGA update process as following to indicate the detailed update status:



After FPGA update is completed successfully, a message box will pop up, then power off and power on the chassis to enable the update:



CAUTION

If there is not any module numbers displayed in the launcher during the launching process, the possible reason is the controller's TRX software version is not compatible with the later FPGA version in the module.

To upgrade the module's FPGA version, please go to http://www.keysight.com/find/m9410a -> **Support** Tab -> **Drivers, Firmware & software** to download the latest FPGA service pack *UpdateFPGA.exe*. After running this file, the FGPA version will be upgraded and the current installed module number will be shown in the launcher.

TRX Software & Modular FPGA Compatibility

The M9410A/M9411A service pack is a software package with FPGA downgrade pack for M9410A/M9411A software/hardware compatibility. The instrument software installed on the controller only recognize the module with its corresponding or older FPGA version(s). If you want to use an early released software with module which has a newer FPGA version, the FPGA downgrade pack must be installed along with the instrument software. Please go to http://www.keysight.com/find/m9410a > **Support** > **Drivers, Firmware & Software** to download the service patch of the early released TRX software respectively. o

Please follw the procedures below to complete the patch installation:

1. Install the M9410A/M9411A modules for the FPGA downgrade into the chassis.

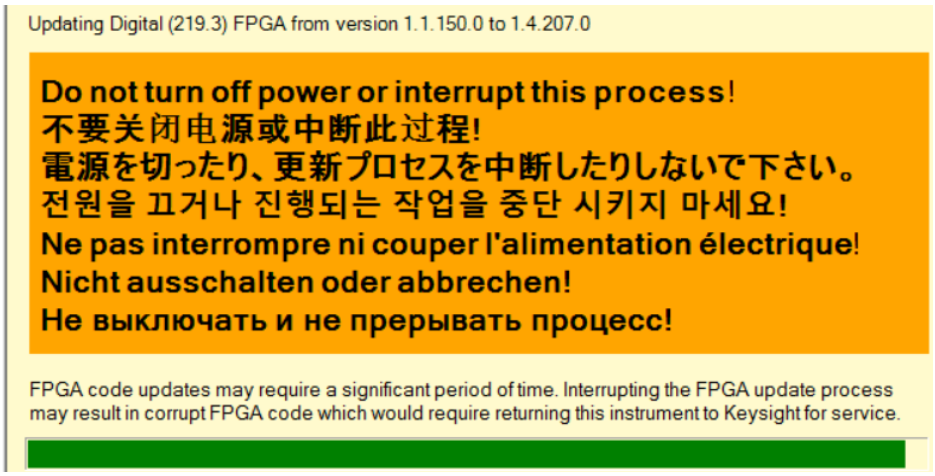
CAUTION

Before installing this service pack, please double check your TRX software version on the controller is matched with the service pack, and the M9410A/M9411A module is installed properly in the chassis. If you do not install the modules into the chassis, the FPGA downgrade will not be completed even the service pack is installed successfully in your controller.

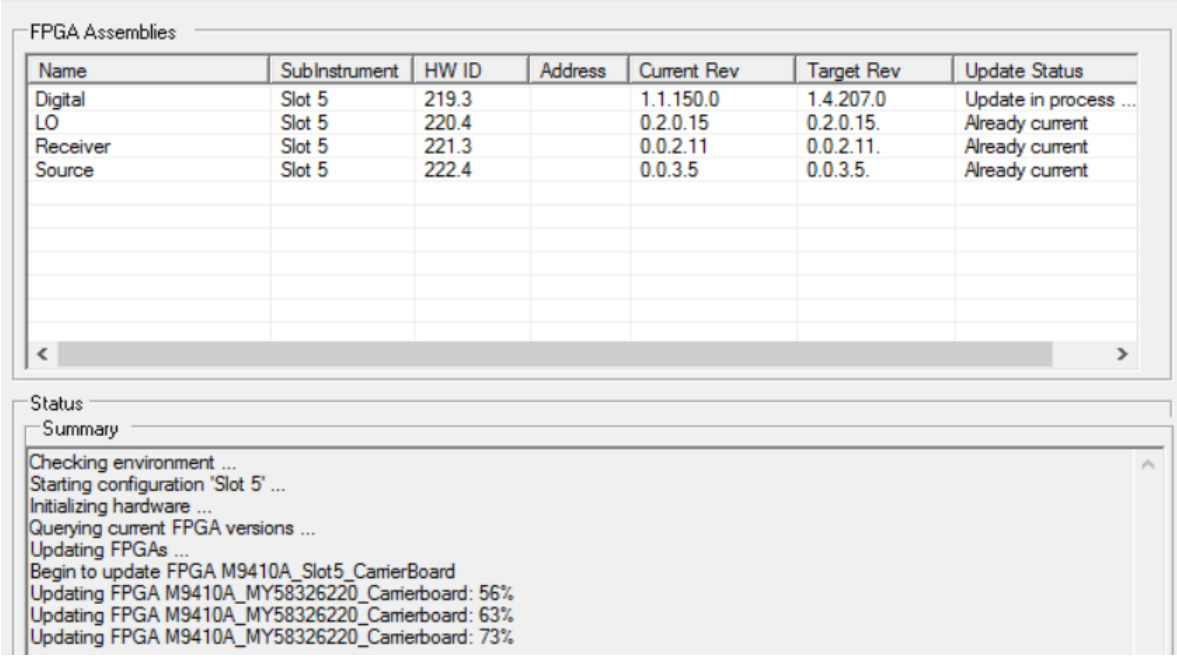
2. Turn off the TRX application and the launcher program if they are still running.

3. Download the service pack on your controller, right click on the file "VXT2_ServicePack_M.xx.xx_Rev_1.exe" and select "**Run as administrator**".

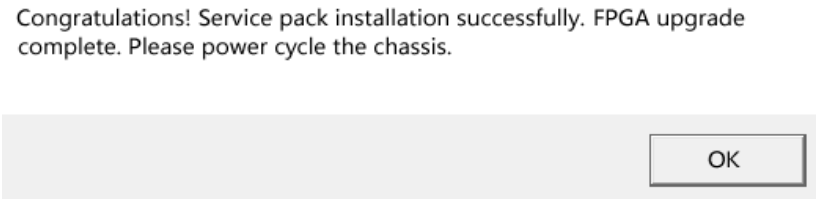
4. An installation window will pop up. Click **Yes** to initiate the installation and the FPGA downgrade process will be triggered automatically.
5. The FPGA update will last for 3 - 30 minutes for each module depending on the different FGPA versions. The pop-up window as below indicates the updating status.



Update FPGA Status



6. When the installation is completed, a window will pop up as below. Click "OK" and restart the controller to activate the FPGA update.

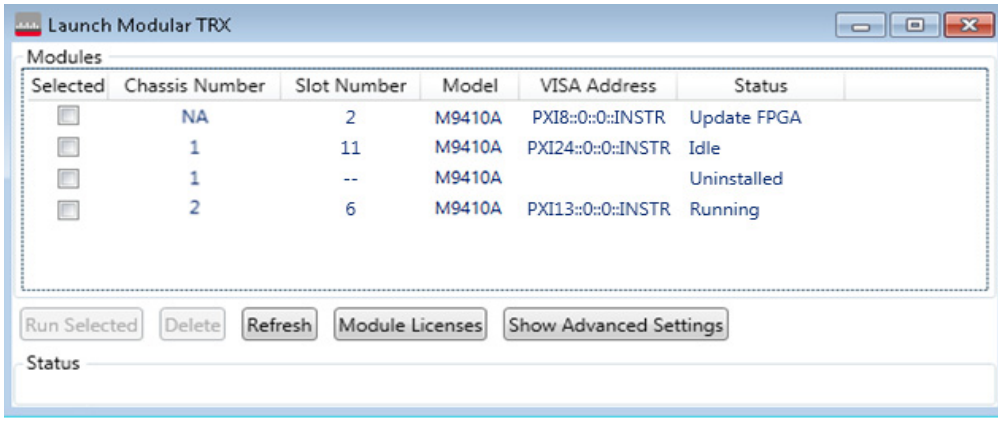


7. Please follow chapter 4, "Launching Modular TRX Application" on *M9410A/M9411A Getting Started Guide* to launch the application. The FPGA on this module will be updated automatically. After FPGA update is completed successfully, power off and power on the chassis to enable the FPGA update.

If the service pack is installed successfully, the module name will be listed in the launcher window.

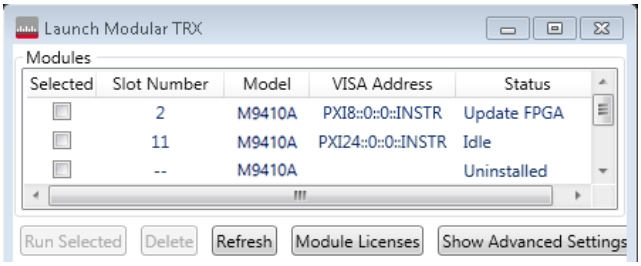
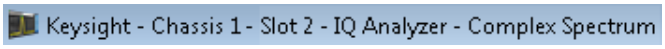
Launcher Features

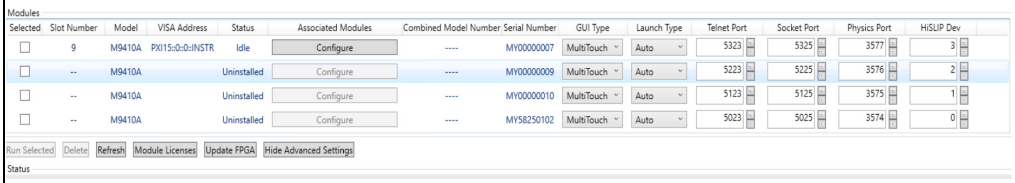
Launcher UI is shown as following for the configurations and launching. The modules shown in the list include not only the modules which have been saved in configuration file but also the modules that are not saved but currently existing in the chassis.



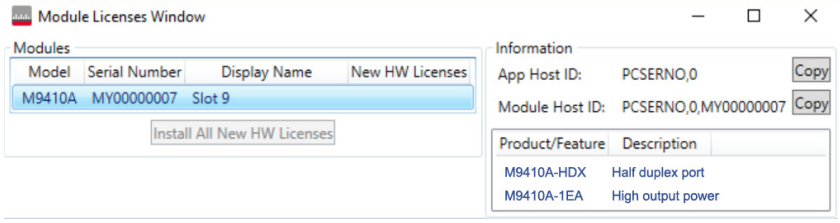
Refer to the table below for the description of each items in the launcher.

Items	Description
Selected	Indicates whether this module is selected. If this module is selected, the check box of that module will be checked

Items	Description
Chassis Number	Shows the Chassis Number in which the module is inserted in. This column will only be visible when there is chassis number greater than 1. When there is only one chassis used, this column will be invisible, the panel shows as following:  If there is more than one chassis used, Chassis Number information will also be shown as a part of application title information, such as:  For the module which is uninstalled, the Chassis Number is shown as "NA".
Slot Number	Shows the Chassis Number in which the module is inserted in. For the module which is uninstalled, the Slot Number is shown as "NA". Slot number will be shown as a part of application title information.
Model	Shows the model name of the module.
VISA Address	VISA address string for the module. If the module is uninstalled, the VISA address will be empty.
Status	It indicates the status of each module as following: ▪ **Idle:** The module is in Idle state, no application running or FPGA updating with the module. It can be used to launch a Modular TRX application. ▪ **Running:** Modular TRX application is running with the module. You can not launch another Modular TRX application with this module. ▪ **Update FPGA:** FPGA on the module is being updated, or the FPGA on the module need be updated. ▪ **Uninstalled:** The module is not installed in the chassis. It is loaded from the saved configuration file but the module has been unplugged.
Run Selected:	When this button is pressed, if current selected module's "Launch Type" is "Manual" Or "Auto", and the "Status" state is "Idle", the Modular TRX application will be launched and connected to the indicated M9410A/M9411A/M9415A module. In addition, the configurations will be saved into the configure file automatically. You can select multiple items via ctrl or shift and left click. You can also use mouse or arrow keys to change the selected module.
Delete	Delete the uninstalled module from the module list.
Refresh	Refresh the module list by searching all existing M9410A/M9411A/M9415A modules.

<table>
<tr><th>Items</th><th>Description</th></tr>
<tr><td>Show/Hide Advanced Settings</td><td>When this button is pressed, the columns of advanced settings will be shown as below, and the button will be displayed as "Hide Advanced Setting".
 

The "Update FPGA" button will be shown when the Advanced Settings is unhidden.
If you press it again, the columns of advanced settings will be hidden again.
Associated Modules:
Click Configure to list a all associated modules in a pop-up window.
Combined Modules:
Displays the combined model number.</td></tr>
<tr><td>Show/Hide Advanced Settings</td><td>Serial Number:
Shows the serial number of the module.
GUI Type:
Chooses to use keyboard & mouse or touch screen to navigate the GUI
Launch Type:
Configures the start-up configuration of the software for the individual M9410A modules in the chassis.
There are three launch types:
▪ Auto:
If the launch type is "Auto", when you use command line to launch x application, the modular TRX application will be launched for the module. Please refer to "Launch Modular TRX Application Automatically" on page 55
▪ Manual:
If the launch type is "Manual", the controller will only run the Modular TRX application by pressing "Run Selected" button with the check-box for the module selected.
▪ Disabled:
If the launch type is "Disabled", the Modular TRX application will not be launched on the controller by "Run selected" button.
Telnet/Socket/Physics/HiSLIP Port:
Sets the Socket Port, Physics Port, and HiSLIP Dev for each module in the list. For more information about these settings please refer to the Programming Guide.</td></tr>
</table>

Items	Description
Update FPGA	This key is available in advanced settings. It is used to update the FPGA of all the modules that are inserted in the chassis if the FPGA version on the module is different from the version required by modular TRX. If there is any modular TRX running on the controller, this button will be disabled and grayed out. You need to close all the modular TRX instances before updating FPGA.
Module Licenses	A panel of module hardware license installation will be shown by pressing this button.  The left panel shows a list of installed modules. The installed module hardware licenses will be shown in the right pane after you selecting one module in the left pane. App Host ID is for redeeming software licenses on a controller, Module Host ID is for redeeming hardware licenses for a module with a controller. You need to provide these information when you are redeeming licenses. Use "Copy" button to copy the selected module host information text for the selected module. The copied host information can be pasted to where the host information is needed such as getting a hardware license for the module. If there is any new hardware license available, the new hardware license will be shown in the "New HW licenses" column and the "Install All New HW License" button will be available to install all new hardware licenses onto modules. Please refer to "Hardware License Installation" on page 53 for details.

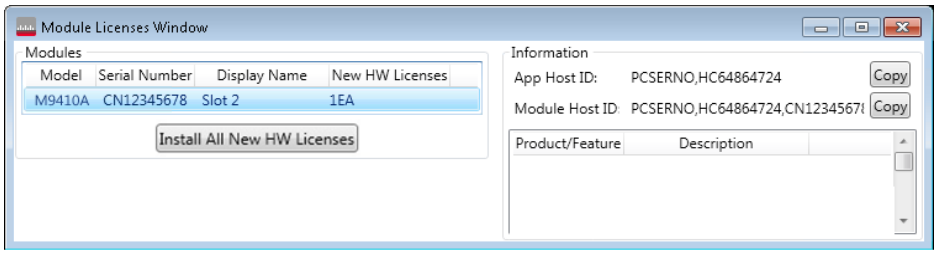
Hardware License Installation

Hardware license is the license that works with specified hardware features, such as "1EA", "HDX". Hardware license can only work with the module that installed the license on.

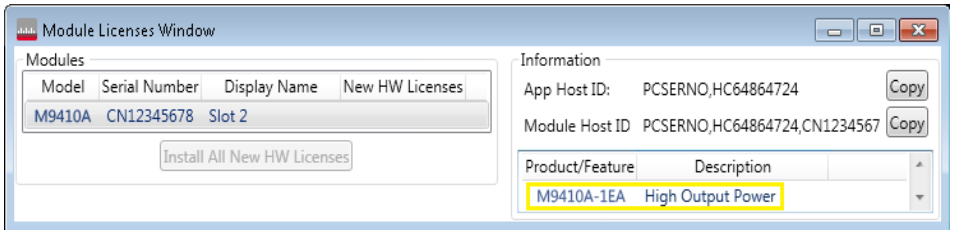
Hardware license is pre-installed inside module in factory before shipment, installing hardware license is only requested for hardware upgrade.

Following steps shows the recommended method to install hardware license:

1. Install hardware license file on controller by using Keysight License Manager. Please refer to "Install License by Using License Manager" on page 40.
2. Open launcher and click "Module License" button, the module license window with available hardware licenses you installed in step 1 will be shown as following.



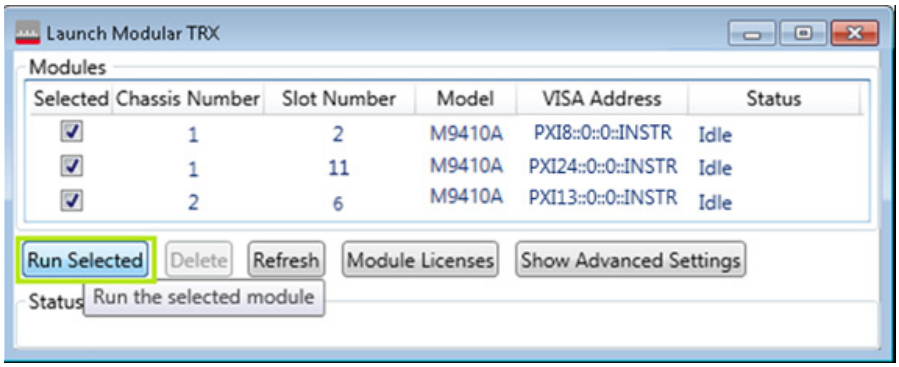
3. Click "Install All New HW Licenses" to install the hardware licenses. If there are multiple available licenses on multiple modules, all licenses on each module will be installed at same time. It will take several seconds to install the hardware licenses. After hardware license is installed successfully, the "New HW licenses" column will be empty and the "Install All New HW Licenses" button will be disabled and grayed out.
4. Click on the module in the module list which you installed the hardware license on, make sure the hardware license is installed successfully from the module information on the right of the window.



Launching Modular TRX Application with Launcher

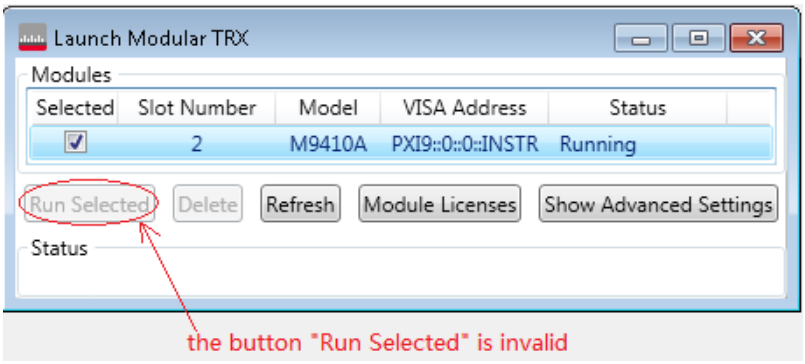
Launch Modular TRX Application Manually

Click "Run Selected" button in Launcher to launch Modular TRX Application with one or multiple modules:

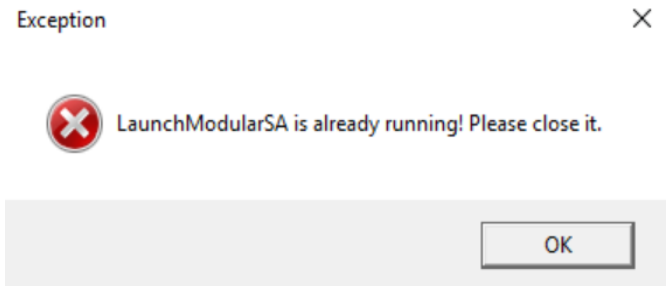


If multiple installed modules with "Idle" status are selected, multiple modular TRX application instances will run with each module after "Run Selected" button is clicked.

If a module is already running via IVI driver or some other drivers, the "Run Selected" button will be disabled as below.



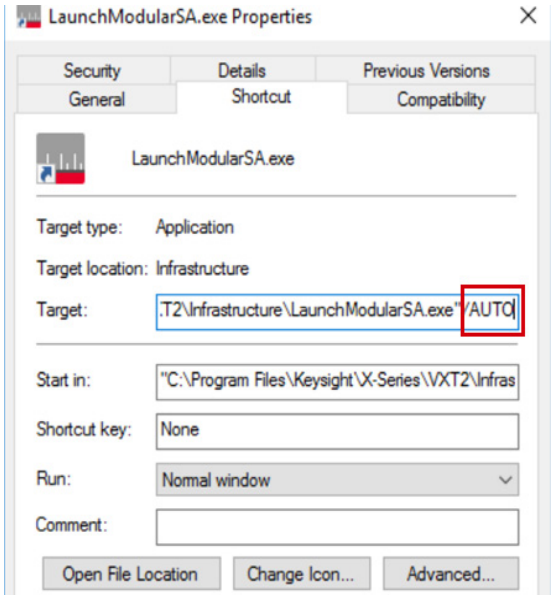
If you double click the *.exe file (i.e. C:\Program Files\Keysight\X-Series\MTRX\Infrastructure\ Agilent.SA.xSA.exe) directly in the installed folder, an error message will pop-up as blow:



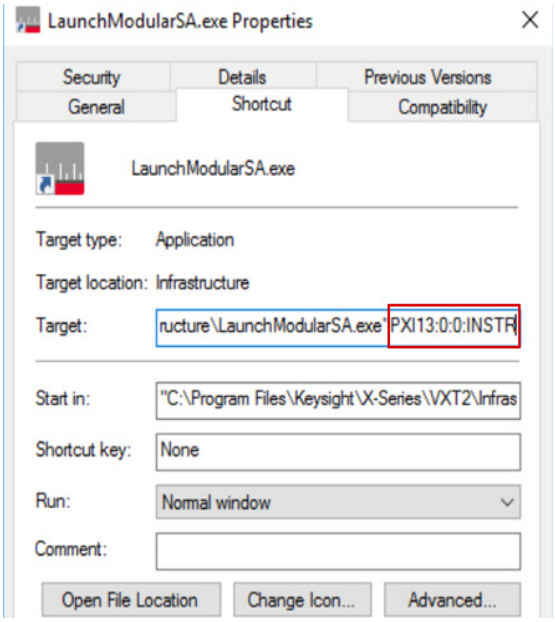
Launch Modular TRX Application Automatically

Follow the steps below to configure the argument of *LaunchModularTRX.exe* launching Modular TRX Application automatically:

1. Right click on the *LaunchModularTRX.exe* icon on desktop and choose "Properties".
2. On the pop-up Properties panel, click *Shortcut* tab and add "/Auto" or PXI VISA address of the module as argument of the target as following:



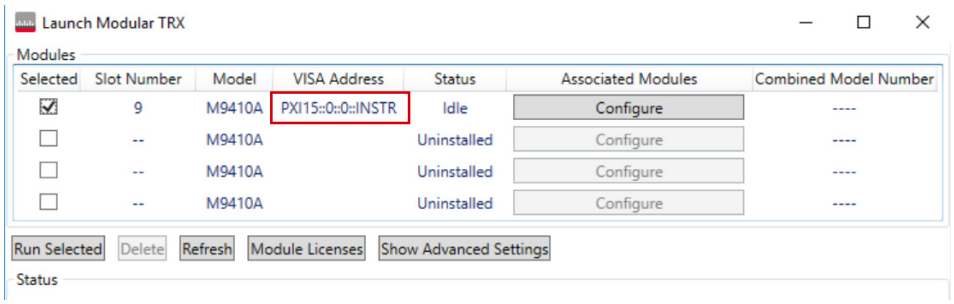
Or:



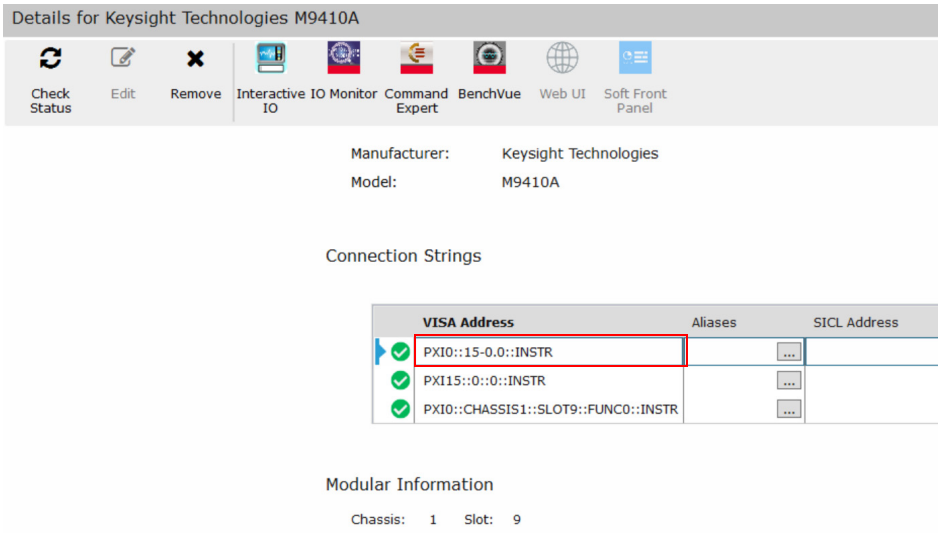
If the "/Auto" is added as argument, when the launcher is started, modular TRX application instances will be launched with all the installed modules with Launch Type of "Auto" that you configured last time from the Launcher UI. With this method you can launch multiple modular TRX application instances with multiple modules.

If PXI VISA address is added as argument, when the launcher is started, modular TRX application instance will be launched with the module with the PXI VISA address you input. With this method you can only launch modular TRX application instance with one specified module.

PXI VISA address of the module is shown in thee Launcher UI as below:



The PXI VISA address is also shown in Keysight Connection Expert as below.



3. Click Apply and OK to apply the argument.
4. Run Launcher. If the argument is added correctly, the modular TRX application will be launched automatically without showing the Launcher UI.
5. You can drag *LaunchModularTRX.exe* with correct argument into the window startup folder, then the modular TRX application will be launched automatically when you start up the controller next time.

Launch Modular TRX Application by Programming Codes

As an execute file, you can program to launch modular TRX application by starting the launcher with correct argument. See the following example code in C#:

```
try
{
    Process process = new Process();
    process.StartInfo.UseShellExecute = false;
    process.StartInfo.FileName = "Launcher.exe";
    process.StartInfo.Arguments = "PXI8::1::3::INSTR";
    process.Start();
    process.WaitForExit();
    exitCode = process.ExitCode;
}
catch (Exception ex)
```

The argument setting could be either /Auto or PXI VISA address. For details of the argument, please refer to"Launch Modular TRX Application Automatically" on page 55.

Launch Modular TRX Application by IVI driver

Keysight IVI drivers simplify the creation and maintenance of instrument control applications in a variety of development environments. IVI drivers allow you to programmatically control your instrumentation while providing a greater degree of instrument interchangeability and code reuse. For M9410A/M9411A/M9415A modules, you can also use IVI driver to launch the modular TRX application on the module and control to get data from the module with or without launching the modular TRX application.

Please refer to the example below to initialize IVI driver without running Modular TRX application:

```
KtM941xA driver = null;
string resource = "PXI0::23-0.0::INSTR";
string options = "QueryInstrStatus=true, Simulate=false, DriverSetup= AppStart = flase";
if(AssemblyLoadEventArgs.Length>0)
{
    resource = AssemblyLoadEventArgs[0];
    options = "QueryInstrStatus=true, Simulate=false, DriverSetup= AppStart = flase";
}
try
{
    //create driver instance
    driver = new KtM941xA();
    const bool idquery = true;
    const bool reset = true;
    //initialize the driver. see driver help topic "Initiallizing the IVI-COM Driver" for additional information
    driver.Initialize(resource, idquery, reset, options);
```

If customer want to run Modular TRX Application, set `AppsStart = true` during IVI initialization as below:

```
options = "QueryInstrStatus=true, Simulate=false, DriverSetup=
AppStart = true";
```

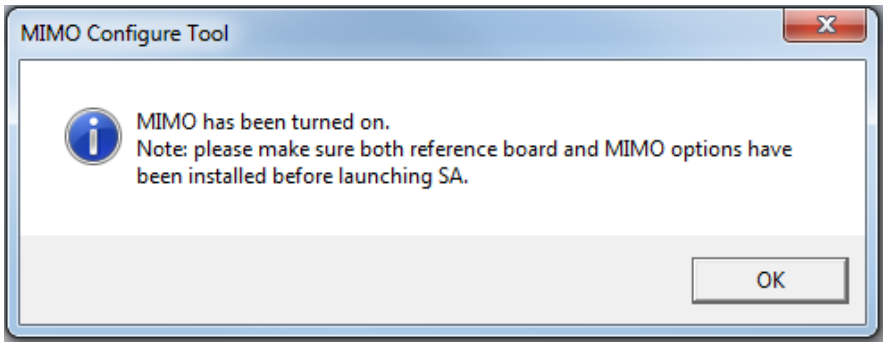
Please refer to Keysight IVI drivers help document for details. The help document is available in: Start Menu > Keysight M941xA PCIe Module.

Launch Modular TRX Application for MIMO Measurement

M9410A/M9411A/M9415A supports MIMO measurement as option MMO. This feature is available when the MIMO option is installed.To use this feature, you need enable MIMO function before launching the Modular TRX application. The MIMO configure tool is needed to enable the MIMO feature, the *MIMO configure tool* is located: "C:\Program Files\Keysight\X-Series\VXT2".

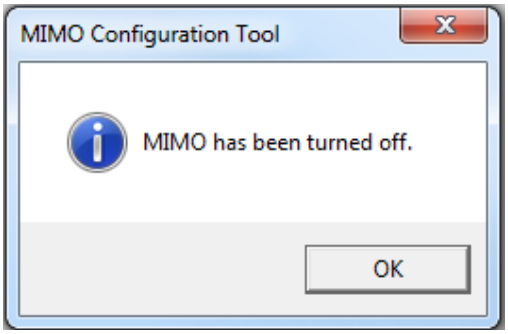
NOTE **To use MIMO function with M9410A/M9411A/M9415A, all the modules should be installed in M9019A chassis.**

To enable MIMO function, double-click MimoOn.exe, a window will pop up as below:



Click OK and MIMO function will be turned on.

To disable MIMO feature, double-click MimoOff.exe, a window will pop up as below:



5 Using Modular TRX application

This chapter provides some guidelines for how to use a modular TRX application.

The capabilities described in this section are Microsoft Windows 10 features. The description provided here gives some guidelines for using the capabilities with the instrument. You need to refer to the Windows 10 help documentation for more information. Your version of Windows may not match these instructions exactly.

NOTE For embedded controller users, you need an external USB keyboard and mouse to fully use these features.

"Remote Desktop: Using the M9410A/M9411A/M9415A Remotely" on page 60

"TCP/IP Address Setting in Keysight Connection Expert" on page 63

"Display Features" on page 66

"Function Verification - Making a Basic Measurement" on page 72

"Set the Paging File Size for Multiple Applications" on page 74

"Using the Interactive Help System" on page 76

Remote Desktop: Using the M9410A/M9411A/M9415A Remotely

Windows Remote Desktop is recommended for remote control of the controller. It offers fully-interactive control that is almost identical to direct control of the M9410A/M9411A/M9415A.

NOTE

The Remote Desktop functionality is a Microsoft Windows 10 capability. The following discussion provides some guidelines for using this capability with the instrument. You need to refer to the Windows 10 help documentation for more information. As Windows evolves, these instructions may no longer be exact.

Overview of Remote Desktop operation

Using the Remote Desktop functionality allows you to control and interact with the controller from a remote computer.

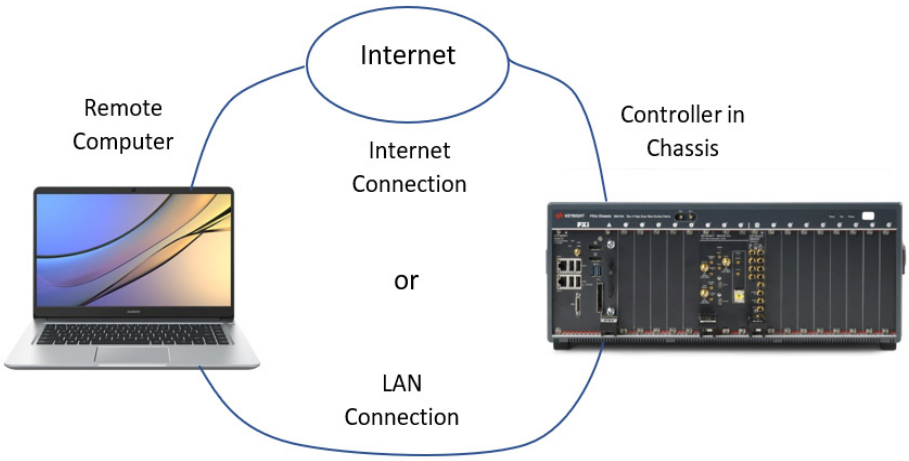
When you have configured the controller for remote connectivity, and configured a separate computer to act as a Remote Desktop Host, you can send commands to the controller from the remote computer, and you can see the application display on the screen of the remote computer.

This section provides full details of how to set up the controller for remote connectivity, and also how to set up a computer running any version of Microsoft Windows as a Remote Desktop Host.

Setting up Remote Desktop operation

It is possible to access and control the controller through direct LAN connection or the Internet, or a local internet. This section provides details of how to use this functionality.

Figure 5-1 Connection setup for remote desktop operation



NOTE

To perform this operation successfully, you must have Administrator level access to the controller.

Table 5-1 Setting up a remote desktop connection

Step	Action
1. On the controller, open the Windows Control Panel	▪ On the controller windows menu, press **System**, **Control Panel**,
2. Select System functions	▪ From the Adjust your computers settings menu, click **System**.
3. Access Remote setting	▪ In the Control Panel Home window, select **Remote Settings**
4. Select the Remote option	▪ On the Remote tab, in the Remote Desktop section, click the checkbox to allow remote connections to this computer.
5. To add users	▪ Click **Select Users**, **Add**.
6. Follow the on screen instructions.	

Setting up the remote computer

The procedure depends on whether the Remote Computer to be set up is running Windows 10, or another version of Microsoft Windows.

Remote computer running Windows 10

Windows 10 includes the Remote Desktop Connectivity Client software, so no additional setup is required.

Remote computer running another version of Windows

You can use any version of Windows to install and run the Client software for Remote Desktop Connectivity. However, you need to have available a Windows installation CD-ROM, because that contains the Client software.

How to locate the computer name/IP address of the Controller

To connect a remote computer to the controller, you need to know its Computer Name or IP address. Those information can be displayed as follows:

Table 5-2 Locating the name from the Keysight application

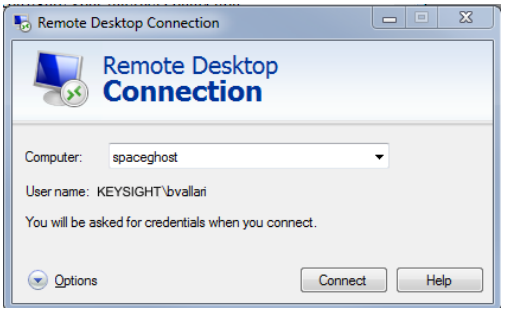
Step	Notes
On the TRX application front panel, press , **System**, **Show System**.	A page listing various parameters appears.The controller's computer name and IP address is shown in the list.

Running a Remote Desktop session

Initializing a Remote Desktop session

After setting up the remote computer for Remote Desktop Connectivity, as described in "Setting up Remote Desktop operation" on page 60, you are ready to start a Remote Desktop session.

Table 5-3 Starting a session

Step	Notes
1. Click > **Windows Accessories** > **Remote Desktop Connection.**	A Remote Desktop Connection dialog appears: 
2. Enter the computer name/IP address of the controller.	
3. Click **Connect**.	A login dialog box appears.
4. Enter the login account name and password.	

The controller Window 10 system display appears on the screen of the remote computer. Please refer to "Launch Modular TRX Application Manually" on page 54 to launch the Modular TRX application on your remote computer.

Ending a Remote Desktop session

To disconnect the remote computer from controller, ending the session:

Step	Notes
Click the **X**, then click **OK** on the dialog-box.	For full-screen, the X appears at the top center of the window. For non full-screen, the X appears in a box at the right of the window's title bar.

TCP/IP Address Setting in Keysight Connection Expert

M9410A/M9411A/M9415A supports the TCP/IP connection standards for LAN and HiSLIP (High-Speed LAN Instrument Protocol) instrument.

There are two connection configurations to control a M9410A/M9411A/M9415A module.

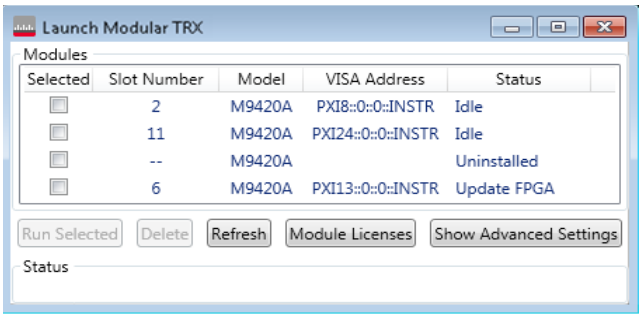
Local Control - The controller is a modular installed in the chassis with M9410A/M9411A/M9415A module or the controller is a PC and there is not any controller module installed in chassis. Both of the two connections use the PCI-PCI bridge for data communication.

Remote Control - The controller is a modular installed in the chassis and an external PC controls the M9410A/M9411A/M9415A module via LAN connection as a remote controller.

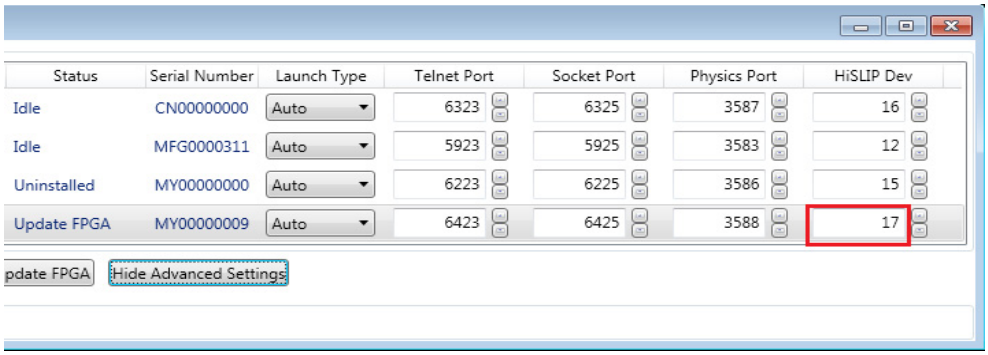
Address Setting in Local Control

Please refer to the procedures below to set the address in Keysight Connection Expert when the module is set in local control.

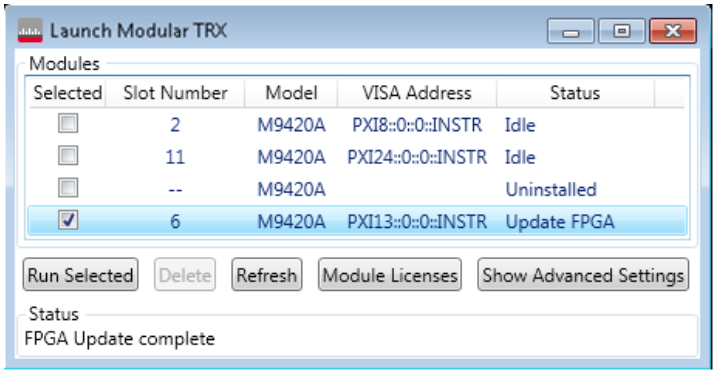
1. Run *LaunchModularTRX.exe* in controller. The pop-up window is shown as below.



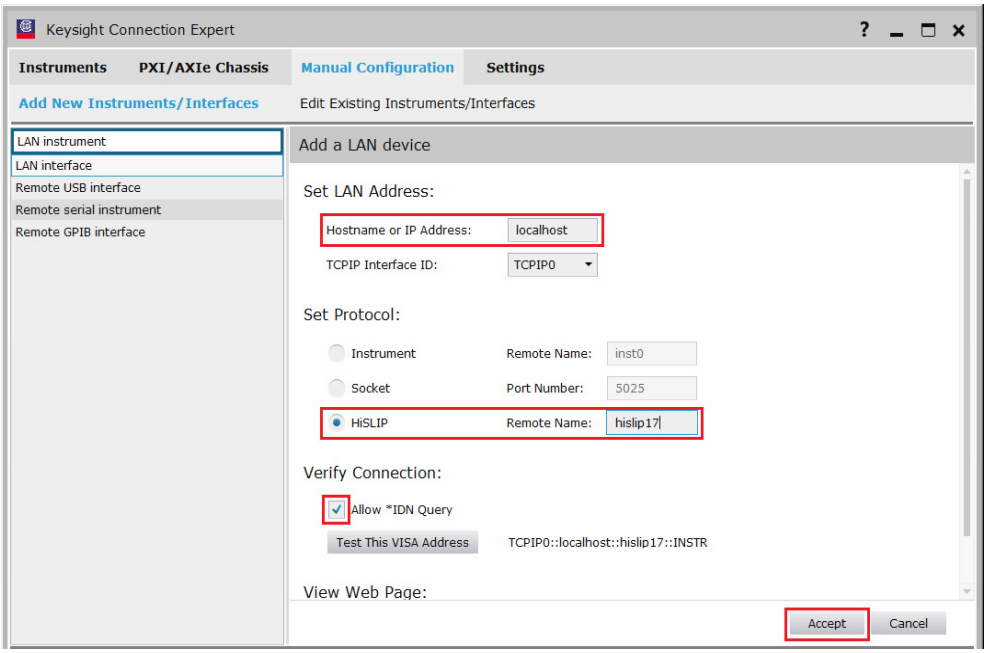
2. Click **Show Advanced Settings**. For this transceiver, the "HiSLIP Dev" value is 17. This value will be used to set the remote name in *Keysight Connection Expert*.



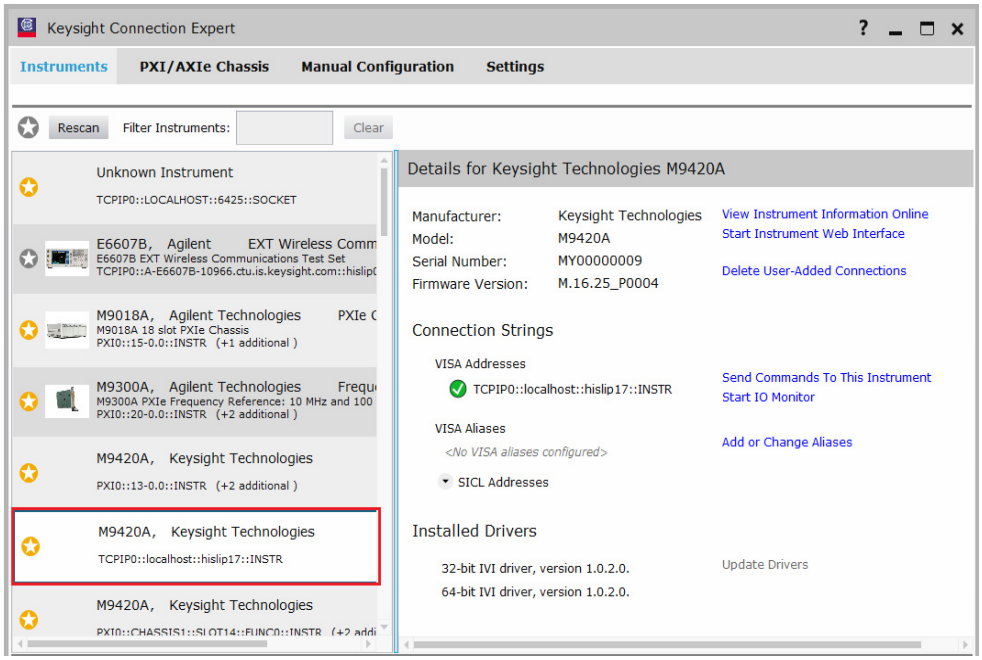
3. Check the box named **Selected** and click **Run Selected** to run the Modular TRX application.



4. Run Keysight Connection Expert. Click **Manual Configuration**.
   a Set Hostname or IP Address as **localhost**.
   b Set Protocol to **HiSLIP** and set Remote Name to **hislip17**
   c Check the box named **Allow *IDN Query** and click **Test This VISA Address** to verify the connection. If the connection is ready, the address will be shown next to the button.
   d Click **Accept** as a terminator for the settings



5. Click Instrument on the tool bar. You will find M9410A and its TCP/IP address is `TCPIP0::localhost::hislip17::INSTR`. This address is used by the Automatic Test System run in controller or external PC which communicate with the modular by PCIe-PCIe bridge.



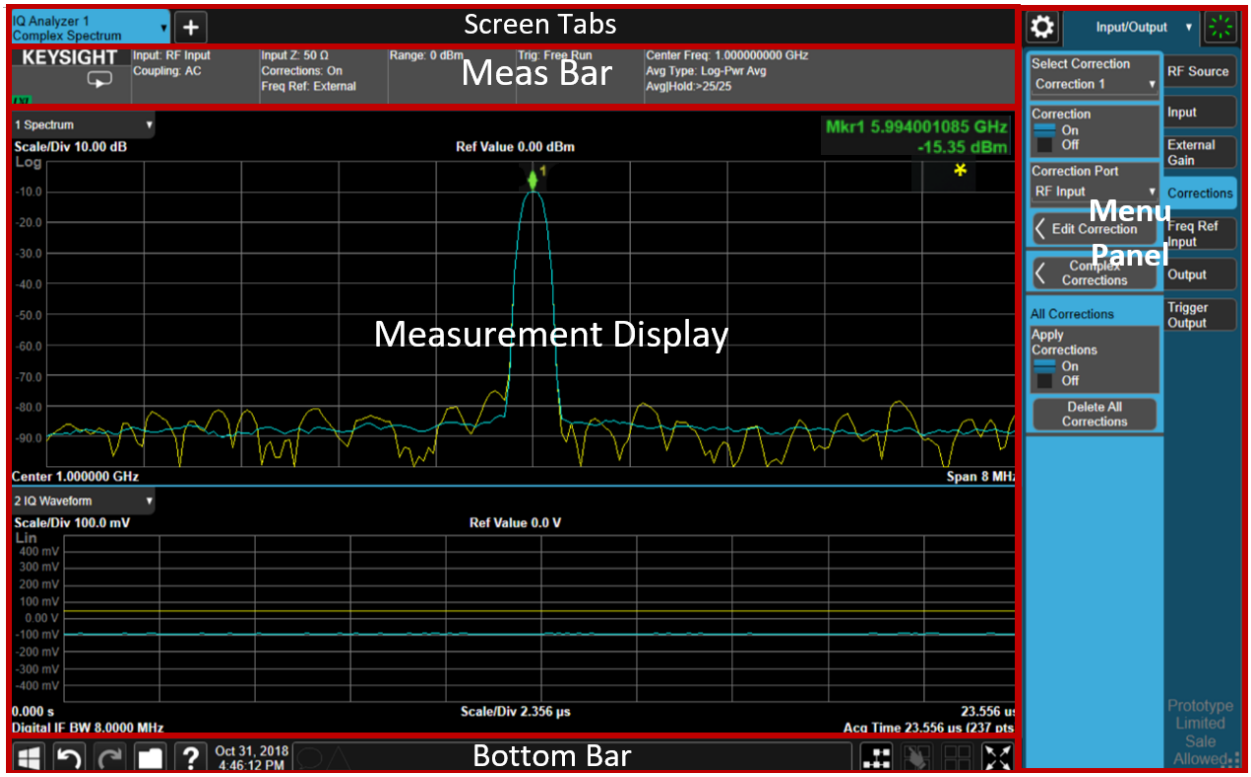
Address Setting in Remote Control

For Remote control, you need know the controller's IP address. Please press **System** > **Show** > **System** in Modular TRX Virtual Front Panel to get the IP address of the controller.

Please follow the step 4 and step 5 of "Address Setting in Local Control" on page 63 to set the address in Keysight Connection Expert. The only difference is to set the Hostname or IP Address as xxx.xxx.xxx.xxx (controller's IP address) rather than *localhost*.

Display Features

This section describes the regions of the TRX application window.



Invalid Data Indicator

The invalid data indicator is displayed whenever the data on the display does not match the settings of the analyzer. The most common example of this is when settings have changed in the time since the data in the traces on the display was taken. This means that the screen annotation cannot be guaranteed to match the trace data. For example, if you change Center Frequency, the invalid data indicator will display until a new sweep has completed.

If any Trace is in View mode (displaying but not updating) and the settings are changed, the invalid data indicator will display as long as that trace remains in View. Traces that are blanked do not turn on the invalid data indicator.

Not all settings require display of the invalid data indicator when they change, only changes that require a new acquisition will cause it to display. For example, changing the Y-Axis scale does not cause the invalid data indicator to display, unless the attenuation changes.

Also, the invalid data indicator is turned on:

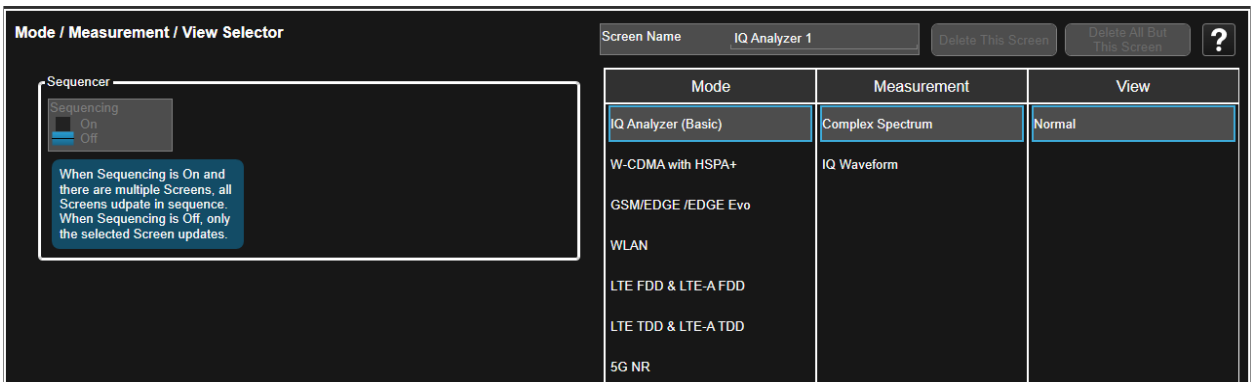
- When the counter is turned on, until the completion of the first count

- When a trace is imported from mass storage and the trace's parameters do not match the current analyzer settings
- When a trace is sent from a remote interface (since there is no way to know if its settings match)

NOTE The Data Invalid Indicator has an associated status bit that can be checked at any time to see if it is on.

Screen Tabs

Along the top of the display are tabs, one for each measurement screen you have defined. Tap the + sign to "clone" the current measurement, which can be changed once it is created. Tap the current screen tab to display the following dialog:



This dialog allows you to choose a Mode, Measurement and View.

When you select a mode, the measurements that are available in the mode are displayed in the Measurement column.

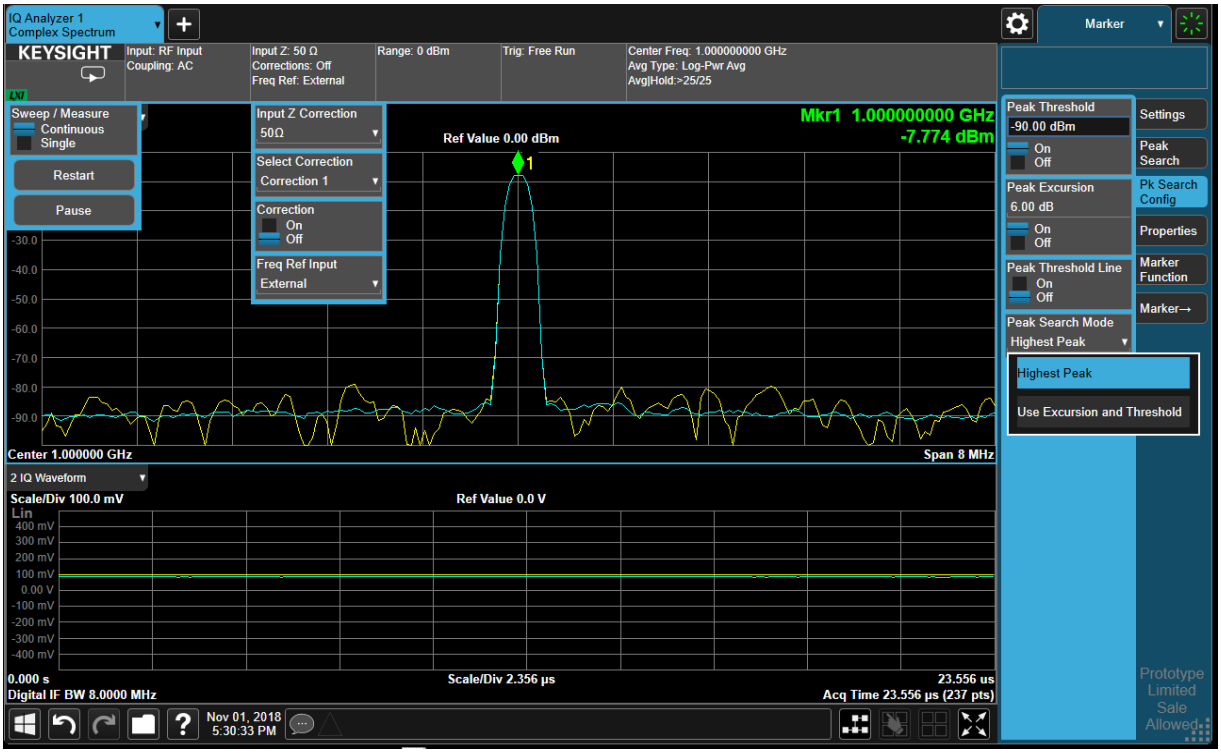
When you select the desired measurement, the views available for the measurement are displayed under the View column.

You can have up to 16 measurement tabs, but only 6 can be viewed at one time. If the tabs overfill the top bar, they scroll left and right using the arrows to the left and right of the tabs.

You switch screens by touching the tabs. To view multiple screens, press the icon on the Bottom Bar.

Meas Bar

The Meas Bar shows general measurement settings and information. The annotations on this bar can be used to change settings. Tap anywhere in the annotation box to access the drop-down panel that contains relevant parameters. The following graphic shows some of the drop-down menus and the parameters they contain.



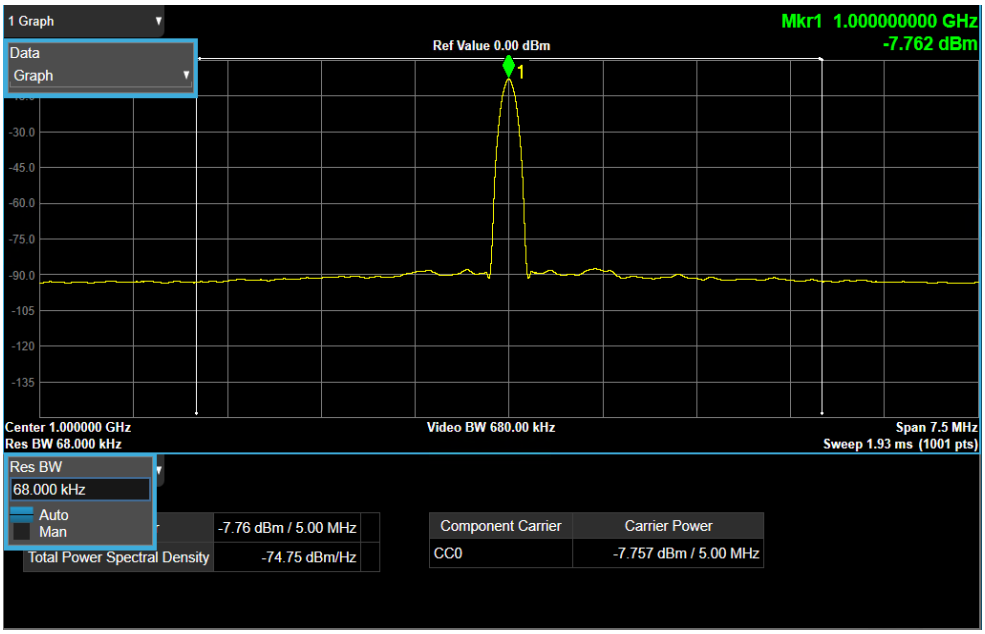
Indicates single/continuous measurement.

Measurement Display

This area shows the measurement results in graphical and tabular form. You can interact with this area using drag, scroll and tap by mouse.

On the signal:
Scroll - changes the active function parameter
Horizontal drag - changes the center frequency
Vertical drag - changes the reference level
Markers may be moved by dragging them to the desired location

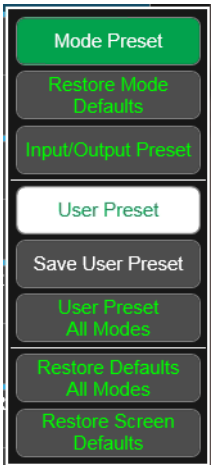
The annotation drop-downs in the window area allow you to change parameters. When you click in those areas, the drop-down control menus appear as shown in the following graphic.



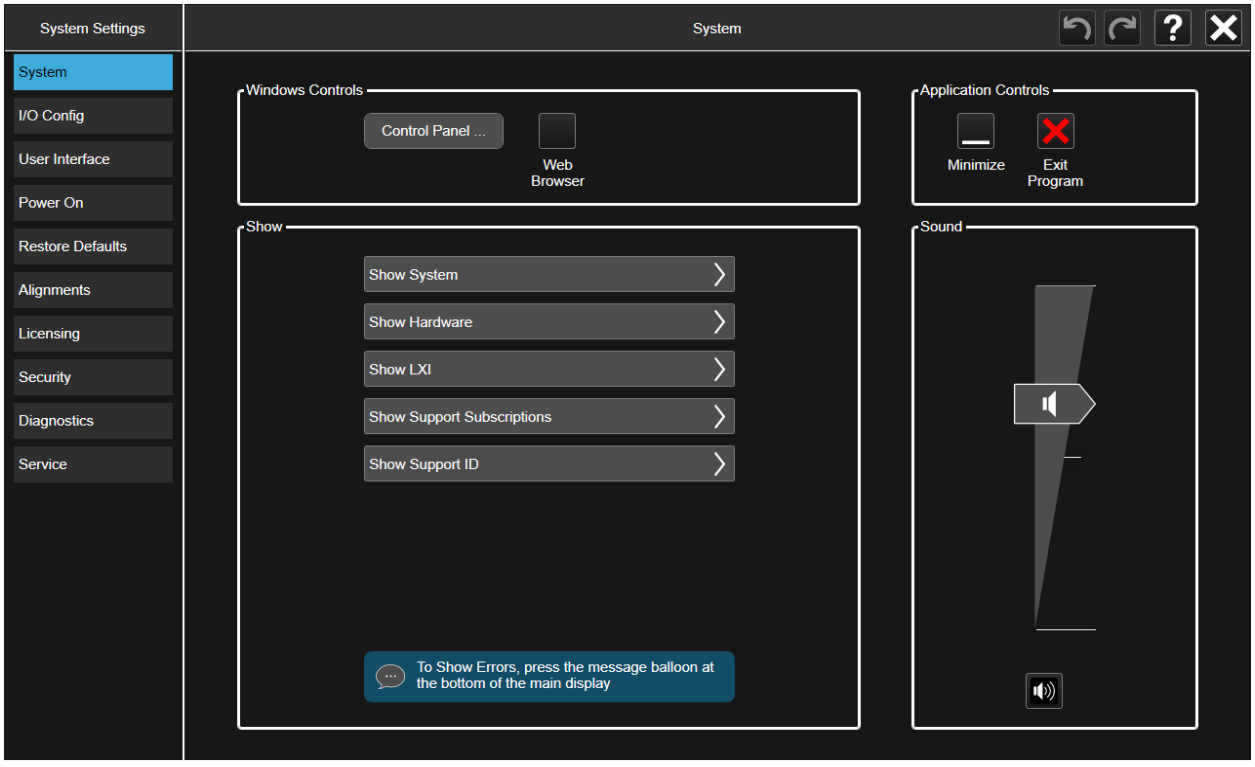
Menu Panel

At the top of the menu panels are two icons:

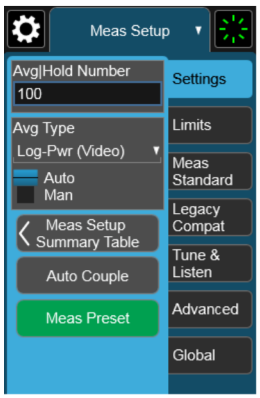
The Preset icon accesses the following control menu:



The System icon accesses the following dialog:

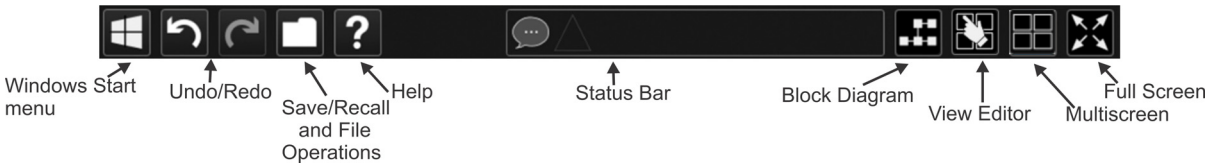


The drop-down panel contains the measurement controls. Notice that the Frequency panel has a Settings tab on the right side. Other panels may have multiple tabs. The tabs access controls for the particular parameter noted on the tab.



Bottom Bar

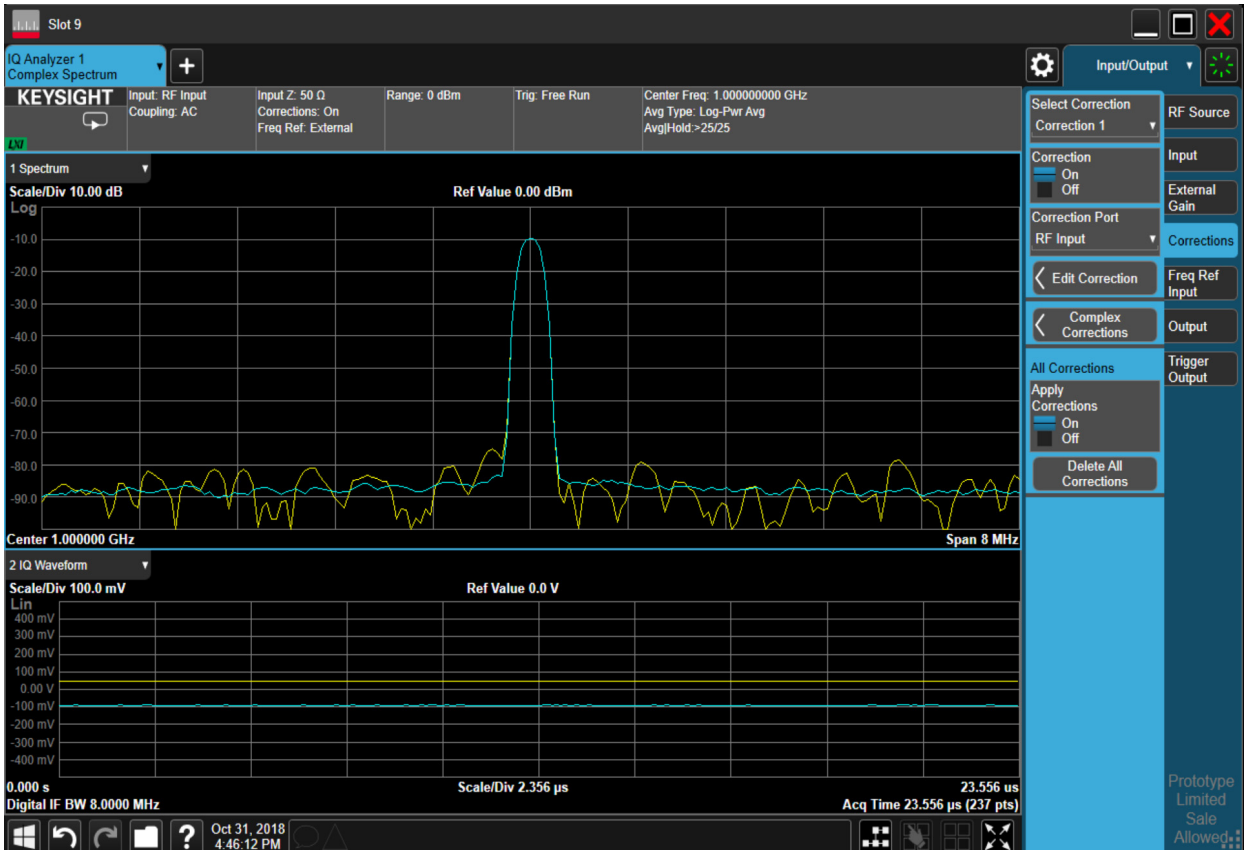
The bottom bar contains several icons that access various controls.



Function Verification - Making a Basic Measurement

To make sure all the hardwares and softwares are ready for further use, please perform the following steps to generate a CW signal:

1. Connect M9410A/M9411A/M9415A **RF Out** and **RF In** with a SMA cable.
2. Run Modular TRX application software by click *LaunchModularTRX.exe*. Please refer to "Launch Modular TRX Application Automatically" on page 55 for the detailed procedure.
3. Set source to generate a CW signal and use receiver to observe this signal.
    1. Press **Input/Output** > **RF Source** > **Source Amplitude** > **- 20 dBm** to set the signal amplitude to -20 dBm
    2. Press **Frequency** > **1 GHz** to set the signal frequency to 1 GHz.
    3. Select RF Output Port to **RF Output**.
    4. Turn **RF Output** On to output this signal
    5. Press **Frequency** > **Center Freq** > **1 GHz** to set the receiver center frequency to 1 GHz.



If you observe the CW signal as figure above, it indicates the M9410A/M9411A/M9415A is ready for your further use.

Protecting Against Overpowering

The input circuitry of the transceiver can be damaged by applying signals that exceed the maximum safe input level of +27 dBm average total power. Refer to the transceiver's data sheet for more details regarding the maximum safe input level. Repairing damage to the input circuitry can be expensive.

If the module will be used to measure signals which might be near the maximum safe input level, use external attenuators and/or limiters to help protect the transceiver input. The External Gain, amplitude Corrections, and/or Ref Lvl Offset features may be used to compensate for the gains and losses of external devices. External Gain and Corrections are under the Input/Output menu and Ref Lvl Offset is under the Amplitude menu.

WARNING

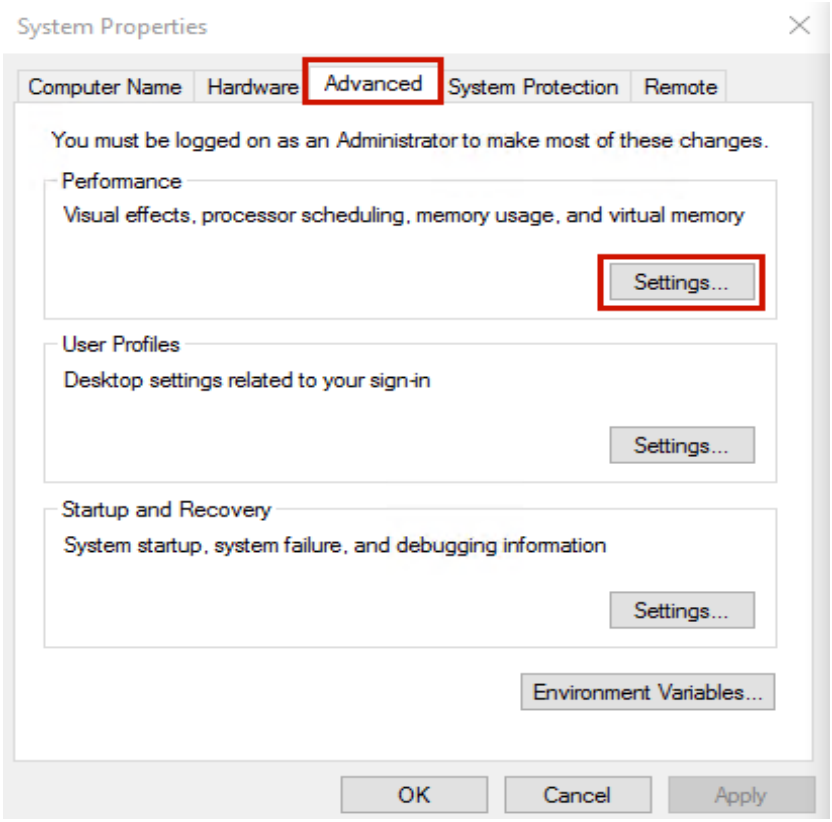
Operator is responsible to maintain safe operating conditions. To ensure safe operating conditions, modules should not be operated beyond the full temperature range specified in the Environmental and physical specification. Exceeding safe operating conditions can result in shorter lifespans, improper module performance and user safety issues. When the modules are in use and operation within the specified full temperature range is not maintained, module surface temperatures may exceed safe handling conditions which can cause discomfort or burns if touched. In the event of a module exceeding the full temperature range, always allow the module to cool before touching or removing modules from chassis.

Set the Paging File Size for Multiple Applications

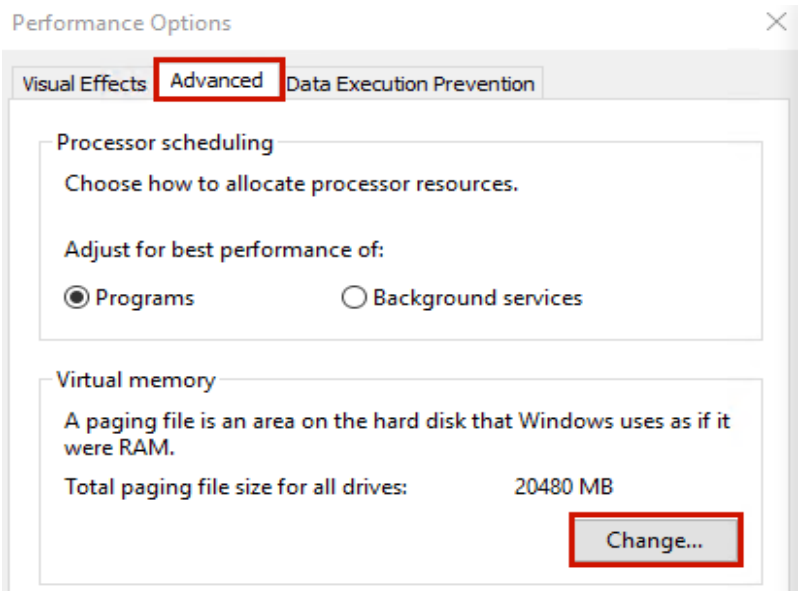
To use multiple applications for some specific measurement such as 4x4 MIMO measurement, please ensure the system drive (C:) have 40 GB free space or greater and the paging file size is set properly.

Please follow the procedures below to set the system paging file size properly.

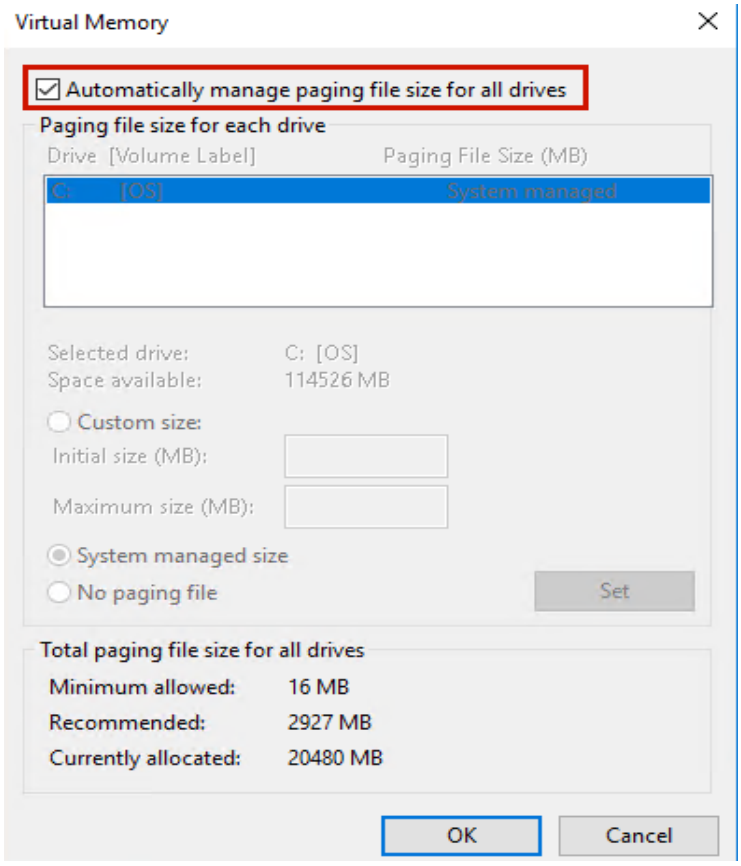
1. Click Search icon on your windows desktop, type "SystemPropertiesAdvanced" and the system properties window will be pop up as below. Select Advanced tab and click Settings button of performance area.



2. In the performance options window as below, select Advanced tab and click Change button of virtual memory area.



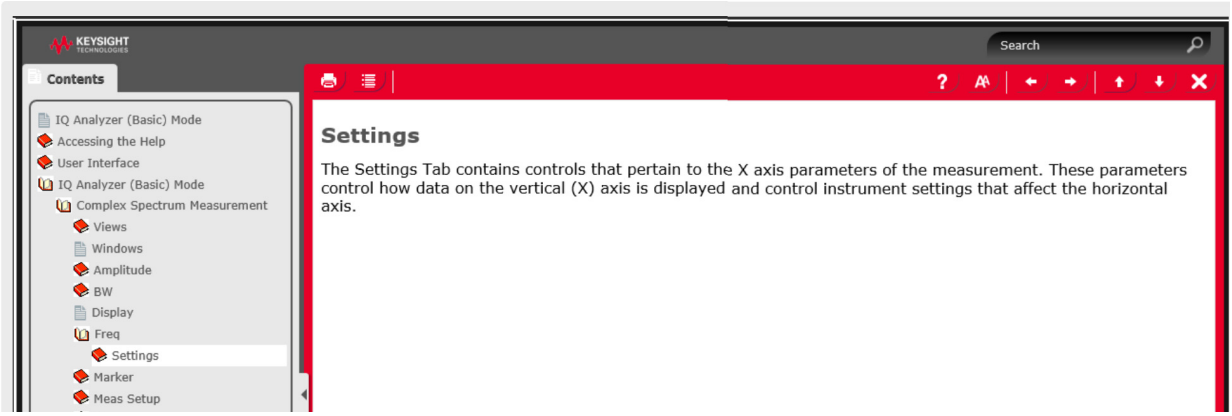
3. Select "Automatically manage paging file size for all drives" and press OK.



Then, the paging file size will be automatically set for your multiple applications measurement.

Using the Interactive Help System

To use the interactive help system of TRX applications, please click Help key on the bottom bar, or right click on your mouse and select Help, the help screen will be displayed as following:



You can navigate to any menu and by clicking on soft key, the help information of the soft key setting will be shown on the help screen.

You can also use your mouse to navigate the help content from the tree view on the left panel.

Press Esc to exit the help information screen.

6 Service Information

This chapter provides the basic service information such as how to return a transceiver to service.

"Calling Keysight Technologies" on page 78

Calling Keysight Technologies

Keysight Technologies has offices around the world to provide you with complete support for your transceiver. To obtain servicing information or to order replacement parts, contact the nearest Keysight Technologies office listed below. In any correspondence or telephone conversations, refer to your transceiver by its product number, full serial number, and software revision.

Locations for Keysight Technologies

Online assistance: http://www.keysight.com/find/assist

Americas

Canada 1 877 894 4414	Latin America (305) 269 7500	United States 1 800 829 4444

Asia Pacific

Australia 1 800 629 485	China 800 810 0189	Hong Kong 800 938 693
India 1 800 112 929	Japan 0 120 (421) 345	Korea 080 769 0800
Malaysia 1 800 888 848	Singapore 1 800 375 8100	Taiwan 0800 047 866
Thailand 1 800226 008		

Europe & Middle East

Austria 43 (0) 1 360 277 1571	Belgium 32 (0) 2 404 93 40	Denmark 45 70 13 15 15
Finland 358 (0) 10 855 2100	France 0825 010 700* *0.125 Euros/minute	Germany 49 (0) 7031 464 6333
Ireland 1890 924 204	Israel 972-3-9288-504/544	Italy 39 02 92 60 8484
Netherlands 31 (0) 20 547 2111	Spain 34 (91) 631 3300	Sweden 0200-88 22 55
Switzerland 0800 80 53 53	United Kingdom 44 (0) 118 9276201	

Other European Countries: http://www.keysight.com/find/contactus

Read the Warranty

Please read the warranty and become familiar with its terms.If your instrument is covered by a separate maintenance agreement, please be familiar with its terms.

Service Options

Keysight Technologies offers several optional maintenance plans to service your transceiver after the warranty has expired. Call your Keysight Technologies office for full details.

If you want to service the instrument yourself after the warranty expires, you can purchase the service documentation that provides all necessary test and maintenance information.