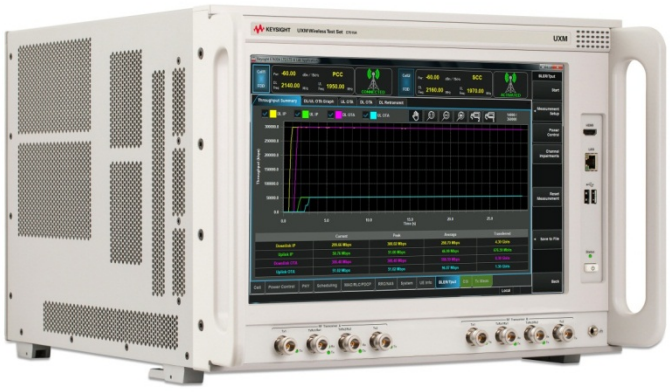
Keysight E7515A UXM Wireless Test Set

Assess Design Readiness with Greater Confidence



Getting Started Guide

KEYSIGHT TECHNOLOGIES

Notices

Warranty

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Statement of Compliance.

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

Manual Part Number

E7515-90001

Edition

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Documents Platform Version 1.2.1.x

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Keysight Technologies, Inc.

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Safety Notices

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies, Inc. assumes no liability for the customer's failure to comply with these requirements.

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.

Electrical Rating

Input Voltage Range: 100/120/220/240 V_{AC}

Input Frequency Range: 50/60Hz, nominal

Input Power Rating: 1100 Watts Max

Mains supply voltage fluctuates up to +/- 10% of the nominal voltage.

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

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

WARNING	This instrument is heavy. Two people are required to lift this instrument.

WARNING	Please consult ergonomic guidelines regarding placement of the external keyboard when using it with the instrument. Using the keyboard in an uncomfortable or awkward environment could result in personal injury.

CAUTION	Before switching on this instrument, make sure: - the rating for the service breaker is correct. - the supply voltage is in the specified range.

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

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

CAUTION	This product is designed for use in Installation Category II and Pollution Degree 2 environment.

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

Electrical Safety Compliance

SAFETY

Complies with European Low Voltage Directive 20006/95/EC

- IEC/EN 61010-1, 3rd Edition
- Canada: CAN/CSA C22.2 No. 61010-1-12
- USA: UL std no. 61010-1, 3rd Edition

Acoustic statement (European Machinery Directive 2002/42/EC, 1.7.4.2u)

Acoustic noise emission	Geraeuschemission
LpA <70 dB	LpA <70 dB
Operator position	Am Arbeitsplatz
Normal operation mode	Normaler Betrieb
Per ISO 7779	Nach DIN 45635 t.19

EMI and EMC Compliance

EMC

Complies with European EMC Directive 2004/108EC

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, class A
- AX/NZS CISPR 11
- ICES/NMB-001
  This ISM device complies with Canadian ICES-001
  Cet appareil ISM est conforme a la norme NMB-001 du Canada.
- South Korean Class A EMC declaration: This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

  A 급 기기 (업무용 방송통신기 자재)

  이기기는 업무용(A 급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며,

  가정외의 지역에서 사용하는 것을 목적으로 합니다

Warranty

This Keysight Technologies instrument product is warranted against defects in material and workmanship for a period of three years from the date of shipment. During the warranty period, Keysight Technologies will, at its option, either repair or replace products that prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by Keysight Technologies. Buyer shall prepay shipping charges to Keysight Technologies. Keysight Technologies shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Keysight Technologies from another country.

Where to Find the Latest Information

Keysight will periodically update product documentation. For the latest information about this wireless test set, including software upgrades, operating and application information, and product and accessory information, see the following URL:
www.keysight.com/find/UXM-Manuals

Is your product software up-to-date?

Keysight will periodically release software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, go to the Keysight Software Manager website at:
www.keysight.com/find/softwaremanager

Table of Contents

1 Introduction

Welcome to the Getting Started Guide for the Keysight E7515A UXM Wireless Test Set (UXM). The purpose of this guide is to provide you with the basic steps for getting started with your test set and where you can go to get additional help information. It also provides first-time power on instructions, licensing information, operating system information, and general hardware information.

Overview

The UXM is the most highly-integrated signaling test set created for functional and RF design validation in the 4G era and beyond. It provides the capabilities you need to test the newest designs, delivering LTE-Advanced category 7 now and handling more complex requirements later.

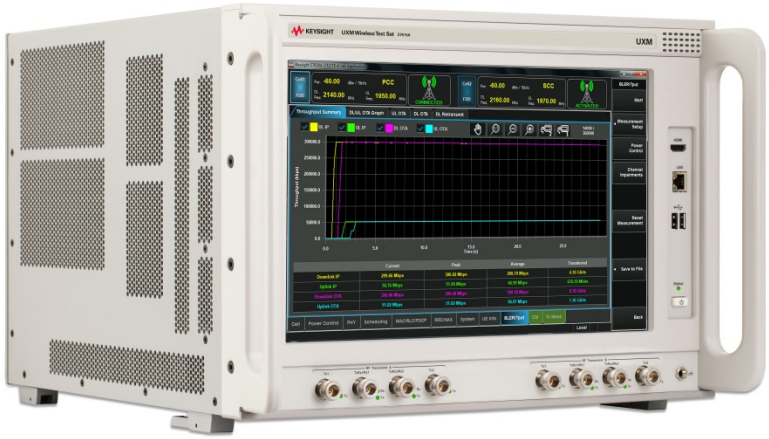


Figure 1-1: Keysight E7515A UXM Wireless Test Set

Capabilities of the UXM

- Stable, bidirectional data throughput at 300 Mbps downlink (DL) / 100 Mbps uplink (UL)
- Category 4/6/7 support with two independent 100 MHz RF transceivers enabling multiple cells, DL/UL carrier aggregation, up to 4x2 DL MIMO, and integrated fading
- Receiver test capabilities including flexible channel definitions and closed-loop testing
- Trusted X-Series measurement applications for transmitter testing
- Wide range of network emulator capabilities including complex handover scenarios (such as CSFB and SRVCC), VoLTE support (including SPS and multi-DRB) and sleep modes for battery drain test
- Frequency Division Duplex (FDD) and Time Division Duplex (TDD) options

General Specifications

Environmental	
Operating temperature	5° C to 45° C, 30 g/m3 absolute humidity (5% to 85% (non-condensing) relative humidity)
Storage temperature	-20° C to +65° C, 50 g/m3 absolute humidity (5% to 85% (non-condensing) relative humidity)
Altitude	To 2000 m
Electrical safety	Refer to “Electrical Safety Compliance” on page iii.
EMI	Refer to “EMI and EMC Compliance” on page iv.
EMC	Refer to “EMI and EMC Compliance” on page iv.

NOTE	This product is designed for indoor use, only.

Size and weight	
Dimensions (HxWxL)	305 mm (321 mm with feet) x 435 mm x 445 mm (504 mm with handles)
Weight	33 kg (1-cell), 36 kg (2-cells)

Input power requirements	
Voltage & frequency	100/120/220/240 V_{AC}, 50/60Hz, nominal
Power consumption	1100 W MAX

NOTE	• Mains supply voltage fluctuates up to +/- 10% of the nominal voltage. • Transient over-voltages are typically present on the mains supply.

WARNING	This is a Safety Class 1 Product (provided with a protective earth ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited. (IEC 348 clauses 17.3.3c & 17.3.4).

CAUTION	This instrument has an auto-ranging line voltage input. Ensure the supply voltage is within the specified range. When installing the product in a cabinet the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4° C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used. It is your responsibility to ensure the ambient temperature does not exceed the rated ambient temperature stated in the specification.

UXM Software Applications

You must operate the UXM with one of the software applications described below:

Keysight E7530A LTE/LTE-A Test Application (TA) Software License

This software application license enables the test application version of the LTE/LTE-Advanced software. The TA was created to meet the needs of RF design validation, and includes RF measurement capability and basic base station emulation functionality. Options are available to enable FDD, TDD, 2 carrier DL carrier aggregation and 4x2 downlink MIMO. You must purchase either the E7630A LA or the E7530A TA described above.

Keysight E7630A LTE/LTE-A Lab Application (LA) Software License

This software application license enables the lab application version of the LTE/LTE-Advanced software. The LA is targeted at overall device design validation, and includes the RF measurement capability of the E7530A TA, plus IP data-based functionality such as end-to-end IP data throughput, advanced network emulation and functional test capabilities. Options are available to enable FDD and TDD, and each LA version license adds new capabilities, building on the previous version. You must purchase either the E7630A LA or the E7530A TA described above.

Latest documentation

For the latest documentation and software updates for the above products, please go to www.keysight.com/find/E7515A.

About the E7530A/E7630A LTE/LTE-A Test/Lab Application

The application runs on the embedded Windows controller present in the UXM and uses the provided touch-screen based interface, integrated fading, network emulation and measurement capabilities present in the test set to provide you with a simple to use, bench-top design verification tool.
The software application provides two different operation modes:

- Signaling based mode: In this scenario mode, the TA/LA is capable of emulating a single cell LTE and LTE-Advanced network (or dual cell network if you purchased the E7515A-RB1/BB1 as well as the -RA1/BA1). This mode enables you to recreate test environments similar to the real-life conditions the UE will encounter during its operation on an actual network including fading and MIMO variations.

  In the signaling scenario mode, you are also capable of configuring several communication parameters, ranging from the different modulation and coding schemes, to the size of the

bandwidth allocations for both UL and DL, as well as other additional parameters.
If you have purchased the option- AFP-FDD for your TA or FDD version A.02 of the LA, then, you can also configure the DL Carrier Components (CC) and other related Carrier Aggregation requirements. For more information on Carrier Aggregation, visit the 3GPP website's description.

- Non-signaling based mode: In this scenario mode, you can configure the test set to generate a compliant broadcast signal, and start the transmission of PDCCH channel with allocations for the DUT, without the need to complete an ATTACH procedure with the UXM.

Installing the E7530A/E7630A LTE/LTE-A Test/Lab Application

This software comes already installed on your UXM. If there is a problem and you need to re-install it, refer to *Installing the Software* on page 40.

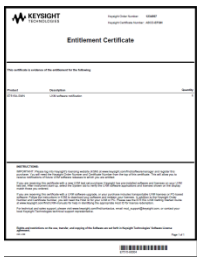
2 Quick-Start

This section describes how to set up your UXM, install product licenses and provide test set maintenance. You can also contact your Keysight representative to help get on-site startup assistance to assist with all steps outlined in this section, for it is included with your purchase of the UXM.
The following topics are included in this section:

Initial Inspection

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

Verifying the Contents

Item	Deliverable	Description
Getting Started Guide (this document)		Provides first-time power on instructions, licensing information, operating system information, and general hardware information.
Keysight E7515A UXM Wireless Test Set		Warning: The instrument is heavy and requires a two person lift.
License entitlement certificate(s)		IMPORTANT: You must register your instrument purchase using the included entitlement certificate. Follow the instructions on the Certificate. If this is your first visit to the license management website, you will be required to register. NOTE: Refer to *License Installation* on page 17, for more information.
Keysight Test USIM card, tri nano (E7515-10910)		See www.keysight.com/find/usim for details.
Keysight 3GPP standard Mini SIM card (T1099-11200)		See www.keysight.com/find/usim for details.

Item	Deliverable	Description
Keysight 3GPP standard Micro SIM card (T1099-11300)		See www.keysight.com/find/usim for details.
Keysight 3GPP standard Nano SIM card (T1099-11400)		See www.keysight.com/find/usim for details.
Mouse (T4010-20001)		A USB mouse to simplify screen navigation.
Keyboard (T4010-20002)		A USB keyboard to simplify data input.
Power Cable		Connection for Instrument Power.

Shipping Problems?

If the shipping materials are damaged or the contents of the container are incomplete:
Contact the nearest Keysight Technologies office.
Keep the shipping materials for the carrier's inspection.
If you must return a test set to Keysight Technologies, use the undamaged original or comparable shipping materials. See *Returning Your Test Set for Service* on page 43.

Instrument Location and Rack Mounting Requirements

Locating the Test Set

Make sure that the left-side panel fan inlet and right-side panel exhaust vent areas are not obstructed. The minimal required clearance is 2.75 inches (7 cm).

NOTE	Install the instrument so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front-panel switch is only a standby switch and does not act as a LINE switch. The rear-panel switch is a LINE switch, however it is only to be relied upon as supplementary protection. If needed, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

Table Top Ambient Temperature

CAUTION	Do not exceed an ambient temperature of 45° C when operating the instrument on a table top.

Rack Mounting – Hardware and Temperature

If you choose to locate your test set in a rack, follow the guidelines provided in this section.

CAUTION	When mounting instrument in a rack, do not exceed the lower of: • Outside rack ambient temperature of 35° C • Or, an internal rack air temperature of 45°C

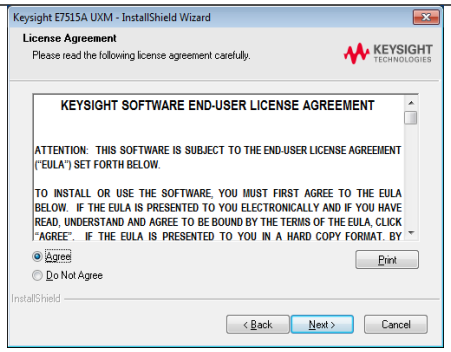
Do not rack mount the test set side-by-side with any other instrument with side ventilation. Make sure the exhaust air from the first instrument is directed away from the inlet of the second unit. If the pre-heated air from the first instrument is directed into the second instrument, it can cause excessive operating temperatures in the second unit and can cause instrument failures. The test set draws air in from the left side and exhausts air from the right side. Do not mount other equipment immediately above the instrument. The minimal required clearance is 2.75 inches (7 cm).

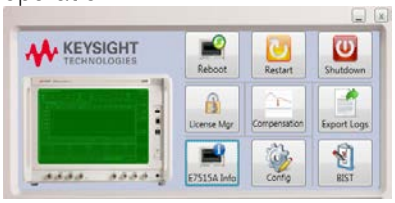
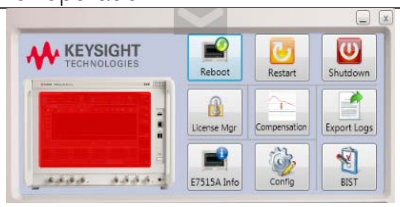
CAUTION	VENTILATION REQUIREMENTS: When installing the instrument(s) into a cabinet consideration shall be given to the convection flow into and out of the cabinet. Consideration shall also be given to the individual instruments to avoid having the heated discharge of one instrument, now becoming the cooling intake air for another instrument. Another area of concern is verification that the maximum ambient operating temperature of the instrument(s) is not exceeded by cabinet installation. Keysight recommends forced air convection whenever an instrument(s) are installed in a cabinet and further recommends that the maximum operating temperature of the cabinet be reduced 10°C from the lowest, of the maximum operating temperature of a single instrument. If there are any concerns or special requirements a Keysight Field Engineer should be consulted to assure instrument(s) temperature compliance and performance.

Turning On the Test Set the First Time

WARNING	DO NOT remove the AC power during boot-up/shutdown of the operating system or during the process of initializing the software. This can cause damage to the system files and prevent proper operation of the instrument.

CAUTION	Before switching on this instrument, make sure the supply voltage is in the specified range.

Step	Action	Notes
Connect power cable	Install the instrument so that the detachable power cord is easily reached by the operator.	Ensure power outlet is provided with a protective ground as specified.
Power on the test set	Position the test set so you have easy access to the power cord and plug it in.	See *Instrument Location and Rack Mounting Requirements* on page 12 and *Power requirements* on page 8 for more details.
	Select the **On** position for the rear-panel AC line power switch. (Refer to details in *Rear Panel Feature* section on page 31. Press the power button (bottom right of instrument front panel) when the LED above the power button illuminates in yellow. **NOTE:** It is best to wait at least 3 seconds after the LED is yellow before pressing the power button. Refer to details in *Front Panel Feature* section on page 29.	Front-panel power button 
Accept the License Agreement	When you see the pop-up window asking if you want to accept the license agreement, select **Agree**, **Next**.	 After power-on, the operating system boots-up and you see a black background with Keysight Technologies logo displayed on the screen. The E7515A Control Panel (shown below) is overlaid on top of this Keysight screen and remains visible while the internal hardware boards of the UXM are booted-up. Upon the first boot-up you will be asked if you wish to accept the

Step	Action	Notes
		license agreement. See *E7515A Control Panel Functions* on page 21 for a detailed description of each E7515A Control Panel icon. 
Wait until you see the green or red color displayed in the UXM pictorial graphic, located in the upper left corner of the E7515A Control Panel.	The changing colors of the E7515A Control Panel pictorial graphic indicate the "ready-state" of the UXM.  Yellow indicates the UXM is in the process of becoming ready for operation.  Green indicates the UXM is ready for operation.	
	 Red indicates an error has occurred in the system and the unit is not ready for operation. Refer to the *Troubleshooting* section on page 43.	
Install License	Refer to *License Installation* on page 17.	You will need the Entitlement Certificate you received in the delivery of your UXM. See *Verifying the Contents* on page 11.
Connect the mouse	Connect the mouse and the	

Step	Action	Notes
and the keyboard(Optional)	keyboard to the test set's USB ports.	
The *Keysight LTE_LTE-A Application* is started by default after E7515A Control Panel is ready.	The TA/LA software opens displaying the appropriate splash screen.	 E7530A-TA or E7630A-LA
Begin using your new software after the splash screen disappears.	The TA/LA opens displaying the **Cell** tab. For detailed information on how to use the software, refer to the Keysight UXM User's Guide.	

Shutting Down the Test Set

Step	Action	Notes
To power off: 1. Close the TA/LA software by selecting  located on the upper right of the display.		

Step	Action	Notes
2. It is recommended that you press the front-panel power button. You can also select **Shutdown** from the MS Windows **Start** menu or select the Shutdown icon on the E7515A Control Panel.	The display will show the windows shut-down screen.	 Front-panel power button  Shutdown button on Control Panel
Forced power off	Press and hold the front-panel power button for more than 5 seconds.	WARNING: Do not force power off unless the normal procedure does not work correctly.

Licensing

All licenses required to operate your UXM have been installed at the factory (except transportable licenses – see below) and can be recovered using one of the procedures outlined in the chapter entitled, *Test Set Operating System* on page 35. Complete these steps if you need to add licensing to your UXM:

1. Follow the directions located on the license entitlement certificate that you received with the delivery of your UXM.
   NOTE: You may register or sign in with your profile at:
   www.keysight.com/find/softwaremanager in order to obtain any software updates and/or new licenses using your entitlement details.
2. In order to generate a license unique to your UXM, you will need to enter the "HostID".

   To determine the Host ID of your UXM, select the License Manager icon  located on the E7515A Control Panel. (Refer to the section, *To View the E7515A Control Panel* on page 21 for assistance.) The Keysight License Manager (KLM) window opens and displays your Host ID:

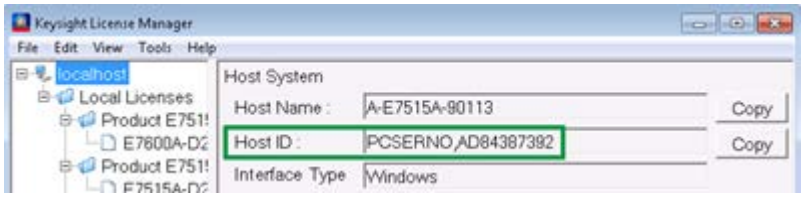


Figure 2-1: Determining Your Host ID

3. After the registration/sign-in/filling in information, an e-mail with the generated license file will be sent to you. You need to copy the license file to the root directory of a USB memory stick and then insert the USB memory stick into the UXM. It will automatically install any licenses that it finds on the USB memory stick for the test set.

Transportable Licenses

Transportable licenses are identifiable by the "T" included in their license number such as: E7530A-1TP-FDD or E7630A-2TP-FDD. This type of license enables you to move the license from one host instrument or PC to another, without the need to contact Keysight. Follow the steps above to install the transportable license for the first time.

Then after that installation, to transport a license, run Keysight License Manager on the host that currently has the license, and transport the license. (Select **Help** > **Keysight License Manager Help** and search for "transport" to find detailed instructions.)

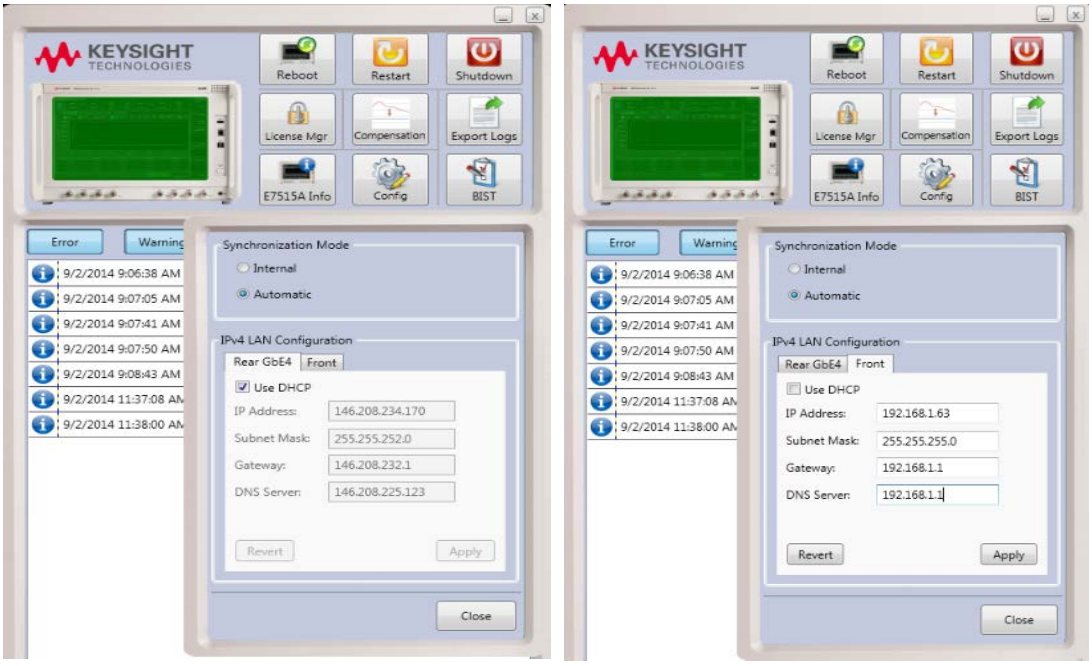
NOTE	Transportable licenses for the E7515A UXM allow you to transport licenses up to 30 times within the previous 10 days.

You can also save a transportable license to Keysight Software Manager (KSM) for later assignment to a host. To do so, review the *Transporting Licenses* section (found as described above) in the **Keysight License Manager Help**. When you are asked to choose a destination for the license, select, **Save the license to Keysight Software Manager**.
When you are ready to assign the license to a host, come back to KSM and look for the action bubble entitled, *You can request new licenses*. Click the bubble and follow the instructions given.

Other related topics for managing your software and licenses can be found by reviewing the *Keysight License Manager Help* available from the **Help** drop-down menu of the KSM software.

LAN Address Configuration

The UXM has two network interface controllers that connect the instrument Host PC (embedded PC module) to external LAN outputs. See *Front and Rear Panel Features* on page 27 for more information. Both static and dynamic IP address assignments are supported.
If your site network supports Dynamic Host Configuration Protocol (DHCP), these front and rear LAN ports are assigned IP addresses automatically when they are connected to the LAN.
In order to identify these external LAN port IP addresses configured in your UXM, it is easiest to use the **CONFIG** button on the E7515A Control Panel.



These IP addresses can be used to find the test set on the LAN and communicate with external PCs and/or DUTs.

Anti-Virus Protection and Firewalls

The instrument is shipped with the Windows 7.0 firewall disabled. No anti-virus software is shipped with the instrument. It is recommended that you ***do not*** enable anti-virus protection for normal operation.

WARNING	Take care to verify that USB memory devices used with the UXM are virus-free before using with the instrument.

NOTES:

- Connecting the test set directly to the public LAN is potentially insecure, because the test set does not provide anti-virus protection. It is preferred that you connect the test set to the public LAN by way of a PC with antivirus protection.
- The instrument internally operates using fixed IP addresses for the following IP addresses. Do not modify the default network settings for the following connections, as this may cause problems with the operating system of the test set:
  - LAN2
  - Internal NIC
  - LAN4

Instrument Information and Maintenance

Power Requirements

Power line voltage does not need to be selected.
See “Power Requirements” on page 8 for more information.

Instrument Maintenance

Protecting against overpowering

The input circuitry of the test set can be damaged by applying signals that exceed the maximum safe input level of +27 dBm average total power or +/- 30 VDC. Repairing damage to the input circuitry can be expensive. If the test set 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 test set input. Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord can cause product damage.

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

Cleaning the instrument

WARNING	To prevent electrical shock, disconnect the Keysight Technologies Model E7515A from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

Cleaning connectors

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

WARNING	Keep isopropyl alcohol away from heat, sparks, and flame. Store in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemical, or carbon dioxide; water may be ineffective. Use isopropyl alcohol with adequate ventilation and avoid contact with eyes, skin, and clothing. It causes skin irritation, may cause eye damage, and is harmful if swallowed or inhaled. It may be harmful if absorbed through the skin. Wash thoroughly after handling. In case of spill, soak up with sand or earth. Flush spill area with water. Dispose of isopropyl alcohol in accordance with all applicable federal, state, and local environmental regulations.

Protecting against electrostatic discharge

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

Test equipment and ESD

To help reduce ESD damage that can occur while using test equipment:
Before connecting any coaxial cable to a test set connector for the first time each day, momentarily short the center and outer conductors of the cable together.
Personnel should be grounded with a 1 MΩ resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the test set.
Be sure that all instruments are properly earth-grounded to prevent build-up of static charge.

Additional information about ESD

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

3 E7515A Control Panel Functions

The E7515A Control Panel enables you to interact with and manage the hardware components of the UXM. It is always running if the test set is turned on. If it is not displayed on the screen, it is minimized in either the lower left or right area of the Windows task bar.

To view the E7515A Control Panel

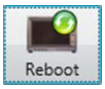
Right-click on the E7515A Control Panel icon  from the task bar and select, **Open Control Panel**.

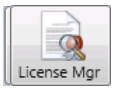
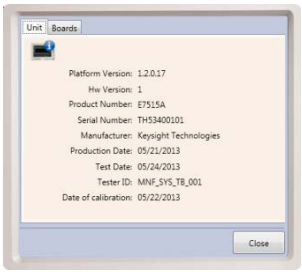
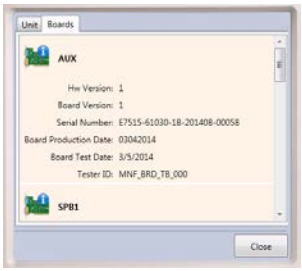
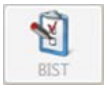
NOTE	To access the Windows task bar from inside the TA/LA software application, you can use the Application Switch tool to switch to the desktop and find the task bar, or you can connect the USB keyboard to the UXM using one of the USB ports located on the front and rear panels of the UXM. Press the key showing the windows icon  . This is usually located in the lower-left corner of the keyboard.

NOTE	If the E7515A Control Panel icon is not present in the task bar or on the desktop, it can be opened by selecting the Windows **Start** Menu, **All Programs**, **Keysight E7515A Platform**, **E7515A Control Panel.**

E7515A Control Panel Icon Descriptions

The following functions are available by selecting the various E7515A Control Panel icons:

Icon	Description
	Performs a rebooting of the UXM hardware boards and their firmware. This may be required if you are seeing anomalies in the TA/LA software or cannot get **Cell ON** to activate.
	Restarts the UXM to the initial platform operational state and ends up launching the applications. You can also restart the UXM from the Window **Start** menu.
	Shuts down the UXM hardware and software. It is recommended that you close all application software before selecting this E7515A Control Panel option. You can also shutdown the UXM from the Window **Start** menu or the front-panel power button.

Icon	Description
	Opens the Keysight License Manager. Displays all licenses installed in your UXM. Also, enables you to drag and drop any license files you need to install. Refer to *License Installation* on page 17 for more information. NOTE: This may not be necessary, if licenses have already been installed at the factory.
	Enables you to input compensation for loss due to cabling. Refer to the UXM Help, located in the instrument software, for more information.
	Opens a browser window at D:\Users\Administrator\AppData\Roaming\Keysight\E7515A which enables you to browse to a different location or to designate this location for saving the E7515A Control Panel's currently displayed errors for future reference in a .zip file.
	Opens window with two options for obtaining instrument traceability information. Use this information when you need to discuss your test set with an authorized Keysight representative. Below is a sample of what you might see in your instrument. • Unit  • Boards 
	Enables you to set the instrument synchronization options and LAN Address Configuration. For the synchronization option, the default is **Automatic** which means that the instrument automatically synchronizes with an external clock if detected; otherwise it uses the internal clock. If **Internal** is selected, the instrument ignores any external reference and always uses the internal one. • Internal • Automatic **Important**: Changing this setting should be done when changing the IP Address configuration and when the UXM has no software applications running. (For example: when no DL/UL cells are in use.)
	Enables you to perform Built-In Self Tests for the UXM. Refer to the Built-In Self Tests (BIST) section below for details of this function.

Built-in Self Tests (BIST)

These tests provide you with the ability to diagnose which areas of the UXM hardware and firmware are not functioning properly.

When to Perform the BIST?

Perform the BIST whenever you are experiencing a possible UXM malfunction. Base this decision when any of the following occurs:

- After rebooting the hardware boards (by selecting the **Reboot** icon: 

), the E7515A Control Panel pictorial graphic displays a red screen.
- It appears that either the UL or DL is not communicating properly.

Available BIST

There are two sets of tests (one for each transceiver) with 5 available tests in each set. If your UXM has only one transceiver, you will only see one set of tests, as shown below. If you also have transceiver B, you will see the same tests listed again, except the “A” will be replaced by a “B” to differentiate the two transceivers.

- RF Transceiver A – DL RIO Loopback test
- RF Transceiver A – DL/UL Tone Generation test
- RF Transceiver A – UL RIO Tone Reception test
- RF Transceiver A – Tone Generation and Measurement test

Each test confines itself to one function or communication path in order to verify that the specific area is functioning properly. After selecting the BIST icon 

located in the E7515A Control Panel, descriptions of each test are provided by using touch or the up/down arrow keys on your keyboard to highlight the specific test of interest. These descriptions help you determine which tests to perform. Select the test(s) you wish to perform by selecting the box to the left of the test name. Since the complete set of BIST take less than 2 minutes, it is recommended that you run them all unless you are specifically interested in only a subset of UXM hardware-related functions.

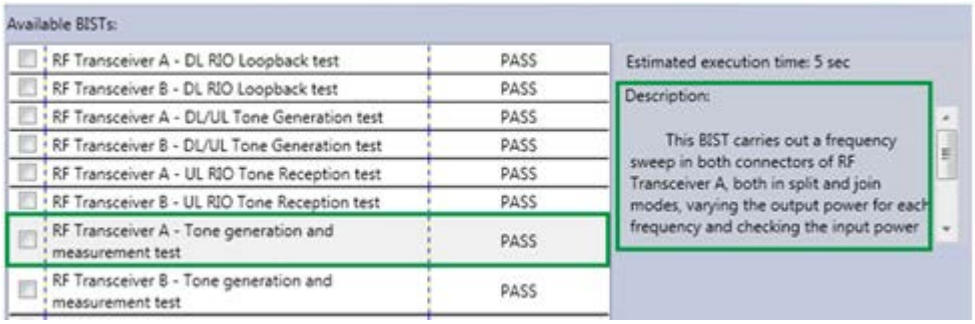


Figure 3-1: Available BIST and their descriptions

Running the BIST

When you select the BIST icon  the warning message below is displayed:

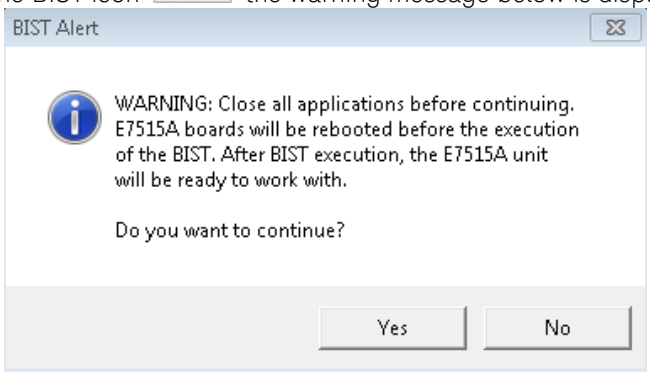


Figure 3-2: Close all applications – Warning

If you are ready to perform the BIST, select **Yes** to continue.
Some of the tests require that you connect a cable to the front-panel ports. A pop-up message appears providing you with the necessary instructions.

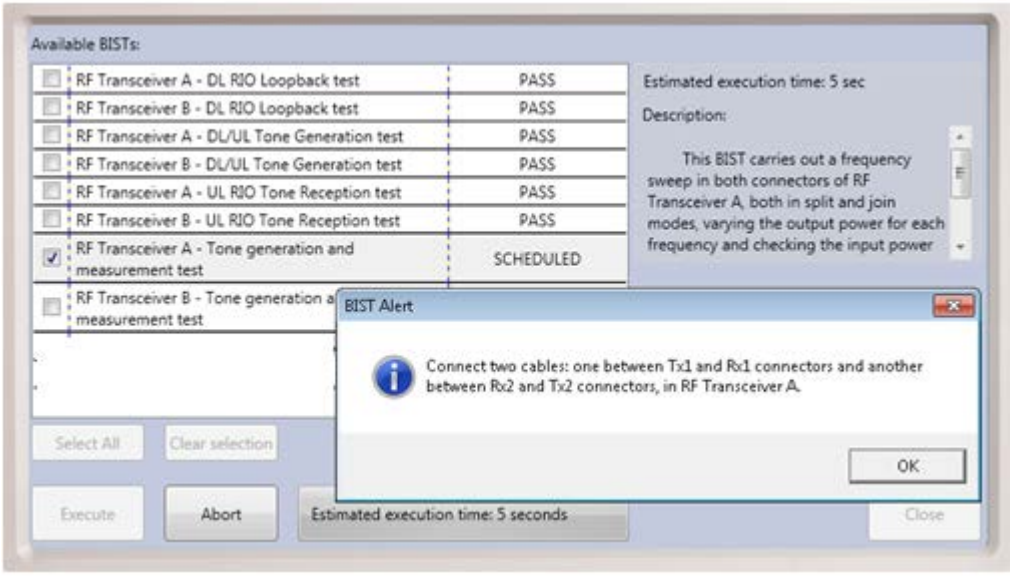


Figure 3-3: Tests requiring connection between front-panel ports

When the BIST are completed, a *BIST Alert* message is displayed, as shown below, as well as the pass/fail results of each test.

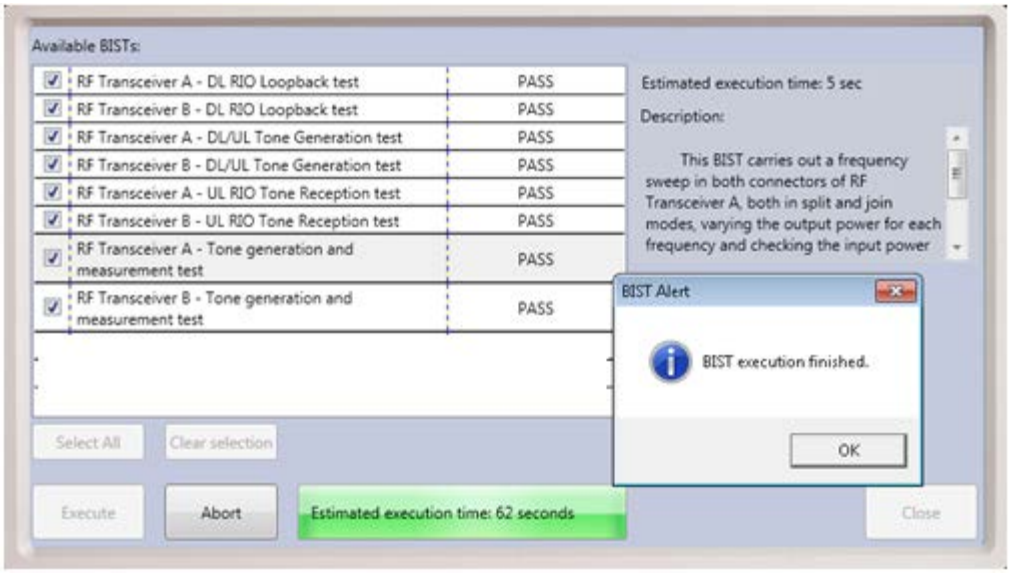


Figure 3-4: BIST execution finished

The pass/fail diagnostic information provided by the BIST is valuable information to have when discussing any problems you may be having with your UXM. If any of the tests do not pass, it is best that you contact your Keysight representative. Refer to the section, *Service and Support* on page 44.

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4 Front and Rear Panel Features

Front Panel Features

Begin using the UXM by becoming familiar with the layout of the Front Panel and the displayed user interface.

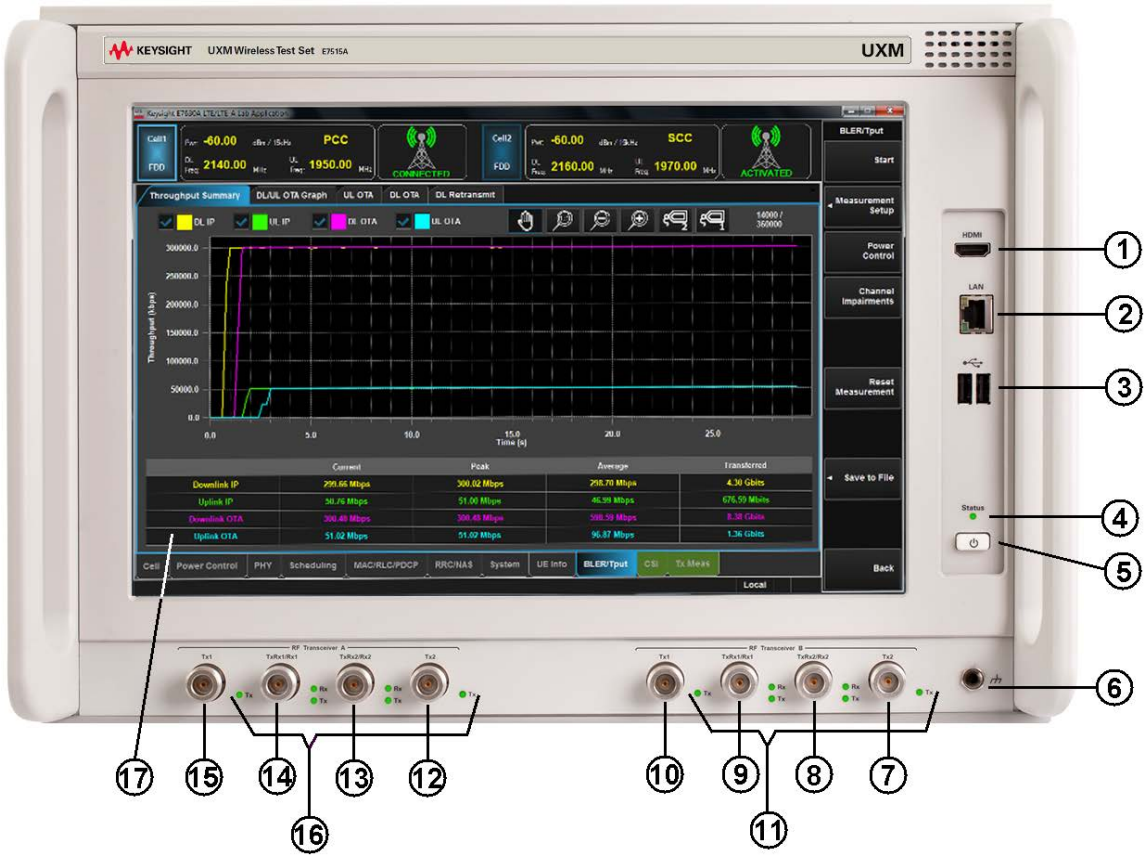


Figure 4-1 Front-Panel

#	Item Name	Description
1	HDMI Output	This is a High Definition Multimedia Interface output. This output transfers uncompressed video data and compressed or uncompressed audio data to an external display (for example: projector or other type of video/audio display. It is a standard HDMI v1.3.
2	LAN3 Input	This RJ-45 connector provides front-panel access from the UXM Host PC to the instrument control module enabling a maximum Ethernet data rate of 1 Gigabit. This connector is used for downloading firmware upgrades, new test set applications, saving data to an external memory drive and other reasons for which you may wish to connect to a local area network and/or to the internet.

#	Item Name	Description
		The IP address for this input is labelled, "Front_LAN" and can be viewed by using the **CONFIG** button on the E7515A Control Panel. See *LAN Address Configuration* on page 18 for more information.
3	2 - USB Inputs	Universal Serial Bus inputs for peripheral devices (mouse, keyboard, flash drives). These are USB version 2.0.
4	UXM Power Status Light[1]	Displays the power status of the instrument.[2]
5	Power	This is the On/Off button for AC power. Pressing this button when the instrument is powered off turns it on. Pressing this button briefly will shut down the UXM and Windows Operating System safely. Pressing and holding this button down for more than 5 seconds forces a complete instrument shut-down. *Note*: The rear-panel switch must be turned On and line power must be connected in order for this button to blink if in **Off** position and stay lit if in **On** position.
6	Earth Ground	Available for those situations where earth ground is required.
7 - 10	RF ports for Transceiver B[2] (RFM2)	These ports transmit and receive using the Transceiver B[2] base station emulator of the UXM.
7	Tx2	This provides the secondary RF output port for Transceiver B[2]. The maximum safe input level is 0.5W (+27 dBm), -15 to 0 Vdc.
8	TxRx2/Rx2[3]	This secondary Transceiver B[2] port acts in duplex mode, when it transmits and receives RF signals or in simplex mode when it only receives RF input. The maximum safe input level is 1W (+30 dBm), ±10 Vdc. This port is not used by the TA/LA software application.
9	TxRx1/Rx1	This primary Transceiver B[2] port acts in duplex mode, when it transmits and receives RF signals or in simplex mode when it only receives RF input. The maximum safe input level is 1W (+30 dBm). The Absolute Maximum Power is 2W (+33dBm), 0V DC input voltage.
10	Tx1	This provides the primary RF output port for Transceiver B[2]. The maximum safe input level is 0.5W (+27 dBm). The Absolute Maximum Power is 1 W (+30dBm), 0V DC input voltage.
11	Indicator Lights for RF Transceiver B[2] ports	These lights indicate the status of the connectors, not whether they are connected to a device or not.[4] Note that each antennae has 3 indicator lights. One for the transmitter and two for the transmitter/receiver.
12-15	RF ports for Transceiver A (RFM1)	These ports transmit and receive using the Transceiver A base station emulator of the UXM.
12	Tx2	This provides the secondary RF output port for Transceiver A. The maximum safe input level is 0.5W (+27 dBm), -15 to 0

#	Item Name	Description
		Vdc.
13	TxRx2/Rx2[3]	This secondary Transceiver A port acts in duplex mode, when it transmits and receives RF signals or in simplex mode when it only receives RF input. The maximum safe input level is 1W (+30 dBm), ±10 Vdc. This port is not used by the TA/LA software application.
14	TxRx1/Rx1	This primary Transceiver A port acts in duplex mode, when it transmits and receives RF signals or in simplex mode when it only receives RF input. The maximum safe input level is 1W (+30 dBm), ±10 Vdc.
15	Tx1	This provides the primary RF output port for Transceiver A. The maximum safe input level is 0.5W (+27 dBm), -15 to 0 Vdc.
16	Indicator Lights for RF Transceiver A ports	These lights indicate the status of the connectors, not whether they are connected to a device or not.[4] Note that each antennae has 3 indicator lights. One for the transmitter and two for the transmitter/receiver.
17	Touch-screen	LCD Flat-Panel Display with single touch 15" capacitive touch-screen.

Table Notes:

1. UXM Power Status Indicator light settings:
   - **Off**: Back-panel power switch is off.
   - **Yellow**: The first time the back-panel power switch is turned on (UXM (front-panel switch is off). It may display as green when the Micro-Controller Unit is loading (~3 seconds) after which it remains yellow.
   - **Green blinking**: The UXM is booting up.
   - **Green**: UXM is available for use or in use.
   - **Green/Yellow blinking**: Instrument Control Module (ICM) for the Micro-Controller Unit is downloading firmware. (Not the FPGA ICM.) When the FPGA-ICM is downloading firmware, the LED is green.
   - **Yellow blinking**: UXM is shutting down.
   - **Yellow/Orange blinking**: UXM is off after an abnormal shutdown.
2. You need to purchase option E7515A-RB1 (RF up-down converter B) and E7515A-BB1 (Digital baseband transceiver B) in order to have a 2nd transceiver.
3. These ports are not used by the TA/LA software application.
4. RF Transceiver A/B Status Indicator Light settings:
   a. The LEDs display meaningful information to you *only* after you have launched the TA/LA. At this time the LEDs displayed are the result of your selection or de-selection of duplex mode of the **RF Output 1/2 (A)** box on the **System** tab of the Application.
   b. When RF Duplex mode is de-selected:
      i. In this mode, channel 1 is configured in simplex mode. (Tx1 connector is used for transmission.) The following LEDs are lit in this mode:
         - LED - Tx1.
         - LED - Rx1.
         - LED - Rx2. - This receiver connection is not used by the TA/LA.
         - LED - Tx2 - This transmitter connection is not used by the TA/LA in 1x1 antenna configuration.
   c. When RF Duplex mode is selected:

i. In this mode, channel 1 is configured in duplex mode (Tx1Rx1/Rx1 connector is used for transmission). The following LEDs are lit in this mode:
    - LED - Rx1.
    - LED - Tx1Rx1.
    - LED - Rx2. - This receiver connection is not used by the TA/LA.
    - LED - Tx2. - This transmitter connection is not used by the TA/LA in 1x1 antenna configuration.

Notes (table note 4):

- Channel 2 cannot be configured in duplex mode from the TA/LA and, in consequence, is always working in simplex mode; therefore, channel 2 LEDs will never change once the TA/LA is running.
- As receptions are not configurable (there is only one possible connector for reception on each channel), all receiver LEDs in both RF Transceivers are always be On.

Rear Panel Features

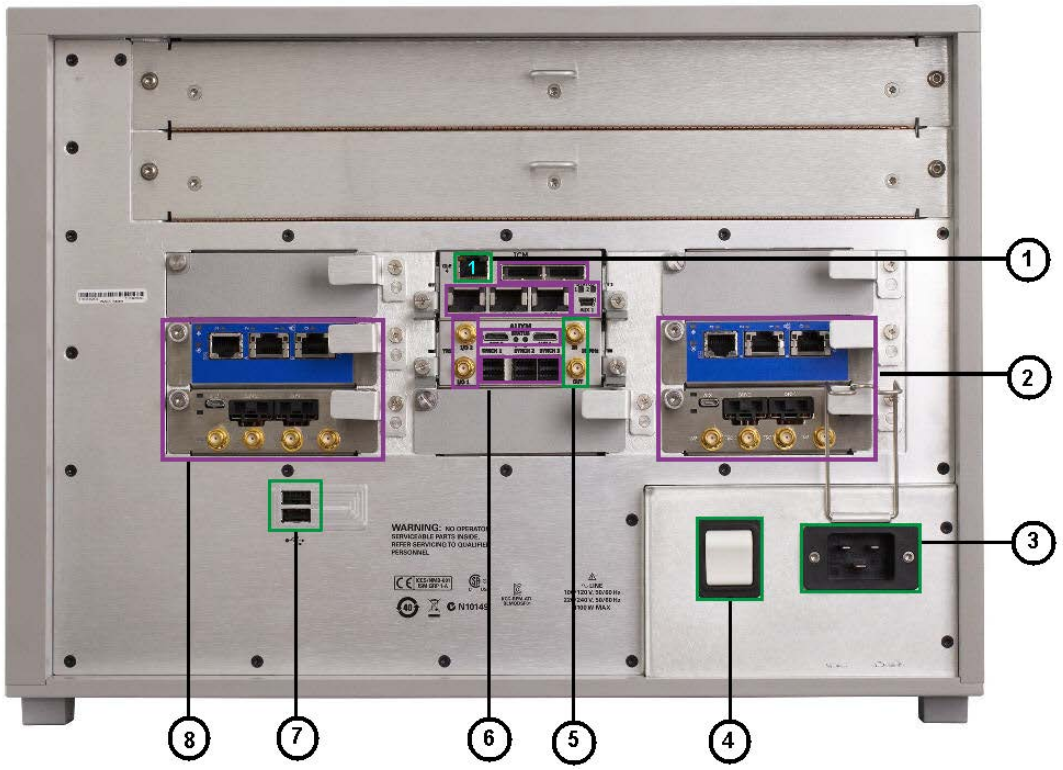


Figure 4-2: Rear Panel

Figure Notes:

1. All I/O ports outlined in green are available for customer use.
2. All I/O ports outlined in purple are available for factory personnel only.
3. Removing any of the rear panel modules may invalidate your warranty.

#	Item Name	Description
1	LAN1	This is the Ethernet port that is connected internally to the UXM Host PC. Use this port to connect the UXM to the LAN. The IP address for this input is labelled, “ICM_GbE4” and can be viewed by using the **CONFIG** button on the E7515A Control Panel. See *LAN Address Configuration* on page 18 for more information.
2	PPM-A (top) SPM-A (bottom)	The connectors of these modules are for factory use only. Do not remove.
3	Power Cord Input	C14 physical connector for AC Power Entry.
4	Switch	This is the AC line power switch. It is not to be relied upon as supplementary protection. Top side depressed = On. If line power is connected and this switch is On, the front-panel switch light should be lit.
5	SMA Input/Output 10 MHz Reference[1]	The top coaxial SMA connector is a 10 MHz clock reference input.
		The bottom coaxial SMA connector is a 10 MHz clock reference output.

#	Item Name	Description
6	Various inputs/outputs	All ports outlined in purple in this area are not available for use.
7	2 - USB ports	Universal Serial Bus inputs for peripheral devices (mouse, keyboard, flash drives). These are USB version 2.0.
8	PPM-B (top) SPM-B (bottom)	The connectors of these modules are for factory use only. Do not remove.

Table Notes:

1. Do not modify connections to the internal and/or external references while the TA/LA is running and the DL/UL cells are in use.

NOTE	The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply.

WARNING	Do not cover or block the air flow vents.

Front and Rear Panel Symbols

	This symbol is used to indicate power ON.
	This symbol is used to indicate power OFF.
	This symbol is used to indicate power STANDBY mode (yellow in standby, green when instrument is ON).
	This symbol indicates the input power required is AC.
	This symbol indicates earth ground.
	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.
	The RCM Mark is a Compliance Mark according to the ACMA Labelling Requirement.
	South Korean Certification (KC) mark; includes the marking's identifier code which follows this format: MSIP-REM-YYY-ZZZZZZZZZZZZZZ
	ICES / NMB-001 Cet appareil ISM est conforme a la norme NMB du Canada. This is a marking to indicate product compliance with the Industry 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).
	The CSA mark is a registered trademark of the CSA International.
	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 symbol on all primary and secondary packaging indicates compliance to China standard GB 18455-2001.

To return unwanted products, contact your local Keysight office, or see http://www.keysight.com/environment/product/ for more information.

Refer to *Returning Your Test Set for Service* on page 43 for further instructions.

5 Test Set Operating System

Keysight Software Installed

Your test set has a number of software applications already installed: The E7515A Platform, the E7530A/E7560A LTE/LTE-A, the X-Series Measurement Application, IMS-SIP Server, and Application Switch Tool.

Customer Installation of Software

If for some reason you need to re-install any software you purchased, it is available on a hidden drive located in your UXM (*ONLY* applied to software version 1.2.1.0). Refer to *Installing the Software* on page 40 in the Test Set Operating System chapter of this manual.

Uninstalling the Platform and TA/LA Software

Uninstallation is a dialog driven process. You can access the uninstall dialog of the *Keysight LTE_LTA-A Application* (TA/LA) within the Windows **Start** menu, or by using the **Control Panel\All Control Panel Items\Programs and Features** dialog within Windows. Detailed instructions are in *Removing the Software* on page 40 in the Test Set Operating System chapter of this manual.

Installation of 3rd Party Software

It is recommended that you do *not* install any non-approved software on the UXM. Installation of 3rd party software on the UXM may render the system inoperative and is not supported by Keysight Technologies.

System Maintenance

Back-up

It is recommended that you have a regular back-up strategy. Your IT department may already have a back-up strategy in place which is suitable for the test set and its data.

The Windows 7 operating system has a Backup utility that you can use to archive files and folders in case of a hard disk drive failure. See the Microsoft Windows Help and Support Center for more information on this utility.

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

System Restore

Windows 7 contains the capability to restore the system to a previous point in time. *System Restore* is enabled with default settings as provided by Microsoft. However, *System Restore* is not 100% successful. Therefore, it is not the recommended method to back-up the instrument. *System Restore* has not been tested to verify successful restoring. It is best to use the procedure described in the section, *Disk Drive Recovery Process* on page 36.

Hard Drive Partitioning and Use

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

- The C: partition contains the Windows 7 operating system and software installed by Keysight. This is an Open System which means you can install additional software. However it is recommended that you use an external PC to host all additional software applications that you wish to use in conjunction with the UXM. The installation and/or use of other software is not warranted and could interfere with the operation of the test set software. If instrument repair is ever needed, the Keysight version of the C: drive is the only part of the instrument software that is restored by the Keysight Recovery process. You must reload any other software that you have added in the instrument.

IMPORTANT	It is recommended that you use an external PC to host software applications you wish to use in conjunction with the UXM. Installing applications on the instrument Host PC may result in a compromised performance of the UXM including decreased throughput and/or measurement performance.

- The D: partition is reserved for data storage. The User Accounts that are configured by Keysight have their My Documents folder mapped to the D: drive. This is for the convenience of backing-up the test set measurement data. You should always back-up the data on the D: drive to an external device. This enables you to restore the data if you ever need to replace the hard drive.

NOTE	Storing your data on the Desktop is not safe during a system recovery. It is recommended that you always store your data in the My Documents folder that is mapped to the D: drive.

- The E: partition is reserved for Keysight's use. The primary use of the E: drive is for storing the Calibration and Alignment data, the configuration files for the Platform Boards and Host PC. Do not change or overwrite the files on this drive. This could cause your instrument to not meet specifications, or even to stop functioning correctly. Do not use this drive for data storage.
  It is also recommended that you back-up the contents of this drive by using an external device. This enables you to restore the data if you ever need to replace the hard drive.

Disk Drive Recovery Process

The Keysight Recovery System can be used to repair errors on the test set's C: drive partition or to restore the original factory configuration of the system software. The Keysight Recovery System is stored in a separate hidden hard disk drive partition. Repairing errors on the hard disk drive may result in loss of data or files. If you need more information about the Windows "chkdsk" error repair process, see the chkdsk documentation in the Microsoft Windows 7 Help and

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

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

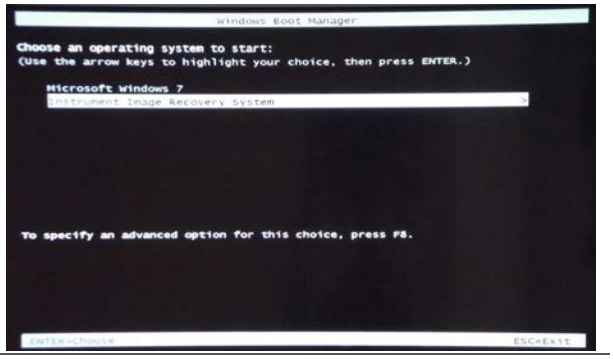
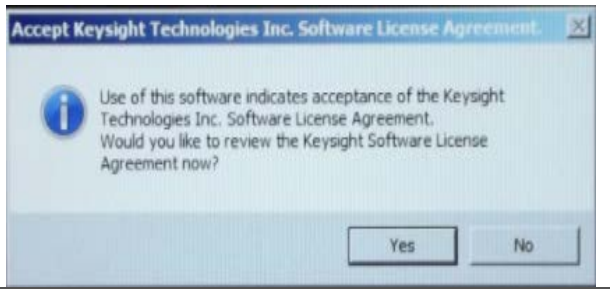
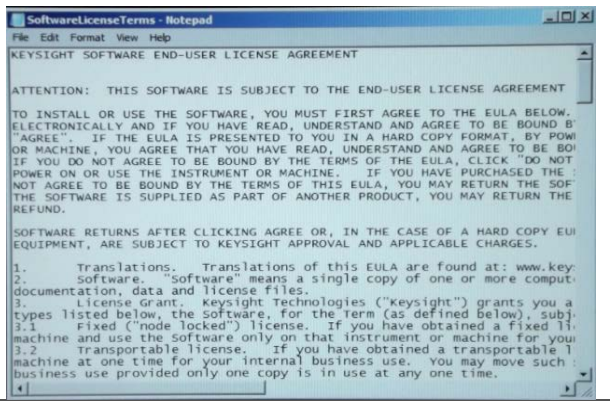
NOTE	Storing your data on the Desktop is not safe during a system recovery. It is recommended that you always store your data in the My Documents folder that is mapped to the D: drive.

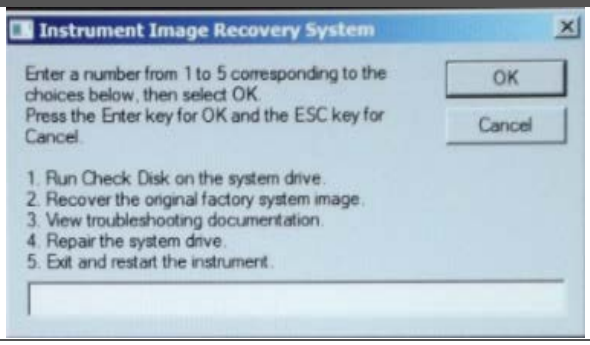
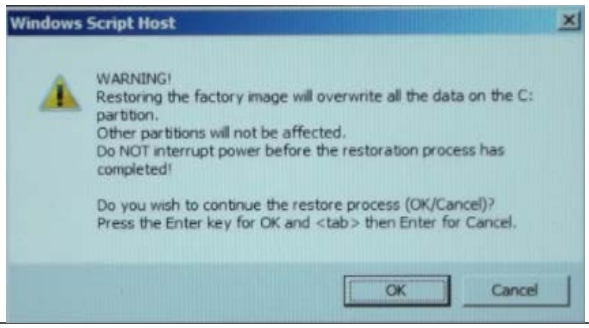
Restoring the original factory system software will synchronize the code in the Field Programmable Gate Arrays (FPGAs) on the various hardware assemblies with the versions included in the original factory system firmware/software. You may see the E7515A Control Panel is in a faulty state at the end of the recovery process because the unit must be shut-down and restarted in order to process the changes correctly.

NOTE	It is recommended that you use a regular back-up strategy. Your IT department may already have a back-up strategy in place which is suitable for the test set and its data. See *System Maintenance* on page 35. Using the Keysight Recovery System in conjunction with a regular back-up strategy should allow you to fully recover the test set software and data.

It is recommended that routine back-ups of the instrument information be performed to keep current archives of the instrument information. This allows a full recovery of the instrument information after the instrument recovery system operations are performed. See *Backup* on page 35 for more details.

Using the Test Set Recovery System

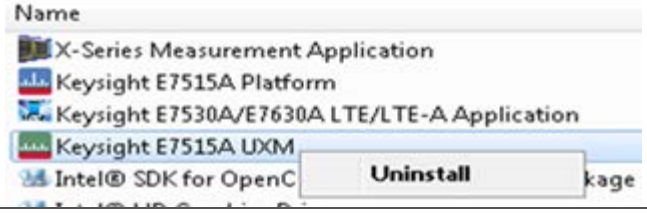
Step	Notes
1. Make sure the instrument is turned off and there are no Ethernet cables connected to the instrument.	
2. Turn on the instrument. • Press the down arrow key to move the highlight to **Keysight Recovery System**, and then press **Enter**.	The Windows Boot Manager screen is displayed. 
3. After selecting the Keysight Recovery System, the instrument boots the Keysight Recovery System for 2 or 3 minutes. Finally, the instrument displays a message asking if you would like to review the Keysight license agreement. Select **Yes**.	
4. Review the terms. Select the “X” in the upper right corner to close this window.	
5. Accept the license agreement by selecting **Yes**.	

Step	Notes
6. When the Keysight Recovery System has booted, follow the on-screen instructions to recover the image of the C: drive. · Type in the number **2**, then press **OK** to select "Recovery of the original factory system image."	
7. A warning message appears. · Press **OK** to start the recovery, which may take up to 20 minutes to complete.	
8. The instrument then re-executes the following process: *Turning on the Test Set the First Time* on page 14.	

Updating the Keysight E7515A UXM software

The following steps are required to update your Keysight E7515A UXM if you are migrating to any software version 1.2.1.0 or greater that is available at www.keysight.com/find/softwaremanager.

Removing the Keysight E7515A UXM Software

Step	Notes
1. Connect a USB keyboard and mouse to the instrument	
2. Log out of the default user (instrument): · Select Start, Log Off	
3. At the log in prompt enter: · User Name: administrator · Password: Keysight4u!	
4. Uninstall the Keysight E7515A UXM software by performing the following: · Select Start, Control Panel, All Control Panel Items, Programs and Features. · Find the *Keysight E7515A UXM*. Right-click on the application and select Uninstall.	
	
5. When prompted to completely remove the selected application and all of its features, select Yes. Select OK to any pop-up windows that appear. · When the software uninstall is complete, select Finish.	

Installing the Keysight E7515A UXM Software

Step	Notes
1. If you have just completed uninstalling the Keysight E7515A UXM software, then you may be able to skip steps 2 through 4, below.	
2. Connect a USB keyboard and mouse to the instrument	
3. Log out of the default user (instrument): · Select Start, Log Off	
4. At the log in prompt enter: · User Name: administrator · Password: Keysight4u!	
5. Obtain the latest version of software installer from: www.keysight.com/find/softwaremanager	
6. Locate the software installer program: "Keysight E7515A_UXM 1.2.1.0 .exe".	

Step	Notes
7. Follow the on-screen prompts to continue the installation.	
NOTE The installation process takes about 5 minutes. Do not turn the instrument power off or serious damage may occur. If any pop-up windows appear, click **OK** or **Ignore** to proceed.	
8. When the installation has finished, you may be prompted to restart the instrument. If this prompt is shown, then select **Yes, I want to restart my computer now**, **Finish**.	
9. After the instrument restarts, the newly installed version of the UXM instrument software will run.	

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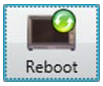
6 Troubleshooting

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

1. Select the *Reboot* icon 

in the E7515A Control Panel whenever the UXM hardware and/or software appear to be in a faulty state. Once the E7515A Control Panel indicator turns green, the UXM is in the ready state and you can proceed with your testing. Note that you may need to perform this reboot more than once to obtain the green display indicator condition. Note that the Restart and Shutdown affect the test set and windows.
2. Perform the BIST if rebooting the Platform boards does not cause the E7515A Control Panel indicator to display the green state. These tests provide you with valuable information when speaking with your Keysight representative. Refer to the section entitled, *Built-in Self Tests (BIST)* on page 23 for detailed instructions.

Returning Your Test Set for Service

Calling Keysight Technologies

Keysight Technologies has offices around the world to provide you with complete support for your wireless test set. 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 test set by its product number, full serial number, and software revision.

To access your product information, select this icon 

in the E7515A Control Panel view after switching to the E7515A Control Panel via the Application Switch tool or after performing both or only the second action described below:

1. If you are inside the TA/LA software application, press the windows icon  key on your USB connected keyboard to enable you to view your windows task bar.
2. Once you have access to the windows task bar, double-click the E7515A Control Panel icon:  to maximize the E7515A Control Panel view.

Locations for Keysight Technologies

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

If you do not have access to the Internet, one of these centers can direct you to your nearest representative:
Should the Declaration of Conformity be required, please contact a Keysight Sales Representative, or the closest Keysight Sales Office. Alternately, contact Keysight at: www.keysight.com.

Service and Support

Americas

Brazil
55 11 3351 7010
United States
(800) 829 4444

Canada
(877) 894 4414

Mexico
001 800 254 2440

Asia Pacific

Australia
1 800 629 485
China
800 810 0189
Hong Kong
800 938 693
Other Asian Countries:
(65) 6375 8100
www.keysight.com/find/contactus

India
1 800 112 929
Japan
0120 (421) 345
Korea
080 769 0800

Malaysia
1 800 888 848
Singapore
1 800 375 8100
Taiwan
0800 047 866

Europe & Middle East

Austria
0800 00 11 22
Belgium
0800 58 580
Finland
0800 523 252
France
0805 980 333
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Other Unlisted Countries:
www.keysight.com/find/contactus

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0200 88 22 55
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United Kingdom
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