Berkeley Nucleonics RTSA7550

Real-Time Spectrum Analyzer User Guide Version 4.0

Berkeley Nucleonics Corporation - 2955 Kerner Blvd. - San Rafael, CA 94901
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Preface

This preface describes the audience for, the organization of, and conventions used in this document. It also identifies related documentation and explains how to access electronic documentation.

Audience

This document is written for technical people who have basic understanding, familiarity and experience with network test and measurement equipment.

Conventions

This section describes the conventions used in this document.

Note: This symbol means **take note**. Notes contain helpful suggestions or references to additional information and material.

Caution: This symbol means **be careful**. In this situation, you might do something that could result in equipment damage or loss of data.

Warning: This symbol means **danger**. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with the standard practices for preventing accidents.

Obtaining the Latest Documentation and Software

Please contact **Info@berkeleynucleonics.com** to obtain the latest documentation and the latest releases of new firmware and software.

Document Feedback

Please send your comments about this document or our other documentation to **Info@berkeleynucleonics.com**.

Thank you, we appreciate your comments.

Obtaining Technical Assistance

The BNC Support website provides online documents for resolving technical issues with BNC products at **https://www.berkeleynucleonics.com/support**.

For all customers who hold a valid end-user license, BNC provides technical assistance 9 AM to 5 PM Eastern Time, Monday to Friday. Contact us at **Info@berkeleynucleonics.com** or by calling **+**1 415-453-9955

Before contacting Support, please have the following information available:

- RTSA7550 serial number which is located on the identification label on the RTSA7550's underside.
- The product version.
- The firmware version running on the RTSA7550.
- Versions of BNC software you are using, potentially including the API libraries to third-party applications.
- The operating system and version you are using.

Overview of the BNC RTSA7550

The RTSA7550 Real-Time Spectrum Analyzer (RTSA) is a high-performance software-defined RF receiver, digitizer and analyzer. It is designed for stand-alone, remote,distributed, and/or embedded real-time spectrum analysis, monitoring and intelligence applications.

BNC has patented software-defined RF receiver technology that provides industry leading combined sensitivity, tuning range, instantaneous bandwidth and scan rate. Additionally, the RTSA7550 provides real-time sophisticated triggering, search and loss-less capture of signals of interest using an integrated patented digital signal processing engine.

The RTSA7550 is ideal for monitoring, management and surveillance of transmitters, whether they are in-building or spread across a geographic area. Applications include but are not limited to spectrum analysis, 5G wireless technology, research, test and measurement, spectrum monitoring and OEM integration.

The RTSA7550 Real-Time Spectrum Analyzer provides Gigabit Ethernet for stand-alone, remote and distributed applications. BNC supports a rich set of industry-leading standard protocols and APIs, enabling the RTSA7550 to easily integrate into your new or existing applications. Standard protocols include the Standard Commands for Programmable Instruments (SCPI) protocol for controlling and obtaining status from the RTSA7550 and the VITA 49 Radio Transport (VRT) protocol for digitized data and its associated context information. APIs are provided for interfacing and performing data acquisition and spectral analysis with Python™, C/C++, MATLAB® and LabVIEW®

Applications can also be built within the PyRF development framework. PyRF is built on the Python programming language and is open-source under BSD licensing. PyRF handles the low-level details of real-time acquisition, signal processing and visualization, and provides feature rich libraries, example applications and source code, all specific to the requirements of signal analysis.

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Getting Familiar with the BNC RTSA7550

This section provides information about the front and rear panels, connection ports and identification label of the RTSA7550 Real-Time Spectrum Analyzer.

Note: The type and placement of connectors and components on the panels and the case may vary depending upon the product variant and version.

The Front Panel

The front panel of the RTSA7550 (the left side of the picture above) contains the power switch, status indicator LEDs and input connectors for the RF antenna and analog IQ ports.

The Rear Panel

The rear panel of the RTSA7550 (the right side of the picture above) contains the power input, 10 MHz reference clock I/O, hardware reset push-button, HIF output, analog I/Q outputs, USB console (CNSL), Ethernet, and GPIO port.

The Underside

The underside of the BNC RTSA7550 provides an identification label, as illustrated in the following page. The label on your product may vary depending on your product variant and version. This product “Version” number is important for identifying which firmware can be used to update your product.

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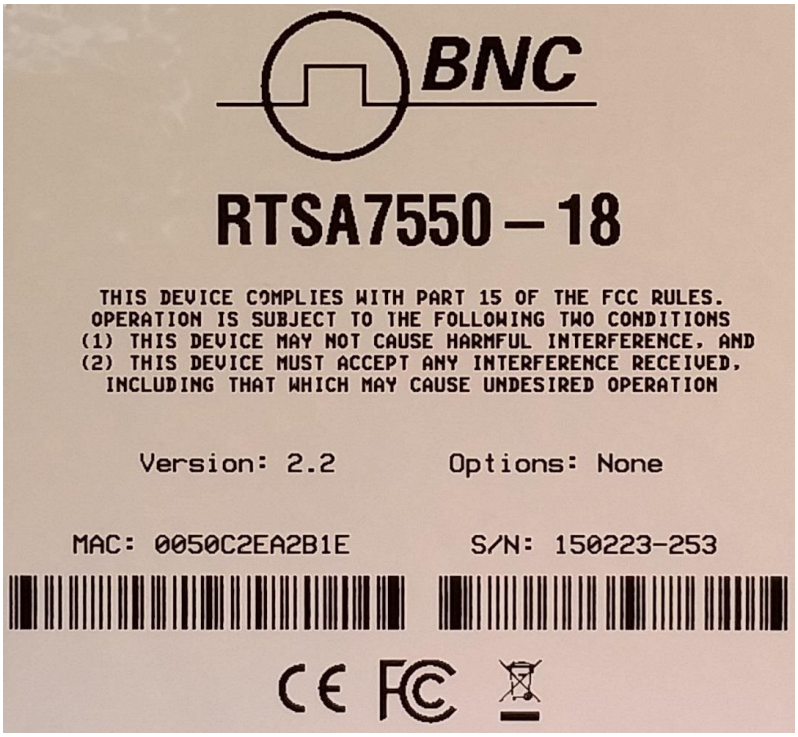

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Installing the BNC RTSA7550

Ensure that you read and understand the following information about safety and electrostatic discharge before you unpack and install the RTSA7550.

Warning: Only trained and qualified personnel should be allowed to install or replace this equipment. Read the installation instructions before you connect the system to its power source.

Preventing Electrostatic Discharge Damage

Electrostatic Discharge (ESD) is a single-event, rapid transfer of electrostatic charge between two objects, such as an operator and a piece of electrical equipment. ESD can occur when a high electrostatic field develops between two objects in close proximity. ESD occurs when electronic components are improperly handled and is one of the major causes of device failures in the semiconductor industry.

Electrostatic discharge is more likely to occur with the combination of synthetic fibers and dry atmosphere. Always follow these steps to prevent ESD.

Warning: Never open the front or rear panels of the RTSA7550 as personal injury may result and opening the chassis will void the warranty. There are no user-serviceable parts inside. Always contact BNC support for service through the online support form at **https://www.berkeleynucleonics.com/support**

Caution: To prevent ESD, wear an ESD-preventive wrist strap that you provide, ensuring that it makes good skin contact.

Caution: Do not touch any exposed contact pins or connector shells of interface ports that do not have a cable attached. If cables are connected at one end only, do not touch the exposed pins at the unconnected end of the cable.

Unpacking the Box

The following table lists the items that come with your RTSA7550 analyzer. If any of the items are missing or damaged, please contact your BNC customer service representative.

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BNC RTSA7550 Shipping Box Contents:

- RTSA7550 Real-Time Spectrum Analyzer
- Power adapter and cable
- Straight-through Ethernet cable
- USB flash drive with associated documents and software
- USB-A to mini-B cable for the USB console port
- Antenna
- Precautions & Quickstart Guide

Note: The antenna is included for your convenience and only intended to perform adequately across a limited frequency range.

Connecting the Antenna, Ethernet and Power Cables

Caution: Never connect a transmitter directly to the receiver with a cable.

Caution: Do not over-tighten the antenna connector on the jack. Using a wrench, pliers or even your hand to over-tighten the antenna can cause permanent damage to the receiver.

1. Screw the antenna on to the RTSA7550 "RF IN" antenna input SMA jack. Carefully turn the antenna screw by hand until it encounters resistance. See System Specifications for the maximum allowable input and cautions.
2. Connect one end of the Ethernet cable to the RTSA7550's Ethernet port and the other end to an Ethernet port on your router or PC.
3. Connect the RTSA7550 analyzer to its power adapter.

Warning: Use only the power adapter provided with the unit.

4. Plug the power adapter into a power outlet.
5. Push the power switch towards the power symbol to power the unit on.

Note: See Administration Console section for description of the RTSA7550 status.

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Selecting Where to Mount the RTSA7550

Caution: To prevent damage to the RTSA7550 radio receiver, do not install or operate the RTSA7550 within 2 feet (60 cm) of devices such as Wi-Fi access points that transmit more than +15 dBm power.

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Connecting to the RTSA7550

The RTSA7550 analyzer is a network device and typically all communications with the RTSA7550 analyzer are via a Gigabit Ethernet connection, either directly to a computer or across an IP network. The RTSA7550 analyzer's Gigabit Ethernet connection provides control and status of the RTSA7550 using SCPI commands and data using the VRT protocol.

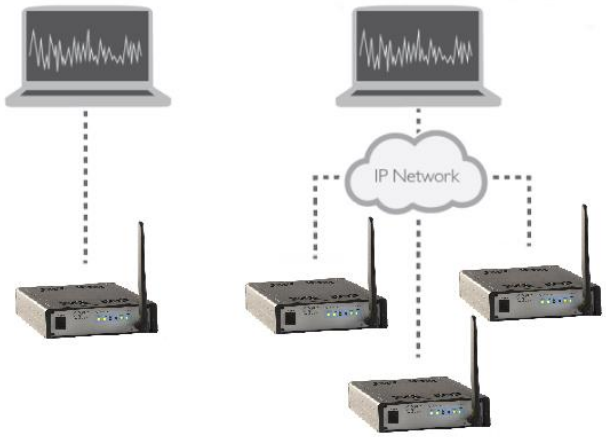
This section provides instruction for different methods of connecting to the RTSA7550 via its Ethernet port and obtaining its IP address.

Deciding on Your Network Topology and IP Address Allocation

Note: To connect with the RTSA7550 analyzer via its Ethernet port, you must decide on both the topology of your network connection and how your RTSA7550 obtains its IP address.

As illustrated in the following picture, the RTSA7550 supports any IP network topology connected via its Ethernet port including:

- a direct connection to a computer across an RJ-45 Ethernet cable as per the Connecting the RTSA7550 Analyzer Directly to a Computer section;
- a connection across a routed local network, whether on the same subnet or across different subnets or across a routed wide-area network such as the Internet, as per the Connecting to the RTSA7550 Analyzer Across a Network section.



The RTSA7550 analyzer also supports different methods of obtaining its IP address including:

- dynamic IP address allocation via the Dynamic Host Configuration Protocol (DHCP), which is applicable to a routed network topology that has a DHCP server;
- dynamic IP address allocation via the Automatic Private IP Addressing (APIPA) protocol (otherwise known as Auto-IP), which is applicable for where a DHCP

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server is not available. This method allows a direct connection to a computer that supports Auto-IP or to a local network using a switch. With Auto-IP, a host network device randomly assigns itself a link-local address in the 169.254.x.y subnet when it fails to contact a DHCP server. Many operating systems (OSs), including Windows, support Auto-IP;

- static IP address allocation, which is applicable to any network topology.

Changing the Method of IP Address Allocation for the RTSA7550 analyzer

This section provides the instruction for re-configuring one IP address allocation type to another.

Note: The RTSA7550 analyzer is configured for dynamic IP address allocation by factory default.

If your RTSA7550 analyzer is configured for dynamic IP allocation, then it may be reconfigured for static IP address allocation using either its web administration or USB console. Using the administration console in this scenario requires first a connection to the RTSA7550 via its Ethernet port, which in turn requires dynamic allocation of its IP either by DHCP or Auto-IP.

If your RTSA7550 is configured for static IP allocation, then it may be reconfigured for dynamic IP address allocation using its administration or USB console or via a hardware reset. Using the hardware reset to reconfigure to dynamic IP allocation is the simplest method and is described in the section. Using the administration console requires a connection to the RTSA7550 via its Ethernet port.

Connection to the RTSA7550 using dynamic or static IP allocation is described in the following sections. The console usage is described in the or section.

Connecting the RTSA7550 Analyzer Directly to a Computer

This section provides instruction on connecting the RTSA7550 analyzer directly to a computer via their Ethernet ports using an Ethernet cable.

In order to connect directly to a RTSA7550, the host PC might require a spare Ethernet interface that is not otherwise used as its primary network connection. For example, you may use a wireless connection for primary network connectivity or obtain a second Ethernet card or USB adapter to connect to the RTSA7550.

For this overview, the BNC S240 Real-Time Spectrum Analysis Software is used to connect to the RTSA7550 analyzer. The latest version of this software can be found at **https://www.berkeleynucleonics.com/support**

To connect the RTSA7550 directly to your computer:

1. Decide on whether you will be using static or dynamic IP allocation. Regardless

   of which method you choose, both your PC's and the RTSA7550 Ethernet interface must be configured for the same method of IP allocation. If necessary, configure your RTSA7550 to your chosen method of IP allocation following the instruction in the section.

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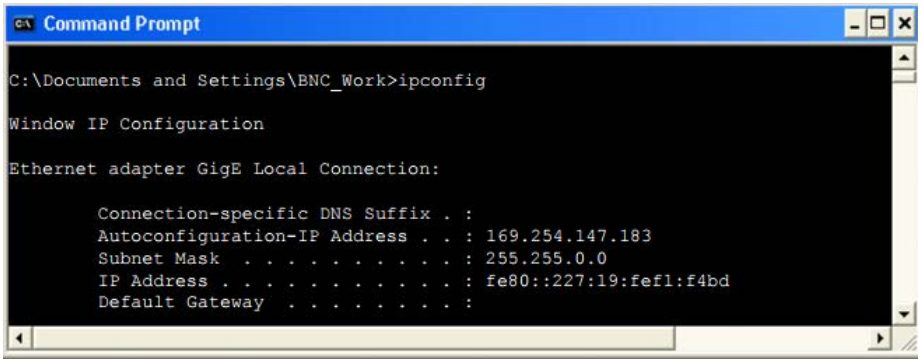
2. Connect the provided Ethernet cable to both your PC's and the RTSA7550 Ethernet ports.
3. Power up the RTSA7550 and wait a minute for it to complete booting.
4. Check to ensure that either your PC's or the RTSA7550 LINK indicator is illuminated. If it is not then your PC may not support automatic crossover on its Ethernet connection and you may require an RJ-45 crossover Ethernet cable as specified in the section.
5. If you're using static IP allocation then skip to the next step. Otherwise, check the STS LED for the Auto-IP setup completion (take a minute or longer).

Note: While the RTSA7550 is searching for a DHCP server, the STS LED blinks yellow slowly until it obtains an IP address either via DHCP or Auto-IP. The STS LED blinks in a green heartbeat pattern if it has set up successfully to using an Auto-IP address.

Verify the host PC's IP configuration using the PyRF Discovery Tool. With a Windows OS, open a Command window and type **ipconfig** to show the IP addresses assigned to each interface. The Ethernet interface should show a 169.254.x.y address as seen in the following picture as an example.



6. Use the PyRF Discovery tool or the S240 Real-Time Spectrum Analysis Software

   (as shown in the following figure), both provided by BNC, to determine the assigned IP address of the RTSA7550. In order for the Discovery tool to locate the RTSA7550, both your computer and the RTSA7550 must be configured for the same subnet. If you are using Auto-IP dynamic IP allocation, then they will both be on the same 169.254.x.y subnet. If you are using static IP and the Discovery tool cannot locate the RTSA7550, then you need to have prior knowledge of its static IP address or use the USB console.

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7. The assigned IP address may now be used to communicate with the RTSA7550 analyzer.

Note: Link-local addresses used for Auto-IP are non-routable, so communications is limited to devices within the local subnet. This restriction may be an issue when running virtual machines (e.g. Mac Parallels, VirtualBox, etc.) that may be connected through virtual routers to the host PC's physical network interface.

Note: After obtaining a link-local address, the RTSA7550 continues to request a DHCP address. If a DHCP server responds at a later time, the link-local address is overwritten with the offered IP address. This new address is retained until the network cable is physically unplugged or the RTSA7550 is restarted.

Connecting to the RTSA7550 Analyzer Across a Network

This section provides instruction on connecting the RTSA7550 to a computer across a routed local network whether on the same subnet or across different subnets or across a routed wide-area network such as the Internet.

To connect the RTSA7550 across a network:

1. Decide on whether you will be using static or dynamic IP allocation. Both your PC and the RTSA7550 do not need to be configured for the same method of IP allocation; although to locate your RTSA7550 using the BNC Discovery tool requires that they be on the same subnet. If necessary, configure your RTSA7550 to your chosen method of IP allocation following the instruction in the section. If you are using dynamic IP allocation then your router or your network must support a DHCP server.
2. Connect the provided Ethernet cable to both your router's and the RTSA7550 Ethernet ports.

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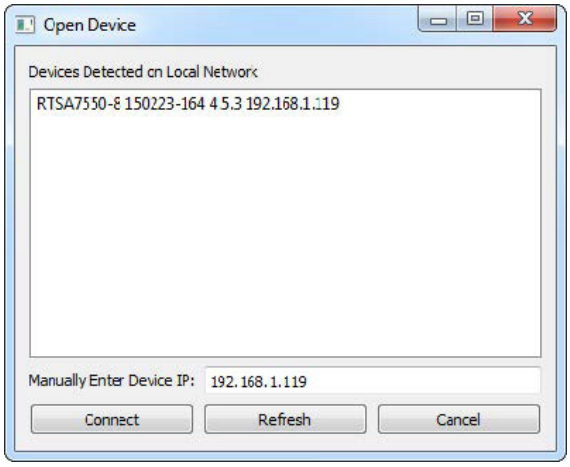
3. Power up the RTSA7550 and wait a minute for it to complete booting. The sequence of connecting and powering on are inconsequential.
4. Check to ensure that either your router's or the RTSA7550's LINK indicator is illuminated.
5. If your RTSA7550 is behind a firewall or a router with firewall capability, then your network's DHCP server is likely assigning private IP addresses (e.g. 192.168.x.x, 10.x.x.x, 172.x.x.x), and the firewall is likely providing some form of network address translation (NAT) function. If this is the case and if you require access to the RTSA7550 from outside your firewall, then you will likely have to configure the firewall to allow port forwarding on port 37000 and 37001. If necessary, consult with your network administrator.
6. Use the PyRF Discovery tool or the S240 Real-Time Spectrum Analysis Software both provided by BNC, to determine the RTSA7550's assigned IP address. In order for the Discovery tool to locate the RTSA7550, both your computer and the RTSA7550 must be configured for the same subnet. If you are using DHCP then you may have to query your router's allocation tables to determine the IP that is allocated to your RTSA7550 MAC address. If you are using static IP and the Discovery tool cannot locate the RTSA7550, then you need to have prior knowledge of its static IP address or use the USB console. If necessary, consult with your network administrator.



7. The assigned IP address may now be used to communicate with the RTSA7550.

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Administration Console

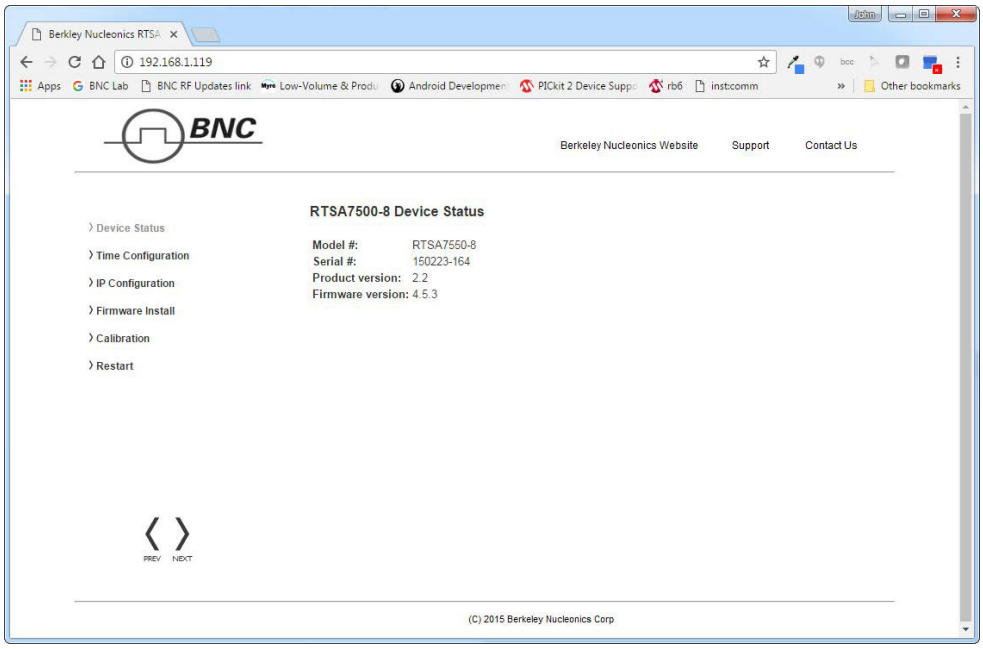
This section provides instruction on connecting to the RTSA7550 via its web-based Administration Console. The Administration Console provides the ability to:

- obtain status information from the RTSA7550;
- change date and time configuration;
- change IP configuration;
- upgrade the RTSA7550 software/ firmware;
- upload customized calibrations settings;
- and/or reset the R5500.

All of these functions may be performed via the network either locally or remotely.

Connecting via Your Web Browser

Connect to the RTSA7550 Administration Console by entering the IP address of your RTSA7550 into a web browser's web address dialog. The IP address is shown in the S240 software as the connected device. The following "Status" web page should appear providing information on the RTSA7550's MAC address, hardware and software versions.



Configuring the RTSA7550 Time

The time on the RTSA7550 analyzer can be set manually or as per host PC's time or via an NTP server.

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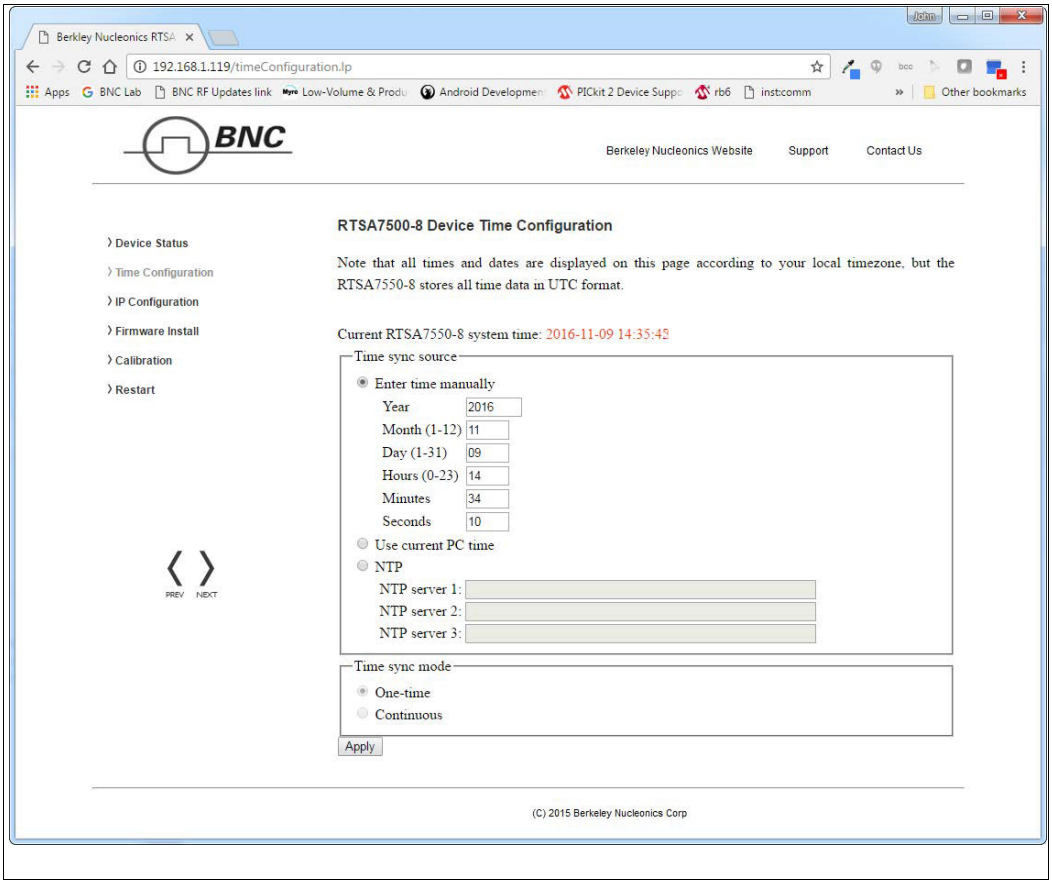
Note: The RTSA7550 analyzer stores its time based on the Coordinated Universal Time (UTC) and otherwise has no notion of local time-zones. Conversely, the web dialog translates and displays the RTSA7550 time based on the local time-zone setting of the PC.

1. Click on the "Time Configuration" link in the left column menu of the administrative console web page. The following "RTSA7550 Device Time Configuration" web page should appear.
2. Select the time synchronization source.
3. If “Enter time manually” is selected then enter the date and time based on your local time-zone.
4. If “Use current PC time” is selected then the data and time fields will be populated automatically.



5. If “NTP” is selected, enter at least one NTP server IP address and select whether the time be synced just this one time or continuously. If “continuously” is selected, the RTSA7550's time is synchronized to the NTP server on a continuous and regular basis, the regularity of which is optimally determined automatically.
6. Click the “Apply” button.

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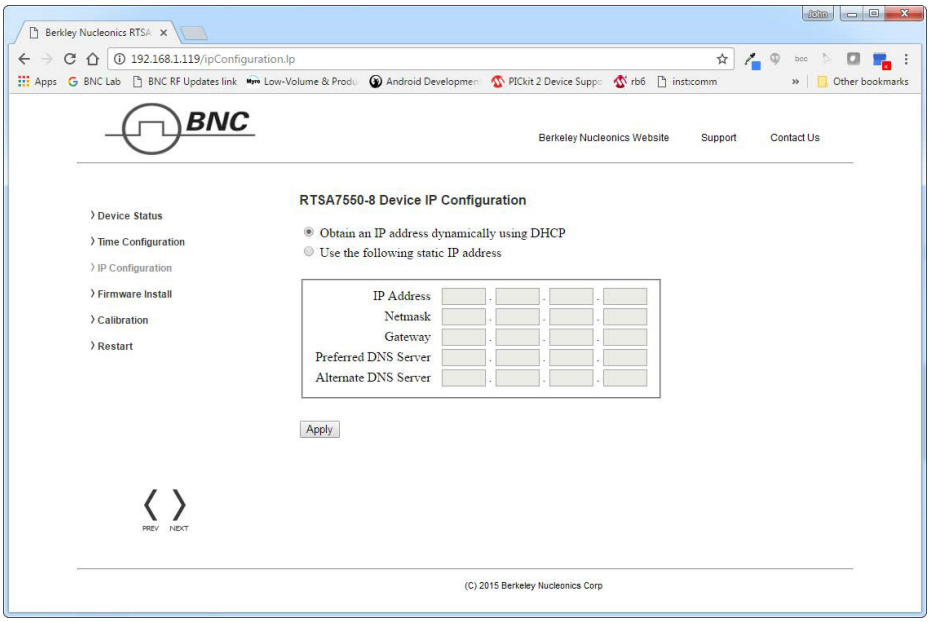
Configuring the RTSA7550 IP Address

The RTSA7550 provides options for selecting whether the RTSA7550 IP address is obtained dynamically using DHCP or is set manually to a static address.

Caution: Please note that if the RTSA7550 IP address is set to static IP then the only way to communicate with the RTSA7550 is via that IP address. If you mistakenly enter the wrong IP address and/or subnet mask, or forget the IP address, then you can change the IP configuration Using the USB Console or Restarting the RTSA7550.

1. Click on the "IP Configuration" link in the left column menu of the administrative console. The following "RTSA7550 Device IP Configuration" web page should appear. Once the “Apply” is clicked, the new configuration will take effect immediately and the current configuration and web page will no longer be valid.



Updating the RTSA7550's Firmware

This section will step you through updating the RTSA7550 firmware. The firmware install file contains firmware images associated with the RTSA7550 FPGA, Linux operating system and the embedded application. The process of updating will copy the new images to the RTSA7550 in addition to and without erasing the current installed images. The new install will only take effect upon the RTSA7550 being restarted.

Note: Updating firmware might over-write any user-defined calibrated values, see Customizing the RTSA7550 Calibration for more information.

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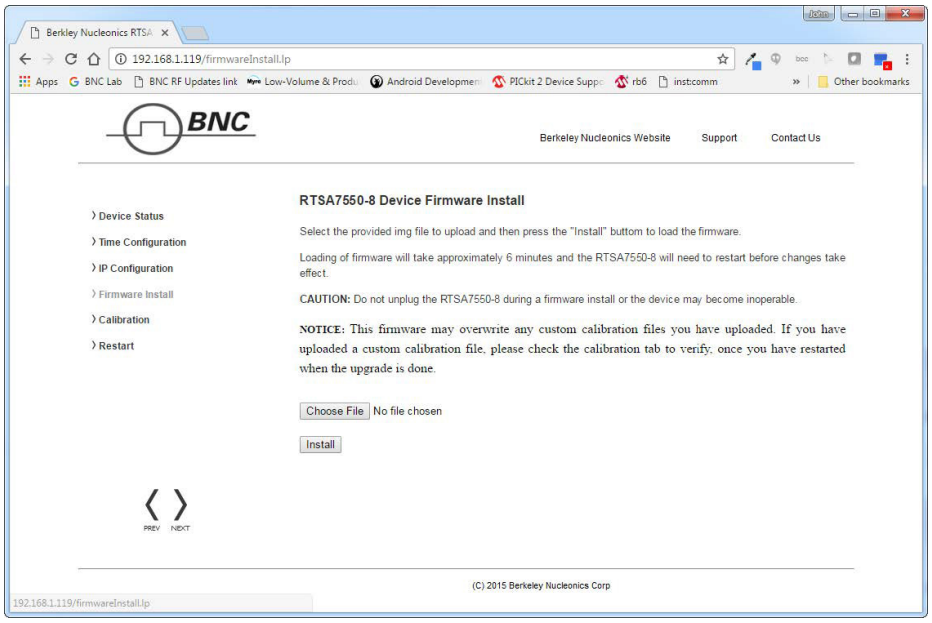
1. Click on the "Firmware Install" link in the left column menu of the administrative console. The following "Firmware Install" web page should appear.



Warning: Do not unplug the RTSA7550 during a firmware update or the device may become inoperable.

2. Enter or browse to the location of the "BNC_RTSA7550_firmware_vX.Y.Z.img" (or similar *.img) firmware image file and then click the "Install" button.

   When the firmware image for the intended product version is installed, the following "Firmware Install" web page should appear which will step through the progression of the firmware being uploaded and installed.

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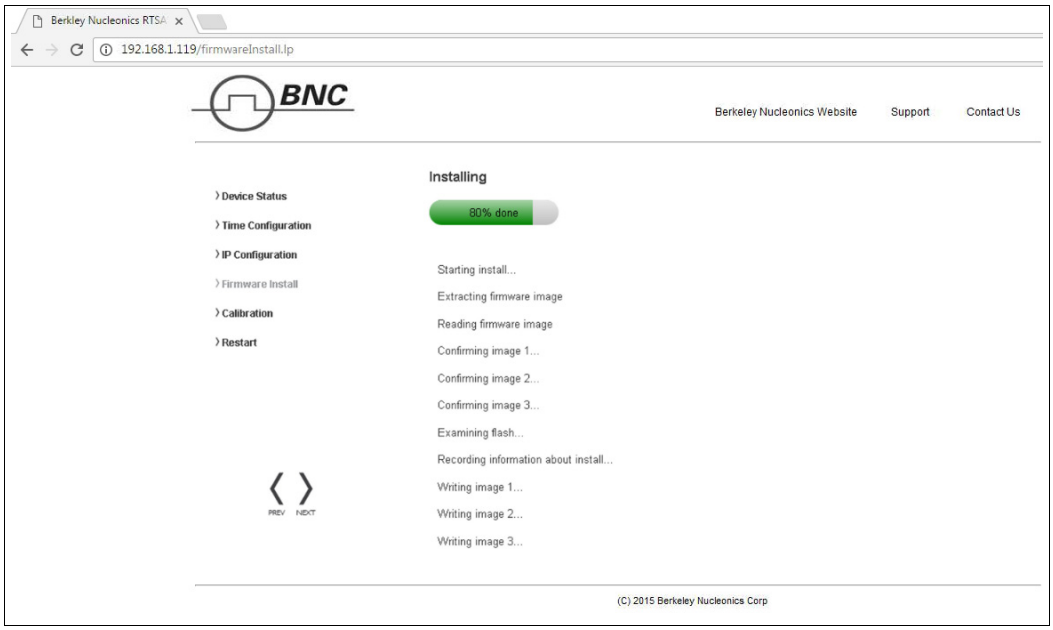
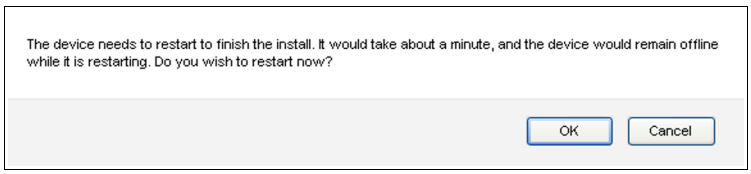


3. Upon completion, the following web dialog box should appear. Press the "OK" button to restart the RTSA7550 or "Cancel" to defer restarting until a later time.



Note: If the RTSA7550 is not restarted immediately after a firmware install process, then the newly installed firmware will take effect upon the next restart of the RTSA7550 regardless of whether it is a software restart or a power-on reset.

In addition, the boot up might take over a minute when there are new changes to the calibration setup or Auto-IP connection method is used.

Customizing the RTSA7550 Calibration

The RTSA7550 supports user-defined calibration settings if you do not want to use the BNC default calibration settings. This allows you to calibrate the RTSA7550 analyzer's RFE with reference levels based on, for examples - frequency ranges, temperature ranges, and insertion loss of the attenuator that are specific to your own applications.

You can upload your own calibration settings through the RTSA7550 administration console using the instruction described in the following section.

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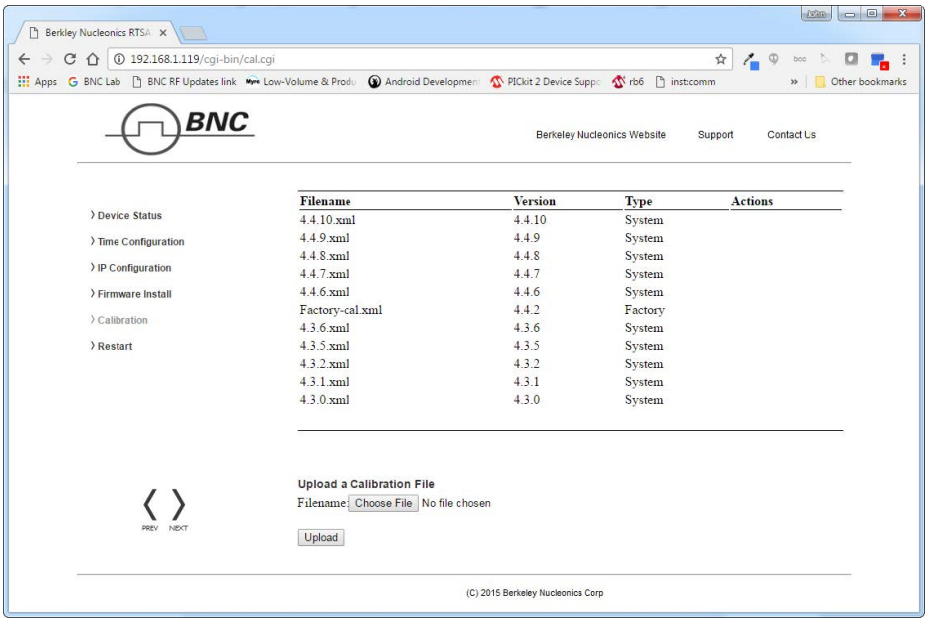
Uploading a Custom Calibration File

You can upload your custom calibration settings file to the RTSA7550 via the administrative console.

Note: You must restart the RTSA7550 for the new calibration settings to take effect.

Note: Custom calibrated values might get over-written by a new firmware update. After restarting the unit once the firmware update is done, check the Calibration tab of the administration console to see which calibration file source is listed on the top of the Filename list (ie. “System” or your customized file).

1. Click the "Calibration" link in the left column menu of the administrative console web page. The "RTSA7550 Device Calibration" page will appear.



2. Click “Browse”. An Explorer window will open on your PC.
3. Navigate to the location of the desired file and click “Open”. The selected file name appears beside the “Browse” button in the Administration console.
4. Click “Upload”. When successful, the custom calibration file is uploaded to the RTSA7550 and appears in the list of calibration files. The most recent uploaded file will be listed at the top of the table.
5. Restart the RTSA7550 by using the administrative console or toggling the power switch. The boot up will take longer than usual after the restart as the embedded system applies the new calibrated values.

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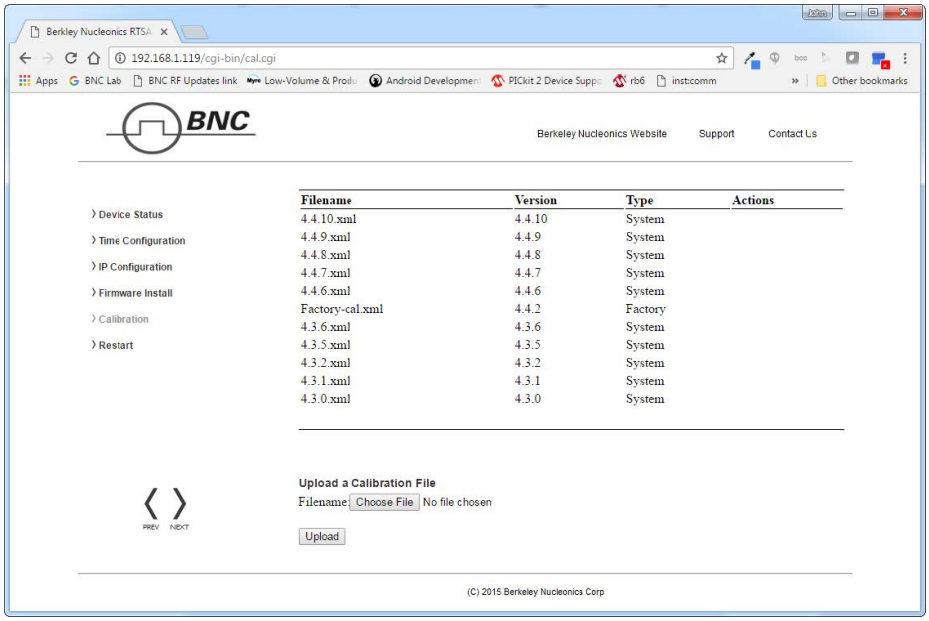
6. If a tag or its value is incorrectly created in the custom file, an error, when detected, will be displayed with the appropriate message and the file will not be uploaded. See the following picture for example.



Calibration File Source Selection

When more than one calibration settings file are present in the system, the RTSA7550 selects the calibration source using the following priority:

1. Firmware version specified in the calibration file
2. Calibration file source with the following priority going from higher to lower:
    a. User-defined file
    b. BNC factory defaults (from factory calibration)
    c. BNC system defaults (from firmware update)
3. Created date and time of the calibration file (as listed in the <created> field)

For example, if two calibration files have the same firmware version, then the file source is compared. If the source is the same, then the created date and time is compared. The most recent date will be used.

Any calibration data that is not specified or missing in the new calibration file will be retrieved from the calibration file of the next highest priority.

Restoring the Default Calibration Settings

You can restore the calibration settings to system defaults at any time by deleting all custom calibration files from the system. You will not be able to delete the system calibration file.

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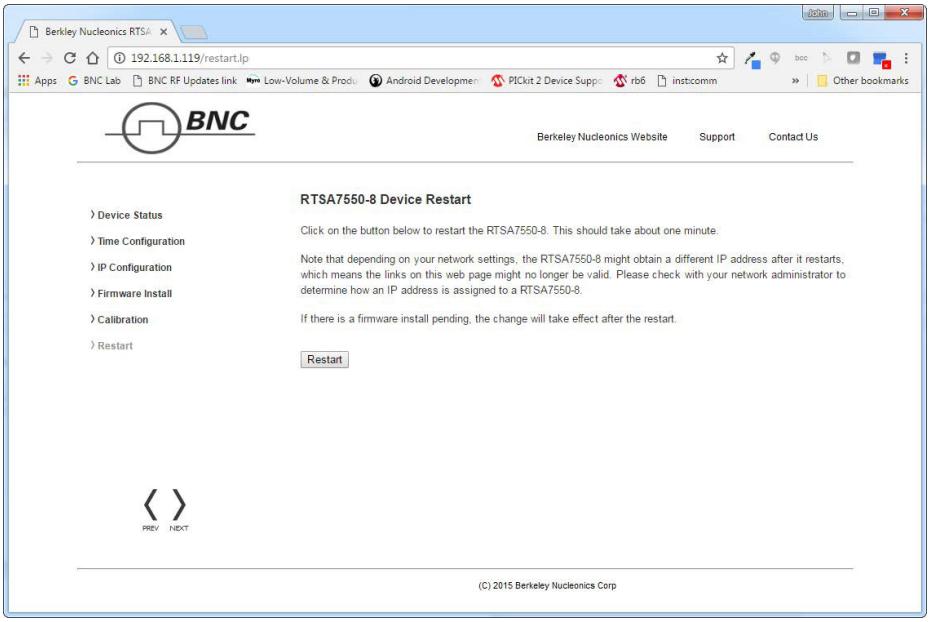
1. In the "RTSA7550 Calibration Upload" page, select a custom calibration file from the list and click “DELETE” in the Actions column.
2. Repeat step 1 for all custom calibration files on the system.
3. Restart the RTSA7550 either by using the web administrative console or toggling the power switch. The default calibration settings take effect upon device restart.

Note: Performing a Reset to Factory Settings will also reset all the calibration data to either factory defaults or system defaults following the file source selection priority mentioned above.

Restarting the RTSA7550

The RTSA7550 may be restarted via its internet connected administration console. Performing this type of restart is equivalent to a power-on reset.

1. Referring to the previous "Status" web page, click on the "Device Restart " link in the left column. The following "Restart" web page should appear.
2. Click on the "Restart" button.



Note: Depending on your network settings, the RTSA7550 might obtain a different IP address after it restarts which will result in the links to the web pages no longer being valid. Please check with your network administrator to determine the IP address of the RTSA7550. This might happen only when the unit is not in static IP mode or a factory reset has been done to the unit.

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Reset to Factory Settings

If for any reason you cannot connect to the RTSA7550 via the Ethernet, then performing this following procedure will reset the RTSA7550 IP configuration to obtain an IP address dynamically using DHCP.

The reset will also set the reference level calibration back to factory default values.

Follow the steps below to reset your box.

1. Power on the RTSA7550
2. At any time while the RTSA7550 is powered on, *press and hold* the reset button (locate in the rear panel of the box) for at least 5 seconds by inserting a paper clip or similar object
3. The STS LED will *blink green fast* several times to acknowledge that factory reset has been performed
4. Wait for the unit to completely boot up (another ~20 seconds) and run the PyRF Discovery tool to determine the unit's IP or use the USB Console to verify the network settings (see Using the USB Console section).

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Using the USB Console

This section provides instruction on connecting to the RTSA7550 via its USB console. The USB console provides control and status of the RTSA7550 using SCPI commands. Typical applications may include configuring and querying the RTSA7550 network IP or controlling and querying the RTSA7550 in an external digitizer application.

Note: The RTSA7550 USB console allows for the communication of SCPI commands and status. It does not support the transfer of VRT data nor does it support the web administration console.

Installing the USB Drivers on Your PC

The RTSA7550 USB console uses a Silicon Labs CP210x USB to UART Bridge Virtual COM Port driver, which may require configuration of drivers on your PC.

1. Power on the RTSA7550 and wait approximately 30 seconds to allow it to boot up.
2. Connect the USB cable to the RTSA7550 USB console port and your PC's USB port.
3. Depending on the version of your PC's Windows OS, your PC should automatically detect the RTSA7550 as a new USB device and install the appropriate driver. Check to ensure that the driver is properly installed by inspecting Control Panel > Device Manager > Ports (COM & LPT), at which a “Silicon Labs CP210x USB to UART Bridge (COM7)” (or equivalent COM#) should appear without error. If the driver has not appeared or has errors, then proper drivers may be found at http://www.silabs.com/products/mcu/pages/usbtouartbridgevcpdrivers.aspx.
4. With the USB to UART Bridge drivers installed, again take note of the COM port number that it has been assigned by inspecting **Control Panel** > **Device Manager** > **Ports (COM & LPT)** .

Connecting to the USB Console

Connection to the USB console requires a serial terminal program on your PC. The following provides an example using PuTTY from http://www.putty.org/.

1. Follow the instructions above to install the USB drivers on your PC.
2. Launch your terminal program (i.e. PuTTY) on your PC.
3. Configure your terminal program to connect via the COM port associated to the USB to UART Bridge (as seen in the terminal configuration panel image below). If using a different serial terminal program, ensure the serial settings used are **baud speed (bits per second) 9600; data bits 8; stop bit 1; parity none; and flow control none.**

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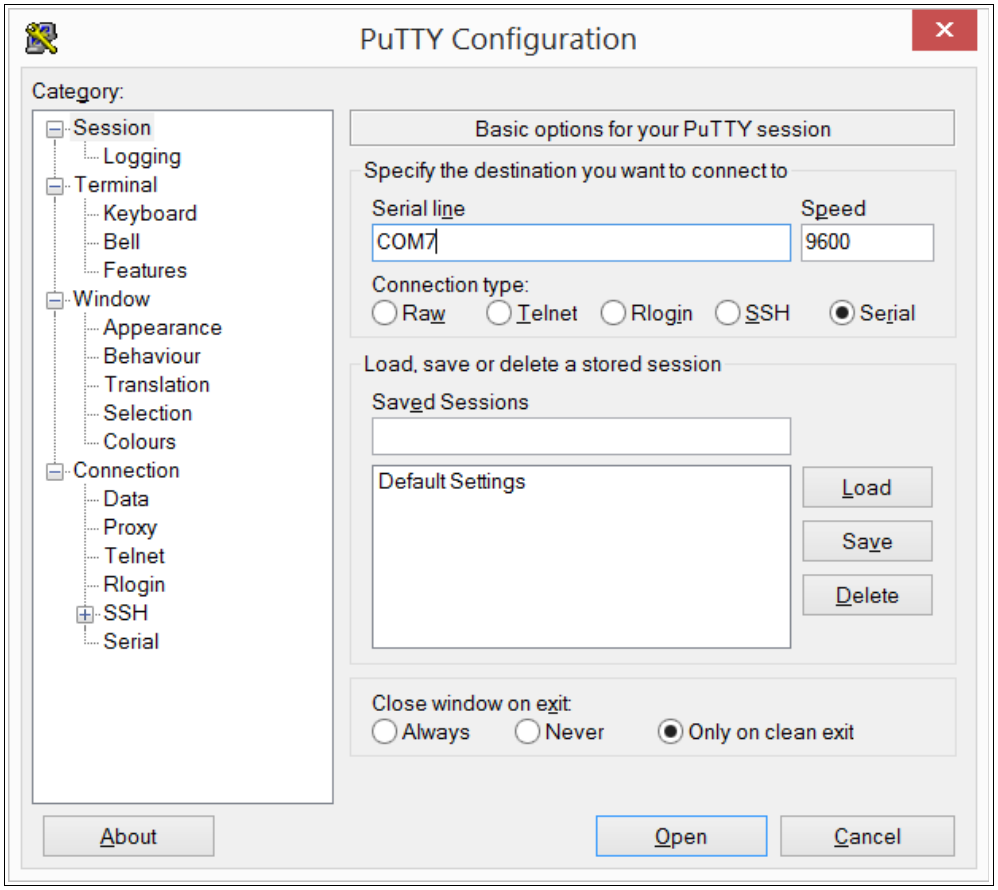

4. Open the terminal session.
5. Press the “Enter” key and a “>” cursor should appear in the terminal window. If the cursor does not appear then the USB to UART Bridge may be expecting a typical VT100 terminal response. Repeatedly press “Ctrl+C” and “Enter” until the cursor appears. The cursor may take several seconds to appear.
6. Enter *IDN? command and press the “Enter” key. The RTSA7550 should return a message with its device identification such as “BNC, RTSA7550....”
7. Refer to the RTSA7550 Programmer's Guide that is associated with the firmware release of your RTSA7550 for the SCPI commands to use with your RTSA7550 via the USB console terminal window. The firmware release version of your RTSA7550 will be noted in the device identification string reported by the “*IDN?” SCPI command.

Configuring the RTSA7550 Analyzer's IP Address via the USB Console

The RTSA7550 provides options for selecting whether the RTSA7550 IP address is obtained dynamically using DHCP or is set manually to a static address.

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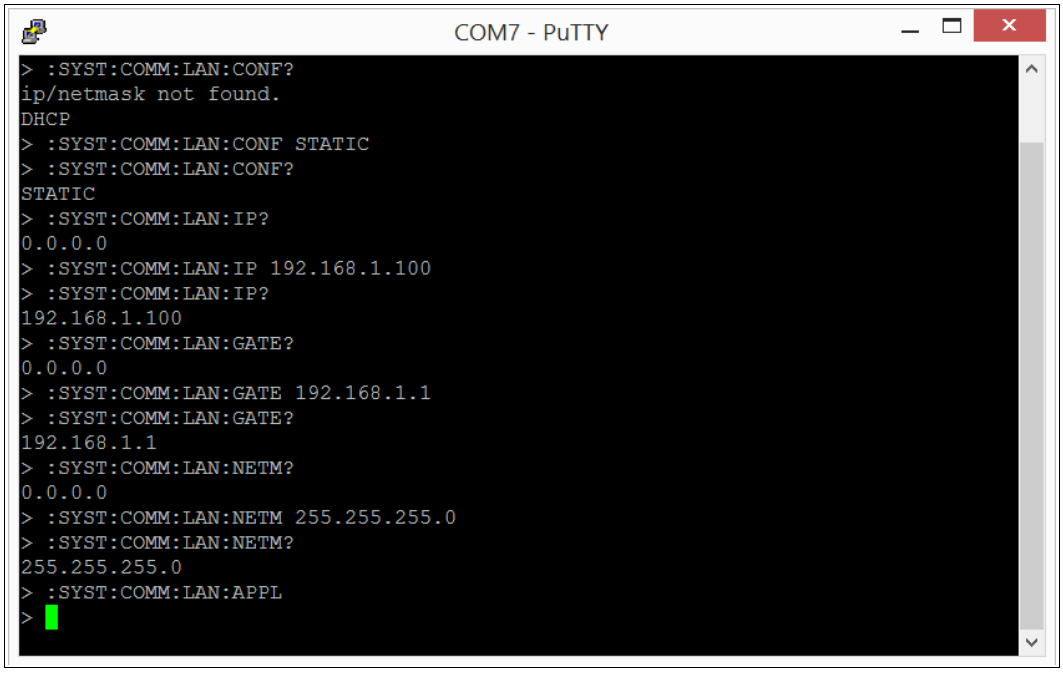
Caution: Please note that if the RTSA7550 IP address is set to static IP then the only way to communicate with the RTSA7550 is over the network via that IP address or via the USB console. Hence, if you mistakenly enter the wrong IP address and/or subnet mask, or forget the IP address, then you can query/reconfigure the IP settings via the USB console as described below or perform a (page) to reset the IP back to the factory DHCP default configuration.

1. Follow the instructions above to install the USB drivers on your PC and connect to the USB console.
2. Refer to the illustration below as an example, enter the following SCPI commands substituting in the appropriate IP address configuration for your RTSA7550:

```
:SYST:COMM:LAN:CONF?
:SYST:COMM:LAN:CONF STATIC
:SYST:COMM:LAN:IP?
:SYST:COMM:LAN:IP <IP address>
:SYST:COMM:LAN:GATE?
:SYST:COMM:LAN:GATE <gateway address>
:SYST:COMM:LAN:NETM?
:SYST:COMM:LAN:NETM <netmask address>
:SYST:COMM:LAN:APPL
```



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Status Indicator LEDs

The RTSA7550 has status indicator LEDs as illustrated and described in the following.

Power-up Sequence

During normal bootup, the Power (PWR) Indicator LED will be green while the remaining LEDs will flash orange in sequence from left to right until the firmware is launched. The sequence may occasionally stop briefly during the bootup phase.

Power (PWR) Indicator LED

The PWR indicator LED indicates that the input and internal power voltages are correct.

PWR Indicator LED	Internal Power Status
Off	Not receiving power from power adapter
Green	All internal power conditions are good
Orange or Red	One or more of the internal power conditions are not present or corrupted

Status (STS) Indicator LED

The STS indicator LED indicates the status of the RTSA7550 as it boots from power-on and/or reset and the network activity.

STS Indicator LED	Boot Error Condition
Off	Not applicable
Slow blink orange	Waiting for DHCP address
Solid orange	Hardware failure
Slow blink red	Firmware failure
Fast blink red	Hardware failure
Slow blink green	Busy

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Heartbeat blink green	Auto-IP address used
Solid green	Ready for connection

10 MHz Reference (REF) Clock Source and Lock Indicator LED

Referring to the above illustration, the REF LED indicates whether the RTSA7550 is using the internally generated 10 MHz reference clock or an external reference clock provided via the 10 MHz IN SMA connector, and whether that selected reference clock source is of sufficient quality for the internal PLL to lock to it.

REF LED	10 MHz Reference Clock Source
Solid green	Internal clock reference selected (and provided via the 10 MHz IN SMA connector) and PLL has successfully locked to it
Slow blink green	External clock reference selected and PLL has successfully locked to it
Slow blink red	External clock reference selected but PLL cannot lock to it
Solid red	Internal clock reference selected but PLL cannot lock to it

RF Chain PLLs LOCK Indicator LED

Referring to the above illustration, the LOCK LED indicates whether the clock sources in the selected RF chain are of sufficient quality for the internal PLLs to lock on them.

LOCK LED	Reference Clock Quality
Green	All PLLs in the current RF chain have locked to their corresponding frequencies
Red	One or more PLLs in the current RF chain have not locked to their corresponding frequencies

Ethernet LINK Status and ACT Indicator LEDs

The Ethernet LINK status and ACT indicator LEDs indicate the status of the Ethernet connection.

LINK Status LED	Ethernet Link Status
Off	No Ethernet link connection
Orange	10/100 Mbit Ethernet link connection
Green	GigE Ethernet link connection

ACT Indicator LED	Ethernet Activity
Off	No Ethernet activity
Green	Ethernet transmit or receive activity

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Hardware Reference

This section provides physical and performance specifications, and port and cable pinouts for the RTSA7550.

System Specifications

The following table outlines the physical specifications for the RTSA7550 analyzer.

Description	Design Specification
Dimensions (H x W x D without/D with rubber feet)	
	10.58 x 6.81 x 2.15/2.40 in. (26.9 x 17.3 x 5.46/6.1 cm)
Weight (approximately)	6 lbs (2.7 kg)
Digital interface ports	Ethernet 10/100/1000, USB 2.0 console, micro-DB25 GPIO
Analog interface ports	RF IN, I and Q OUT, 10 MHz REF IN and OUT[1]
Input supply voltage	12 VDC +/- 5%
Input supply current	1.8 A maximum
Operating temperature	32 to 122°F (0 to 50°C)

[1] Availability depending on the product model or application. Check with your product specification.

SMA Connectors

The SMA connectors on the front and back panels are all female jacks with 50Ω nominal impedance. The following table outline the maximum and minimum power level restrictions on the SMA connectors.

Caution: Injecting signal levels that exceed the specifications described in the following table will result in permanent damage to the receiver.

Connector Name	Direction	Max Power Level	Min Power Level
RF IN[1]	in	+10 dBm – with attenuation -10 dBm – without attenuation	N/A
10 MHz IN[2,3]	in	0 dBm	-10 dBm
10 MHz OUT[4]	out	N/A	N/A
HIF OUT	out	N/A	N/A
I,Q OUT	out	N/A	N/A

[1] It is recommended that the output of a signal source be verified with the use of a power meter prior to connecting the source directly to the RF IN connector. Until it can be

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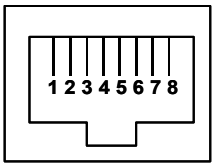
determined the front-end attenuator is in the circuit (see the RTSA7550 Programmer's Guide), it is best to inject signals lower than -10 dBm. Additionally, any external signal sources connected to RF IN must be turned on only after powering on the RTSA7550 and turned off prior to powering down the RTSA7550.

[2] The 10 MHz reference input must be powered down prior to powering down the RTSA7550.

[3] To set the RTSA7550 to use the external 10 MHz reference, SOURCE:REF:PLL EXT command of the Programmer's Guide.

[4] Availability depending on the product model or application. Check with your product specification.

Ethernet RJ-45 Port Pinout



Pin	Signal
1	BI_DA+
2	BI_DA-
3	BI_DB+
4	BI_DC+
5	BI_DC-
6	BI_DB-
7	BI_DD+
8	BI_DD-

GPIO Port Pinout

The GPIO (General Purpose Input/Output) port supports extended hardware capability including SPI (Serial Peripheral Interface) bus, I^2C serial interface, PPS (Pulse Per Second) input, external triggering input/output and specific radio front end control and status.

Caution: Improper use of the GPIO may cause irreparable damage to the RTSA7550. Do not use the GPIO without prior consultation with ThinkRF's service organization.

Caution: The following pinouts are specific to the RTSA7550 models only.

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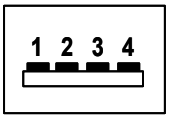
Pin	Direction	Voltage	Signal
1-2, 5-8, 10-13	not applicable	3.3 V	Reserved
3	out	3.3 V	TRIG OUT
4	in	3.3 V	TRIG IN
14	in	3.3 V	PPS
16	out	3.3 V	Spectral Inversion
17-20	bidirectional	3.3 V	EXT IO D[3:0], respectively
23-25	power	12 V	VCC12V
9,15,21, 22	ground	0 V	GND

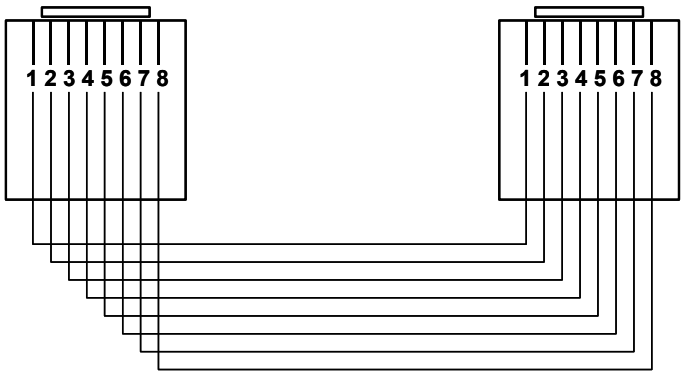
Note: The functionality of the EXT IN/OUT/IO pins is application specific and thus could vary. Refer to ThinkRF's Application Notes or contact BNC support for more information.

USB Console Port Pinout



Pin	Signal
1	+5 VDC
2	Data -
3	Data +
4	Ground

RJ-45 Straight-Through Ethernet Cable



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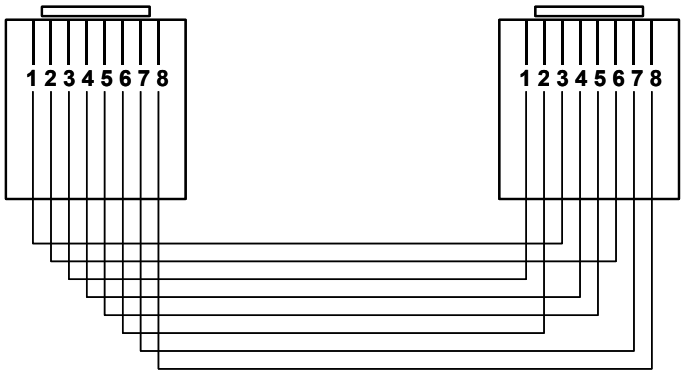
RJ-45 Crossover Ethernet Cable



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