The number of devices and application areas that rely on wireless technologies is continuously growing. More and more devices share the radio and microwave spectrum making it increasingly important for you to be able to analyze different signals to verify your design, find interfering signals, troubleshoot problems and much more. Real-Time Spectrum Analyzers are excellent instruments for monitoring signals in real-time. The instrument includes functionality for analyzing and identifying signals, pulses and other events of interest.

Examples of application areas for RSA’s include:
- Spectrum management – find interference and unknown signals
- Radar/EW – full characterization of pulsed and hopping systems characterize radar and pulsed RF signals
- RF debug – components, modules, and systems
- Radio/Satellite communications – analyze time-variant behavior of cognitive radio and software-defined radio systems
- EMI diagnostics – increase confidence that designs will pass compliance testing
Recording Signals

While Real-Time Spectrum Analyzers are great tools for monitoring current signals there is no functionality and storage space to record the input signal for longer time periods. Recording the signal could be beneficial for many reasons, for example post processing the data to discover new results or previously missed signals. Tests can also be very expensive and having the raw data available for later analysis enables you to fully utilize the tests you make and reduce the risk of having to redo them.

Saving Data

High bandwidth acquisitions produce large amounts of data at high speeds. A Real-Time bandwidth of 110 MHz results in a data stream of 600 MB/s (inphase and quadrature, IQ, data sampled at 150MHz). The storage solutions must provide sufficient write speeds to keep up and enough space to be able to store more than a few seconds. While it is possible to save data to memory at those speeds, writing to a hard drive is usually not. RAID (Redundant Array of Independent Disks) is a technology for combining multiple hard drives to use them as one. The space and possible write speed is increased when data is split up and written simultaneously to different disks but to the user it looks like an ordinary hard drive.
Challenge: Record and store many hours of RF-data

Novator Solutions together with Nortel-co Electronics is offering a solution to the recording problem. Novator Solutions Real Time Spectrum Recorder, RTSRec, is a ready-to-run system letting you record the signal acquired on your Tektronix RSA. RTSRec includes both software and hardware which allows you to record up to 10 hours of raw IQ-data and as an option endless recording is available by utilizing hot-swappable hard drives in the RAID system.

Solution: RTSRec

With RTSRec you never have to worry about missing one time occurrences or redoing tests because you are uncertain of what happened. Out in the field you can monitor frequency ranges of interest with confidence that you will be able to do all the analysis of the data you need back in the lab. The recorded data is always available to be analyzed and reviewed over and over again.
A complete RTSRec recording system consists of:

- Tektronix RSA 5000 or 6000
- Novator Solutions RTSRec

The Tektronix RSA is used as it would be used under normal operation without any recording system present. When a signal needs to be recorded, the record button is clicked on the RTSRec and the recording starts.

The RTSRec system utilizes two output ports on the RSA that has the ability to stream the raw acquired IQ data, from the RSA to other devices. This data streaming is done automatically and no user interaction is needed. The RSA is connected to the RTSRec via two cables that transfer the I and Q data to the RTSRec where the signals are read and saved to the included RAID unit.

RTSRec consists of hardware to receive and record the data and software to control how, when and where the data should be recorded. It is divided into two parts, a server and a client, which handle different tasks. This is illustrated in the schematic overview.
RTSRec Server

The server hardware consists of digital IO to receive the IQ-data stream, RAID and a controller running Windows. It can be accessed either directly by connecting a monitor or remotely via remote desktop.

RTSRec Server software is installed on the controller. Once started, the user rarely uses the server software other than for changing some specific settings. The server software receives commands from the client to know when it should perform different tasks such as start and stop recording. The recordings are stored in an open file format which makes it possible for you to open them in other software as well.

The RTSRec hardware is based on modular hardware from National Instruments. This means that we leverage thousands of R&D hours to provide stable, reliable and well tested hardware. It also makes it easy for us to customize RTSRec to your need and include other signal sources that are of importance to you.

RTSRec Client

The client is a Windows program and can either run locally on the RTSRec server controller or on an entirely different computer located elsewhere (Ethernet connection needed). It is the main interface the operator uses to interact with the recording system and it is used for starting and stopping recording as well as watching already recorded signals.

The user interface is designed with a simple recorder in mind and recording live data is never more than a mouse click away. The spectrum view in the RTSRec client is made to resemble the RSA view by collecting the axis settings from the RSA.

Commonly used settings can easily be accessed in the sidebars. From the user interface it is for example possible to set filenames, if the recording should result in a single large file or multiple smaller ones and if samples acquired before the recording is actually started should be saved as well.
RTSRec Key Features

- Used with market leading Real-Time Spectrum Analyzer: Tektronix Real Time Spectrum Analyzer RSA5000 or RSA6000
- 10 hours RF-data storage at maximum bandwidth
- Ready to run system
- One click recording
- Made for 19” rack mounting
- Data saved in open file format
- Can as an option be delivered mounted in rugged, shock protected cases for easy transport and field use.

RSA Specifications*

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>1 Hz/9 kHz to 26.5 GHz/20 GHz</th>
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<tbody>
<tr>
<td>Real-Time Bandwidth</td>
<td>Max 110 MHz</td>
</tr>
<tr>
<td>Sensitivity at 20 GHz, preamp</td>
<td>-160 dBm/Hz</td>
</tr>
</tbody>
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Customizations

Depending on your needs, RTSRec can to a large extent be customized to your requirements both regarding software and hardware. Examples of such software customizations are custom file formats, interfacing with other software, analysis of the data and automation of the RSA measurements. Hardware customizations include measuring additional signals, generating signals and controlling other instruments. These are just some examples and we will be happy to discuss other customizations with you.

Support and Services

Our success is based on the success of our customers which is why we aim to provide first class service and support. The software and hardware have been designed to be intuitive and easy to use. An education package is included in the product to maximize your efficiency and reduce the start-up time.

With our Service Agreement you will get all software upgrades and access to support. Support is available via email or phone and we can also provide on-site support at extra cost.

If you have our Replacement Service Agreement and your RTSRec hardware needs to be replaced, we will ship a replacement system to you within 48 hours.

* Specifications may change. See Tektronix RSA datasheet for the latest specifications.
Executive Summary

Real Time Spectrum Analyzers are excellent instruments for monitoring signals in Real-Time but cannot record more than a few seconds of data at high bandwidths. Having the raw data available gives the possibility of post processing and reduces the risk of having to redo the tests.

Novator Solutions RTSRec solves this problem and lets the user record up to 10 hours of raw IQ-data at maximum bandwidth (110MHz).

About Novator Solutions

Novator Solutions is a company based in Stockholm, Sweden, that develops test and measurement systems and provides consultant services. We are a National Instruments Gold Alliance Partner and work extensively with the hardware and software platforms from National Instruments. All developers are experts on developing systems based on these platforms, making it possible to deliver systems of the highest quality to our customers.