Instructions for Running the RF Sensor Test Harness

Introduction

This document is a step by step set of instructions for downloading and operating the RF Sensor Test Harness. It assumes the signal generator is controlled by LabVIEW virtual instruments. The RF Sensor Test Harness consists of a Python web server, LabVIEW server (LabVIEW player) and a web browser. The player accepts the waveforms via HTTP; converts the binary waveform files to TDMS (a LabVIEW specific file format) and plays the waveforms.

Required Hardware

- National Instruments PXIe-1085 (chassis)
- National Instruments PXIe-8880 (controller)
- National Instruments PXIe-5646 (VST)

Required Software

- Windows 7 or higher
- LabVIEW 2017
  - An FPGA bit file is needed to run the modified version of the VST Player. The bit file is included with an installation of "NI Streaming Host Example for the NI PXIe-5644R-45R" which is available in the JKI Package Manager (available online).
- Python 2.7 with the following packages:
  - Flask 0.12
  - Requests
  - Pycurl 7.43

Download the RF Sensor Test Harness master branch.
Expand the compressed file to a computer (PXIe-8880) hosting LabVIEW.

1) **Starting the RF Sensor Test Harness (Python Server, LabVIEW player and web browser)**
   a) Locate and double click the "StartUp.bat" file located in the "RF Sensor Test Harness master" folder as shown in Figure 1.
      - The Python status window will appear as shown in Figure 1a.
      - The LabVIEW player will appear as shown in Figure 2a.
      - A web browser will be launched automatically.

   b) Start the LabVIEW player by right clicking on the "v1" as shown in Figure 2a. Select "Start" to initiate the session (Figure 2b). A Debug web service window will appear as shown in Figure 3. Click "OK".
      - The RF Sensor Test Harness user interface (web browser) is already launched and will appear as shown in Figure 4.
      - Press "log in". The default user name and password are "admin" and "default".

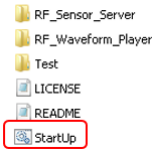

Figure 1: Start up in directory

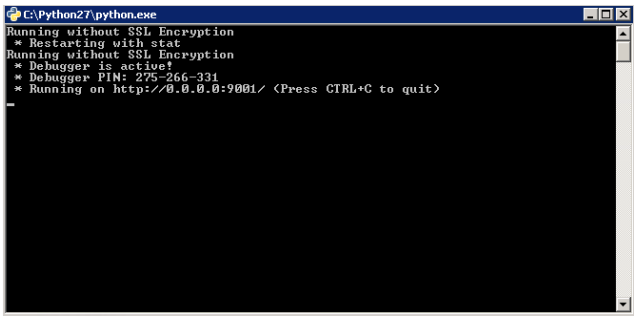

Figure. 1a: Python window

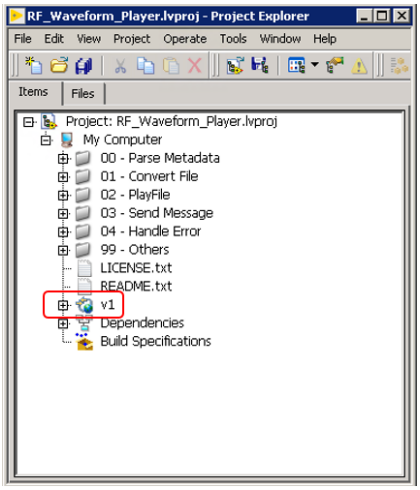

Figure 2a: LabVIEW project window

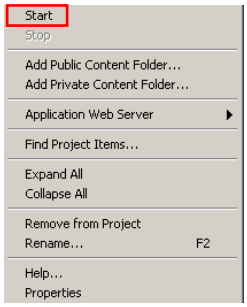

Figure 2b: Start up LabVIEW player

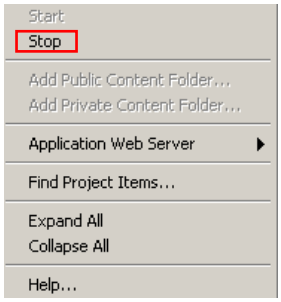

Figure 2c: Stop LabVIEW player

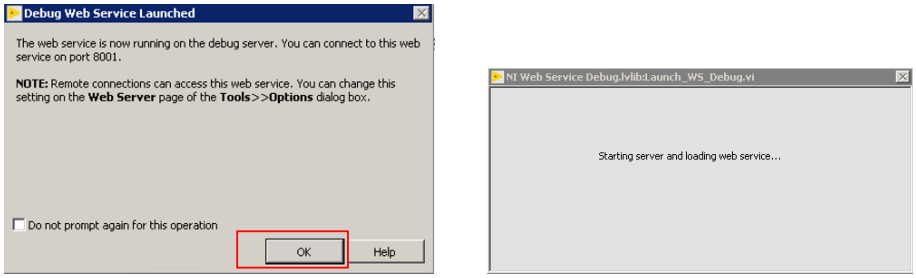

Figure 3: LabVIEW Debug window

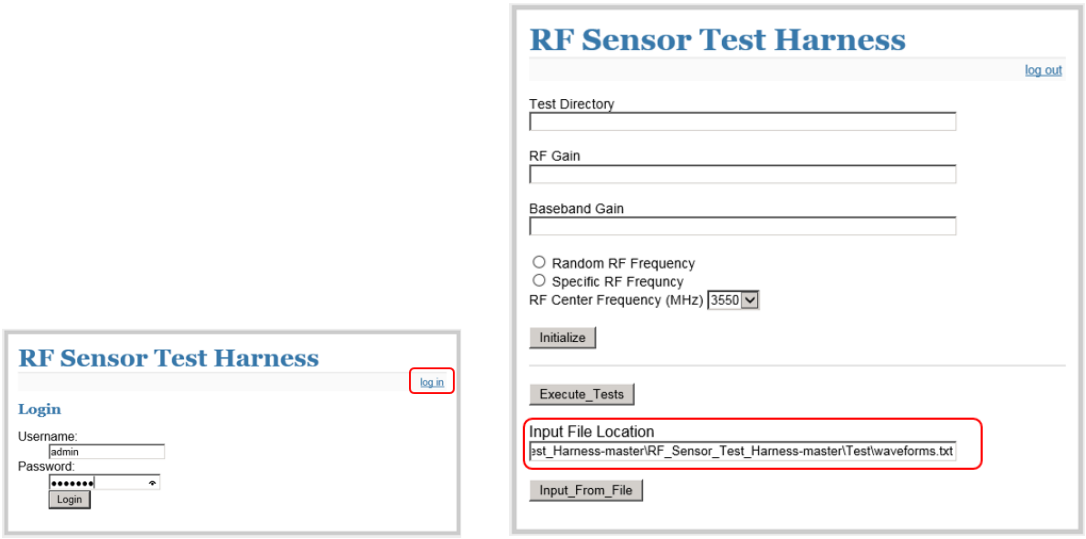

Figure 4: RF Sensor Test Harness user interface

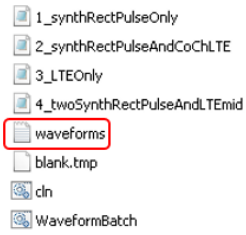

Figure 5: waveform file

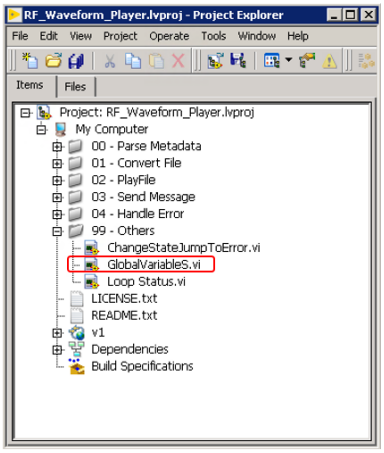

Figure 6: Location for global variables status

2) **Playing the waveforms**

a) Locate the "waveforms.txt" file located in your "Test" folder. See Figure 5.

- Enter the full path of the "waveform.txt" file into the "Input File Location" field of the user interface and press "Input_From_File" to play the waveforms as shown in Figure 4.

The initial run of the RF Sensor Test Harness will convert the included waveforms from binary (.dat) to .tdms format prior to playing the waveforms. As a result, there will be a 60 second delay before the waveforms plays. Once each of the waveforms is converted to .tdms, each waveform will play sequentially with no delay. The new TDMS files will appear in the "Test" directory as shown in Figure 8.

The status of the waveform conversions and waveform playing can be monitored on the GlobalVariables.vi Front Panel.

b) Go to the LabVIEW project and expand the folder “99 – Others”. Double click the “GlobalVariables.vi”. The GlobalVariables.vi front panel will appear as shown in Figure 7.

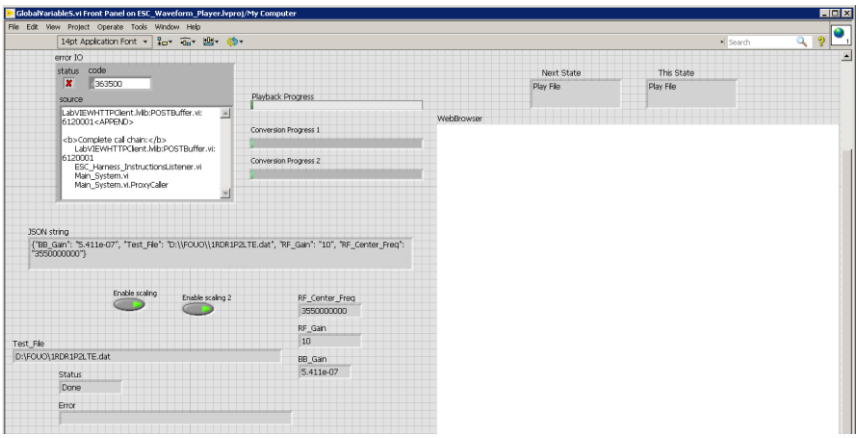

Figure 7: Status of waveform playback

Note: the waveforms can be viewed on your spectrum analyzer. See optional step 5 for configuring your spectrum analyzer.

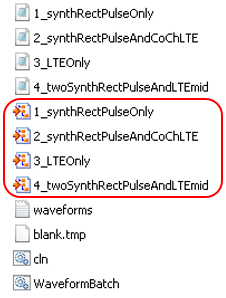

Figure 8: TDMS files

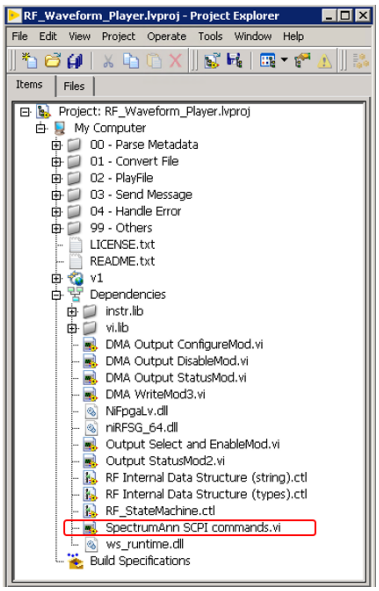

Figure 9: Location of SCPI commands

3) **Stopping the RF Sensor Test Harness (Python Server, LabVIEW player)**
   - To stop the Python web server, select the running Python screen as shown in Figure 1a. Select “Ctrl + C”
   - To stop the LabVIEW player right click on “v1” as shown in Figure 2c. Select “Stop”

4) **Customizing the waveform parameters (optional)**
   - The waveform.txt file included in the download uses the following convention:
     <Path> \waveform.dat, Center Frequency, Scale Factor, Waveform Gain
   - The center frequency, scale factor and waveform gain located in the “WaveformBatch.bat” file will need to be changed accordingly and saved as a .bat file.

- The updated batch file can create a new waveform.txt file by double clicking “WaveformBatch.bat”.
- Repeat step 2a to play the updated waveforms.

5) **Configuring your spectrum analyzer (optional)**

The spectrum analyzer settings are controlled with SCPI commands. The address for the VISA connection will need to be changed.

- To change the VISA address, go to the LabVIEW Project Explorer, expand the Dependencies tab.
- Locate and open the "SpectrumAnn SCPI commands.vi" as shown in Figure 9.
- Enter the VISA address for your instrument. See Figure 11.
- Expand the menu in the case structure to reveal the spectrum analyzer settings for the different waveforms as shown in Figure 12.

If manual configurations are preferred, the "local" key on the spectrum analyzer will end the remote session.

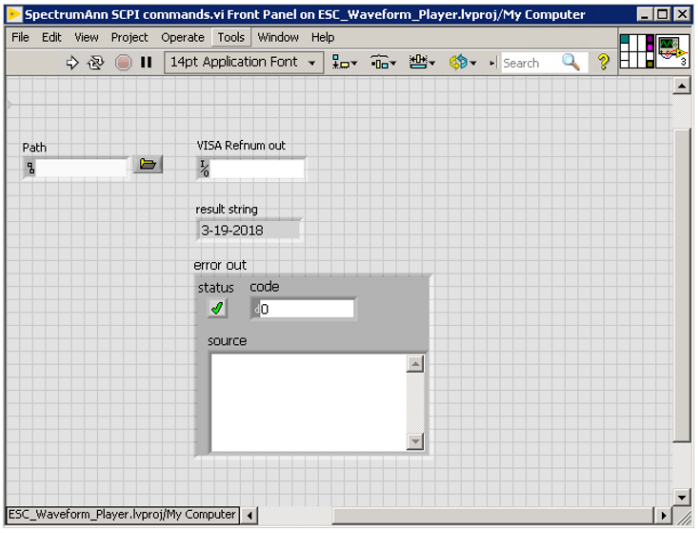

Figure 10: Spectrum analyzer configuration front panel

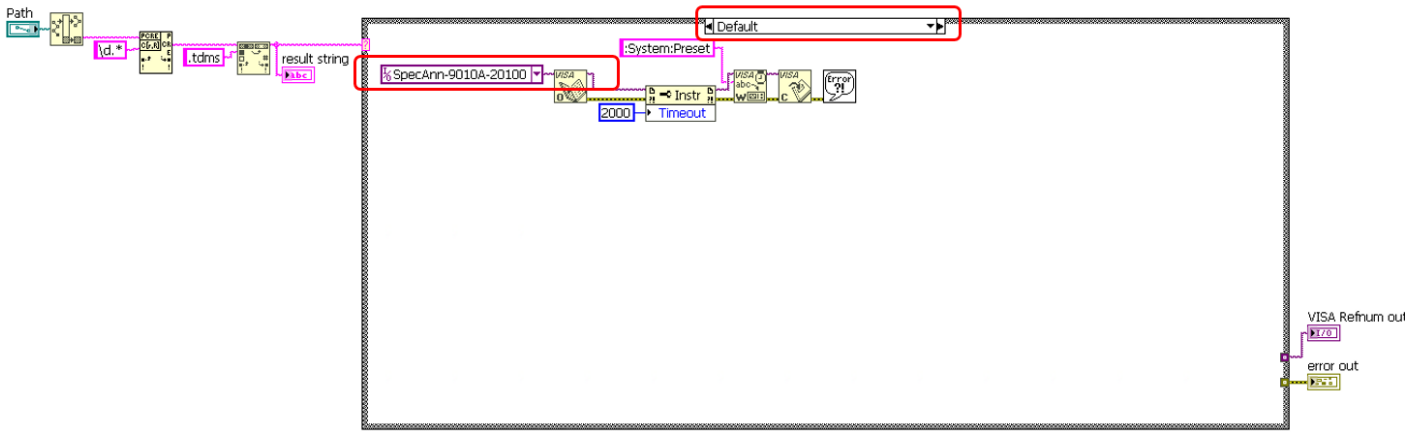

Figure 11: Spectrum analyzer settings

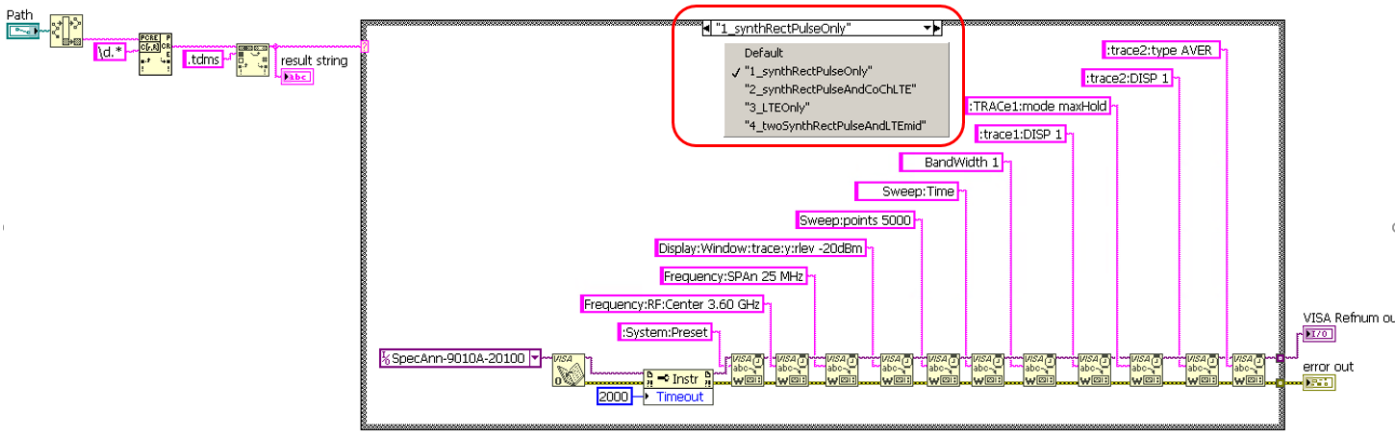

Figure 12: Spectrum analyzer settings

LIST OF ACRONYMS

HTTP	hypertext transfer protocol
PCI	Peripheral Component Interconnect
PXIe	PCI extensions for instrumentation
RF	radio frequency
SCPI	Standard Commands for Programmable Instruments
TDMS	Technical Data Management System
VST	vector signal transceiver
FPGA	field programable gate array