Synchronization of PNA Measurements with SMUs for DC Biasing.

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1 Introduction

This document serves as a guide for setup and execution of measurements using the Keysight N5225 parametric network analyzer with Keithley 2400 source measure units.

2 Change Log

v1.0, date : Document Created

3 Initial Setup for Windows

3.1 VISA Driver Installation

3.1.1 Navigate to `https://www.keysight.com/`. In the upper right section of the screen, search for IO Libraries Suite. The product should appear at the top of the search results. Click on **product details** to navigate to the product page. In the center of the screen, select **Trials & Licenses** in the center of the screen, followed by **Details & Download**. This will bring you to the download page for the current version. Click **Download** and run the installer to install Keysight Connection Expert on your PC, which will be used to set up communication to a remote GPIB network over LAN using the PNA as the GPIB controller.
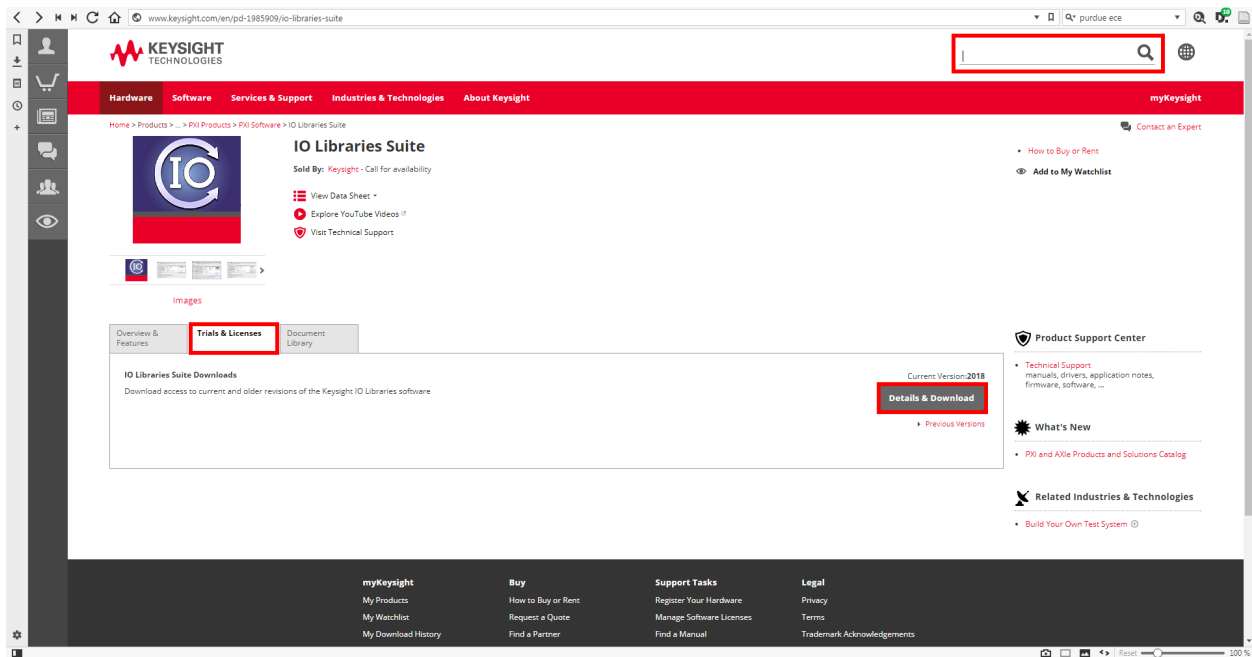

Figure 1: Fig.

3.1.2 Navigate to `http://www.ni.com/downloads/`. Using the search bar on the left, select **Drivers** then **NI Drivers**. In the "Narrow by" section under products, select **Instrument Connectivity** $-$ > **GPIB** $-$ > **GPIB Software** $-$ > **NI-VISA**. You should now see only NI-VISA downloads; download and install the latest version for your system.
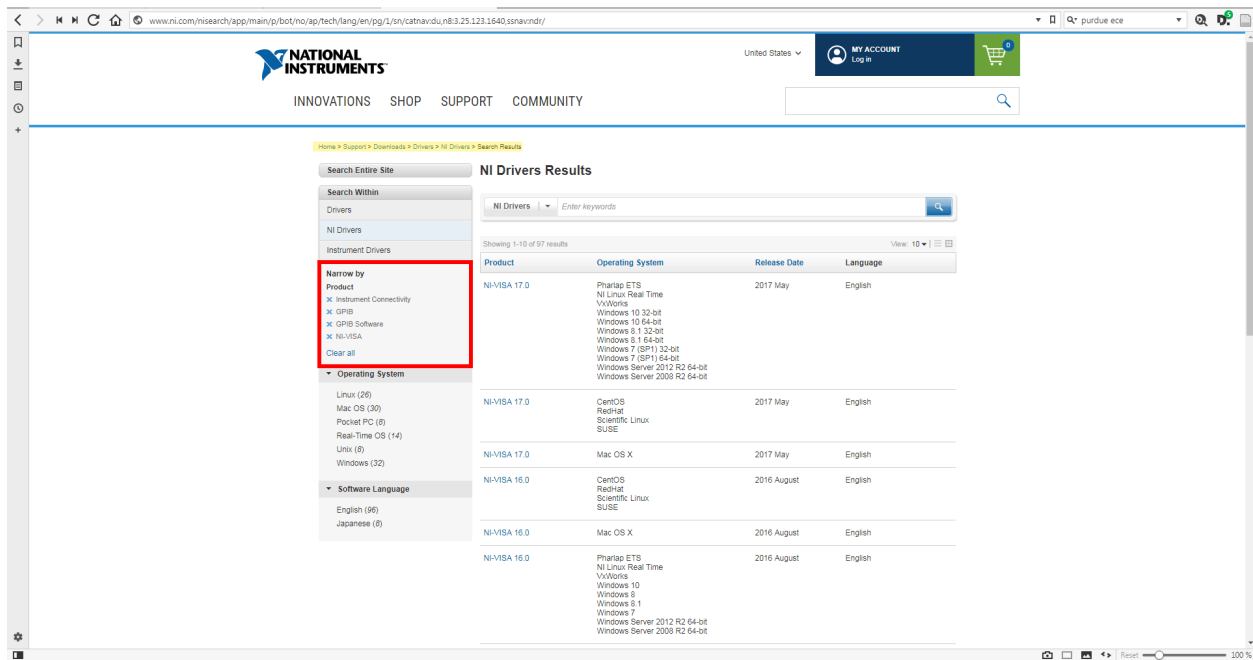
Figure 2: Fig.

3.2 Python Setup

3.2.1 Navigate to `https://www.anaconda.com/download/` and download the Python 3.6 version of Anaconda. Choose 32- or 64-bit based on your system. If you are on Windows and are not sure about your system bitness, right click on **My Computer** (**This PC** in Windows 10), click **Properties**, and the version should be listed under System Type.
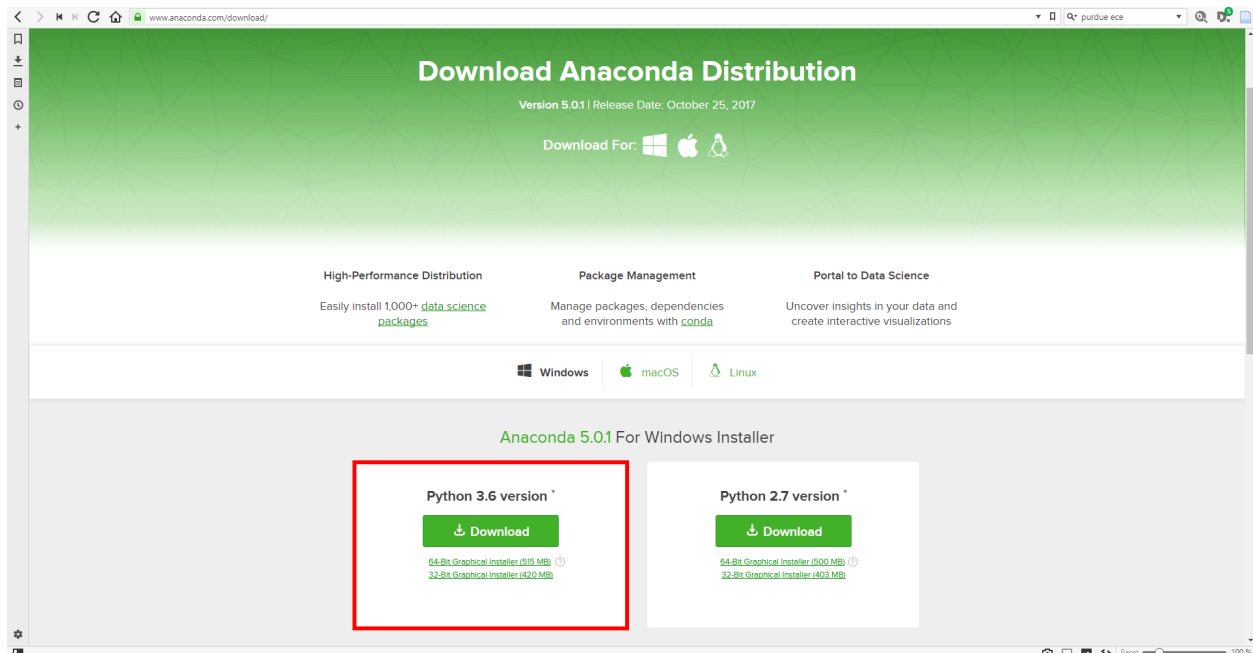

Figure 3: Fig.

3.2.2 Run the anaconda installer, agreeing to the default settings.

3.2.3 Open the start menu, click on the anaconda folder that was created during installation, and open the anaconda prompt as an administrator (right click, select **Run as Administrator**).
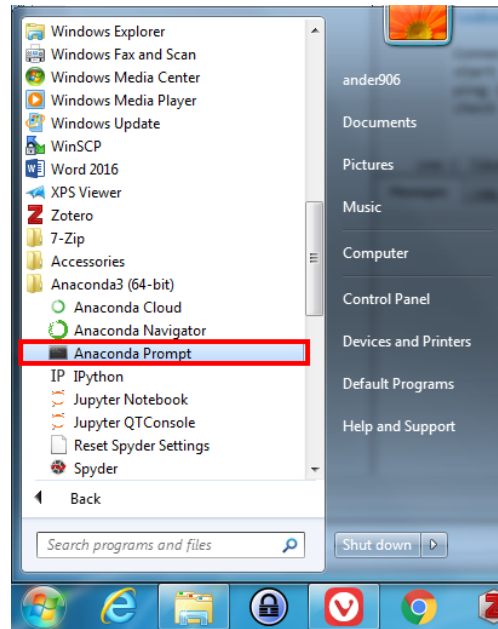

Figure 4: Fig.

3.2.4 Once the terminal window opens and the prompt appears, type the following and press enter:

```
conda install pip
```

3.2.5 After pip is finished installing, the next step is to install the pyvisa package that will be used to communicate with the test instruments. Type the following and press enter:

```
pip install visa
```

3.3 GPIB Network Setup

3.3.1 Connect your to the PNA with an ethernet cord.

3.3.2 In order to communicate with the PNA, your computer's ethernet adapter settings must be set up to match those of the PNA. Open the **Network and Sharing Center** in the Control Panel and select **Change adapter settings** on the left side of the window.
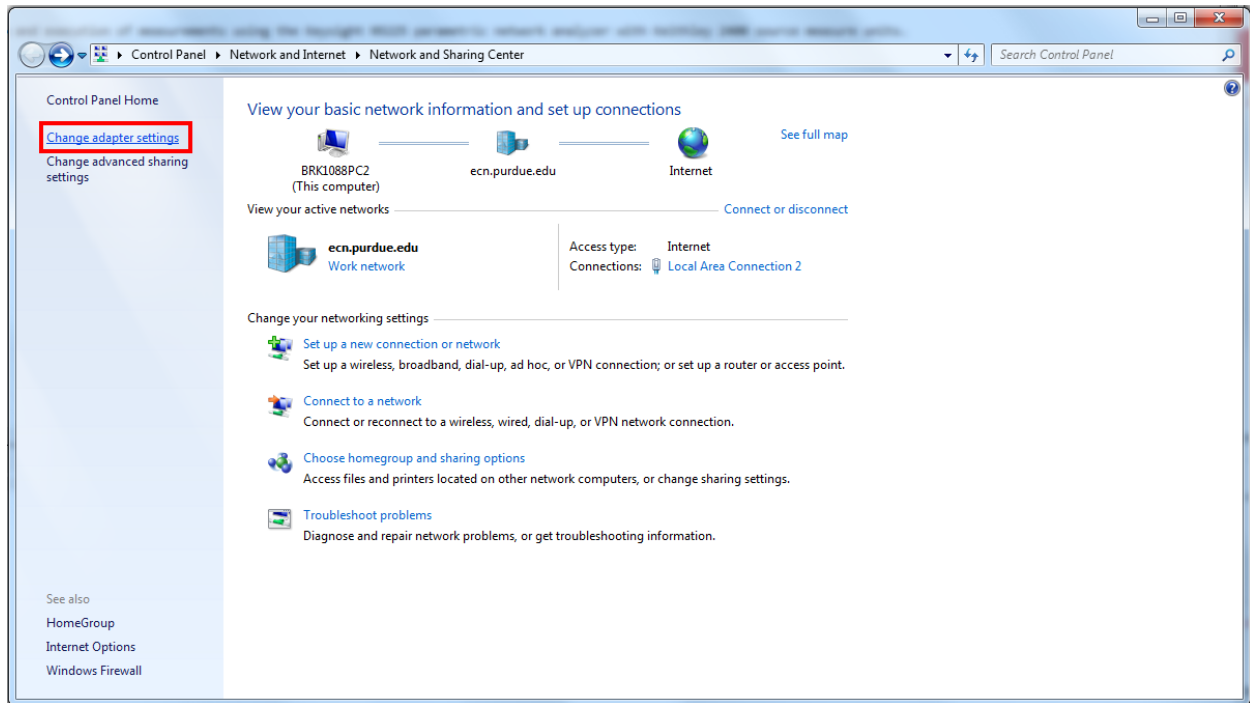
Figure 5: Fig.

3.3.3 Right click on your ethernet adapter and select **Properties**. In **Ethernet Properties**, select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.

3.3.4 In the window that appears, select "Use the following IP address." The PNA uses a default gateway of 192.168.1.2 and a subnet mask of 255.255.255.0. For IP address, enter a value 192.168.1.xx, where the last term is some number besides 1 (used by the PNA) and 2 (the default gateway). Once this is done, select OK and then OK to close out of the IPv4 and Ethernet Properties windows.
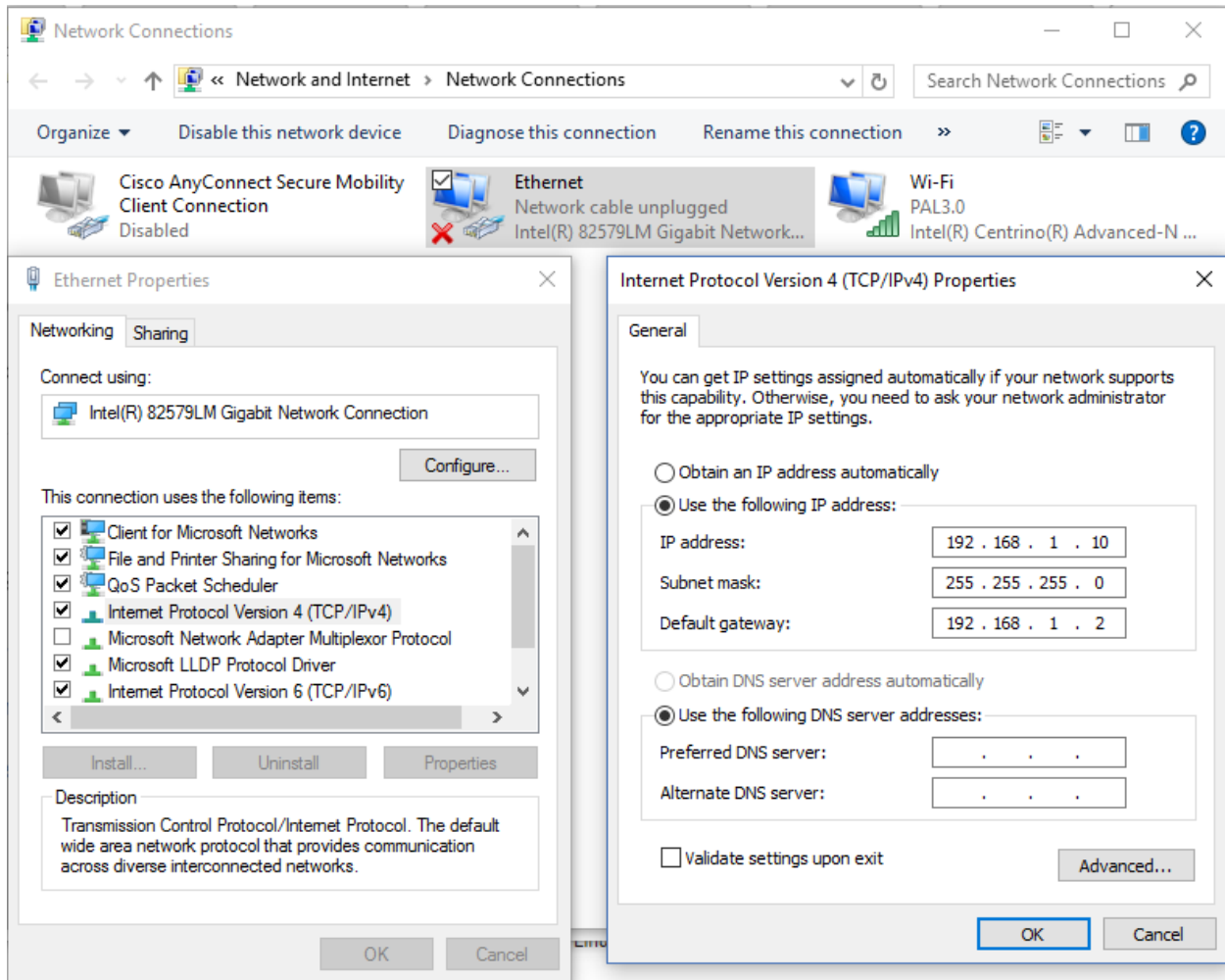
Figure 6: Fig.

3.3.5 The final step before we can make measurements is to set up the remote GPIB network so that your PC can communicate to the SMUs as if it was the GPIB controller. This is done in Keysight Connection Expert. Open Keysight Connection Expert. If your ethernet is set up correctly, the PNA should be detected and appear on the **Instruments** tab. Select the **Manual Configuration** tab along the top of the screen. Under **Add New Instruments/Interfaces** on the left, select **Remote GPIB interface**. Ensure options match those shown in the figure below, then select **Test Connection** to verify the settings. If the test is successful, select **Accept**. You should now be able to control the PNA and SMUs remotely.
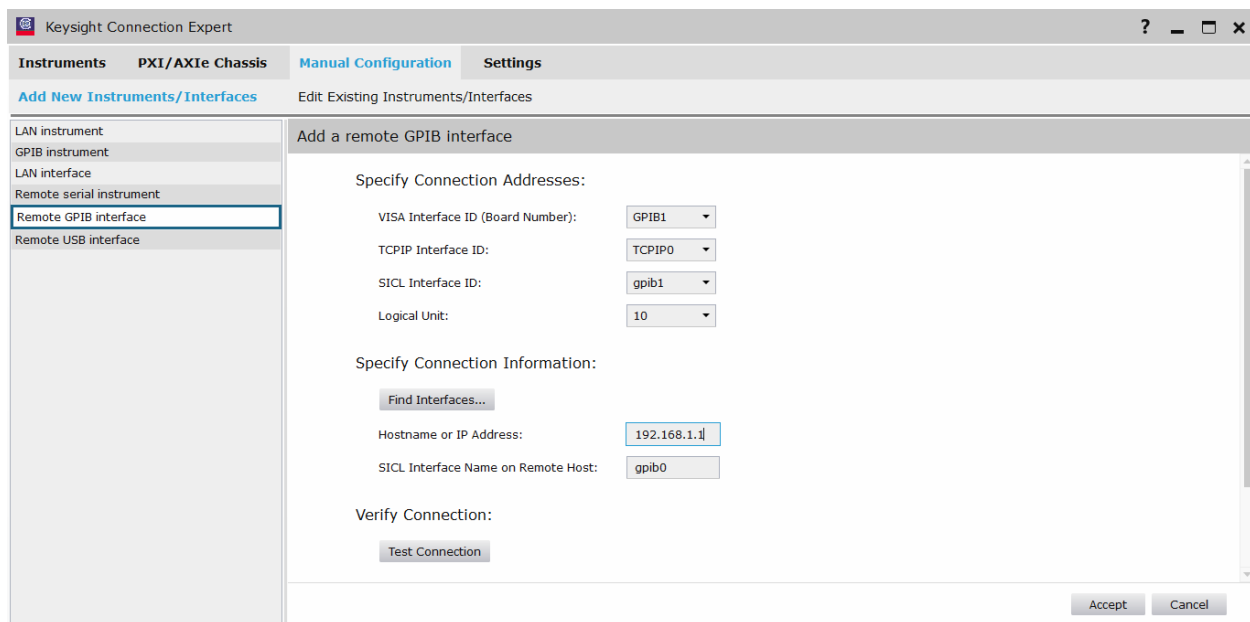
Figure 7: Fig.

4 Controlling Measurements