

PS-CAL Power Sensor Calibration Software



Instruction Manual
PN# PS-CAL-900
Publication Date: September, 2019
REV. C

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	This symbol denotes where precautionary information may be found.
--	---

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Installation Overview

In order to run the PS-Cal software all of the supporting software and hardware must first be installed on the workstation. Along with the PS-Cal software, all of the required software is shipped on the PS-Cal CD.

On the CD you will find the following files and directories: PS-Cal.exe, SetupPS-Cal.msi, setup.exe, PS-CAL-900.pdf (most current revision), licenseAgreement.pdf, changelog.pdf, and R&S Files-.

Installing .Net Framework

PS-Cal requires Microsoft .Net® 4.0 Framework or higher. If necessary, update the workstation .Net installation at microsoft.com.

Installing Proper VISA Libraries

PS-CAL is designed to work with any VISA library. Use the manufacturer VISA installations for your hardware requirements.

Example: If using National Instruments GPIB-USB-HS you would need the National Instruments VISA libraries.

Installing PS-CAL

Once .Net Framework and VISA libraries are installed, use the Setup.exe found on the PS-CAL installation disk to install the PS-Cal software.

First Run

Power sensor calibration templates must be installed before using PS-Cal. When running PS-Cal for the first time, select **Tools -> Generate Blank Templates**. PS-Cal will generate blank templates for all supported sensors and display a notification once it completes its process.

Measurement Methodology Selection

PS-Cal allows for multiple power sensor calibration methodologies. When using with TEGAM hardware the *RFBridge_MultiRun* methodologies should be used.

Station Configuration

PS-Cal maintains a station configuration file on the local hard drive storing a list of the standards used and the VISA resource string / GPIB address of the standard.

To open the station configuration file, select **Configuration -> Edit Configuration**

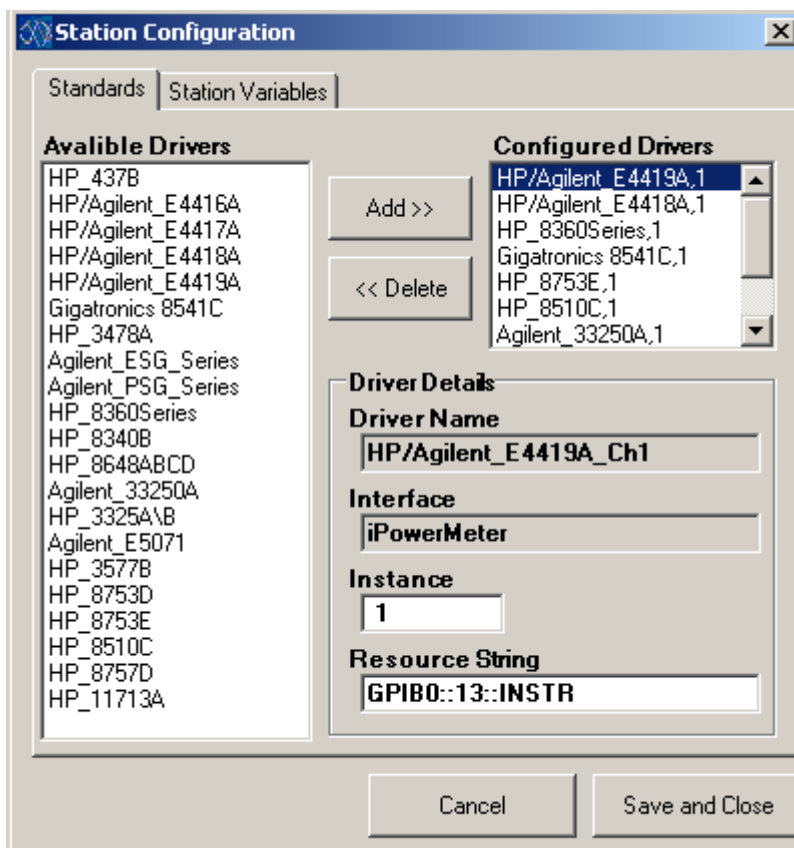


Figure 3.1 Station Configuration

The **Available Drivers** list on the left hand side contains a list of all the standards this version of PS-Cal supports. The **Configured Drivers** list on the right lists all the standards configured on this station. This list contains the name of the driver followed by the instance of the driver. The instance of the driver is used to distinguish instruments in configuration using two or more standards of the same type. For example, if the station is configured with two TEGAM 1830A's, the **Configured Drivers** list would contain two configuration lines, "TEGAM 1830A" and "TEGAM 1830A".

Note: Only the standards listed in the **Configured Drivers** list are available for use in PS-Cal. All drivers must be configured before they are available in the template configuration wizards.

The **Driver Details** section of the form shows the configuration details for this instrument. Each driver must be configured with an **Instance** and **Resource String**.

The **Instance** must contain a number that uniquely identifies the driver / instrument. Typically, the first instrument used is 1 and any other instruments of the same type are 2, 3, 4, etc.

The **Resource String** is a standard VISA resource string. The **Resource String** defines how PS-Cal will communicate with the instrument. Typically, instrument communication is done over the GPIB bus, but PS-Cal is able to communicate with instruments via Ethernet, USB and RS-232. The VISA resource string is a strictly formatted string. GPIB configured instruments are formatted as follows:

GPIB<Card Number>::<GPIB Address>::INSTR.

Note: Refer to the National Instruments VISA documentation for configuration formats for Ethernet, RS-232 and USB instruments.

The second tab on the **Station Configuration** form also contains a list of global station variables. PS-Cal uses the variables as global variables to set values, custom configurations and execution options.

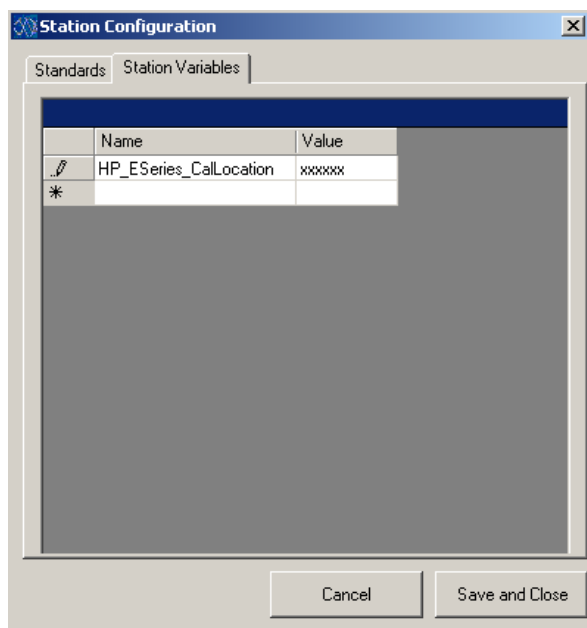


Figure 3.2 Station Variables

After the **Station Configuration** has been edited, the data can be saved back to the configuration files by pressing the **Save and Close** button.

Editing Calibration Data for Standards

The exact data required for each standard varies depending on the Measurement Methodology being used and configuration of the test station. PS-Cal has a set of forms to help users manage the calibration data associated with the station's standards.

Editing Power Sensor Data

To edit calibration data files for a power sensor standard select **Configuration -> Edit Standard Data -> Power Sensor** in the menu. PS-Cal opens a file dialog box.

By default, the Power Sensor Calibration Data files are stored in the "C:\PS-Cal_V4\Standards\" directory. If you are creating Data files for the first time, you can load a blank data file from the "C:\PS-Cal_V4\Blank Templates\" directory.

Navigate to the directory where the data file is stored for the sensor file you wish to edit or view, select the file, and then press **Open**.

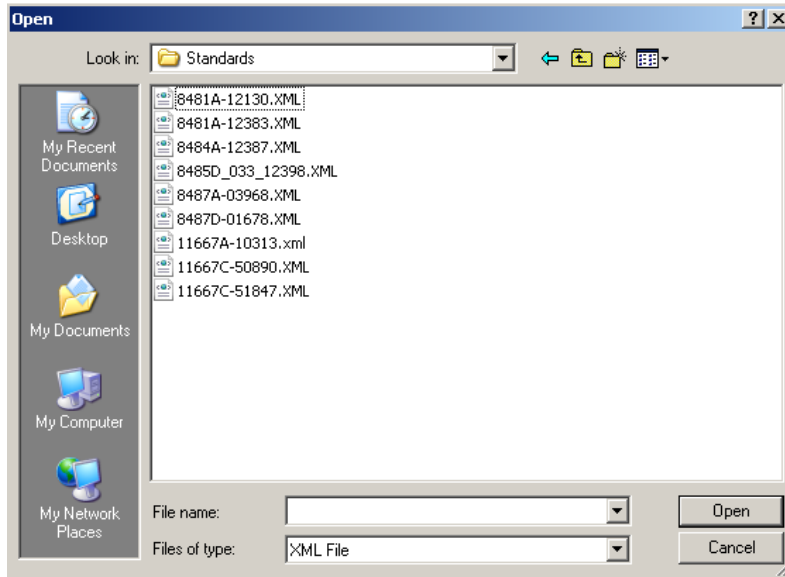


Figure 3.3 Editing Power Sensor Data

PS-Cal loads the data into a Power Sensor Data Edit form. This form allows the user to update the rho and cal factor data, each with their own tab on the edit form. The exact data that must be entered varies, depending on the measurement methodology used to test the UUT power sensors. Refer to the Measurement Methodology to determine exactly what data is required. When in doubt, enter data in all the data fields.

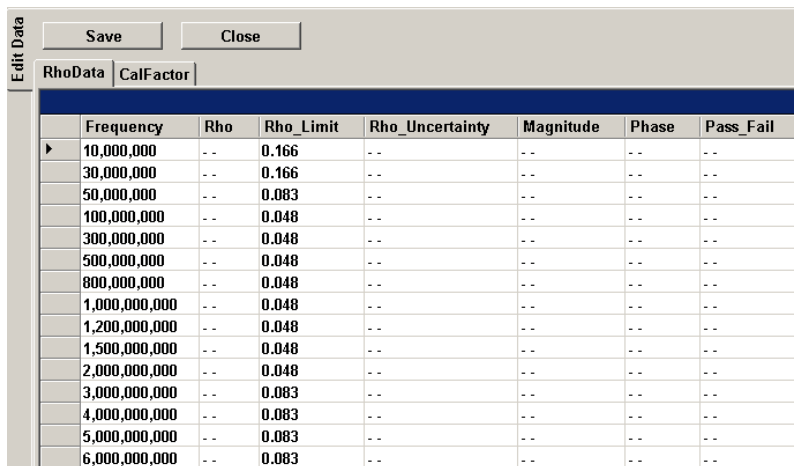


Figure 3.4 Editing Power Sensor Data GUI

When finished editing the data, press the **Save** button to save the data back to disk. Once the data is saved, press the **Close** button to exit the form.

Editing Power Splitter Data

To edit calibration data files for a power Splitter standard, select **Configuration -> Edit Standard Data -> Power Splitter** in the menu. PS-Cal opens a file dialog box. By default, the Power Splitter Calibration Data files are stored in the "C:\PS-Cal_V4\Standards\" directory. If you are creating Data files for the first time, you can load a blank data file from the "C:\PS-Cal_V4\Blank Templates\" directory (see Creating Templates for more information). Navigate to the directory where the data file is stored for the splitter file you wish to edit or view, then press **Open**.

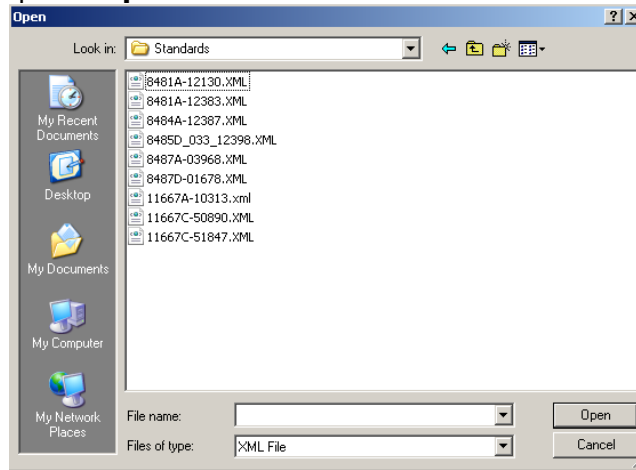


Figure 3.5 Editing Power Splitter Data

PS-Cal will load the data into a Power Splitter Data Edit form. This form allows the user to update the header, S11, S22, S33, S21 and S31 data, each with their own tab on the form. The exact data that must be entered varies depending on the measurement methodology used to test the UUT power sensors. Refer to the Measurement Methodology section to determine exactly what data is required. When in doubt enter all the data fields.

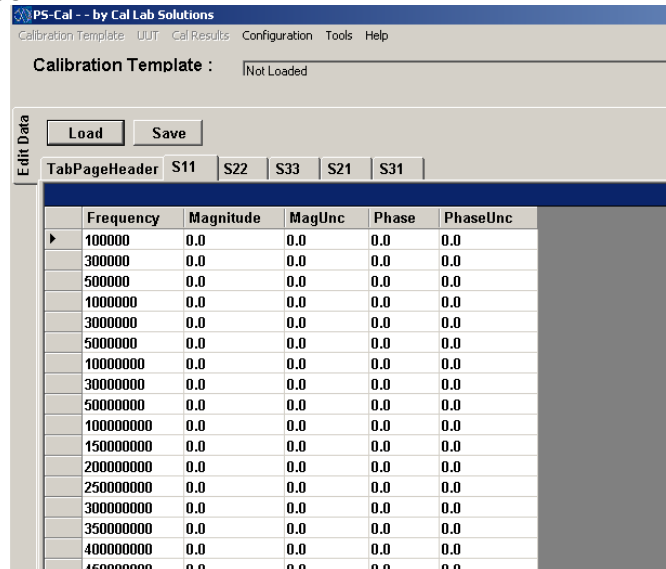


Figure 3.6 Editing Power Splitter GUI

When finished editing the data, press the **Save** button to save the data back to disk. Once the data is saved, press the **Close** button to exit the form.

Editing Thermistor Mount Data

To edit calibration data files for a power splitter standard, select **Configuration -> Edit Standard Data -> Bolometer \ Mount** in the menu.

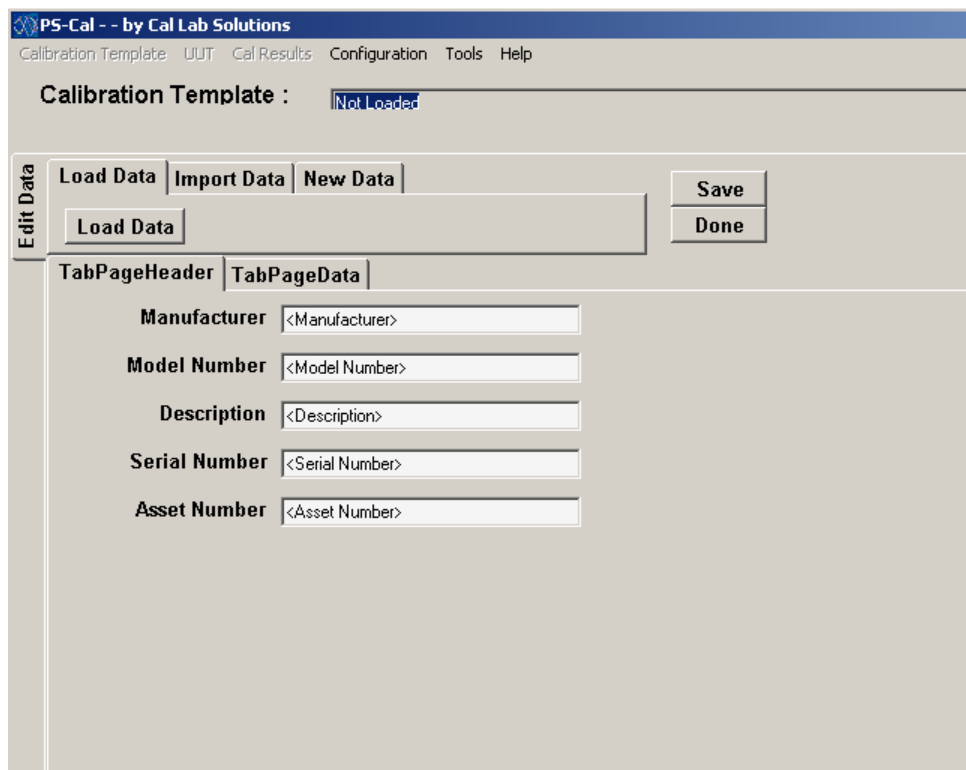


Figure 3.7 Editing Thermistor Mount Data

PS-Cal opens an edit form with three tabs on the top, **Load Data**, **Import Data** and **New Data**. The **Load Data** tab allows the user to load existing PS-Cal formatted data files from the hard drive for editing. The **Import Data** tab allows the user to import data from various formats and converts the format to a PS-Cal compatible format. The **New Data** tab allows the user to create a blank data file.

To load a TEGAM-formatted data file, select **Import Data**. In the **Data Format** field, select *TEGAM.dat*. Click the **Import Dat** button, navigate to the **Standards** directory in the resulting dialog box. Select the appropriate TEGAM data file and click **Open**.

PS-Cal will import the information from the selected data file. To verify the data, click the **Data** tab to see the imported values.

Click **Save** to save the data as a PS-Cal-compatible file.

Creating a Calibration Template

PS-Cal is a template-driven calibration package. This allows you to create several calibration configurations and save each configuration as a separate template. To recall a configuration in the future, load the appropriate template.

Blank templates are created in PS-Cal by clicking **Tools -> Create Blank Templates**. These blank templates are stored in the **"C:\PS-Cal_V4_Blank Templates\"** directory.

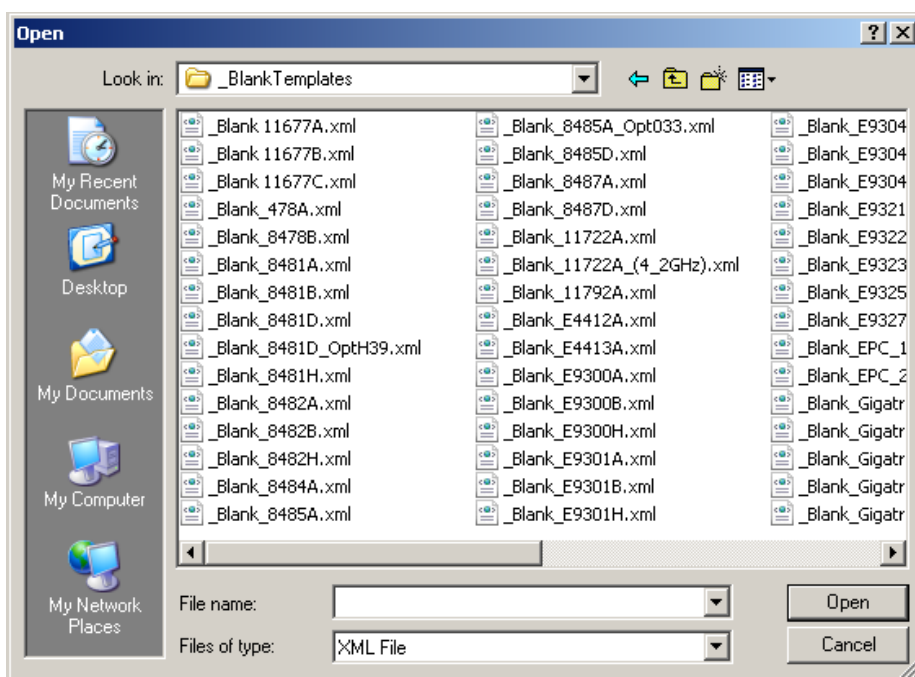


Figure 4.1 Creating a Calibration Template

The first step in creating a calibration template is to open a blank template. In the PS-CAL menu, select **File -> Load** and navigate to the **"C:\PS-Cal_V4_Blank Templates\"** directory. Select the blank template of the power sensor model you are creating a calibration template for and press **Open**. PS-Cal reads the required tests from the blank template and prompts you for details on the Measurement Methodology and standards you will use for this calibration. The required test steps for each power sensor vary based on the manufacturer's written requirements. PS-Cal prompts you through the calibration steps including rho, cal factors, linearity, and EEPROM read / write.

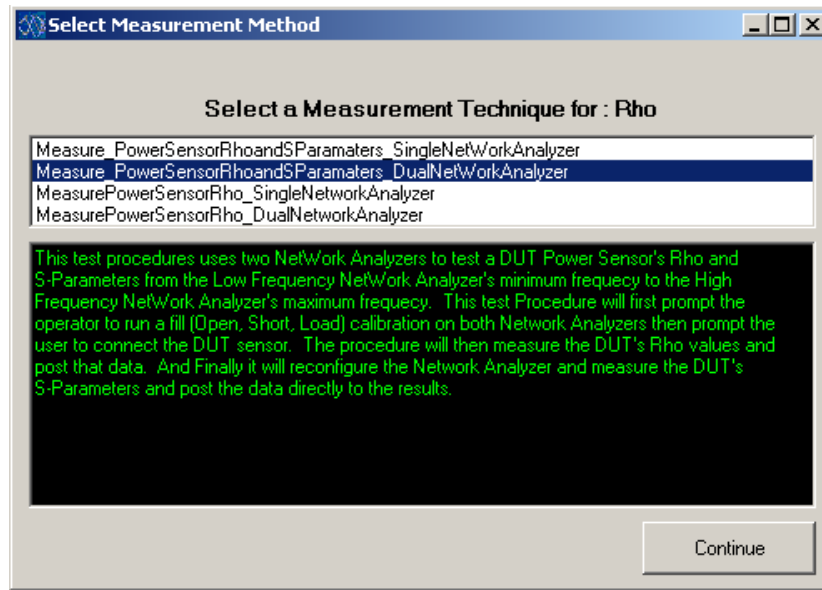


Figure 4.2 Select a Measurement Method

In the **Select Measurement Method** form, PS-Cal displays a list of available Measurement Methodologies in the top section. As you select each Measurement Methodology, PS-Cal updates the lower section of the form with the details of the Measurement Methodology. Once you have decided on the Measurement Methodology, select it and press **Continue**.

NOTE: For Cal Factor tests using the TEGAM 1806(x) Type IV Power Meters or the 1830A RF Thermistor Power Meter, select from the *RFBridge_Multirun* methodologies.

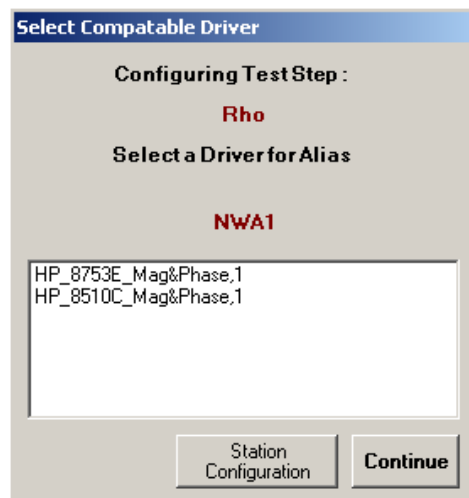


Figure 4.3 Select a Compatible Driver

Since each Measurement Methodology has differing standard requirements, PS-Cal prompts you for each standard required by the Measurement Methodology. In the **Select Compatible Driver** form, PS-Cal displays a list of configured instruments/drivers compatible with Measurement Methodology. If you do not see your standard/driver in the list, it may not be configured. You can edit the station configuration by

pressing the **Station Configuration** button (see section on Station configuration). Once you have decided on the driver you want to use, select it and press **Continue**.

After all the Standards have been selected in PS-Cal, you are prompted to set the test parameters for the test group. These parameters configure the specific options of the test methodology allowing you to fine tune the specifics of each test methodology. For specifics on each option, see the supporting test methodology documentation.

Note: Test parameters are editable after the template has been configured. Most test methodologies have a PARAM button which loads the parameters window.

PS-Cal repeats this process of selecting the Measurement Methodology and Drivers until all Measurement Methodologies and drivers have been configured.

Loading a Calibration Template

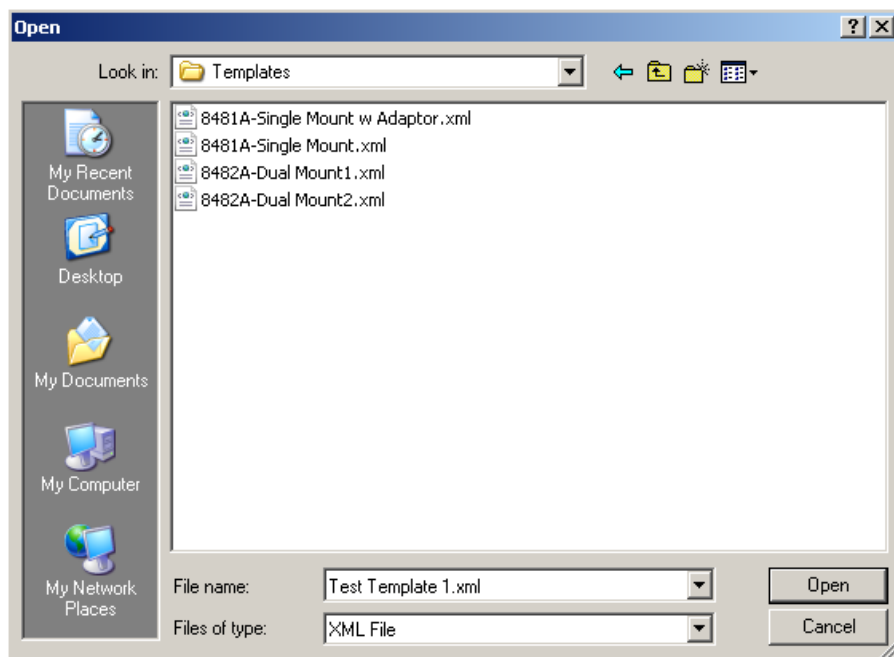


Figure 4.4 Load a Calibration Template

To load a calibration template in the PS-CAL menu, select **Calibration Template -> Load** and navigate to the **"C:\PS-Cal_V4\Calibration Templates\"** directory. Select the calibration template of the power sensor you are calibrating and then press **Open**.

Setting Additional Parameters in the Calibration Template

After creating a calibration template, there are some additional parameters and data that may need to be updated. The parameters set variables defining how PS-Cal performs the calibration, and they vary with each test methodology. Though these variables can be set and updated at any time, for consistency, we recommend that you update them when the template is first created, and if they are modified later, that you save the updates back to the template file.

For each test in the power sensor template there is a parameters button on the screen. The parameters window is opened by pressing the **"Param."** button. Simply update the value in the value column and press **Close**.

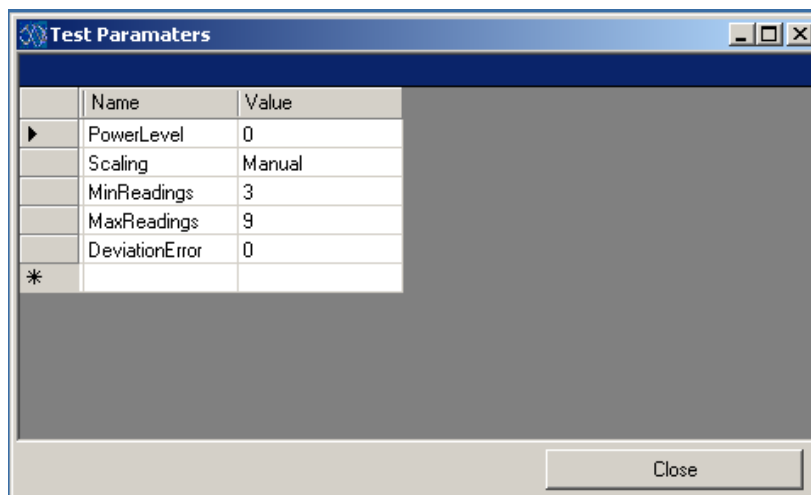


Figure 4.5 Configuring Parameters

In addition to the parameters data, the following values may need to be updated before the calibration template is saved:

- 1) **Uncertainties** By default, PS-Cal calculates on the measurement uncertainties and updates the column if the column contains "- . ". If you would like PS-Cal to report uncertainties that are on your scope, you can update this column and save the changes back to the template. This will force PS-Cal to use your uncertainties on all reports.
- 2) **OnLabel** For many power sensors that have a calibration label, the calibration template can test more frequencies than fit on the label. Under the Cal Factor test there is an **OnLabel** column. This column controls what frequencies will be printed on the calibration label and the data can be updated with **Yes** and **No** values. PS-Cal ignores this data for power sensors that do not require a printed Cal Factor label.

Once all the data and parameters are set in the power sensor template, save the template to update it with the changes. See "Saving a Calibration Template."

Running a Calibration

Once a power sensor template is loaded, PS-Cal displays one tab for each required test step. The exact steps required for each power sensor and each measurement methodology vary. These tabs are loaded in order of operation from left to right.

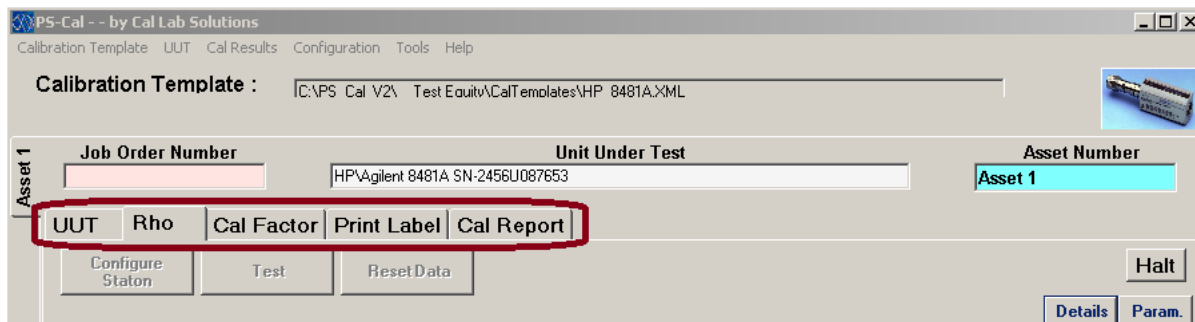


Figure 4.6 Running a Calibration

Two default tabs are loaded with every power sensor. The first is the **UUT** tab containing information about the Unit Under Test (UUT, also known as Device Under Test, DUT) and the work order. Data such as the UUT Serial number, Asset number, Job number, and the Calibration Technician (Cal Tech) who performed the calibration must be updated on this tab.

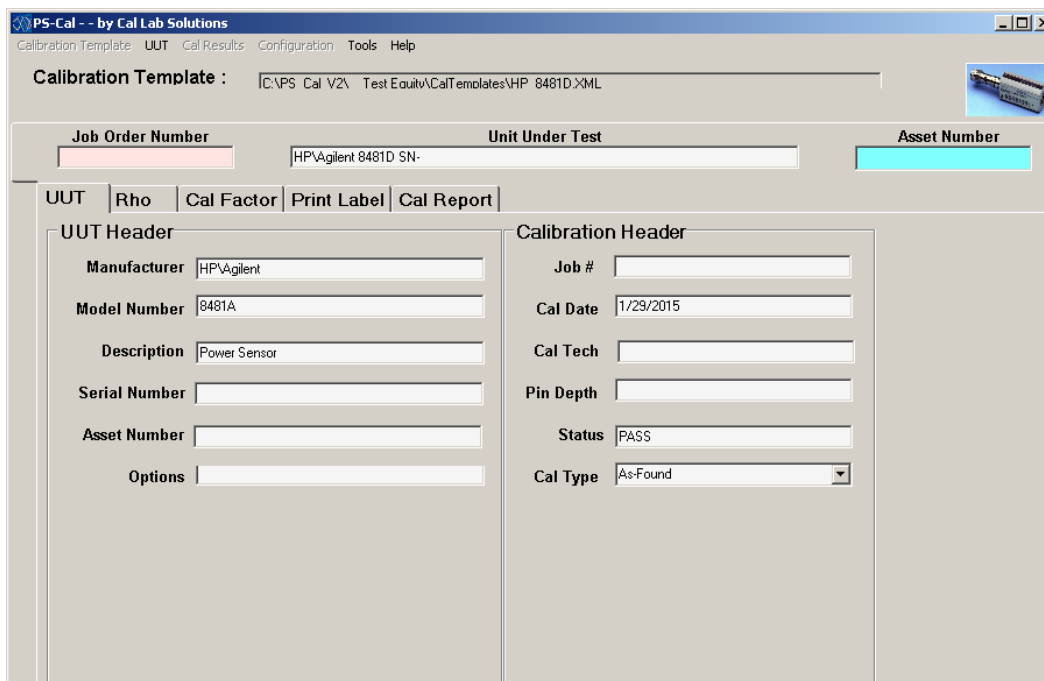


Figure 4.7 Calibration Default Tabs

The last tab is the **Cal Report** tab, which is used to print the report data for the calibration. Once all the steps between the **UUT** tab and the **Cal Report** tab have been completed, the data is ready to print.

Under each test procedure tab, there is a button bar with a button for each of the steps required to complete that calibration step. Like the tabs, the buttons are organized in step order from left to right. The exact buttons that appear on the form varies with each test methodology.

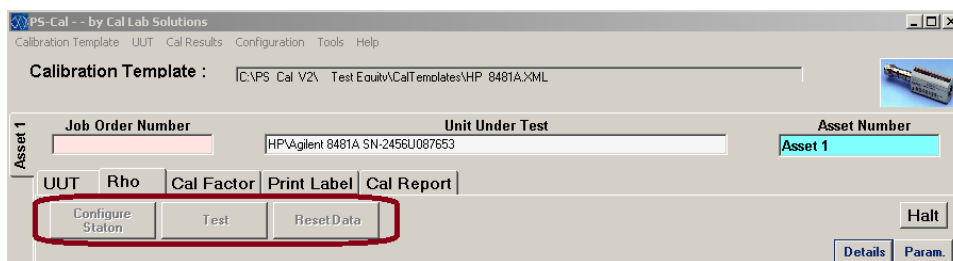


Figure 4.8 Calibration GUI

These buttons are enabled and disabled as required by the test procedure. A button remains disabled until necessary prerequisite steps are performed. For example, the **Cal** button is turned off until the **Configure Station** button has been pressed and the configure station operation has been completed. Then PS-Cal turns on the **Cal** button and allows you to go to the next step in the calibration process.

Another button to make a special note of is the **Halt** button. This button is used to halt the application. For example, if for some reason something was not hooked up correctly or you just need to stop the program, simply press the **Halt** button and PS-Cal will stop executing the calibration steps and reset all the standards to a safe state.

Saving Calibration Data

After you have completed a calibration (or at any point during the calibration), you can save the calibration data to disk. We recommend you save your calibration data often, to prevent loss of data due to a power outage or power failure.

To save your calibration data

1. Select **UUT -> Save As** and navigate to the "**C:\PS-Cal_V4\CalResults**" directory.
2. Enter the file name of the calibration data you are saving (we recommend you use a standard naming conventions of either **<JobNumber>.xml** or **<AssetNumber><CalDate>.xml**).
3. Press **Save**.

Uploading Calibration Data

If the sensor has an EEPROM (Electronic, Erasable Programmable Read Only memory), you can upload the calibration data to the sensor.

To upload the calibration data:

1. Click the **Upload Data** tab.
2. Click the **Download Data** button. This brings up the data for viewing. You will also see the word "Ready!" indicating that the data is now available for upload to the EEPROM on the sensor.
3. Click the **Save/Backup Sensor Data to File** button. This makes sure that the data is saved, in case there is a malfunction with the sensor prior to uploading.
4. Select whether to upload the data for
 - a. Header
 - b. Cal Factors
 - c. Linearity
5. Click the **Upload Cal Data** button. A dialog box prompts you to cycle the power on the power sensor.

Note: to test that the data uploaded correctly, after cycling power on the sensor, with the sensor still connected, click the **Download Data** button.

Printing a Calibration Label

If the sensor is a non-EEPROM based sensor (it does not have an Electronic, Erasable Programmable Read Only memory), it may require a calibration label to be printed. In order to print the calibration label you must have a compatible label printer. Once all the calibration steps have been completed the power sensor calibration label is ready to be printed.

To print the calibration label:

6. Select the **Print Label** tab of the power sensor being calibrated. Under this is a report viewer tool used to generate the label. PS-Cal supports several different label sizes.
7. Select the report size from the drop down.
8. Press the **Run Report** button. PS-Cal presents a print view of the report in the **Report Viewer** window.
9. To print the report, press the **Print** button.

Note: If the report is generating a two page label, remove test points from the label by editing the **OnLabel** under the **Cal Factors** tab. Columns that contain "Yes" in the OnLabel field will be printed on the label.

Printing the Calibration Report

Once all the steps of a calibration are completed, the results of the calibration are ready to be printed. The last tab on the form is the **Cal Report** tab, which combines all the data from each tab into one single report.

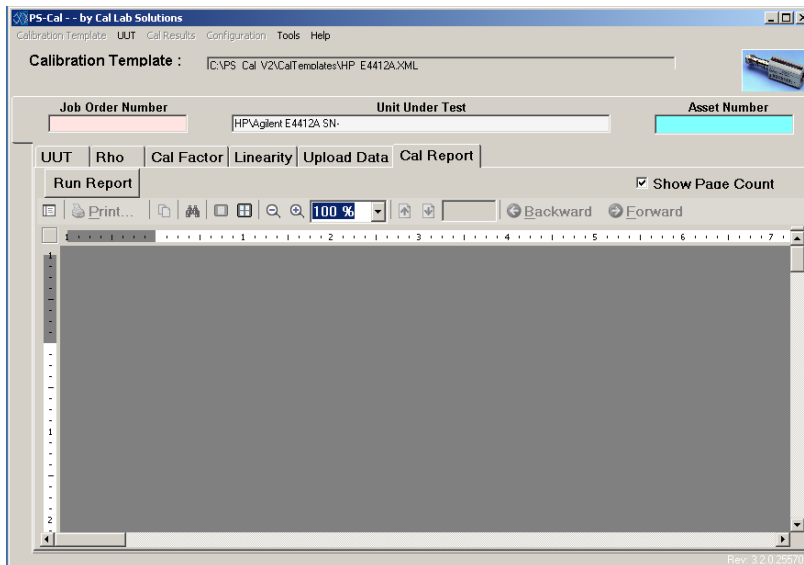


Figure 4.9 Print Calibration Report

To print the Calibration Report:

1. Select the **Cal Report** tab
2. Press the **Run Report** button. PS-Cal presents a print view of the report in the **Report Viewer** window.
3. To print the report, press the **Print** button.

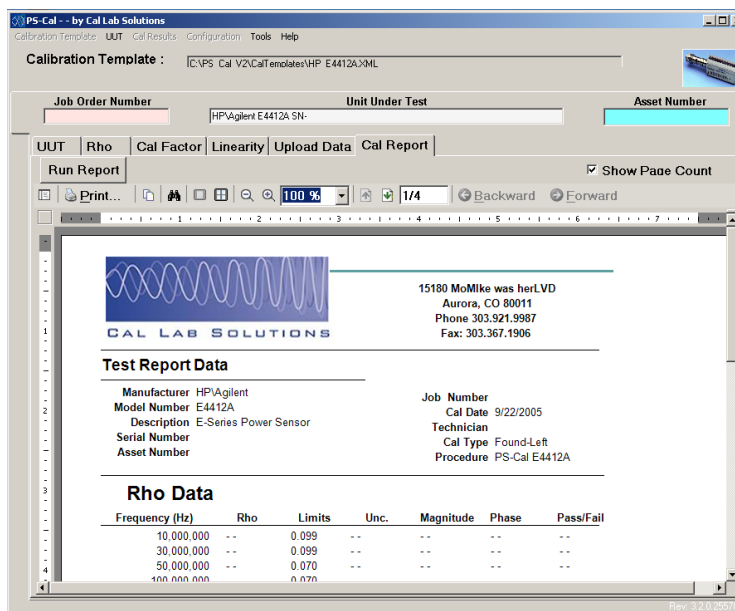


Figure 4.10 Calibration Report Preview

PS-CAL in Batch Mode

PS-Cal is able to calibrate power sensors in batch mode. Though PS-Cal can only calibrate a single sensor at a time, Batch Mode allows the operator to configure that station to test one power sensor, and then use that configuration to calibration the next sensor in the batch. This process saves time, because many power sensor calibration configuration steps are time consuming.

Figure 4.11 Batch Mode

To use PS-Cal in Batch Mode:

1. Click on UUT in the menu bar
2. Select **New**.
This adds an Asset tab.
3. Label the tab by selecting it, and then selecting the UUT tab, and entering the asset number in the **Asset Number** field.
4. The new asset tab is now labeled.

You can now select the newly added asset by clicking its tab along the left. Configuration information and data collected on one power sensor is shared with all the power sensors that are open.