Tips for first-time users of the Power Sensor Support Package

This document offers some tips for anyone using the SureCAL Power Sensor Support Package for the first time. It is divided into four sections, “What You Need”, ”Questions to Ask Yourself”, “Things to Look For” and “Answers to Frequently Asked Questions”

WHAT YOU NEED:

If you want to experiment with the software without running actual tests with hardware, you need:

- A Pentium-based PC or laptop with a IEEE-488 interface card and cable.
- Version 4.1 of Test Manager Lite or higher
- The Power Sensor Support Package

If you want to run an actual calibration using hardware, you’ll need more:

- A common power sensor to test. (recommend HP 8481A)
- A power meter to use with the sensor (recommend HP 436A or 437B)
- A STANDARD power sensor (recommend TEGAM 1807 or F1109)
- Calibration Data (Cal Factors with Uncertainties) for the above standard
- A STANDARD power meter (recommend TEGAM 1805A)
- A microwave synthesizer (recommend HP 8340A or 83630A)

Other equipment may be substituted for the “recommended” models above.

QUESTIONS TO ASK YOURSELF:

Q. How do you calibrate power sensors now?

If you already calibrate some of your own sensors, you will already understand “how it is done” and will have existing hardware you will want to continue using. Rest assured that your current hardware will most likely be supported by SureCAL. If you do not calibrate your own sensors already, you may be worried about the cost of new hardware, but the software’s flexibility allows you many options for configuring a test system. You may need to buy less equipment (or less expensive equipment) than you think.

Q. If you calibrate your own, what standards do you use?

Most likely, you are using one of two systems: a Weinschel System II or an HP 11760S. Users of either system are probably looking to replace their software to obtain the ability to calibrate newer sensors or allow them to use a Windows based computer. The SureCAL Power Sensor Support Package will work with the hardware from either of these two systems. If you are using the Weinschel system, the default Test Profiles in the SureCAL software are ready to go. If you are using the HP 11760S system, the Test Profiles will have to be modified to use that hardware. (This is something you would have to setup only once.)

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Q. What sensors do you need to calibrate?

The SureCAL Power Sensor Support Package includes complete procedures for the following sensors: Anritsu MA2469A, Boonton 4200-4E, Giga-tronics 16936, 80301A, 80321A, 80350A, Hewlett Packard 11722A, 11792A, 478A, 8478B, 84812A, 84815A, 8481A, 8481B, 8481D, 8481H, 8482A, 8482B, 8482H, 8485A, 8485D, 8487A, E4412A, E4413A, TEGAM / Weinschel 1807A, F1109, F1116, F1117A, F1119 and Wavetek 13869. In addition to these, the software recognizes over 100 other sensors, and new sensor definitions can be added.

Q. What sensor would you like to try first?

If you don't have a specific one in mind, we recommend something simple, like a HP 8481A. Try to avoid high power or low frequency sensors for first-time trials. Those procedures require more hook up changes and will take considerably longer to run. Keep it as simple as possible for your first sensor.

THINGS TO LOOK FOR:

- The Power Sensor Support Package is the first of a new class of SureCAL products. It is the first product to bundle multiple procedures, 29 in all, for one price. It is the first procedure to use Test Profiles, which give you unprecedented flexibility in controlling the test parameters.

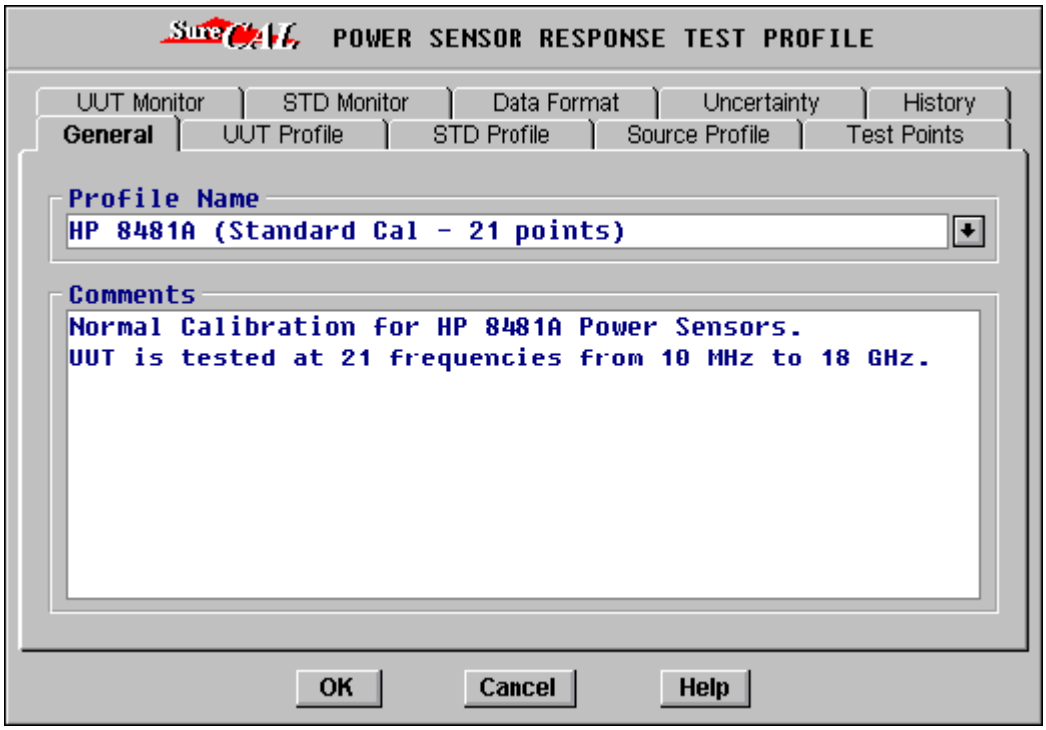
- To begin, launch Test Manager and load any of the 29 sample procedures. (We recommend the HP 8481A for first-time users.) Once the procedure is loaded, take some time to explore the pull-down menus and toolbar buttons, if you are not already familiar with them.

- Go directly to the "CAL FACTORS" procedure step, then click on the  button on the Toolbar. This button allows you to access the Test Profile. You will be prompted to enter a password. Type in the password "SURECAL" (capital letters!). The password is provided to control who has access to the test parameters. You can change it to whatever you like.

- Explore each of the Test Profile Tabs, decribed below:

Test Profile – General Tab

This tab displays the name of the Test Profile and a summary description of it. Any of this text can be edited by clicking on it. If you click on the ▼ button, a picklist of all previously defined Test Profiles is displayed. This list will include all 29 of the predefined profiles included in the Power Sensor Support Package. Press “Esc” or click the mouse outside window to exit the picklist.

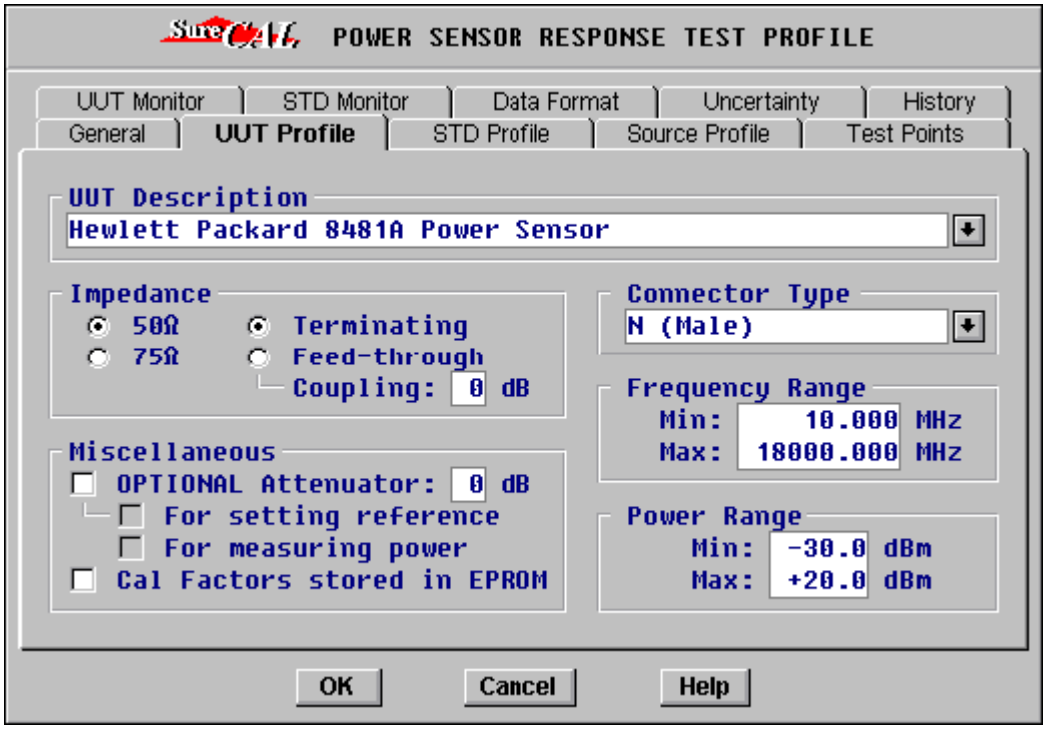


Test Profile – UUT Profile Tab

This tab describes the Unit Under Test. Note the generic nature of the sensor description. Virtually any power sensor can be described on this screen.

Click on the button to the right of the "Connector Type" field to display a picklist of 32 different RF connectors. The software knows which connectors can mate safely and will give specific warnings if you try to mate connectors which could damage each other. You may add to the list of connectors.

Next, click on the button to the right of the "UUT Description" field and view a picklist of 140 predefined sensors to choose from. You can add to this list also.



Test Profile – STD Profile Tab

This tab describes the Standard Sensor. This screen is **identical** to the "UUT Profile" tab. The software is designed to be generic. It can compare any power sensor to any other power sensor, provided that one of them is a "terminating" type and the other one connects to a power splitter or coupler – what the software refers to as a "Feed-through" type. In the picklist of 140 predefined sensors, many of the selections will say, "w/ Splitter", signifying that they are the "Feed-through" type sensors.

Test Profile – UUT Monitor and STD Monitor Tabs

These two tabs are also identical and describe the type of power meters used to monitor the UUT and STD Sensors respectively. Four types of monitor are supported, which covers just about every power meter there is. The four types are:

1) Direct Reading, IEEE controlled

Use this type if there's a SureCAL Driver for the meter you want to use.

2) Direct Reading, Manually controlled

Use this type for meters that have no IEEE interface or have a "Recorder Output" which generates a voltage proportional to the power reading. If monitoring a Recorder Output, you will need a Digital Voltmeter with a SureCAL Driver. You also need to specify the scaling of the output voltage in the fields provided.

3) Bridge Type

If you're not familiar with this type, it's just like a HP 432A or Weinschel 1806 meter. Both have a "VRF" output voltage, monitored by a DMM. This voltage is measured directly across an RF bridge circuit and is not scaled like a Recorder Output. The nominal bridge impedance must be specified to use this type.

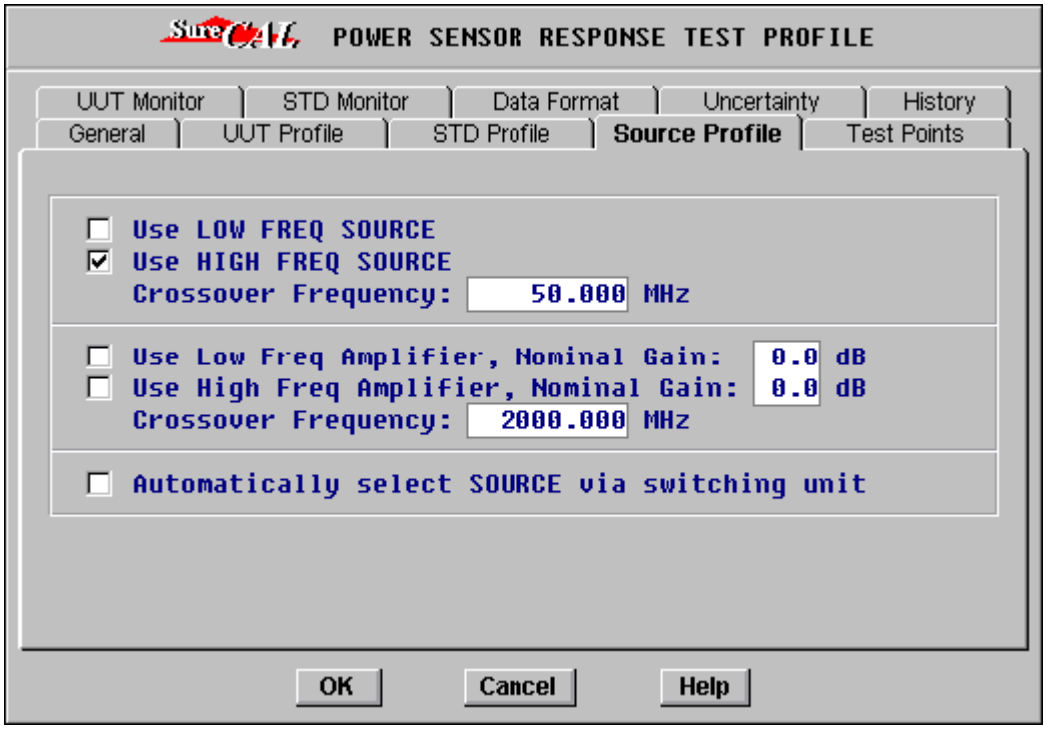
4) Auto-Leveling Controller

If you aren't currently using a Weinschel System II, this option won't mean anything to you. It is used exclusively for the TEGAM / Weinschel 1805A.

Test Profile – Source Profile Tab

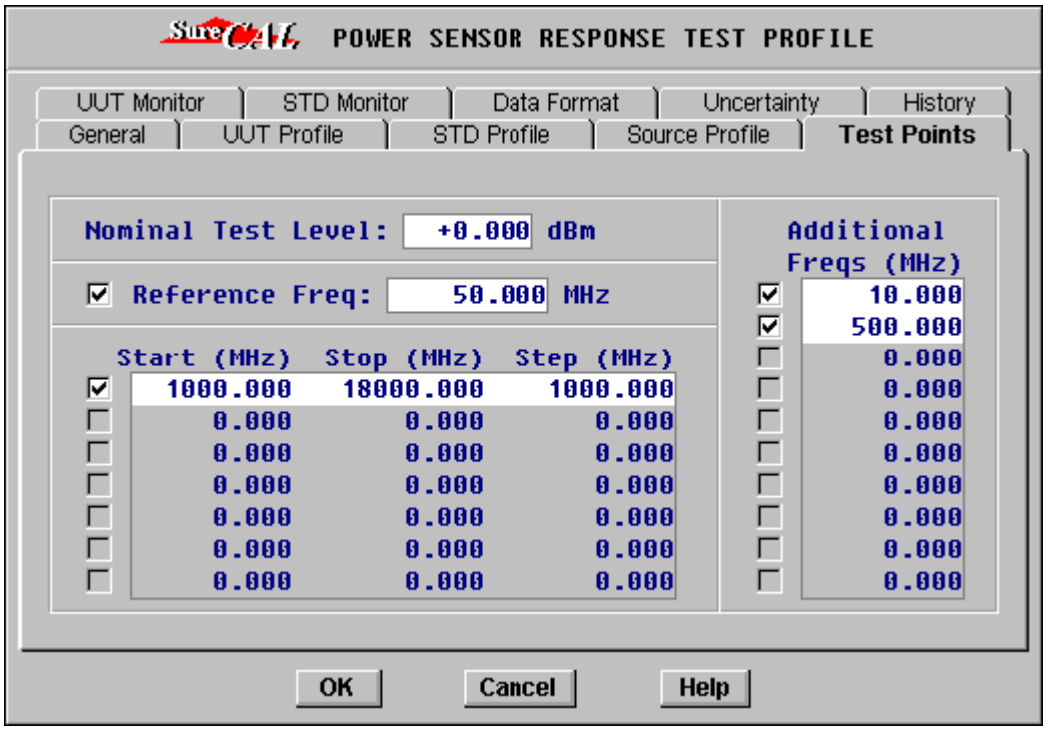
This screen allows you to specify the use of one or two signal sources and the frequency to switch from one to the other. If high power test levels are required, two amplifiers can also be defined.

If you are currently using the HP 11760S system, you can still use your automatic signal routing switch by clicking on the last checkbox. If you are using the Weinschel System II and have an accessory 1727A amplifier / switching unit, that is also supported.



Test Profile – Test Points Tab

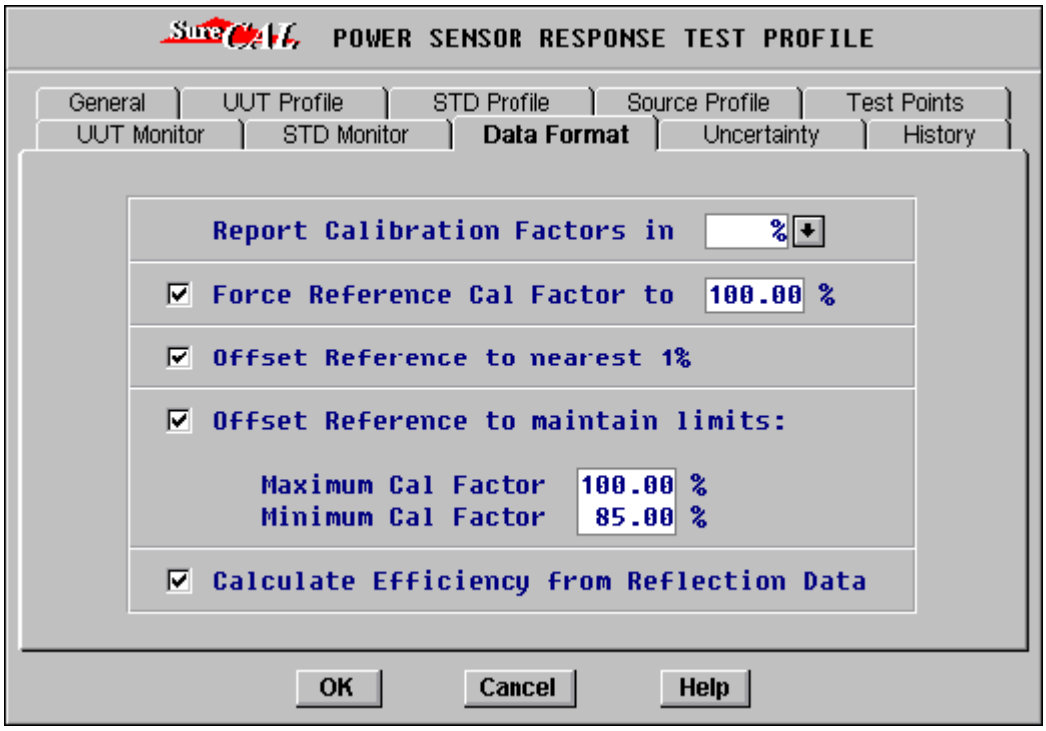
This tab allows you to specify any test frequencies you require and the nominal test level. The frequencies are limited only by the capability of your RF Source(s) and the calibrated range of your Standard Sensor.



Test Profile – Data Format Tab

This tab allows you to specify how test data is reported. Calibration Factors can be reported in "dB" or "%" units. The optional Reference Cal Factor can be specified or limited by specific guidelines. To support older power meters which set their cal factor corrections with a mechanical switch, the reference can be forced to 1% or 0.1dB increments. To support power meters with a limited range of valid cal factors, those limits can be specified. If no limits are specified, the cal factor graph will automatically scale itself to display whatever data is measured.

If you want to report "Effective Efficiency" in addition to Cal Factor, this can be selected as well. You must have manually entered the UUT Sensor's SWR data into it's history data file to make use of this last option.



Test Profile – Uncertainty Tab

This tab allows you to choose between three methods of calculating uncertainty. All three methods consider the following potential sources of error as applicable:

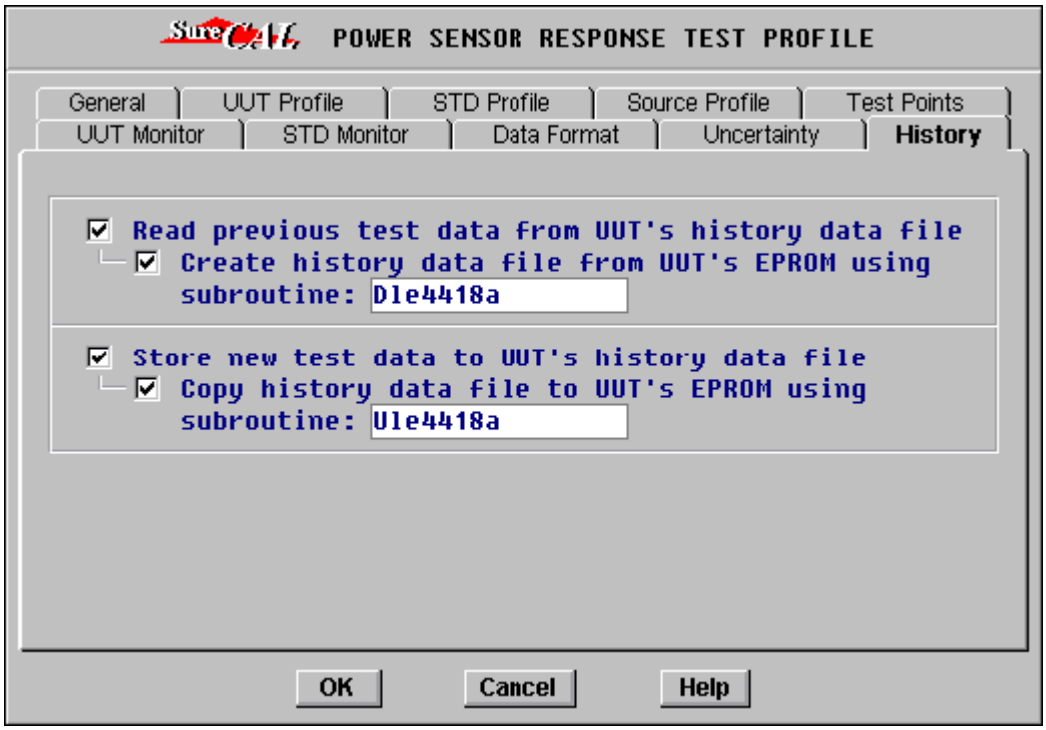
- Standard Sensor's Cal Factor uncertainty
- Standard Power Meter's linearity error
- Standard Power Meter's absolute accuracy error
- UUT Power Meter's linearity error
- UUT Power Meter's absolute accuracy error
- Correction Data uncertainty for adapters, attenuators or minimum loss pads
- SWR mismatch errors and repeatability errors.

The RSS (Square Root of the Sum of Squares) error is calculated, Two times RSS is calculated and the simple sum or "Worst Case" error is calculated. You may choose between these three options.

If previous data is available for the UUT, you may also opt to FAIL the sensor if the reported Cal Factors have changed by more than the reported uncertainty. To include actual (not estimated) repeatability measurements in the uncertainty calculation, the final checkbox can be employed to loop a given test.

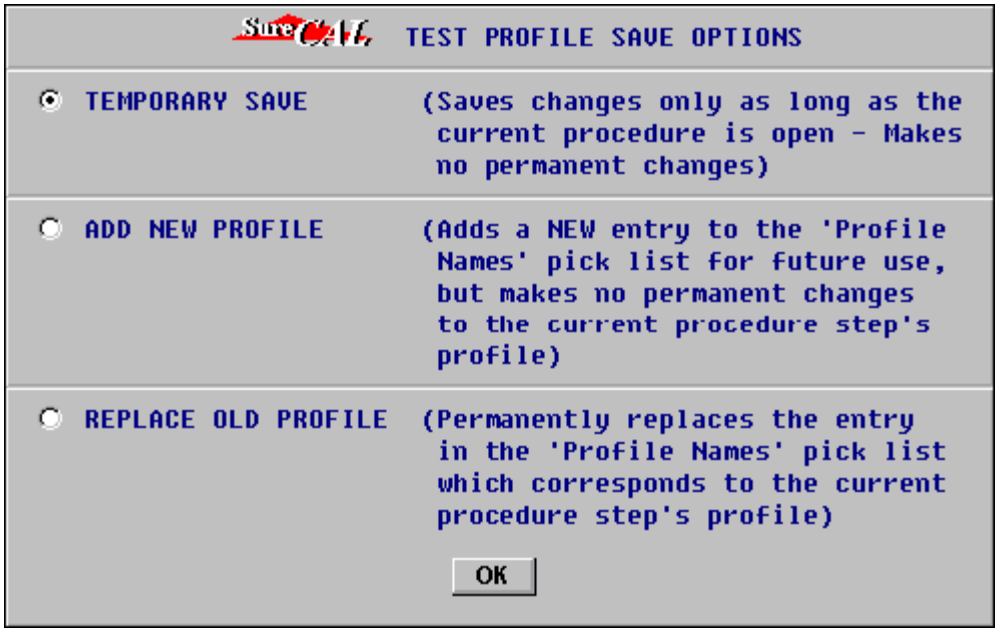
Test Profile – History Tab

This tab is used primarily to specify custom routines for downloading and uploading EEPROM data from/to a UUT sensor. This feature allows the software to be expanded in the future as new EEPROM sensors become available.



Exiting the Test Profile

IMPORTANT: If you have been making changes to the profile that you don't want to save at this point, click "Cancel" at the bottom to exit. If you click "OK" at the bottom, you will be given three options for saving your changes. The screen is pretty self-explanatory. Select "TEMPORARY SAVE" for demo purposes.



- **Before You Run an Actual Test**

Be sure to assign Flexible Standards  before running the test. Not all Generic Names listed will be used. If there is no LOW FREQ SOURCE or AMPLIFIER / SWITCH required, these entries should be "* Not Assigned *" Normally, POWER MONITOR #1 is assigned to the Standard Sensor's power meter and POWER MONITOR #2 is assigned to the UUT Sensor's power meter. A DMM may be substituted if the meter is not the "Direct Reading IEEE Controlled" type.

After setting up flexible standards, press the SPACEBAR to begin. A summary screen of your Test Profile will be displayed. Double-check the information to make sure everything is right, then click "OK".

The software will request a Data File entry for the Standard Sensor. The file TRANSFER.DAT can be used for demo purposes, but it will not have the correct data in it for your standard. Edit this file ahead of time using NOTEPAD to enter valid cal factors and make sure the Expiration Date has not passed. Rename the file to identify it with your Standard Sensor.

The software will next request a Data File for the UUT. You may choose "Proceed Without Data" for the UUT. These data file requests will only happen the FIRST time you run the test. If you want to alter either selection before subsequent runs, click on  .

Next, the program will draw the hook-up for the "Feed-through" sensor (This is normally the Standard), then the hook-up for the "Terminating" sensor (This is normally the UUT). Connect the Standard and UUT sensors together as instructed. The program will begin testing and draw a graph on the screen.

When the test is complete, the program will ask if you want to update the UUT Sensor's data file. Answer "Yes" and a file will be created. After the test finishes, click on  to save the test results. You can view the results by clicking on  .

ANSWERS TO FREQUENTLY ASKED QUESTIONS:

Q. Can the program print labels?

A. Yes. Labels with CAL FACTORS can be printed to one of the computer's local printer ports. It must not be the same printer used for datasheet printouts. The SureCAL program uses a preset format for label printing, but a Basic Language routine can be modified to override the default format.

Q. Does the software work with an HP 8510 Network Analyzer?

A. No. Not yet. The SWR portion of the power sensor test uses an HP 8757 Scalar Network Analyzer manually. SureCAL is currently developing a new product called the RF Component Support Package, which will allow automated data collection using an HP 8510.

Q. Does the software use vector impedance data to compensate for mismatch?

A. Yes it can, but only if you manually enter the vector impedance data into the UUT and STD Sensor data files. If the data is present, it will be used and the uncertainty calculation will be updated accordingly.

Q. How long does it take to calibrate a sensor?

A. This will depend on how many hook-up changes are required and how many frequency points are tested, but a typical 8481A sensor can usually be calibrated in under 10 minutes.