Software User Guide

MA24106A CalXpert™

WARRANTY

The Anritsu product(s) listed on the title page is (are) warranted against defects in materials and workmanship for one (1) year from the date of shipment.

Anritsu's obligation covers repairing or replacing products which prove to be defective during the warranty period. Buyers shall prepay transportation charges for equipment returned to Anritsu for warranty repairs. Obligation is limited to the original purchaser. Anritsu is not liable for consequential damages.

LIMITATION OF WARRANTY

The foregoing warranty does not apply to defects resulting from improper or inadequate maintenance by the User, unauthorized modification or misuse, or operation outside of the specifications of the product. No other warranty is expressed or implied, and the remedies provided herein are the User's sole and exclusive remedies.

DISCLAIMER OF WARRANTY

DISCLAIMER OF WARRANTIES. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, ANRITSU COMPANY AND ITS SUPPLIERS DISCLAIM ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH REGARD TO THE SOFTWARE PRODUCT. THE USER ASSUMES THE ENTIRE RISK OF USING THE PROGRAM. ANY LIABILITY OF PROVIDER OR MANUFACTURER WILL BE LIMITED EXCLUSIVELY TO PRODUCT REPLACEMENT.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL ANRITSU COMPANY OR ITS SUPPLIERS BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR ANY OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOFTWARE PRODUCTS, EVEN IF ANRITSU COMPANY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BECAUSE SOME STATES AND JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

TRADEMARK ACKNOWLEDGMENTS

CalXpert is a trademark of Anritsu Company.
Intel and Pentium are registered trademarks of Intel Corporation.
Microsoft, Windows, Windows Vista, Microsoft Office, Word, Access, Excel, PowerPoint, Visual Studio, Visual Basic, and .NET are all registered trademarks of the Microsoft Corporation.

NOTICE

Anritsu Company has prepared this manual for use by Anritsu Company personnel and customers as a guide for the proper installation, operation and maintenance of Anritsu Company equipment and computer programs. The drawings, specifications, and information contained herein are the property of Anritsu Company, and any unauthorized use or disclosure of these drawings, specifications, and information is prohibited; they shall not be reproduced, copied, or used in whole or in part as the basis for manufacture or sale of any equipment or software programs without the prior written consent of Anritsu Company.

UPDATES

Updates, if any, can be downloaded from the Documents area of the Anritsu web site at:
http://www.us.anritsu.com

For the latest service and sales contact information in your area, please visit:
http://www.anritsu.com/contact.asp

ANRITSU COMPANY SOFTWARE LICENSE AGREEMENT

IMPORTANT-READ CAREFULLY BEFORE OPENING THE SOFTWARE PACKET. BY OPENING THE PACKET CONTAINING THE SOFTWARE, YOU ARE AGREEING TO BE BOUND BY THE TERMS OF THIS AGREEMENT. THIS IS A LEGAL AGREEMENT BETWEEN YOURSELF, AND YOUR EMPLOYER, IF APPLICABLE, AND ANRITSU COMPANY ("ACUS"). IF YOU DO NOT AGREE WITH ALL OF THE TERMS OF THIS AGREEMENT, PROMPTLY RETURN THE UNOPENED SOFTWARE PACKAGE, AND THE ACCOMPANYING DOCUMENTATION TO ANRITSU FOR FULL CREDIT.

SOFTWARE LICENSE AGREEMENT

1. GRANT OF LICENSE. This License Agreement permits you to use enclosed software program (the "Software") on a computer. The SOFTWARE is in use on a computer when it is loaded into temporary memory (i.e. RAM) , installed into permanent memory (i.e. hard disk, CD-ROM, or other storage device), or installed/ loaded into any appropriate Anritsu product. All rights not expressly granted are reserved to ACUS. This Grant of License is not subject to transfer or assignment by Licensee.

2. COPYRIGHT. This SOFTWARE is owned by ACUS and is protected by United States copyright laws and international treaty provisions. Furthermore, it is considered by ACUS to be ACUS proprietary information. Therefore, you must treat the SOFTWARE like any other copyrighted or proprietary material except that you may either (a) make one copy of the SOFTWARE solely for backup or archival purposes, or (b) transfer the SOFTWARE to a single hard disk, provided you keep the original solely for backup or archival purposes. You may NOT copy any written documentation accompanying the SOFTWARE.

3. OTHER RESTRICTIONS. You may not reverse engineer, decompile, or disassemble the SOFTWARE, nor may you publish the SOFTWARE on the internet, or load the SOFTWARE onto your company's network.

4. DUAL MEDIA SOFTWARE. If the SOFTWARE package contains both 3.5 in. disks and CD-ROM , then you may only use the disks appropriate for your computer. You may not use the other disk on another computer, or loan, lease, or transfer them to another user except as part of the permanent transfer of all SOFTWARE and written materials.

5. WARRANTY. ACUS warrants for a period of one (1) year from date of delivery that the SOFTWARE will, unless modified, perform the functions described in the accompanying documentation. ACUS's sole obligation is to undertake to correct or replace any reported error conditions.

ACUS DOES NOT WARRANT THAT THE SOFTWARE WILL RUN PROPERLY ON ALL HARDWARE, THAT THE SOFTWARE WILL MEET LICENSEES REQUIREMENTS, OR THAT ALL SOFTWARE ERRORS WILL BE CORRECTED.

THE WARRANTIES ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

ACUS SHALL NOT BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES, , OR DAMAGES FOR LOSS OF PROFITS, REVENUE, DATA, OR USE, INCURRED BY licensee, REGARDLESS OF WHETHER IN TORT OR CONTRACT, AND REGARDLESS OF WHETHER LICENSEE HAS ADVISED ACUS OF THE POSSIBILITY OF SUCH LOSSES.

6. Export Control. Licensee agrees that it shall not export or re-export the software covered hereunder, or any portion thereof, directly, or through others, to the proscribed countries listed in Section 779.4 and associated or successor sections of the U.S. Export Administration Regulations unless properly authorized by the U. S. Government. Licensee further agrees to fully comply with all of the rules and regulations regarding export of this software that may be issued from time to time by the Japanese Ministry of International Trade and Industry.

7. Any breach of the terms or conditions of this Grant of License will result in termination of the license granted hereunder. Upon termination of the license granted hereunder, Licensee shall return all copies of the software to ACUS, or certify their destruction in writing.

8. This agreement, and all of the rights hereunder, shall be interpreted and determined by the laws of the State of California, and all disputes shall be subject to the jurisdiction of the Courts within the State of California.

产品中有毒有害物质或元素的名称及含量

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 [Cr(VI)]	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷线路板 (PCA)	✕	○	✕	✕	○	○
机壳、支架 (Chassis)	✕	○	✕	✕	○	○
其他（电缆、风扇、 连接器等） (Appended goods)	✕	○	✕	✕	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。

✕：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

环保使用期限

这个标记是根据 2006/2/28 公布的「电子信息产品污染控制管理办法」以及 SJ/T 11364-2006「电子信息产品污染控制标识要求」的规定，适用于在中国销售的电子信息产品的环保使用期限。仅限于在遵守该产品的安全规范及使用注意事项的基础上，从生产日起算的该年限内，不会因产品所含有害物质的泄漏或突发性变异，而对环境污染，人身及财产产生深刻地影响。

注）生产日期标于产品序号的前四码（如 S/N 0728XXXX 为07 年第 28 周生产）。

Equipment marked with the Crossed-out Wheelie Bin symbol complies with the European Parliament and Council Directive [2002/96/EC] (the "WEEE Directive") in the European Union.

For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

Table of Contents

Chapter 1 — General Information

1-1 Scope of Manual

This manual provides general information, installation, and operating information for the Anritsu MA24106A CalXpert™ software application for the MA24106A USB Power Sensor and is intended for users who want to calibrate the MA24106A USB power sensor themselves or through a third-party calibration laboratory.

The procedures described in this manual are specific to the MA24106A. Throughout this manual, the terms MA24106A and power sensor will be used interchangeably to refer to the device. Manual organization is shown in the table of contents.

This chapter contains a description of the MA24106A power sensor and a brief background on power sensor calibration.

1-2 Description

The MA24106A power sensor is a highly accurate, standalone instrument that communicates with a PC via USB. The power measurement capability of the MA24106A is intended to mimic that of a traditional thermal (thermo-electric) power sensor; therefore, it is ideal for measuring the average power of CW, modulated RF waveforms such as 3G, 4G, OFDM, and multi-tone signals. In other words, it measures true RMS power regardless of the type of input signal.

> **Note:** The power sensor has a USB 2.0 interface with a USB Type Mini-B port. The MA24106A can be remotely programmed over this USB interface. In addition to programming, the MA24106A is powered by the USB. The interface is USB 2.0 compatible, but with an interface speed of 12 Mbps.

The MA24106A sensor is a dual path diode sensor where each detection path is assigned to measure a specific range of input power levels. The high power path is assigned to measure power from +23 dBm to –7 dBm while the low power path is assigned to measure power from –7 dBm to –40 dBm. Within their assigned power levels, each of the detection diodes are operating in square-law and are inherently linear in power without requiring any sophisticated correction. An additional benefit of being inherently linear with the absence of complex corrections allows the MA24106A to be linear with virtually any signal type including CW and complex modulated signals such as WCDMA or WiMAX.
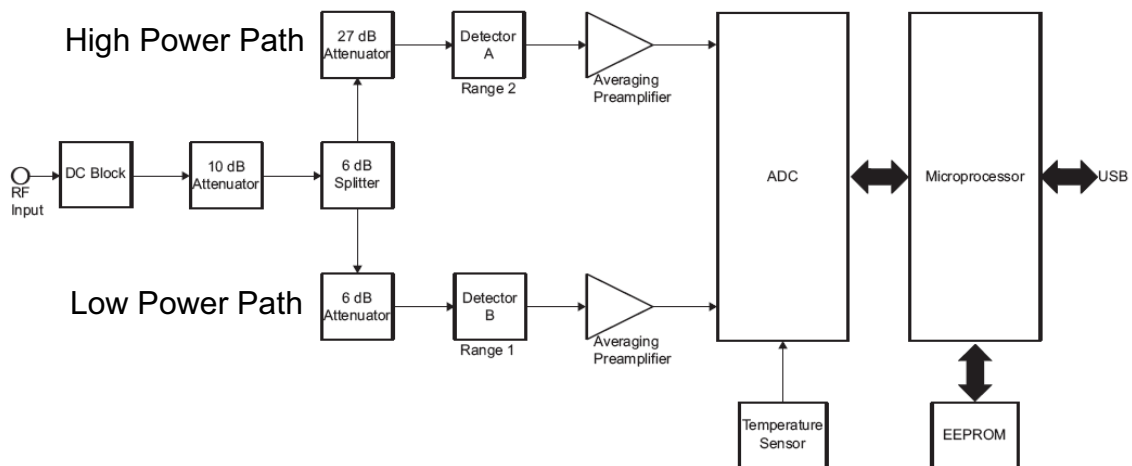

Figure 1-1. MA24106A Block Diagram

1-3   Power Sensor Calibration Background

In general, the following items are needed to calibrate any modern power sensor:

- Sensitivity calibration (50 MHz)
- Calibration factor (Calfactor) characterization
- Linearity characterization
- Temperature characterization
- Range "connection" characterization

Sensitivity calibration and Calfactor characterization are performed at a 0 dBm power level. They are strictly a calibration of the high power detection path.

Note: Calfactor tests are performed at countless calibration laboratories in the industry; and each laboratory has its own techniques, equipment, and measurement uncertainties. Choosing the calibration laboratory will depend on the application and uncertainty requirements. It is highly recommended that customer choose a high quality lab that has experience in performing power sensor calibrations. Anritsu will leave the user to decide which Calfactor calibration service to use. Otherwise, sensors can be sent to Anritsu for periodic calibrations.

Sensitivity calibrates the sensor's response at 0 dBm and 50 MHz. Calfactor test calibrates the sensor's frequency response with respect to 50 MHz and 1 mW.

The MA24106A EEPROM contains very precise linearity and temperature characterization data that are beyond the means of most third-party calibration labs. Linearity means the sensor's response as it relates to input power. Each one of the detection diodes (high and low power paths) operates in square-law and is inherently linear in power; therefore, they do not require periodic linearity calibration.

The temperature characteristics of the detection elements do not change with normal aging and wear; therefore, temperature calibration is not needed for routine calibration. If a sensor is damage due to excessive power or some other physical damages, then the power sensor needs to be returned to the factory for repair and calibration. Contact your local Anritsu Service Center and return the sensor with a detailed description of the observed problem(s).

The Range Connection characterization is performed at a transitional power (-7 dBm) between the high and low power detection paths. This test calibrates the low power detection path to the high power detection path so that the two elements combine for a wide dynamic power range (+23 dBm to -40 dBm) while maintaining a seamless linear response.

Chapter 2 — Installation (PC Only)

2-1 Introduction

This chapter provides information on installing the MA24106A CalXpert™ application. It contains Hardware and Software Requirements for the MA24106A CalXpert Application and a brief overview of Installing the MA24106A CalXpert Application.

2-2 Hardware and Software Requirements

Please make sure that the following minimum requirements are met for installing and using the software:

- MA24106A Power Sensor Drivers Installed
- Intel® Pentium® III with 1 GB RAM or Intel® Pentium® IV with 512 MB RAM, or equivalent (Intel® Pentium® IV with 1 GB RAM recommended)
- Microsoft® Windows Vista® (32-bit only), Windows XP or Windows 2000
- 100 MB hard-disk free space
- Display resolution 1024 × 768
- USB 2.0 full speed (compatible with USB 1.0 and 1.1) interface
- CD-ROM drive

2-3   Installing the MA24106A CalXpert Application
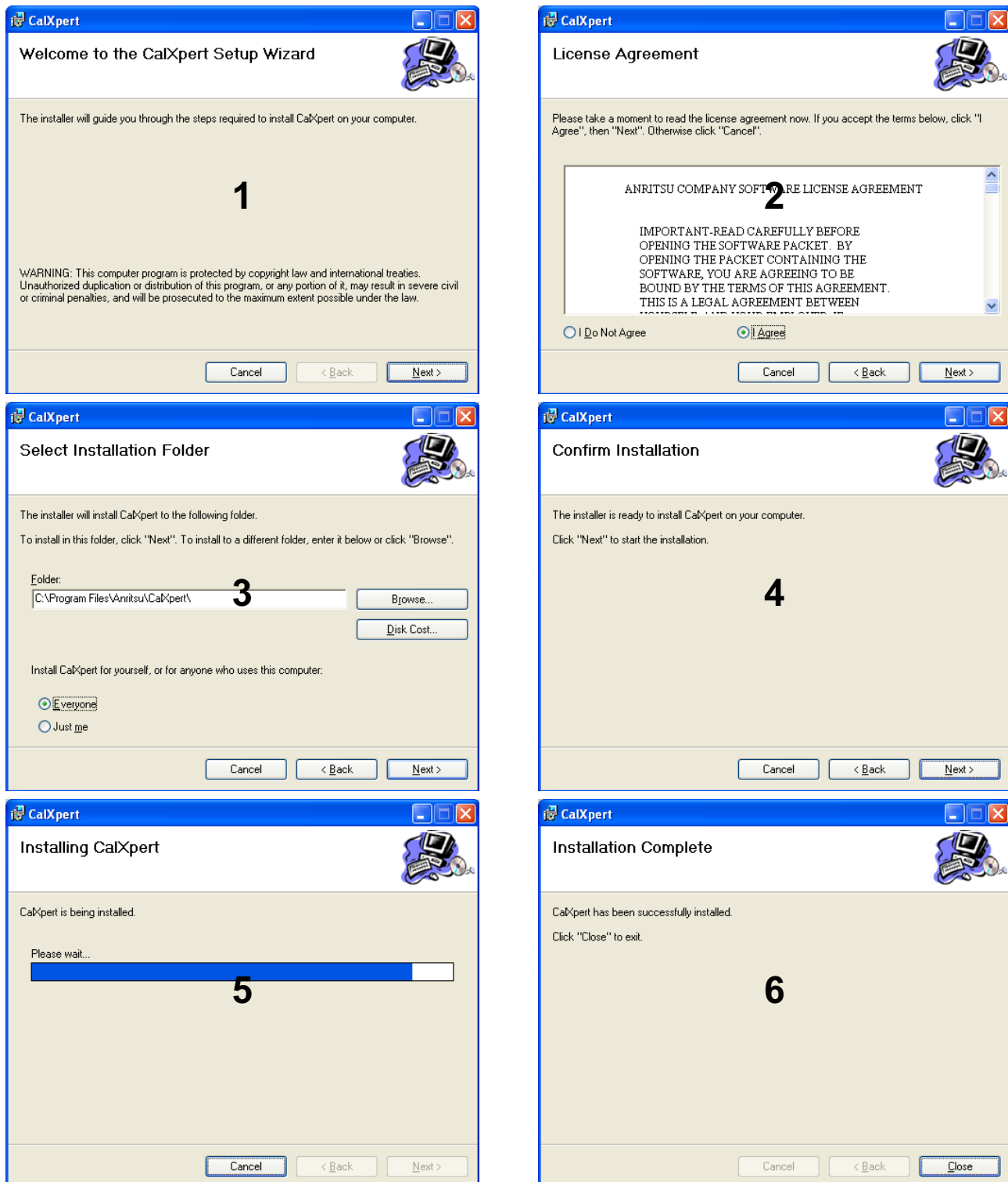
Install as directed in the on-screen installation dialogs:

Figure 2-1.   MA24106A CalXpert Installation

Chapter 3 — Calibrating the Power Sensor

3-1 Calibrating with MA24106A CalXpert

MA24106A CalXpert is a calibration wizard that guides you through the Range connection test and performs necessary operations to complete the calibration of the power sensor. Calibrating the power sensor via the MA24106A CalXpert wizard is just a two step process:

1. Install MA24106A CalXpert as instructed in Chapter 2.

2. Run MA24106A CalXpert with a predetermined Calfactor and 50 MHz Sensitivity file.

> **Note:** All of the calibration steps, Calfactor, sensitivity, and range connection should be performed in succession at room temperature (±1 ºC).

Required Equipment

Equipment meeting the following specifications is required for sensor calibration:

- Synthesizer: 50 MHz to 6 GHz, +15 dBm minimum (Anritsu MG3690 Series)
- Reference Power Meter and Sensor: Absolute power accuracy better than 0.5 dB (Anritsu MA24106A or ML2437A, with MA2442D)
- 10 dB Fixed Attenuator: 1.25 SWR from 50 MHz to 6 GHz (Anritsu 41KA-10)
- K to N Adapter (Anritsu 34NFK50)

Calfactor and Sensitivity

Calfactor corrections are performed at countless calibration laboratories in the industry. Equipment, techniques, and results vary with each lab. Anritsu leaves it to the user to decide which Calfactor calibration service to use. Whether one chooses to subcontract calibration or to use their internal calibration lab, the people doing the calibration need to know the parameters that the MA24106A sensor requires. Here is Anritsu's definition of Calfactor and Sensitivity:

Calfactor (freq) = PowerRead (freq) / PowerRead (50 MHz)

Sensitivity = PowerRead (50 MHz) / 1 mW

where

freq is the frequency of the DUT's input power.

PowerRead (50 MHz) is the DUT power reading at 50 MHz when input power is 1 mW (0 dBm).

PowerRead(freq) is the DUT power reading when input power is 1 mW (0 dBm) at a given frequency (freq).

> **Note:** Do not change the Calfactor of the sensor at any time during the sensitivity and Calfactor calibration process. The cal factor frequency of the sensor should be set at 50 MHz throughout the process.

Temperature Consideration

Temperature of the sensor is another important factor needed for Calfactor characterization. If the Calfactor test is performed manually, then the sensor temperature (not the ambient) can be found by using the MA24106A CalXpert Program or by using the remote command TMP? (refer to the remote programming sections of the MA24106A power sensor documentation).

Saving Calfactor and 50 MHz Sensitivity

The Calfactor and 50 MHz Sensitivity must be saved to a text file before executing the MA24106A CalXpert wizard. This file is required by MA24106A CalXpert to perform the calibration. The file format is given below:

```
Model Number
MA24106A
Serial Number
XXXXXX
Date:
MM/DD/YYYY
Temperature:
XX.X
Sensitivity
X.XXXX
```

Freq	Calfactor (%)
0.05	XX.X
0.10	XX.X
0.30	XX.X
0.50	XX.X
1.00	XX.X
1.50	XX.X
2.00	XX.X
2.50	XX.X
3.00	XX.X
3.50	XX.X
4.00	XX.X
4.50	XX.X
5.00	XX.X
5.50	XX.X
6.00	XX.X

> **Note:** There is a single <TAB> spacing between frequencies and percentages. A sample file is provided in the Program Files folder where MA24106A CalXpert was installed.

Range Connection Characterization and Final Calibration Upload

The MA24106A CalXpert program generates three files that are stored in the program files directory. The default location is: C:\Program Files\Anritsu\CalXpert. These files are:

- **MA24106A_<serial number>.hex**
  This file is generated before user commences the calibration of the sensor and contains old calibration data. This file is generated in cases where users need to revert to original calibration data.

- **NEW_MA24106A_<serial number>.hex**
  This file is generated after the user completes the calibration of the sensor and contains new calibration data.

- **CalibrationReport.xls**
  This file is generated after the user completes the calibration of the sensor. It contains old and new Calfactor and corresponding differences.

The range connection characterization requires a –7 dBm (+/- 0.5 dBm) signal applied to the input of the sensor. A 10 dB fixed attenuator can be connected in-line to improve the source match.

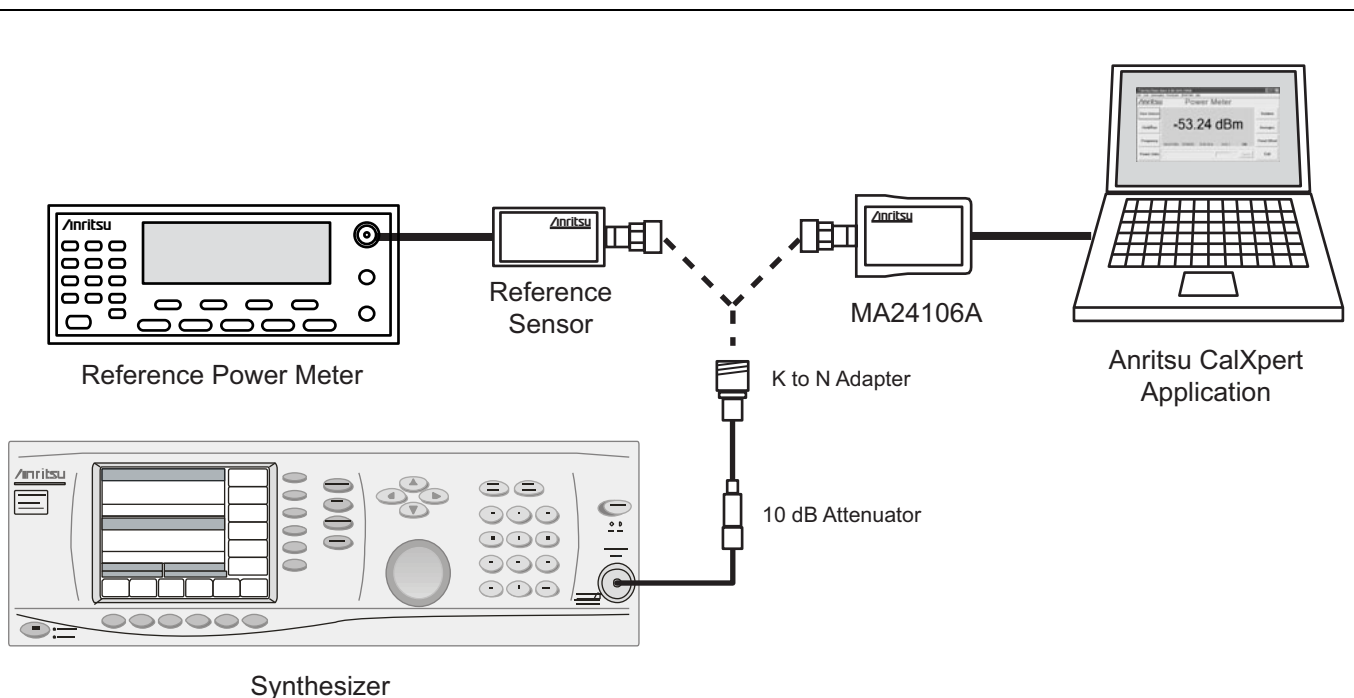**1.** Connect a reference sensor to the synthesizer as shown in Figure 3-1 below:

Figure 3-1.   Range Connection Characterization Setup (typical)

2. Record the synthesizer power settings that result in a measured power of –7 dBm for each of the following frequencies:

Table 3-1.   Synthesizer Frequency and Power Settings

Frequency (GHz)	Synthesizer Power Setting (for –7 dBm)
0.050	
0.100	
0.300	
0.500	
1.000	
1.500	
2.000	
2.500	
3.000	
3.500	
4.000	
4.500	
5.000	
5.500	
6.000	

These recorded settings are used later to properly set the synthesizer when the MA24106A CalXpert wizard prompts for a –7 dBm input.

3. Connect the power sensor to the PC (Figure 3-1) and launch the MA24106A CalXpert wizard.

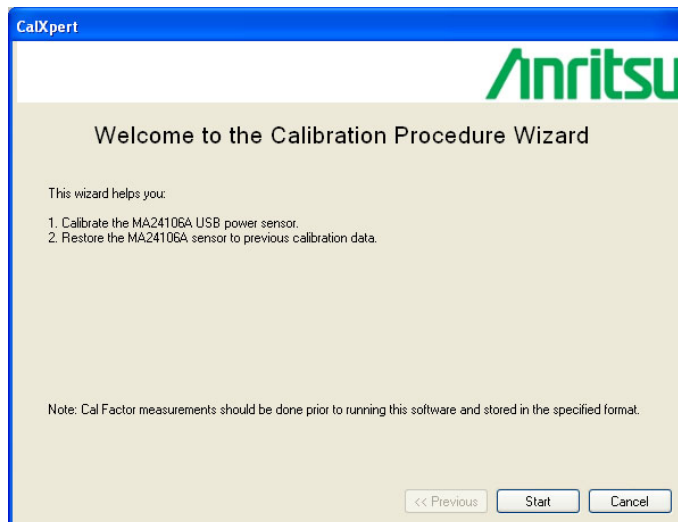**4.** Click Start in the Welcome screen as shown below:

Figure 3-2.   MA24106A CalXpert Welcome

5. Select your sensor from the list and click Next >>. Connected power sensors should populate in a list as shown below. If your sensor is not shown, click the Refresh List button.

Note: If MA24106A CalXpert does not detect your power sensor, refer to the power sensor's documentation for procedures on resolving communication problems.
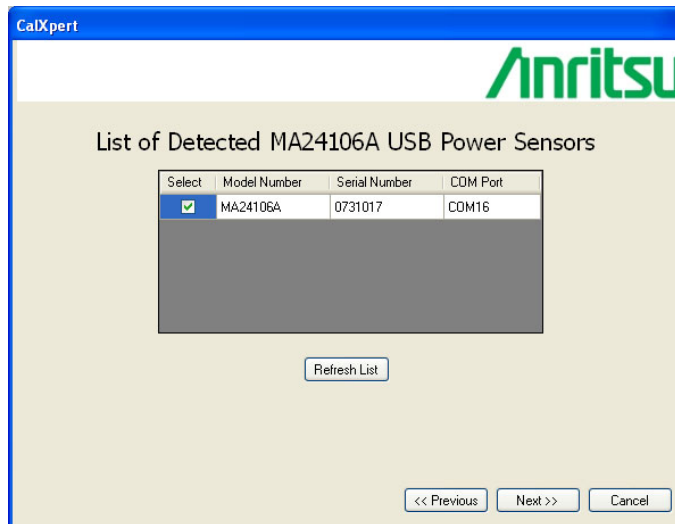

Figure 3-3.   Detected Sensor List

6. The following dialog provides for selecting the Calfactor and 50 MHz Sensitivity file created earlier. Start a new calibration by clicking Browse to select the Calfactor file, then click Next >>. Additional options for restoring a previous calibration (refer to Step. 9) or for instantly detecting the temperature of the power sensor are also available.
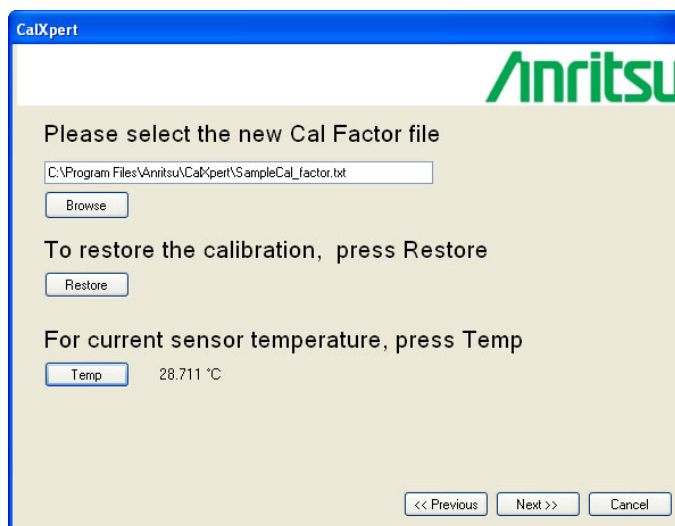

Figure 3-4.   MA24106A CalXpert File Selection, Restore Calibration, and Temperature Check

---

7. The MA24106A CalXpert wizard now guides you through a series of 17 steps to complete the calibration. Follow the on-screen instructions as shown below.
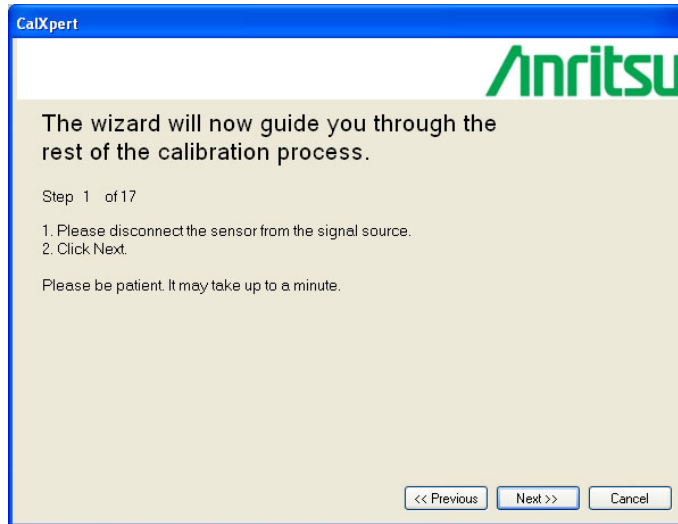

Figure 3-5.   MA24106A CalXpert Wizard Step (1 of 17)

8. When the calibration is complete, the following screen is displayed. Click Finish to close MA24106A CalXpert.
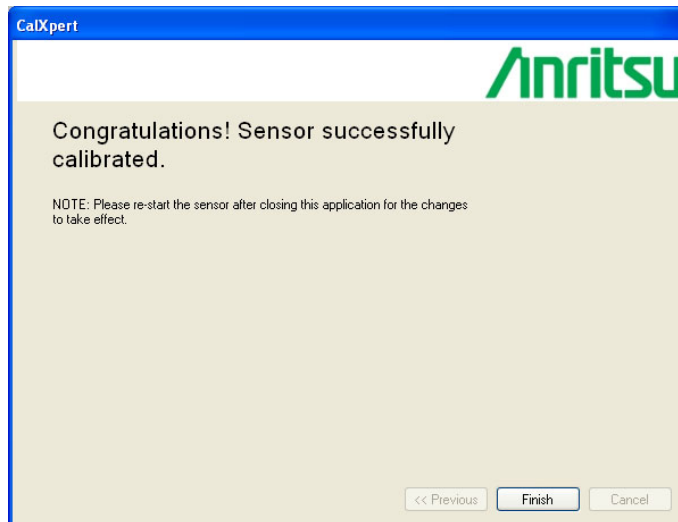

Figure 3-6.   Calibration Complete

9. To restore a previous calibration, click Restore (Figure 3-4) and select the appropriate HEX file, then click the Load button as shown below.
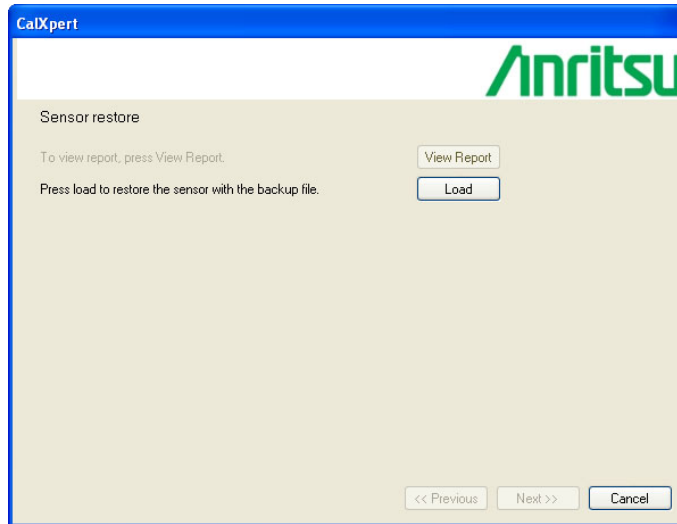

Figure 3-7.   Loading (Restoring) a Previous Calibration

10. When the calibration has been successfully restored, the following screen is displayed. Click Finish to close MA24106A CalXpert.
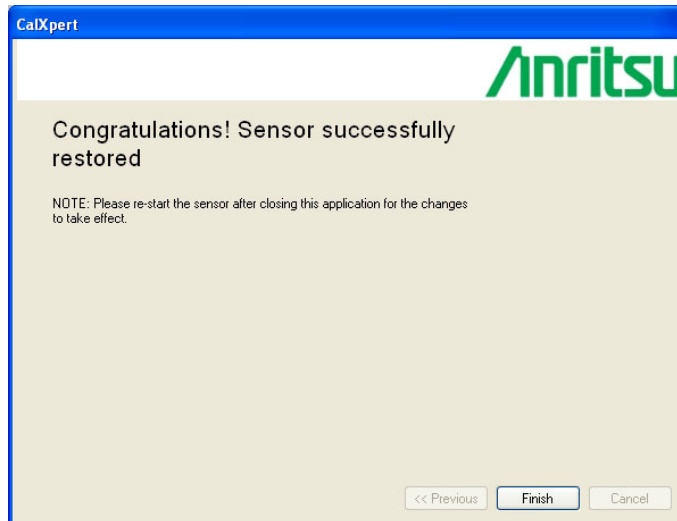

Figure 3-8.   Restored Calibration Complete

3-2   Automating the Calibration Using DLL's

If desired, the MA24106A CalXpert functionality can be automated into exiting automated calibration programs via DLLs supplied by Anritsu. The supplied DLL's are interdependent and should always be copied together as a group. The following DLL's are used for the automated operation:

- USBPowerSensorLibrary.dll
- office.dll
- Microsoft.Vbe.Interop.dll
- Microsoft.Office.Interop.Excel.dll

The main DLL file is the USBPowerSensorLibrary.dll. Other DLL's are its dependencies. The main class in USBPowerSensorLibrary.dll is USBPowerSensorDriver class whose functions can be accessed by including the namespace USBPowerSensorLibrary and creating an instance of the class by instantiating it with the code line (C#):

```
private USBPowerSensorDriver psDriver = new USBPowerSensorDriver();
```

The functions in the DLL can then be accessed through this object. The DLL contains many useful functions listed below:

Sensor Detection and Enlisting Functions

All of the following functions are used for auto detection of the MA24106A sensors:

The following function can be registered to an event in the parent application and it will update the main application with the serialNo and Ports of the connected sensors. It is implemented as a delegate.

```
UpdateSensorListEvent
```

The following function refreshes and generates refresh events for all of the connected sensors. Auto detection can be disabled or enabled by using the auto detection functions.

```
RefreshSensorList
```

The above functions can be understood from the calibration application source code shown below:

```
public event USBPowerSensorDriver.UpdateSensorListDelegate
UpdateSensorListEvent;

public delegate void UpdateSensorListDelegate (string serialNo, string comPort);

public void RefreshSensorList();

public void USBPS_EnableSensorAutoDetection();

public void USBPS_DisableSensorAutoDetection();
```

Connection/Disconnection Functions

The following functions return `True` if successful:

```
public bool USBPS_Connect(string comPortNumber, string sSerialNumber);

public bool USBPS_Disconnect();
```

Calibration Read/Write Functions

The following function reads the current/original calibration data from the sensor and stores it in MA24106A_<serialnumber>.hex file. It returns `True` if successful.

```
public bool GetCalData();
```

The following function loads the calibration data from the given hex file specified in the path parameter and returns `True` if successful.

```
public bool LoadSensor(string path);
```

The following function checks and extracts the information from the given CalFactor text file as specified in the path parameter. It returns `OK` if successful. Any other response indicates an error.

```
public string CheckAndExtract(string path);
```

The following function generates the new calibration file after all of the analysis and data collection is complete. The file is saved as NEW_MA24106A_< serialnumber >.hex. It returns `True` if successful.

```
public bool GenerateNewFile();
```

The following function reads the old calibration file and the new calibration file and generate the report for the calibration at the specified path. The file is saved as CalibrationReport.xls. It returns `True` if successful.

```
public bool GenerateReport(string path);
```

Data Collection Functions

All functions below are interfaces to sensor commands:

The following function collects data when the sensor is not connected to any signal source. This should always be the first step of calibration data collection. Returns "OK" if the data is successfully connected. Any other response indicates an error.

```
public string GetDataOpen();
```

The following function collects data at a particular frequency as specified by the parameter. The signal source should be set at the same frequency before calling this function. Returns "OK" if the data is successfully connected. Any other response indicates an error.

```
public string GetDataAtGHz(double dFrequency);
```

Additional functions to sensor commands:

```
//returns internal temperature of the sensor as float value.
public double USBPS_GetTemperature();

//returns the identification string as read from the sensor.
public string USBPS_RequestIDN();

//sends "START" command to the sensor.
public void USBPS_SendStart();

//sends "STOP" command to the sensor and returns sensor's response as string.
public string USBPS_SendStop();
```

Automation Steps

1. Determine Calfactor and 50 MHz sensitivity as explained earlier in this chapter. Save this Calfactor file as .txt file.

2. Connect to the sensor using the DLL "USBPS_Connect(comport,serial)" function.

3. Read in the given Calfactor file by calling the DLL function "CheckAndExtract(path)" where path is the path to the Calfactor text file.

4. Start the sensor by calling DLL "USBPS_SendStart()" twice with a 50 ms delay between each call.

5. Disconnect the sensor from any signal source and run DLL "GetDataOpen()".

6. Connect the sensor to the signal source and adjust source power until the input power to the sensor is −7 dBm +/- 0.5 dB.

7. Set the frequency of the signal source to 50 MHz.

8. Run DLL function "GetDataAtGHz(0.05)" to read data at 50 MHz.

9. Repeat Step 8 for each of the following frequencies (in GHz):

   0.1, 0.3, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0

   Ensure that the correct value is passed to the parameter of the DLL function "GetDataAtGHz()". The function takes the frequency in GHz as its parameter. Also make sure that the data for all of the above frequencies is collected before going to the next step.

10. After collecting data at each frequency, run DLL "GetCalData()". It will read the old calibration file from the sensor and save it as 'MA24106A_<serialNum>.hex'.

11. Run DLL "GenerateNewFile()". This file takes data generated in Steps 1, 8, 9, and 10 and prepares a final calibration file after doing all the analysis and math. The new file is saved as: NEW_MA24106A_<serialNum>.hex

12. Run DLL "LoadSensor(string path)" where path is the path of the new calibration file saved in the previous step. This loads the sensor with new calibration data generated in Step 11.

13. Run DLL "GenerateReport(string path). This DLL reads the old and new calibration files and generates the report in a file "CalibrationReport.xls" for the calibration at the specified path.

14. The sensor is now calibrated and can be disconnected from the application by running DLL "USBPS_Disconnect()".

3-3 Verifying Calibration

The calibration can be verified by running operational tests outlined in the power sensors documentation.

Appendix A — Connector Care and Handling

Anritsu MA24106A Power Sensors are high-quality precision laboratory instruments and should receive the same care and respect afforded to such instruments. Follow the precautions listed below when handling or connecting these devices. Complying with these precautions will guarantee longer component life and less equipment down time due to connector or device failure. Also, such compliance will ensure that Power Sensor failures are not due to misuse or abuse – two failure modes not covered under the Anritsu warranty.

Beware of destructive pin depth mating connectors

Destructive pin depth of mating connectors is the major cause of failure in the field. When an RF component is mated with a connector having a destructive pin depth, damage will usually occur to the RF component connector. A destructive pin depth is one that is too long with respect to the reference plane of the connector (Figure A-1, left).

The pin depth of DUT connectors should be measured to assure compatibility before attempting to mate them with Power Sensor connectors. An Anritsu Pin Depth Gauge or equivalent can be used for this purpose (Figure A-1, right)
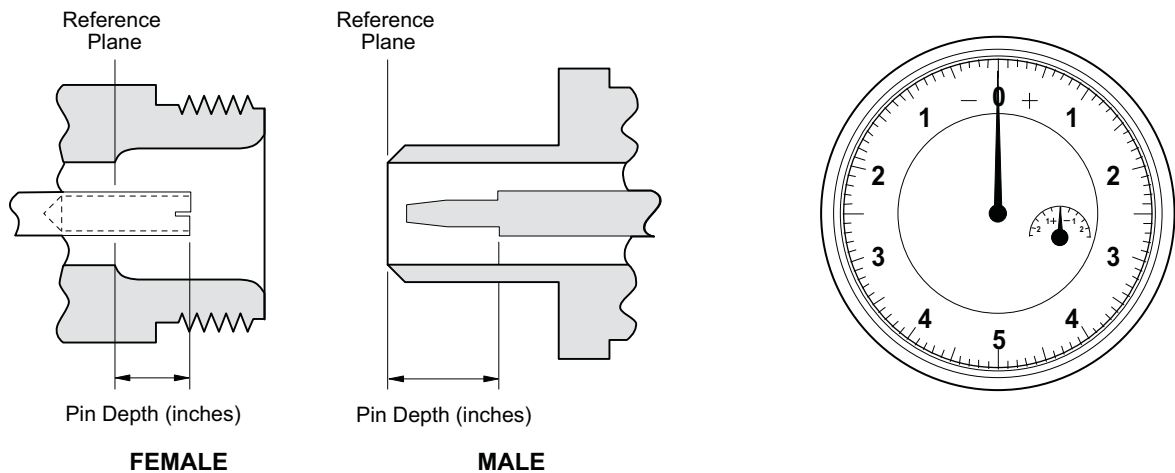

Figure A-1. Pin Depth

If the measured connector is out of tolerance in the "+" region, the center pin is too long (see Table A-1, below). Mating under this condition will likely damage the precision RF component connector. If the test device connector measures out of tolerance in the "−" region, the center pin is too short. This should not cause damage, but it could result in a poor connection and a consequent degradation in performance.

Table A-1. Allowable DUT Connector Pin Depth

Connector Type	Pin Depth Gage Model #	Pin Depth (inches)	Pin Depth Gage Readout
N-Male	SC3825	0.207 +0.030 −0.000	0.207 +0.000 −0.030
N-Female	SC3825	0.207 +0.000 −0.030	0.207 +0.000 −0.030

Avoid over torquing connectors

Over torquing connectors is destructive; it may damage the connector center pin. Always use a connector torque wrench when tightening connectors. Never use pliers to tighten connectors.

Avoid mechanical shock

Connectors are designed to withstand years of normal bench handling. However, do not drop or otherwise treat them roughly. Mechanical shock will significantly reduce their service life.

Avoid applying excessive power

The MA24106A sensor is rated at 150 W maximum continuous input power given a load VSWR of 3:1 or less. Exceeding the maximum input power level may permanently damage the internal components, rendering the power sensor useless.

Cleaning connectors

The precise geometry that makes the RF component's high performance possible can easily be disturbed by dirt and other contamination adhering to the connector interfaces. When not in use, keep the connectors covered. To clean the connector interfaces, use a clean cotton swab that has been dampened with denatured alcohol.

The following are some important tips on connector care:

- Use only isopropyl alcohol as a cleaning solvent. Do not use excessive amounts of alcohol as prolonged drying of the connector may be required.
- Never put lateral pressure on the center pin of the connector.
- Verify that no cotton or other foreign material remains in the connector after cleaning.
- If available, use compressed air to remove foreign particles and to dry the connector.
- After cleaning, verify that the center pin has not been bent or damaged.
- Avoid touching connector mating planes with bare hands. Natural skin oils and microscopic dirt particles are very hard to remove.
- Always check the pin depth of DUT connectors before use to determine if they are out of spec. One bad connector can damage many.
- Always use an appropriate torque wrench.
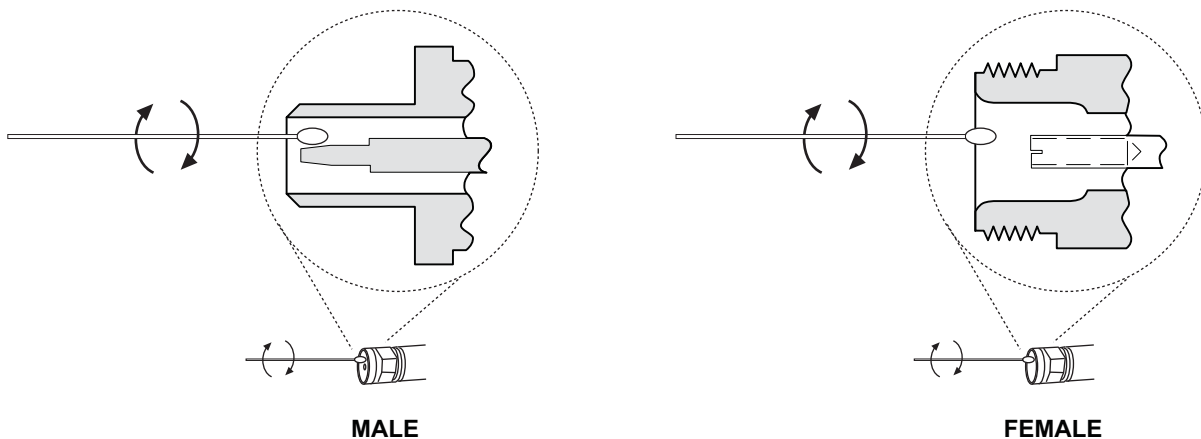- Put dust caps on the connector after use.

MALE   FEMALE

Figure A-2.   Cleaning Connectors

Anritsu