

Model AMS-8050

Antenna Measurement System

User Manual



 **ETS-LINDGREN**[™]
An ESCO Technologies Company

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Notes, Cautions, and Warnings

| | |
|---|---|
|  | <p>Note: Denotes helpful information intended to provide tips for better use of the product.</p> |
|  | <p>Caution: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.</p> |
|  | <p>Warning: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.</p> |



See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

General Safety Considerations

| | |
|---|---|
|  | <p>The electrical installation of this product should be accomplished by an individual who is authorized to so do by the appropriate local authority.</p> <p>The installation should be in compliance with local electrical safety codes.</p> |
|  | <p>Do not make any modifications to this unit without consulting the factory directly.</p> |



See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

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1.0 Introduction

The ETS-Lindgren AMS-8050 is a compact, fully anechoic RF enclosure for antenna pattern measurements. This over-the-air test system for wireless device measurement may be used for:

- Pre-certification testing
- Design validation
- Performance measurement
- Production testing

The AMS-8050 is an ideal solution when space is a limitation as it is a self-contained, freestanding test chamber. Integrated drawers allow components required for testing to remain with the system. The chamber is incorporated into a movable chassis allowing the entire system to be transported between different test stations. The ability to transport the system and store all components within the cart makes it an ideal solution for multiple research and development groups.



Figure 1: AMS-8050 Antenna Measurement System

The integrated, turnkey, antenna measurement system makes efficient pre-certification two and three dimensional (2-D and 3-D) test measurements with the help of ETS-Lindgren's EMQuest™ EMQ 100 test software. The AMS-8050 system is able to perform 3-D antenna pattern measurements regardless of the antenna under test and may be equipped with an active transmitter. Antenna pattern measurement is achieved quickly and accurately due to the use of a dual polarized measurement antenna and precise, low visibility, multi-axis positioning system (MAPS).

The AMS 8050 System includes our versatile EMQuest EMQ 100 Antenna Pattern Measurement Software. The software makes fully automated (pattern and frequency response) measurements for both active and passive antennas, including their vector and scalar qualities, in either transmit or receive mode. Post-processing capabilities include calculations for directivity, gain, radiation efficiency, total radiated power and total isotropic sensitivity. EMQ 100 also calculates industry specific quantities such as Near-Horizon Partial Radiated Power and Near- Horizon Partial Isotropic Sensitivity required by the CTIA Over-The-Air Performance Test Plan. Advanced graphic capabilities allow data to be shown in a variety of 2-D and 3-D formats, exported to Microsoft Excel, PDF files or saved in Microsoft RTF format.

Standard Configuration



ETS-Lindgren may substitute a similar part or new part number with the same functionality for another part/part number. Contact ETS-Lindgren for questions about part numbers and ordering parts.

- AMS-8050 fully RF anechoic test chamber, prepared for transportation (with crate)
- MAPS (Multi-Axis Positioning System) and drive system (mounted in the drive cart)
- Model EMCenter with RF Switches (mounted in the system cart)
- Model 3164-08 dual-polarized antenna (mounted in the end wall)
- Communication antenna (mounted in the ceiling)
- Electrical power filter for drive system motor-base (mounted in the drive cart)
- Electrical power filter for equipment/EUT outlets (mounted in the drive cart)
- One, ½ inch threaded pipe penetration (mounted in the system cart)
- One, type N feed thru (mounted in the system cart)
- One, type SMA feed thru, fixed (mounted in the system cart)
- One, type SMA feed thru, rotating (mounted in the system cart)
- One, IEC outlet strip for test equipment (mounted in the system cart)
- RF shielded hatch

Optional Items



Additional options may be available. Please contact your sales representative for a complete list of options.

INFRARED (IR) CAMERA SYSTEM

The IR camera system including monitor, power filter and required cables, allows the user to observe the EUT while a test is in progress.

- Camera panel module with integrated filter
- 15-inch (38.1 cm) LCD monitor
- Camera power supply
- BNC video cable

MODEL 3126 PRECISION REFERENCE SLEEVE DIPOLE ANTENNAS

As an option, ETS-Lindgren Model 3126 series dipole antennas cover various frequencies and may be used to perform calibration tests in the AMS-8050.

TEST FIXTURES

As an option, the AMS-8050 system may include various test fixtures including:

- Phantom Head
- Phantom Hand

DEVICE MOUNTS

As an option, the AMS-8050 system may include several different mounts for various test fixtures. The mounts include, but are not limited, to:

- Personal Computing Device Mount
- Phantom Hand Only Mount
- SAM Head/Hand Mount
- Free Space Phantom Hand Mount

ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Warranty information
- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS Lindgren calibration service
- ETS Lindgren contact information

2.0 Maintenance

WARNING

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.



Maintenance of the AMS-8050 is limited to external components such as cables or connectors. If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Maintenance Recommendations

HATCH MAINTENANCE

Use care when cleaning the finger stock to avoid bending or breaking the springs which will jeopardize the hatch seal.

CAUTION

Greasing or painting the finger stock will jeopardize the hatch seal.



Figure 2: Finger Stock

The contact surfaces of the hatch leaf must be kept clean from dirt and grease to ensure RF integrity of the system. It is very important that the RF-contact springs and knives are kept clean.

Periodically clean the finger stock around the hatch of the AMS-8050 with isopropyl alcohol. Note that finger stock is present on both the hatch and the hatch-frame. Apply the cleaning agent and wipe the springs carefully, ensuring that the cloth does not catch on the springs bending or breaking them.

Regularly check for foreign objects in the contact spring profile. Foreign objects may damage the finger stock and the hatch frame. Promptly remove any foreign objects.

Contact ETS-Lindgren Custom Service to order replacement parts if damage occurs to the finger stock.

Part Lubrication

A tube of silicone oil is included with the AMS-8050 system. Periodic use of the oil to lube the synthetic pieces of the dipole and SAM head mounts is recommended.

Replacement and Optional Parts

The packing list in the Pre-Installation section of this manual identifies parts and their corresponding part numbers. Use this list to order additional or replacement parts as necessary. Optional parts and their part numbers may be obtained from the ETS-Lindgren Customer Service department.

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

3.0 Specifications

Physical Specifications

| | |
|--|--|
| Operating Requirements (±20%) | Temperature: 70°F (21°C) Relative Humidity: 70% |
| Overall Dimensions (including cart) L x W x H | 8.5 x 5 x 6.3 feet (2.59 x 1.52 x 1.82 meters) |
| Overall Weight (approximate) | 1,800 lbs (816.5 kg) |
| Overall Dimensions Prepared for Transportation (with crate) L x W x H | 9.83 x 5.83 x 7.3 feet (2.99 x 1.78 x 2.23 meters) |
| Overall Weight Prepared for Transportation (with crate) (approximate) | 2,890 lbs (1,311 kg) |
| RF Shielded Hatch Opening Dimension | 30 x 30 inches (76.2 x 76.2 meters) |



The AMS-8050 must be protected against humidity, water, dirt or condense water.

Electrical Power Requirements



The electrical installation of this product is to be accomplished by an individual who is authorized by the appropriate local authority.

The installation must be completed in compliance with local electrical safety codes.

DRIVE SYSTEM ELECTRICAL REQUIREMENTS



NEMA 5-15p
UL CSA

Figure 3: Drive Wiring

The drive system power requirement is a 250 VAC-50/60 Hz-15 Amps, NEMA plug configuration 6-15.

EQUIPMENT/EUT RECEPTACLE REQUIREMENTS



NEMA 5-15p
UL CSA

Figure 4: EUT Wiring

The equipment/EUT power requirement is 115/230 VAC-5 Amps, NEMA plug configuration 5-15.

SCHUKO POWER CONNECTION



Schuko
UL CSA

Figure 5: Schuko Connection

Schuko power plugs are included for European power requirements. The exchange of the power connections requires a qualified electrician. Provide a 230 VAC 10 Amp Schuko connection.

User Provided Equipment

Additional equipment provided by the user is required to complete tests in the AMS-8050.



The AMS-8050 standard configuration includes only the EMCenter controller: all other equipment shown is optional or customer provided. Contact your sales representative for more information regarding recommended equipment.

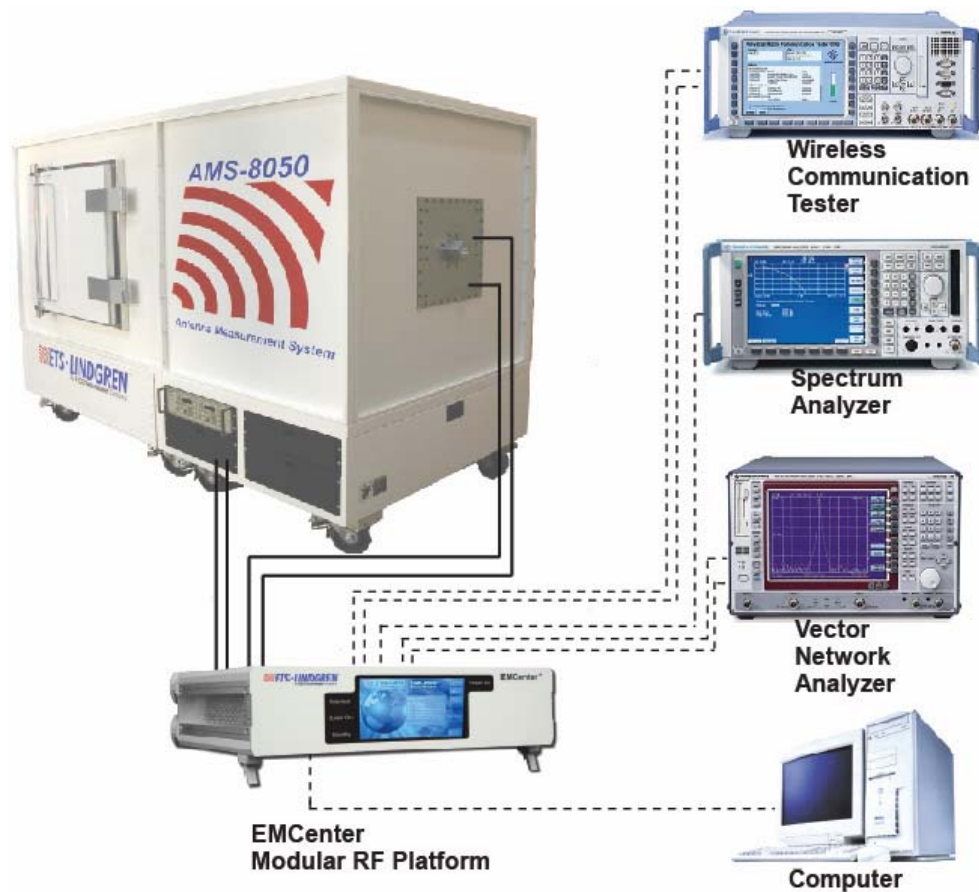


Figure 6: AMS-8050 System Configuration

WIRELESS COMMUNICATION TESTER

A wireless communication tester is needed for over-the-air (OTA) testing [AMPS, CDMA 2000, CDMA-1, GSM, GPRS/EGPRS, TDMA and WCDMA options] (customer selected testing).

SPECTRUM ANALYZER

A spectrum analyzer is needed as the measurement receiver; an RF switch is configured to toggle the measurement receiver to the two receiving ports of the dual-polarized antenna

VECTOR NETWORK ANALYZER

By using a vector network analyzer, the signal generator and the multi-channel receivers are integrated into a single unit with phase lock for both amplitude and phase measurements. In this test configuration, the AUT is excited through a RF cable by the built-in, synthesized signal generator of the VNA.

WINDOWS™ COMPATIBLE COMPUTER

The EMQuest™ EMQ-100 software must be installed on a Windows™ XP or Windows™ 7 operating system compatible computer with Microsoft Office see current EMQuest documentation for the most up to date system specifications. Contact customer service for additional information.

4.0 Pre-Installation Tasks

WARNING

Before connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

Unpacking

PACKING LIST

The following items are included in the packaging. Use the checklist that follows to verify all items were received with the system.

| Rec'd | |
|-------|--|
| | <i>RF cable kit, part #107552-72 including:</i> |
| | One (1) Rotary Joint, Part #107569 |
| | Two (2) SMA Adapters, Part #514052 |
| | One (1) SMA Adapter, Part #514053 |
| | Two (2) SMA Adapters, Part #514054 |
| | Two (2) SMA Adapters, Part #514062 |
| | One (1) SMA Attenuator, Part #514061 |
| | One (1) Ferrite Beaded Cable, Part #109013-06, 15.24 cm |
| | One (1) Ferrite Beaded Cable, Part #109013-07, 17.78 cm |
| | One (1) Ferrite Beaded Cable, Part #109013-08, 20.32 cm |
| | One (1) Ferrite Beaded Cable, Part #109013-12, 30.48 cm |
| | One (1) Ferrite Beaded Cable, Part #109013-18, 45.72 cm |
| | One (1) Ferrite Beaded Cable, Part #109013-57, 1.448 m |
| | <i>Storage Box Contents:</i> |
| | One (1) Silicone oil, Part #890943 |
| | One (1) SMA torque wrench, Part #891076 |
| | One (1) Schuko plug, Part #510089 |
| | One (1) Schuko cord set, two (2), Part #670023 |
| | One (1) EMQuest™ Pattern Measurement software, Part #EMQ-100 |

| Rec'd | |
|-------|--|
| | One (1) T-handled Allen wrench, Part #960010 |
| | Tool Kit, Part #110583 |
| | <i>User Manuals</i> |
| | AMS-8050 User Manual, Part #399777 |
| | EMCenter™ Modular RF Platform Controller Manual, Part #399342 |
| | Model 3164 Horn Antenna user manual, Part #399261 |
| | <i>Antenna mount package including (packed inside system cart rear opening):</i> |
| | One (1), vertical range loss test fixture, Part #110165 |
| | One (1), horizontal range loss test fixture, Part #110166 |
| | SAM head mounting plate, Part #110122, with screws |
| | Free-space mounting, Part # 110185 |
| | Offset mount, Part #110161 |
| | IEC C13-C14 electrical cords, two (2), Part #670038 |
| | One (1) RFC-SMR-100-SMS-100 IN (2.54m) |
| | One (1) RFC-SMR-100-SMS-200 IN (5.08m) |
| | One (1) RFC-SMS-100-SMS-100 IN (2.54m) |
| | One (1) RFC-SMS-100-SMS-120 IN (3.05m) |

5.0 Assembly and Installation

WARNING

Before connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

WARNING

The AMS-8050 must be protected against humidity, water, dirt or condense water. See the **Physical Specifications Table** in the **Specifications Section** of this manual for accurate temperate and humidity ratings.

Locating the AMS-8050

Before moving the AMS-8050, verify the dimensions of the hallway and doorway meet those illustrated below. If the dimensions are acceptable, ensure the hatch is closed and power has been removed from the system then release the brake from each caster and relocate the system.

If the dimensions of the hallway and doorway do not meet those illustrated, the system will need to be disassembled. Contact ETS-Lindgren Customer Service for instructions regarding disassembly and relocation.



When using an elevator to relocate the system, verify the elevator will accommodate the size and weight of the system and accompanying personnel before attempting to move.

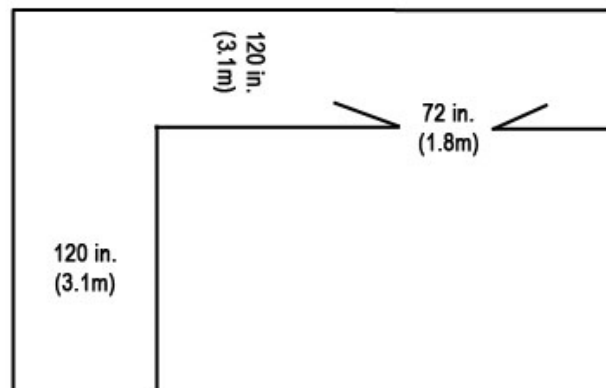


Figure 7: Minimum Corridor and Doorway Dimensions

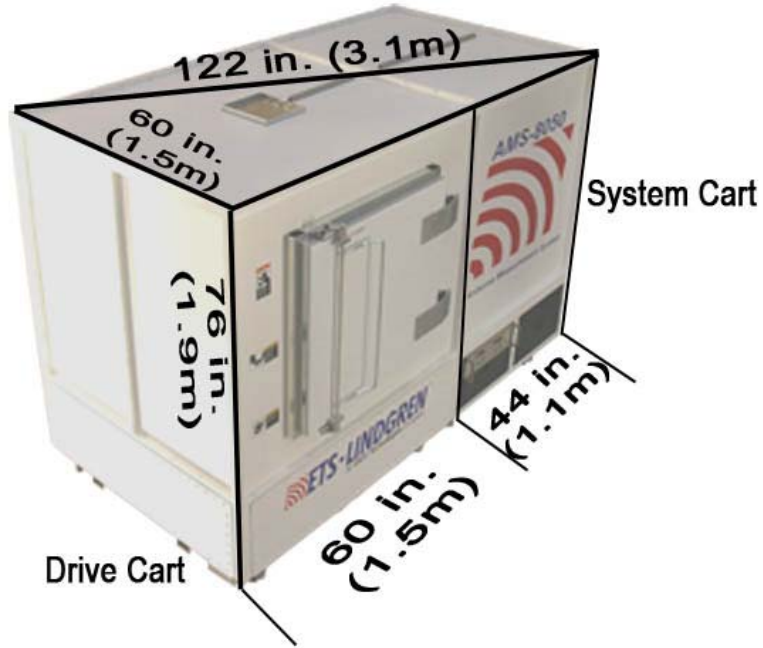


Figure 8: AMS-8050 Outer Dimensions

RF SHIELDED HATCH

Close the hatch carefully to ensure that the locking mechanism is engaged at all points; excessive force is not required. Do not attempt to move or operate the system if the hatch does not close properly

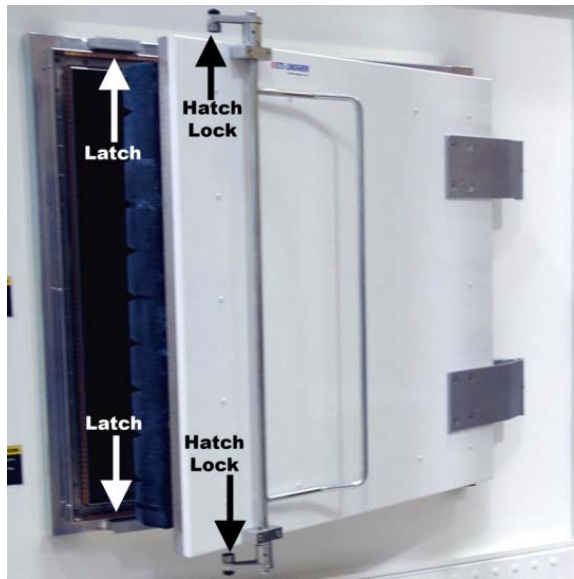


Figure 9: RF Shielded Hatch

LOCKING CASTERS

Once the AMS-8050 has been moved to the intended location, ensure the casters are in the locked position prior to configuring or operating the AMS-8050. To lock the casters, apply pressure to the foot bar provided on each caster.

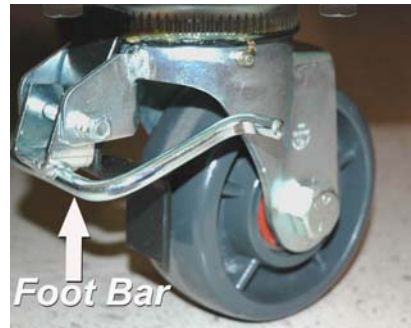


Figure 10: Locking Caster



Remember to release the caster brake before attempting to move the system.

Configuring the AMS-8050

Prior to placing the AMS-8050 test system in service, the following items must be configured to ensure proper operation.

MULTI-AXIS POSITIONING SYSTEM (MAPS)

ETS-Lindgren's Multi-Axis Positioning System (MAPS) is designed to perform measurements of spherical antenna patterns in addition to effective isotropic radiated power of wireless devices. The MAPS is equipped with two motor bases, one to control each rotation axis, controlled through the EMCenter controller through fiber optic control lines. The rotating shaft and assembly is constructed of low reflective dielectric materials. The integrated MAPS system is installed in the drive cart section of the AMS-8050 system.

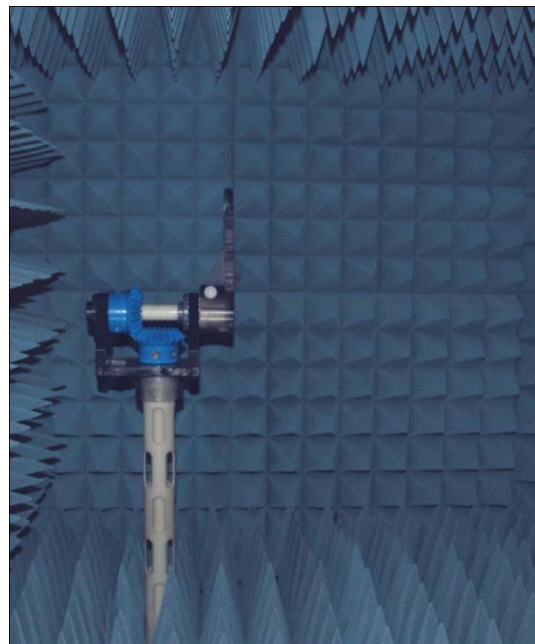


Figure 11: Integrated MAPS System

COMMUNICATION ANTENNA

The ETS-Lindgren communication antenna is mounted in the top of the drive cart section above the MAPS. This antenna is a cavity-backed, square, double-armed, printed spiral antenna developed specifically for ETS-Lindgren's AMS series of chambers. It is a circularly polarized, low profile antenna used for communication with the wireless equipment under test with a frequency range of approximately 700 MHz to 3 GHz.

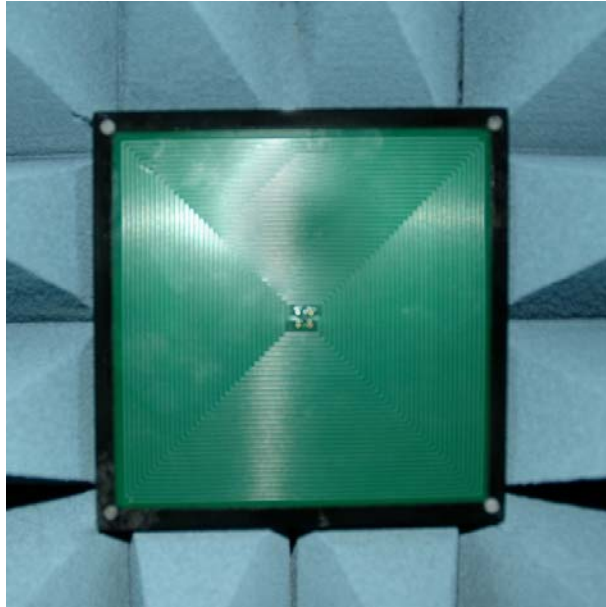


Figure 12: Communication Antenna

MODEL 3164-08 DIAGONAL DUAL POLARIZED HORN ANTENNA

The Model 3164-08 open boundary quad-ridged horn antenna is installed in the end wall of system cart, opposite the MAPS. Similar to two double-ridged waveguide antennas placed orthogonally to each other, the 3164-08 is ideally suited for WiMAX testing with a range of 700 MHz to 10 GHz.

For additional information regarding this antenna, please refer to the Model 3164-08 user manual included with the system.

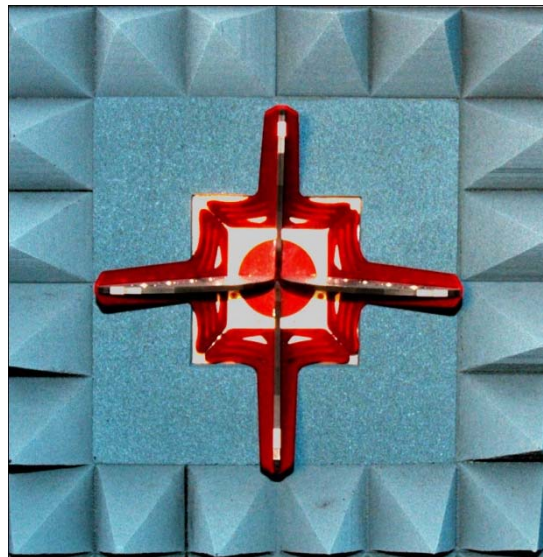


Figure 13: Model 3164-08 Horn Antenna

EMCENTER MODULAR RF PLATFORM

The EMCenter Modular RF Platform, with RF switches, is mounted in the lower section of the system cart. Ensure the controller parameter files are configured correctly prior to putting the system into service.

Refer to the EMCenter Modular RF Platform user manual for information regarding operation and configuration.



Figure 14: EMCenter Modular RF Platform

The steps for connecting the cables associated with the controller follow in the Cable Connection section below.

Cable Connection

The following steps will prepare the system to communicate with the software and integrated controller.

CAUTION

The top of the AMS-8050 is not designed to support a load of any kind. DO NOT physically climb on top of the chamber.

CABLES TO ANTENNA

Begin by connecting the cables to the integrated antennas.

- Using a stepladder and the longest of the RF-Cables, move to the top of the system to access the communication antenna.
- Attach the connector that has a 90-degree angle to the communication antenna. Make certain the cable has good connection by using an SMA torque wrench. Good connections will ensure accurate test results.
- Fit the cable into the interchange provided at the top of the system.

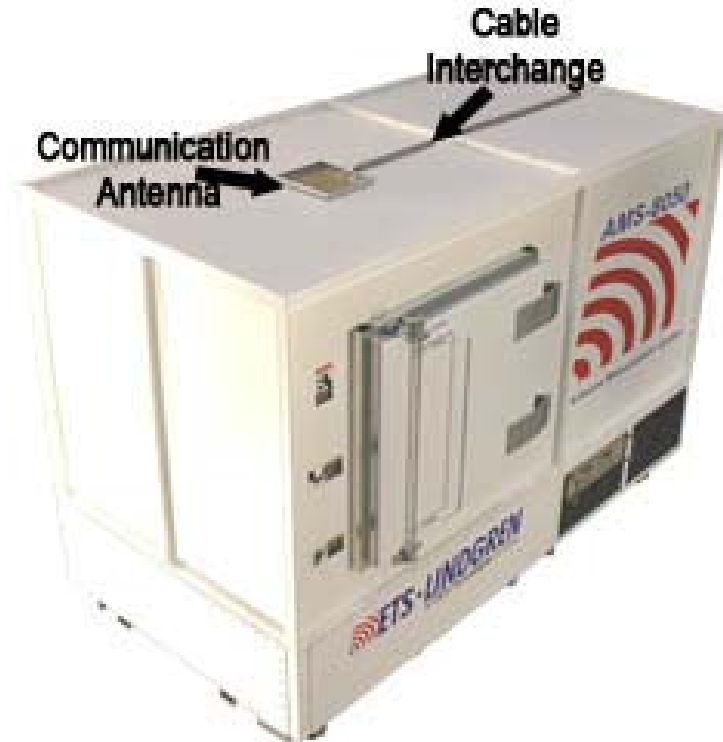


Figure 15: Communication Antenna Connection

- Next, using the two similar length RF cables, attach the cables to the dual polarized horn antenna integrated into the end panel of the AMS-8050.
- Make certain that the cable including a 90-degree connector is connected to the horizontal polarization of the antenna.
- Use the cable that has straight SMA connectors on both ends to connect the vertical polarization of the antenna.
- Verify the cables have been joined securely with the antenna by using an SMA torque wrench.

- Carefully feed all three RF cables into the cable interface provided directly below the dual polarized horn antenna

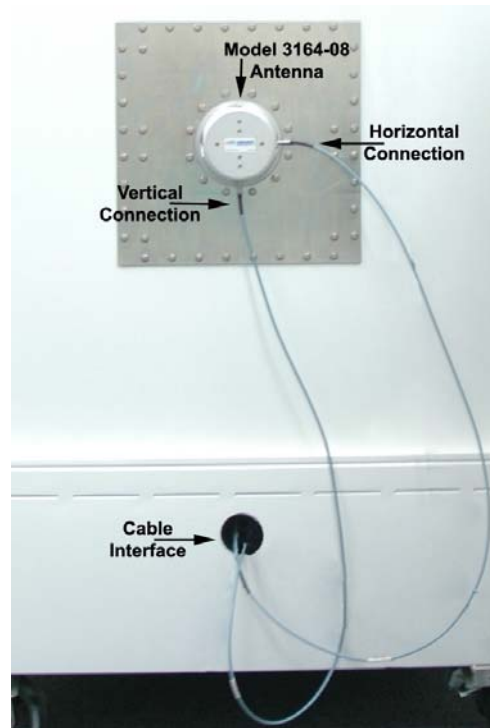


Figure 16: Model 3164-08 Cable Connection

ROUTING CABLES INSIDE THE SYSTEM

The following steps are achieved by working inside the system cart of the AMS-8050.

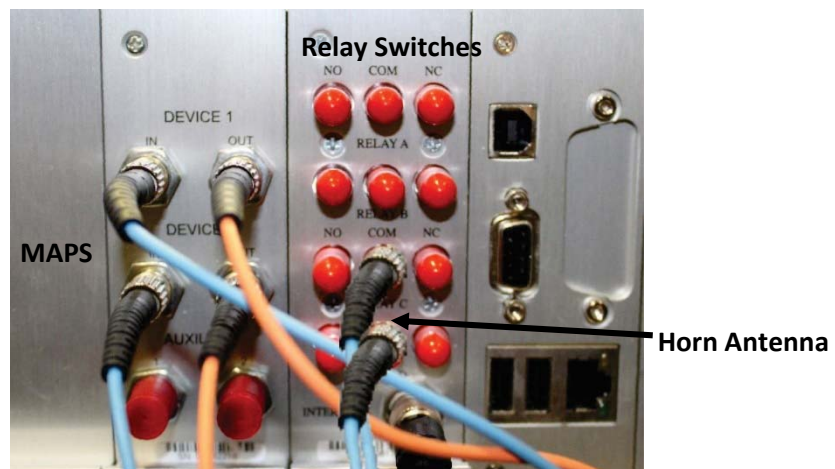


Figure 17: EMCenter Modular RF Platform Cable Connection

- Ensure the four fiber optic cables for the MAPS (turntable) are connected to the device interface ports marked on the back of the EMCenter Modular RF Platform. Confirm the blue cables are connected to the left ports and the orange cables are connected to the right ports.
- Connect the two RF cables for the integrated horn antenna to the relay switches marked “COM” on the back panel of the EMCenter Modular RF Platform.
- Finally connect the power cord provided to the power port on the back of the controller.



Schuko power plugs are included for European power requirements. Exchange of the connections requires a qualified electrical. Please provide a 230 VAC 10 Amp Schuko connection.

- Connect the vector network analyzer and wireless communication tester to the EMCenter Modular RF Platform using the relay switches on the back of the controller.

The customer may provide two additional pieces of equipment to integrate into the relay switches at the back of the EMCenter Modular RF Platform.

FERRITE BEADED CABLE FROM MAPS

The following steps will prepare the MAPS (Multi-Axis Positioning System) for the addition of an EUT/AUT.

Remove the absorber from the top of the MAPS turntable.

Remove the three bolts from the turntable top using the t-handled wrench provided.

Locate the rotary joint located in the center of the MAPS drive. Connect the longest ferrite-beaded cable provided to the rotary joint using the SMA torque wrench provided.

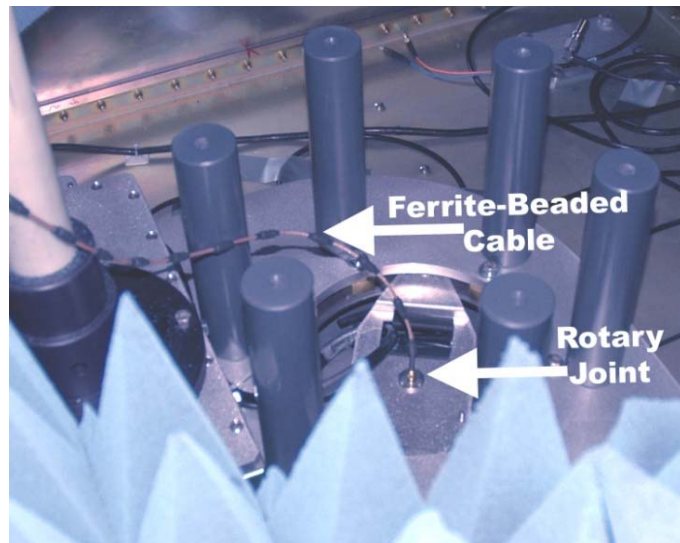


Figure 18: Rotary Joint and Cable Connection

Route the cable from the rotary joint through the slot provided next to the MAPS penetration in the turntable top through the top of the MAPS

Replace the turntable top keeping the excess slack of the cable above the top of the turntable.



Figure 19: Ferrite Beaded Cable to the Top of the Turntable

FINAL CONNECTIONS

To complete the setup of the AMS-8050 system, follow these steps:

- Connect the power for the controller into the integrated power strip.
- Connect the power cord provided to the power filter located under the cart to the integrated power strip.
- Connect the filter power cord to a 125-volt, 15-amp power source and the AMS 8050 power cord to a 250-volt 15-amp power source to provide power to the entire system.

Mounts

Several mounts used to assist in securing antennas or EUT to the mast of the integrated MAPS unit of the AMS-8050 system are included. The following section describes how to install each mount.

FREE-SPACE MOUNT

To connect the free-space mount fixture to the MAPS coupling, turn the lever 180 degrees to lock it in place.

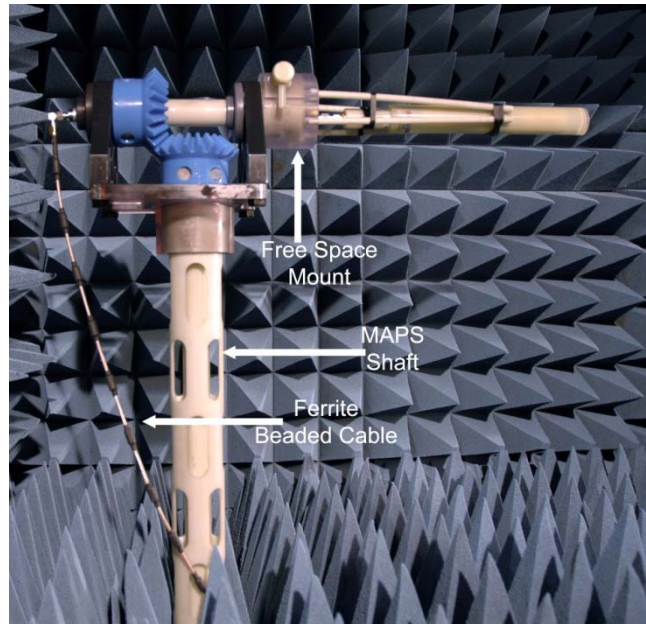


Figure 20: Free-Space Mount

SAM HEAD MOUNT



The SAM head is available as an option to the AMS-8050 system, please contact your sales representative for additional information.

CAUTION

Support the SAM head throughout the entire installation process. Failure to support the SAM head when installing or removing it from the MAPS could result in damage to the head and/or the system.

CAUTION

Check the SAM head mount prior to each test to verify it has not loosened during previous tests.

CAUTION

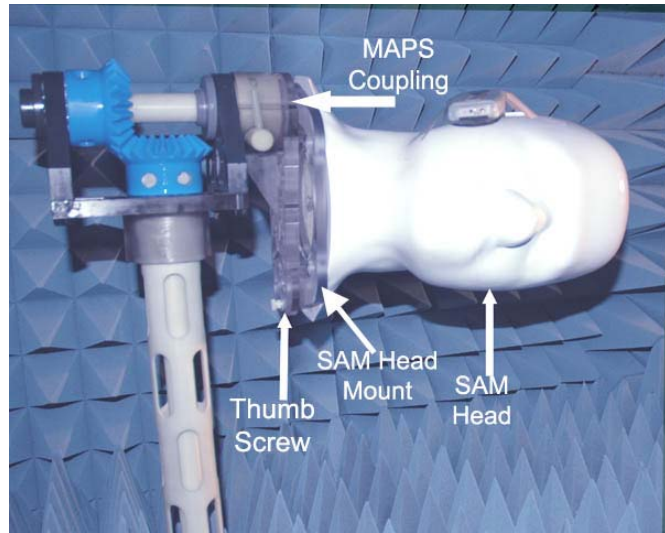
Remove the SAM head from the mounting fixture prior to removing the fixture. Failure to do so could result in damage to the head, chamber and user.

The user must attach the clear plate, or SAM head mount, to the bottom of the SAM head by installing the four plastic screws provided prior to mounting it to the MAPS.

Place the SAM mount on the MAPS shaft and lock it into place by turning the lever 180 degrees.

Place the knobs in the SAM head plate through the holes in the mounting coupling on the MAPS shaft and let the SAM head slide down to secure it in place.

Finally, place the locking ring at the bottom of the SAM mounting fixture and lock the thumbscrew to prevent the SAM head from loosening during testing.



**Figure 21: Mounted SAM Head
(Optional SAM head shown)**

CAUTION

Use only clear masking tape to secure the EUT to the SAM head. Other types of tape may cause interference in the test space. Place the tape in an “X” pattern over the EUT to secure it to the head.

CAUTION

Verify the tape is secure before each series of tests. Failure to secure the EUT properly may result in damage to the EUT and absorber in the AMS-8050 system.

OFFSET MOUNT

To attach the offset mount to the turntable top, begin by carefully removing the two absorber patches from the top of the turntable. Store the absorber patches in a safe location during the calibration equipment set up. Use the two allen screws included to attach the fixture to the top of the turntable.



Figure 22: Offset Mount

VERTICAL AND HORIZONTAL DIPOLE MOUNTS

For a vertical mount, use the shorter of the two clear plastic tubes with a white collar.

Insert the threaded end of the tube into the offset mount on the turntable and carefully hand-tighten.

Thread the ferrite-beaded cable through the slots of the tube to the AUT and ensure a tight connection.

Insert the AUT into the vertical mount and tighten the thumbscrews provided.

Replace the two absorber patches to the top of the turntable.

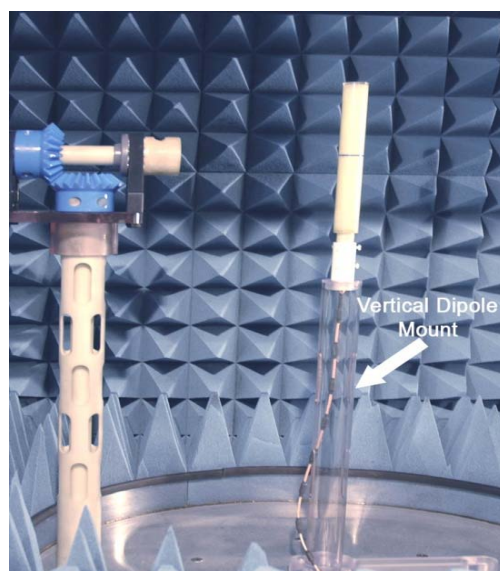


Figure 23: Vertical Dipole Mount
(Optional dipole shown)

For a horizontal mount, use the longer of the two clear plastic tubes with a white collar.

Insert the threaded end of the tube into the offset mount on the turntable and carefully hand-tighten.

Thread the ferrite-beaded cable through the slots of the tube to the AUT and ensure a tight connection.

Slide the AUT into the horizontal mount and insure it is secure.

Replace the two absorber patches to the top of the turntable.

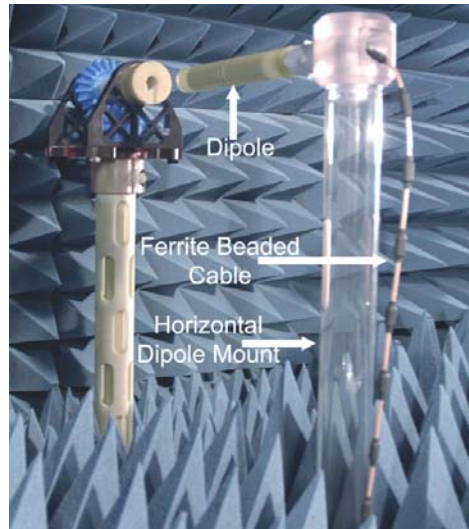


Figure 24: Horizontal Dipole Mount (Optional dipole shown)



When the absorber is replaced on the turntable after installing a dipole mount, it may not be even with the surrounding absorber. Verify the absorber will not be damaged during rotation before proceeding.

EMQuest™ EMQ-100 Antenna Pattern Measurement Software

Please refer to the Help File included with the EMQuest™ software for operation instructions and additional resources.

Optional Infrared (IR) Camera System

The AMS-8050 may, as an option, include an IR camera system. The camera allows the equipment under test to be monitored during rotation.

The optional IR camera system includes:

IR Camera (module includes the IR camera, an absorber patch and an integrated RF filter)

Flat panel monitor

Coaxial cable to monitor

Power cord

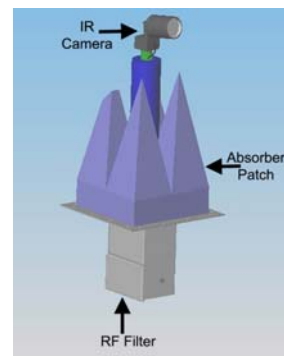


Figure 25: Optional IR Camera Module

INSTALLATION OF THE OPTIONAL IR CAMERA SYSTEM

To install the optional IR camera you will need two people and a 7/16 inch wrench included in toolkit.

- Remove the plastic cover in the floor of the system cart behind the storage drawers.
- Remove the existing shielded panel located in the top of the system cart area behind the storage drawers. The same screws will be used for the new panel.

CAUTION

Absorber is attached to the existing panel; remove the panel with care. Store the panel in a secure location as the system may need to be used in the future without the IR camera in place.

- Slide the IR camera mounting system at a 45-degree angle through the opening with the lens pointed toward the drive cart/MAPS.
- When the camera is inside the AMS-8050 test area, carefully straighten the camera mount and align the holes on the panel and the system.
- Insert the screws removed from the original panel into the camera panel and tighten.
- Run the video cable to connect to the monitor.
- Plug the power supply into the IEC power strip mounted in the floor of the system cart.
- Finally, connect the plug from the power supply into the camera filter port.

For information regarding the operation of the monitor, refer to the operator's manual included with the system.

6.0 Total Isotropic Sensitivity (TIS) Range Calibration

WARNING

Before placing the AMS-8050 into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

This procedure guides the user to determine the proper range calibration loss values contributed to the test equipment used for TIS tests.

Required Equipment

In addition to the AMS-8050 system and its associated accessories, the user will need the following to complete this test:

- Vector network analyzer (VNA), an equipment rack configuration is suggested.
- Low-loss Cable—able to reach from the receive port of the VNA to the transmit antenna mounted on the turntable in the test system (also known as the spare loop back RF cable).
- Dipole antenna(s)

Thru-Calibration

The equipment rack must be configured in TIS test mode. Once the range calibration is complete, return all connections for the equipment back to the configuration for the TIS test mode.

1. Turn on power to the equipment rack.
2. Turn off power to the spectrum analyzer and the wireless communication tester, as these will not be needed for this test.
3. Turn on power to the VNA and allow 30 minutes for warm-up.
4. Connect a cable from the SMA connector, located in the sidewall of the system cart, to the transmit port of the VNA.
5. Next, connect the 10 dB attenuator and longest ferrite-beaded cable to the cable located under the MAPS turntable and to the receive port input on the VNA using a loop back RF cable.



Refer to the Assembly and Installation, Ferrite Beaded Cable from MAPS section for instructions to connect the cable under the MAPS.

Software Set-up Procedure

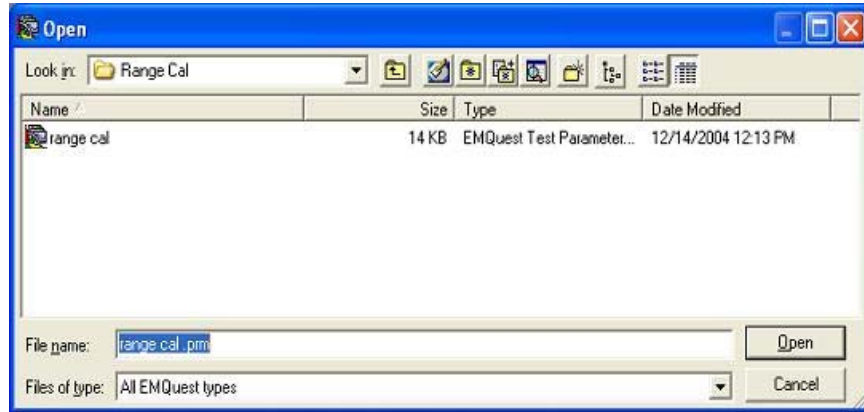


Figure 26: Open EMQuest

1. Open the EMQuest™ measurement software.
2. Select and load the parameter file labeled “Range Cal” in the **Parameters** folder. All parameter files are standard for each test and will not need to be modified.



Refer to the EMQuest software help file and the AMS-8050 video tutorial included with this manual for additional information regarding parameter creation.

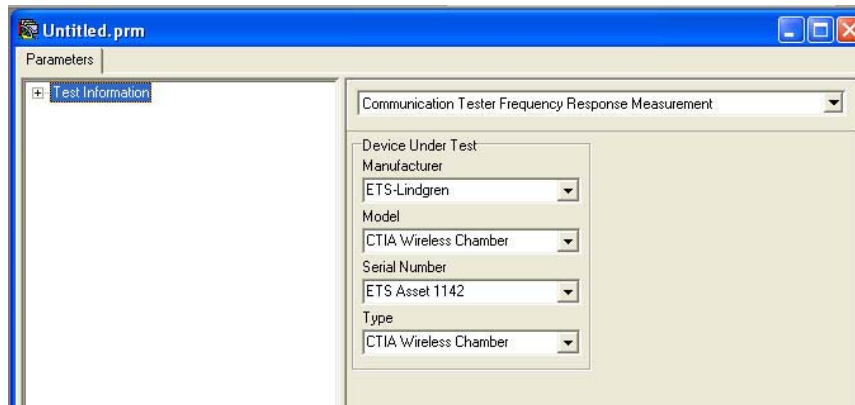


Figure 27: Setting Up the Parameter File

3. Fill in all test information fields in the parameter file by entering the appropriate variables.

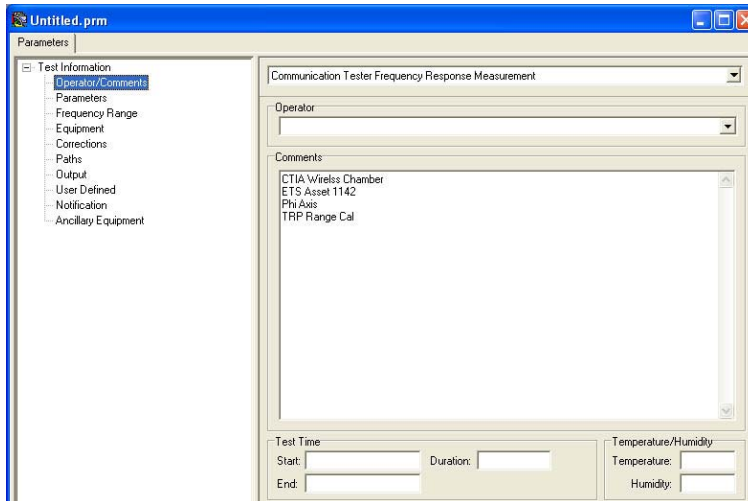


Figure 28: Test Information Table, Operator/Comments

4. Open the **Test Information** table by selecting the “+” symbol next to the term. Select the **Operator/Comments** folder and fill in the requested information. List the polarization and antenna type used for each test. For example, Theta Polarization_3126-880 LF Antenna.
5. The **Parameters** folder will remain standard for each test and will not be modified.
6. The **Frequency Range** folder will remain standard for each test and will not be modified. The frequency range 780 MHz to 2290 MHz is sufficient to cover TIS frequencies.
7. The **Corrections** folder is not required.

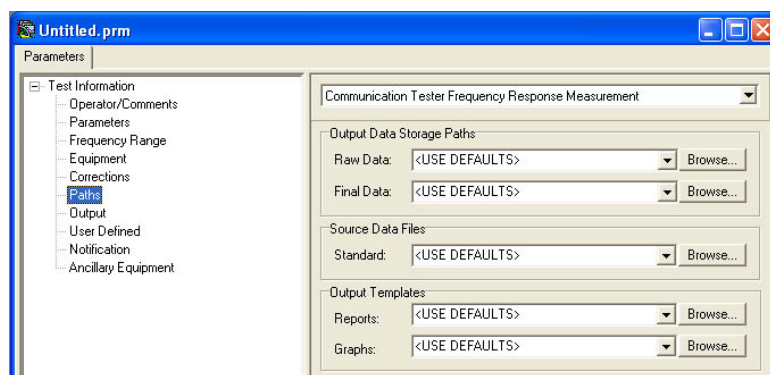


Figure 29: Test Information Table, Paths

8. Select the **Paths** folder and set the raw data path. Create a folder to save the data taken during the test.
9. All other folders are not required.

Phi Polarization (Vertical) Measurement

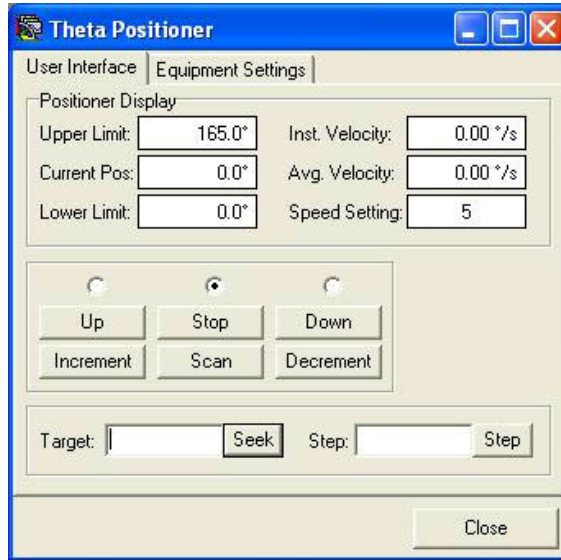


Figure 30: Equipment Menu, Target Window

1. Go to the **Equipment** menu located on the toolbar at the top of the EMQuest software. In the drop down window, select the Theta positioner. Once you have selected the Theta positioner, go to the **Target** window and enter 90.0. Select **Seek**, which will move the turntable into test position.

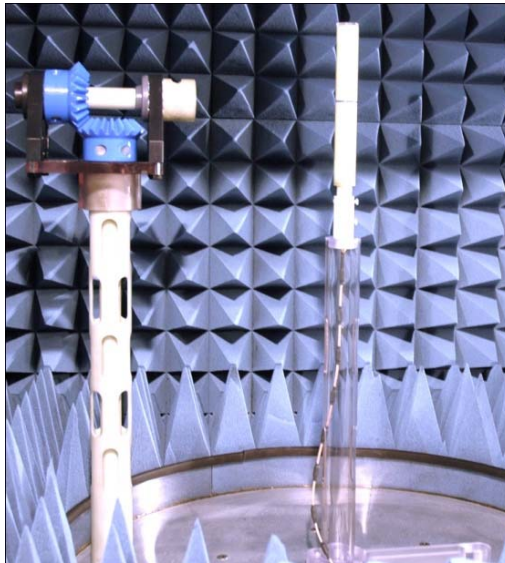


Figure 31: Phi Axis (Vertical) Antenna Mount Set Up (Optional dipole antenna shown)

2. Install the offset mount and insert the vertical dipole mount (see the Assembly and Installation, Mounts section of this manual for more information) and necessary extensions into the center of the turntable. Install the dipole antenna and adjust the elevation to bore sight with the center of the quad-ridge antenna (receive antenna) mounted in the end wall of the AMS-8050.
3. Go to the **Equipment** menu; in the drop down window ensure the switch settings are correct to perform the thru calibration.

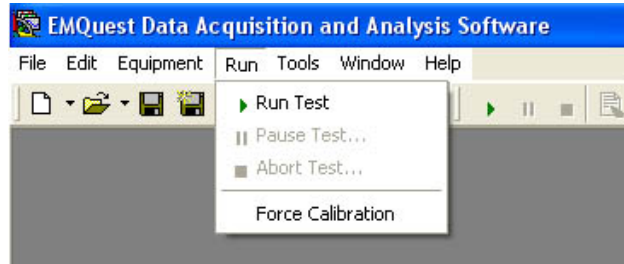


Figure 32: Run Test

4. Select the **Run Test** button on the EMQuest software toolbar to start the response test. The software will ask that the cables be connected for a cable calibration, ensure they are connected then press **OK**. Once the cable calibration is complete, the software will ask you to connect the cable or equipment to be measured; do not press **OK** unless you intend to check the cable calibration.
5. When the calibration check is complete, disconnect the spare loop back RF cable from the 10 dB attenuator and ferrite-beaded cable. Next, connect the 10 dB attenuator and ferrite-beaded cable to the Model 3126-880 dipole sleeve antenna under test (AUT). Secure the AUT in the mount.
6. Return to the equipment rack, remove the cable that is connected to **RF 3 Out** on the wireless communication tester and connect it with the spare loop back cable connected to the receive port input on the VNA.
7. Once all of the cable connections are complete, reinstall the absorber on the turntable and close the chamber door. Select **OK** on the EMQuest software to start the test.

CAUTION

The absorber may not sit flush on the turntable top. Verify the absorber on the tabletop and the absorber surrounding the table will not be damaged during rotation before continuing.

8. Once the test is complete, remove the low frequency antenna and install the next antenna. At this time, change the comments section to reflect the change of antenna.



Repeat this step for each antenna to be used for the TIS test.

9. When all information is updated to reflect the AUT, select the **Run Test** button on the EMQuest software toolbar to start the response test. The software will automatically test the antenna. However, if the cable calibration is lost, repeat the steps in the Software Set-Up Procedure section above. Follow the instructions from the software. Once the cable calibration is complete, repeat steps three through six of this section.

Theta Polarization (Horizontal) Measurement

1. Once again, go to the **Equipment** menu located on the toolbar at the top of the EMQuest software window. In the drop down window, select “Theta Positioner”. Next, go to the **Target** window and enter “90.0”. Select **Seek** which will move the turntable into test position.

CAUTION

The absorber may not sit flush on the turntable top. Verify the absorber on the tabletop and the absorber surrounding the table will not be damaged during rotation before continuing.

2. Install the horizontal dipole mount and the high frequency antenna. Use an alignment tool to achieve the center of the quiet zone. Connect the cable to the antenna then verify it is properly mounted in the center of the quiet zone. At this time, change the **Comments** section to reflect the change of polarization.

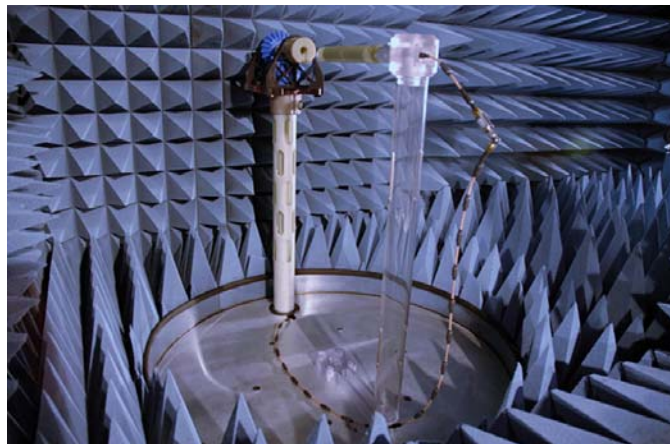


Figure 33: Theta Axis (Horizontal) Equipment Set Up (optional dipole antenna shown)

3. Replace the absorber on the turntable top.



The absorbers may not sit flush. Before beginning the test, verify the absorbers will not be damaged.

4. Go to the **Equipment** menu located on the toolbar at the top of the EMQuest software window. Ensure the switch settings are correct to perform thru calibration.



Thru calibration is not required if it was performed in the previous polarization and equipment or cables are not changed.

5. When all of the information is updated to reflect the AUT, select the **Run Test** button on the toolbar to start the response test. The software will automatically start the test. However, if the cable calibration is lost, repeat steps three and four in the Software Set-Up Procedure section for TIS Range Calibration. Follow the instructions from the software. Once the cable calibration is complete, repeat step five through seven in the Phi Polarization Measurement section above.
6. Once the test is complete, remove the antenna and install the next antenna to be tested. At this time, change the **Comments** section to reflect the change of antenna along with the polarization.
7. When all information is updated to reflect the AUT, select the **Run Test** button on the EMQuest software toolbar to start the response test. The software will automatically test the antenna. However, if the cable calibration is lost, repeat steps three and four in the Software Set-Up Procedure section for TIS Range Calibration. Follow the instructions from the software. Once the cable calibration is complete, repeat steps four through six of this section.

Range Calibration Data

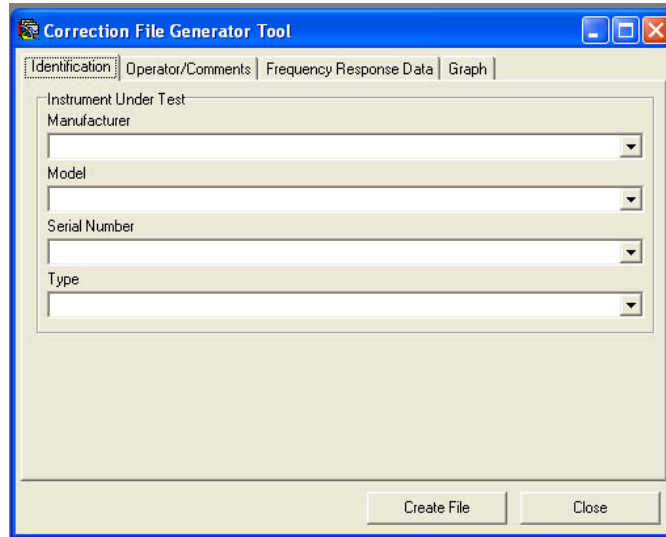


Figure 34: Tools, Correction File Generator

1. Once the measurements are complete, open the corresponding Phi and Theta raw data files. Go to the **Tools** menu of EMQuest software window as and select **Tools**. Next, select **Correction File Generator**.
2. Fill in all identification information along with information in the **Operator/Comments** tab; be sure to note Theta or Phi axis in your comments along with TIS range type.

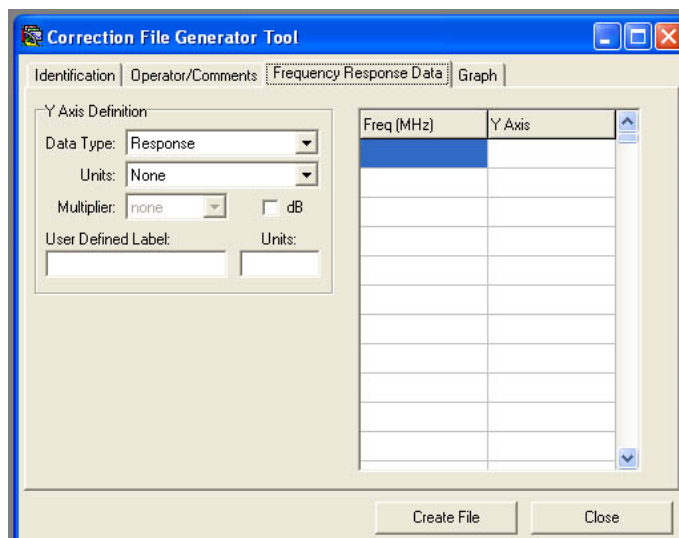


Figure 35: Correction File Generator, Frequency Response Data

3. In the **Frequency Response Data** folder, Data Type is “Loss”, Units are “User-defined”, finally select the **dB** box.
4. Go to the raw-data files and copy the corresponding data into the chart given in the **Correction File Generator** tool. Refer to the calibration data included with each antenna for the appropriate data points.
5. After all of the data has been inserted into the **Correction File Generator** tool, select the **Graph** folder and double check the data. Typical loss will be between -10.0 dB and -40.0 dB. Once data is verified, select the **Create File** button on the bottom of the screen and save the new response file as Theta or Phi along with TIS range type, for example, TIS_Theta Axis Correction.
6. Once both correction response files are created and saved, close the corresponding raw data files. Find the current correction files and open each file.
7. Next, perform a side-by-side comparison of the newly created correction files and the current correction files to be used from the last range calibration. If the measurements are within the specifications, close the current correction files and archive them into a folder.
8. Go back to the newly created correction file. Copy the files and paste them to the location the correction files are stored. These response files will now be used in all TIS measurements. Verify all parameter files that will be affected by the newly created correction files are changed.



Range calibrations must be done on a regular basis to ensure the integrity of TIS measurements.

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7.0 Total Radiated Power (TRP) Range Calibration

WARNING

Before placing the AMS-8050 into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

To determine the proper loss values contributed to the test equipment for TRP tests, follow the steps below.

In addition to the AMS-8050 system and its components, the user will need the following to complete this test:

- Vector Network Analyzer (VNA)
- Low-loss Cable—able to reach from the receive port of the VNA to the transmit antenna mounted on the turntable in the test system (also known as the spare loop back RF cable).
- Dipole Antenna(s)

Pre-Calibration

The equipment rack must be configured in TRP test mode. Once the range calibration is complete, return all connections for the equipment back to the configuration for the TRP test mode.

1. Turn on power for the equipment rack.
2. Turn off power to the spectrum analyzer and the wireless communication tester, as these will not be needed for this test.
3. Turn on the VNA and allow 30 minutes for warm-up.
4. Connect a cable from the SMA connector located in the sidewall of the system cart, labeled *Turntable Center*, to the transmit port of the vector network analyzer.
5. Next, connect the 10 dB attenuator end of the longest ferrite-beaded cable to the rotary joint. Then, connect the 10dB attenuator end of the ferrite beaded cable to the loopback cable via the RF adapter. The other end of the loopback cable should be connected to the receive port of the VNA.



Refer to the Assembly and Installation, Ferrite Beaded Cable from MAPS section for instructions to connect the cable under the MAPS.

Software Set-Up Procedure

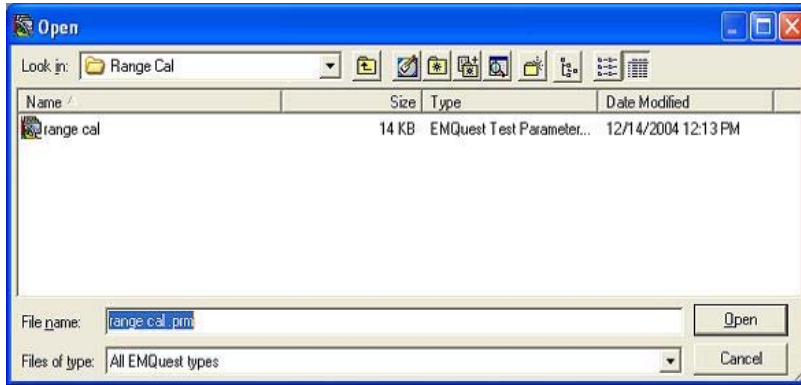


Figure 36: Open EMQuest

1. Open EMQuest™
2. Select and load the parameter file labeled “Range Cal” in the Parameters folder. All parameter files are standard for each test and should not have to be modified.



Refer to the EMQuest software help file and the AMS-8050 video tutorial included with this manual for additional information regarding parameter creation.

3. Fill in all test information fields in the parameter file by entering the appropriate variables (i.e. EUT manufacturer, model number, test type, and serial number).

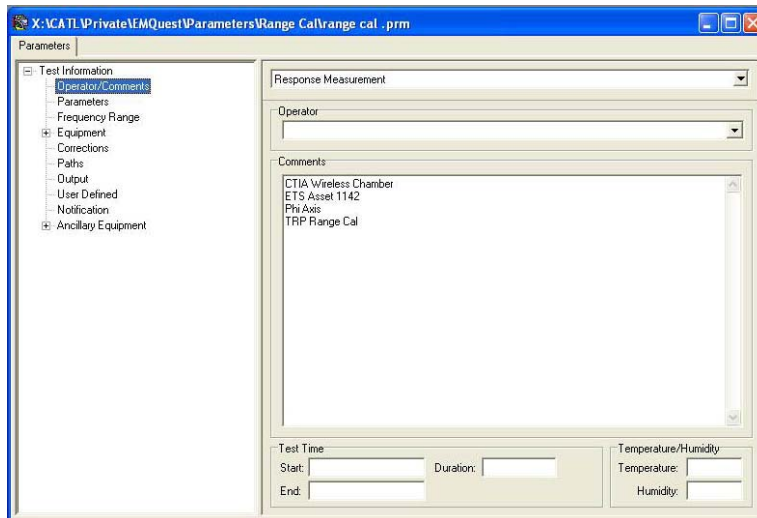


Figure 37: Parameter File

4. Open the **Test Information** table by pressing the “+” symbol to view other folders. Select the **Operator/Comments** folder and fill in the variables. List the polarization and antenna type used for each test, for example Theta Polarization_3126-880 LF Antenna.

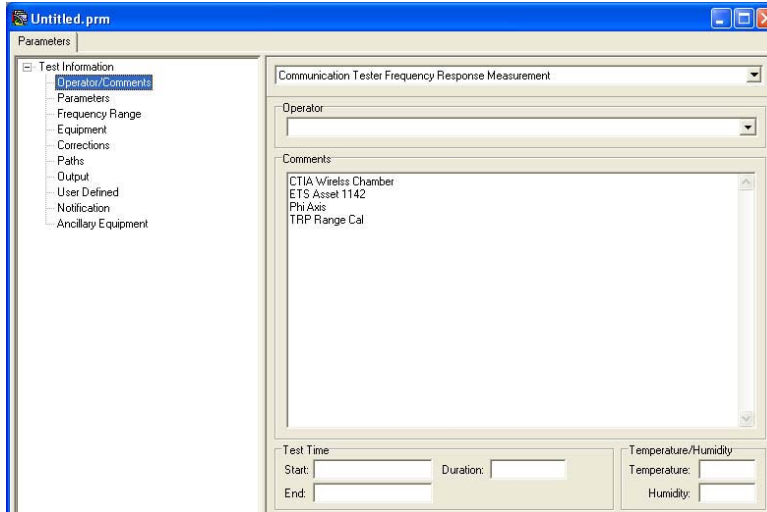


Figure 38: Test Information Table

5. The **Parameters** folder should remain standard for each test and should not be modified.
6. The **Frequency Range** should remain standard for each test and should not be modified. The frequency range 780 MHz to 2290 MHz is sufficient to cover TRP frequencies.
7. The **Corrections** folder is not required.

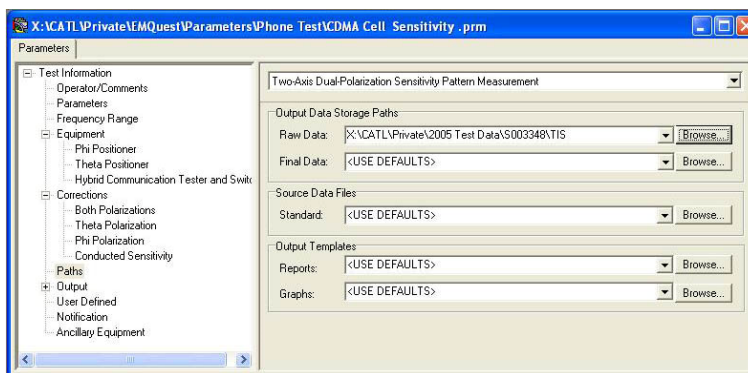


Figure 39: Parameters, Path Folder

8. Select the **Path** folder and set the raw data path. Create a folder to save the data taken during the test.

9. All other folders are not required.

Phi Polarization (Vertical) Measurement

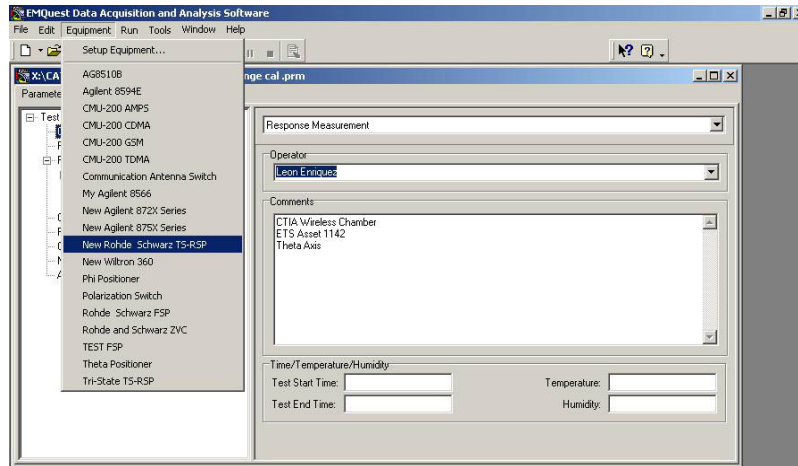


Figure 40: Equipment Tab

1. Go to the **Equipment** menu located on the toolbar at the top of the EMQuest software window. In the drop down window, select the Theta Positioner. Once you have selected the Theta Positioner, go to the **Target** window and enter 90.0. Select **Seek**, which will move the turntable into test position.
2. Install the alignment plate and insert the center post (clear tube) and necessary extensions in the center of the turntable using the offset mount. Install the AUT and adjust the elevation to be at bore sight with the center of the quad-ridge antenna (receive antenna) mounted in the end wall of the AMS-8050.

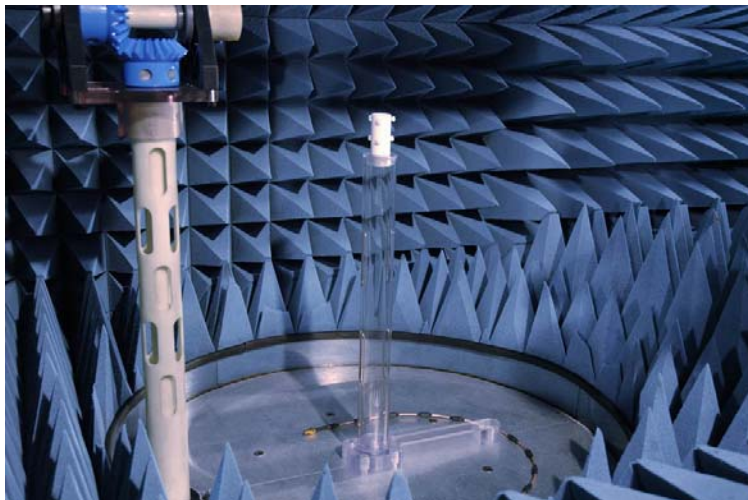


Figure 41: Phi Antenna (Vertical) Mount Set Up

3. Go to the **Equipment** menu located on the toolbar at the top of the EMQuest software window. In the drop down window ensure the switch settings are correct to perform the thru calibration.
4. Press the **Run Test** button on the EMQuest software toolbar to start the response test. The software will ask you to connect the cables together for a cable calibration, press **OK**. Once the cable calibration is complete, the software will ask you to connect the cable or equipment to be measured. Do not press **OK** unless you intend to check the cable calibration.
5. Disconnect the loop back RF cable from the 10 dB attenuator and ferrite-beaded cable.
6. Connect the 10 dB attenuator and ferrite-beaded cable to the Model 3126-880 antenna under test (AUT), located in the chamber.
7. Return to the equipment rack, remove the cable that is connected to the spectrum analyzer (SA) and join it to the spare loop back cable connected to the receive port input on the VNA.
8. Once all of the cable connections are complete, reinstall the absorber on the turntable and close the chamber door. Select **OK** in the EMQuest software to start the test. At this time, change the comments section to reflect the change of antenna.

The absorber may not sit flush on the turntable top.



Verify the absorber on the turntable as well as the absorber that surrounds it will not be damaged during rotation before proceeding.

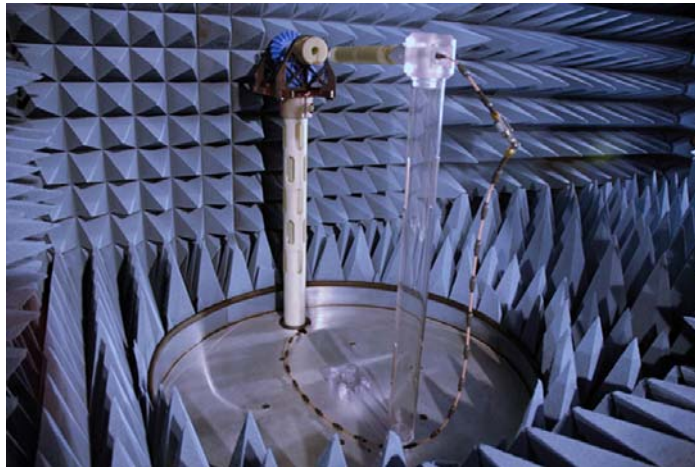


Repeat this step for each antenna to be used for the TRP test.

9. When all information is updated to reflect the AUT, select the **Run Test** button on the EMQuest software toolbar to start the response test. The software will automatically test the antenna. However, if the cable calibration is lost, repeat the cable calibration steps in the Software Set-Up Procedure section above. Follow the instructions from the software. Once the cable calibration is complete, repeat cable calibration steps in this section.

Theta Polarization (Horizontal) Measurement

1. Once again, go to the **Equipment** menu located on the toolbar at the top of the EMQuest software window. In the drop down window, select the *Theta Positioner*. Once you have selected it, go to the **Target** window and enter "90.0". Select **Seek** that will move the turntable into test position.
2. Install the theta axis, horizontal, dipole mount and insert the high frequency antenna. Use an alignment tool to achieve the center of the quiet zone. Once the high frequency antenna is properly mounted in the center of the quiet zone, connect the cable. At this time, change the **Comments** section in the EMQuest software, to reflect the change of polarization.



**Figure 42: Theta Antenna Mount Set Up
(optional dipole antenna shown)**

3. Go to the **Equipment** menu located on the toolbar at the top of the EMQuest software. Ensure the switch settings are correct to perform thru calibration.
4. When all information is updated to reflect the AUT, select the **Run Test** button on the EMQuest software toolbar to start the response test. The software will automatically test the antenna. However, if the cable calibration is lost, repeat the cable calibration steps. Follow the instructions from the software. Once the cable calibration is complete, repeat steps above.
5. Once the test is complete, remove the antenna and install the next antenna. At this time, change the comments section to reflect the change of antenna along with the polarization.



Repeat this step for each antenna to be used for the TRP test.

Range Calibration Data

1. Once the measurements are complete, find and open the corresponding Phi and Theta raw data files. Go to the **Equipment** menu, located on toolbar at the top of EMQuest software window and select **Tools**.
2. Now select **Correction File Generator** in the drop down menu. Fill in all identification information along with operator comments. Be sure to note Theta or Phi axis in your comments along with TIS range type.
3. In the **Frequency Response Data** folder, *Data Type* will be “Loss”, *Units* will be “User-defined”, finally select the **dB** box.
4. Now go to the raw-data files and copy the corresponding data into the chart given in the **Correction File Generator** tool. See the calibration data accompanying each antenna to be used for accurate data.



This list may not contain all applicable dipole antennas, please contact ETS-Lindgren Customer Service for additional antennas and ranges.

5. After all data has been inserted into the *Correction File Generator* tool, select the Graph folder and double check the data. Typical loss will be between -10.0 dB and -40.0 dB.
6. Once data is verified, select the **Create File** button on the bottom of the screen and save new response file as Theta or Phi along with TIS range type i.e. TIS_Theta Axis Correction.
7. Once both correction response files have been created and saved, close the corresponding raw data files. Find the current correction files to be used and open each file.
8. Next, perform a side-by-side comparison of the newly created correction files and the current correction files to be used from the last range calibration. If the measurements are within the specifications, close the current correction files and archive them into a folder as described in step 8 of the Software Set-up Procedure section above. Archive the current correction files before proceeding.

9. Go back to the newly created correction file. Copy the files and paste them to the location you are storing your correction files. These response files will now be used in all TIS measurements. Be sure to change all parameter files that will be affected by the newly created correction files. Range calibrations must be done on a regular basis to ensure the integrity of the TIS measurements.

8.0 Total Isotropic Sensitivity (TIS) Test

WARNING

Before placing the AMS-8050 into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

This procedure applies to Receiver Performance Tests, also known as TIS, for wireless handheld devices.

Equipment Required

In addition to the AMS-8050 system and components, the user will need the following to complete the test:

- Windows™ Compatible Computer
- Wireless Communication Tester
- SAM Head

Pre-Calibration



All equipment must have current calibration to be effective during this test.

10. Visually inspect the AMS-8050 test system for damaged absorber material, which would comprise the test accuracy. If damaged absorber is found, replace it before conducting the test. If new pieces of absorber are needed, please contact Customer Service.
11. With the equipment turned off, daisy-chain the wireless communication tester with the EMCenter Modular RF Platform and the computer system using GPIB cables.
12. Turn all test equipment on and allow it to warm up a minimum of 30 minutes.

Software Setup Procedure

1. Open the EMQuest™ measurement software.
2. Select and load the appropriate CDMA or GSM sensitivity parameter file for the desired cellular standard test. All parameter files are standard for each test and should not have to be modified.



Refer to the EMQuest software help file and the AMS-8050 video tutorial included with this manual for additional information regarding parameter creation.

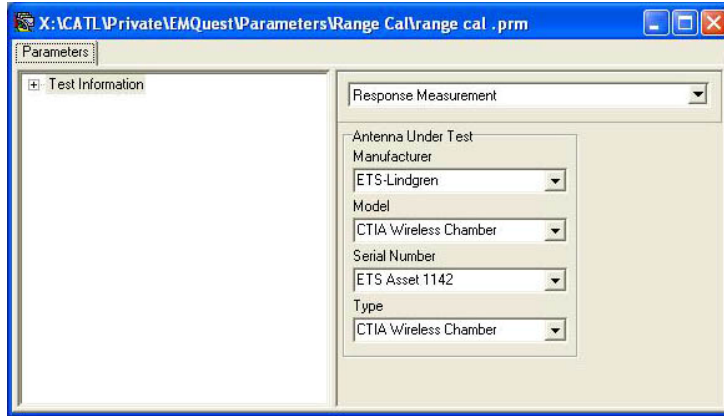


Figure 43: Parameter File, Test Information Table

3. Fill in all test information fields in the parameter file by entering the appropriate variables (i.e. AUT manufacturer, model number, serial number and test type).

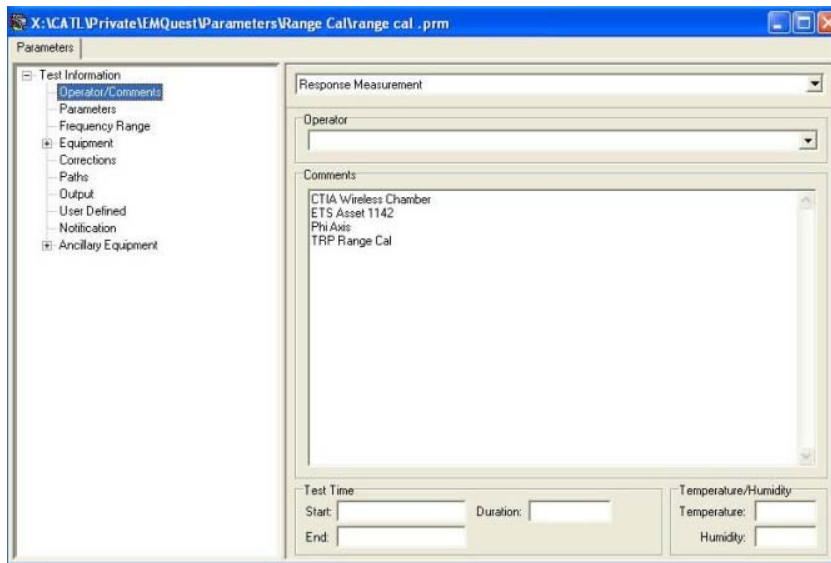


Figure 44: Complete the Test Information Table

4. Open the **Test Information** table by selecting the “+” symbol to view other folders. Select the **Operator/Comments** folder and fill in name of operator, temperature, humidity factor, test comments (setup description, etc.) and any other variables.

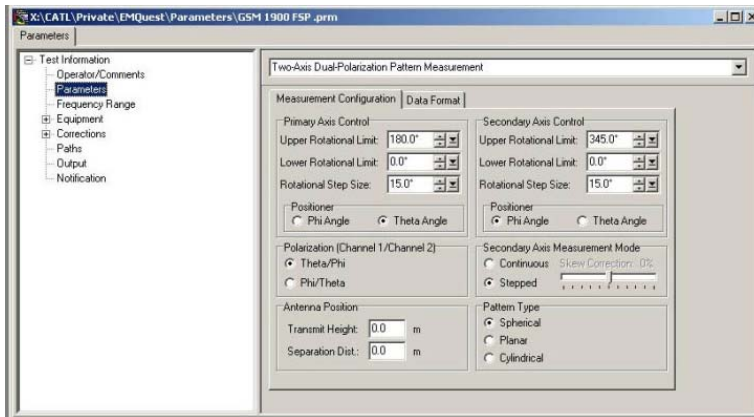


Figure 45: Parameter Folder Set Up

5. Select the **Parameters** folder and complete the information. The information will remain standard for each test and will not be modified once the correct parameter file is created.

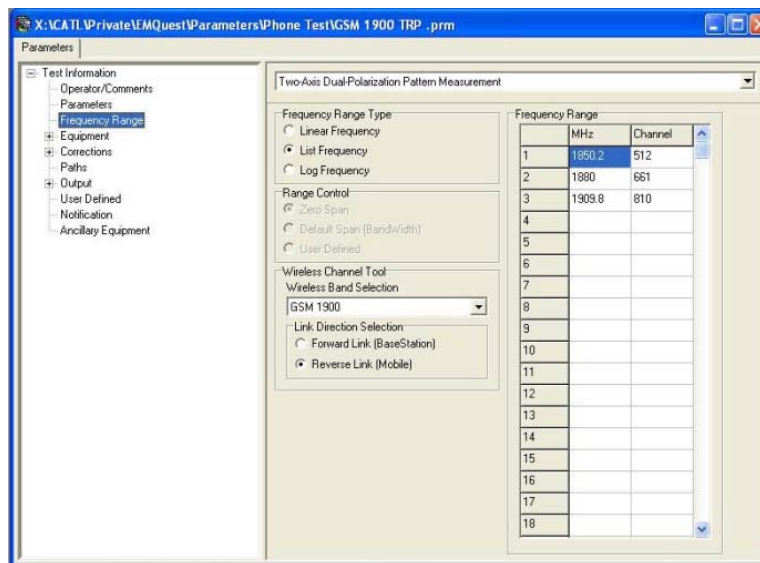


Figure 46: Frequency Range Set Up

6. Select the **Frequency Range** folder and set the desired frequencies (Receive Channels).
7. Set the channel to the desired RX test channel (with the same frequency as in test parameter file).

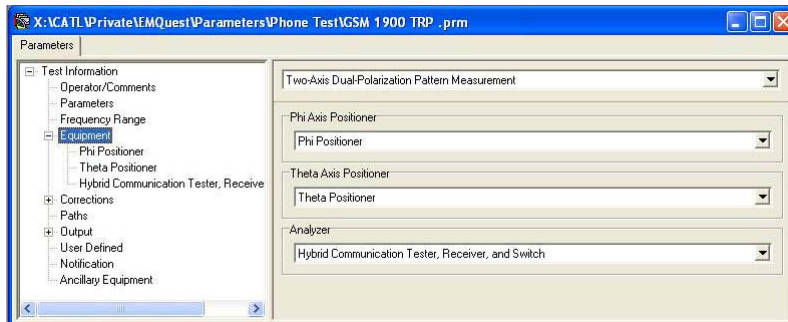


Figure 47: Equipment Folder Set Up

8. Select the **Equipment** folder. The settings are standard for each test.

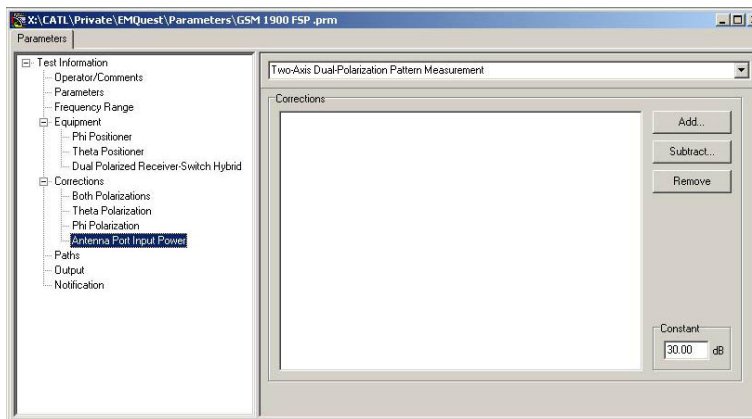


Figure 48: Corrections Folder Set Up

9. Select the **Corrections** folder and enter the required range calibration and reference antenna gain corrections for each polarization. Include any other cable corrections, etc. as needed. For CDMA test, a correction factor must be generated to show the difference between a test run with 2.0% frame error rate (FER) with 500 frames and 0.5% FER with 2,000 Frames. The 2,000 frames measurement should be added to the file, while the 500 frames measurement will be subtracted from the file.

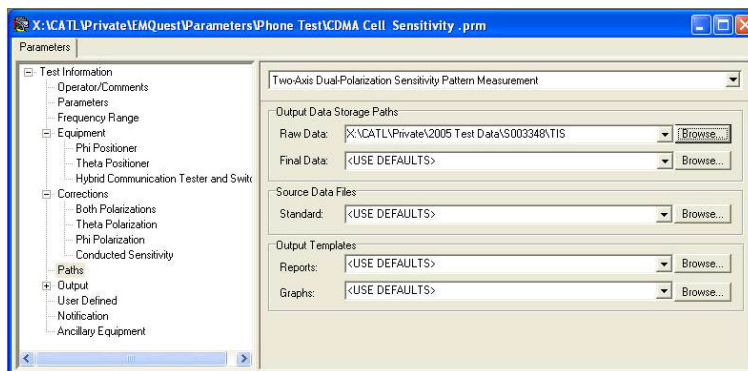


Figure 49: Path Folder Set Up

10. Select the **Paths** folder and set the raw data path.
11. *Output* and *Notification* tabs are not required.

Hardware Setup Procedure

With the software and wireless communication tester setup complete, the next step is to position the phone in the chamber. It is crucial that the tests start at the correct position or the data will be misrepresented.

The “free-space” start position will always involve the phone facing the back wall. This position is zero degrees. The earpiece is positioned directly over center of the turntable.

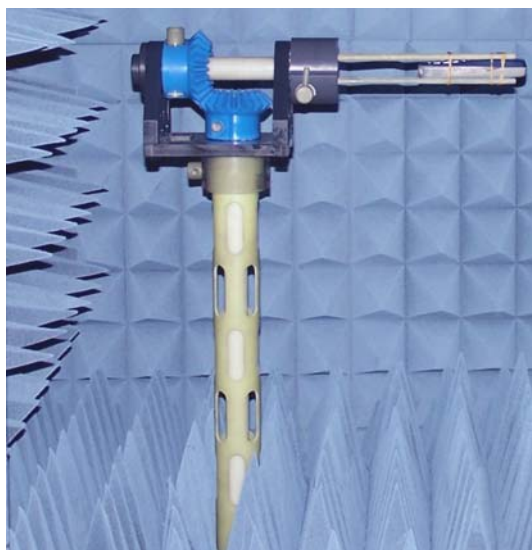
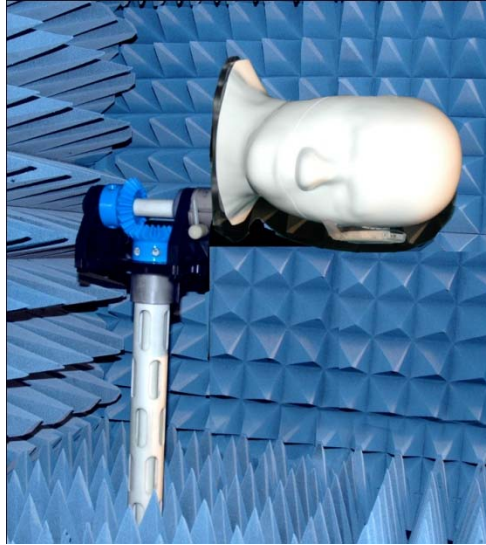
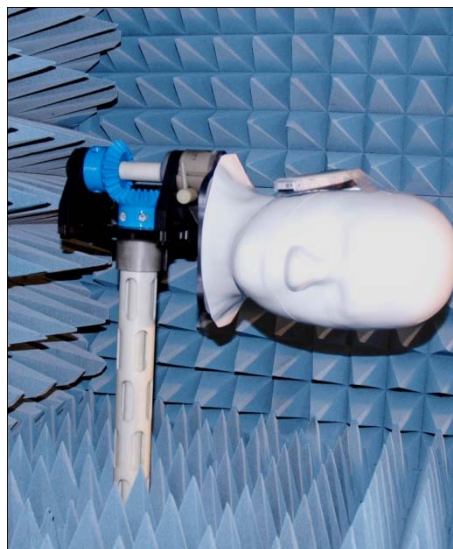


Figure 50: Free-Space Mount with EUT

The figures that follow illustrate the SAM left and right ear positions with the nose pointing toward the door in each picture. The start position is when the SAM head nose faces toward the back wall. Remember that the ear to be tested will always be at the center of rotation, therefore, for the left ear, the position will start with the SAM head below the center of rotation. For the right ear, the position will start with the SAM head above the center of rotation. By design the center of the SAM head/earpiece is directly over center of the turntable.



**Figure 51: SAM Head Left Ear, EUT Mounted—Nose Toward Door
(optional SAM head shown)**



**Figure 52: SAM Head Right Ear, EUT Mounted—Nose Toward Door
(optional SAM head shown)**

- Mount the phone on the MAPS as shown in either right or left ear mount as shown above for the corresponding test type.
- Reinstall all absorber onto the turntable.



Verify the absorber sits firmly on the top of the turntable and will not damage the surrounding absorber when the turntable begins to rotate.

- At this point, the software is ready to establish a call. Select the **Run Test** button on the EMQuest toolbar to start the TIS test and follow the software queries.

- Repeat these steps for all frequencies and modes.

CDMA phones have auto-answer capabilities; therefore, it may not be necessary to remove the phone from the phantom head to access the buttons.

If the phone loses power/connection during the test, the software will “time-out” waiting on the wireless communication tester. Recharge the phone or switch batteries as needed and re-establish the call before selecting **Retry**.



Typical problems associated with “time-out” failures are the result of wrong frequency/channel on the software compared to the wireless communication tester. Check both settings to determine they are the same before selecting **Retry**.

Relative Sensitivity on Intermediate Channels

Once the test is complete, determine and note the following settings (located on the bottom of the table section in raw data) as they will be used later in this procedure.

- Bore Sight Phi position for all three channels: A single orientation can be used for all three reference channels, provided that the measured radiated sensitivity for that orientation and each reference channel is within 3 dB of the best sensitivity measured for that channel.
- Bore Sight Theta position for all three channels. A single orientation can be used for all three reference channels, provided that the measured radiated sensitivity for that orientation and each reference channel is within 3 dB of the best sensitivity measured for that channel.

Determine which polarization had the greatest sensitivity at bore sight.

1. Open and select the appropriate intermediate channel parameter file for the desired cellular standard test. All parameter files are standard for each test.



Refer to the EMQuest software help file and the AMS-8050 video tutorial included with this manual for additional information regarding parameter creation.

2. Refer to the Software Setup section above for steps to filling out test information in parameter file.

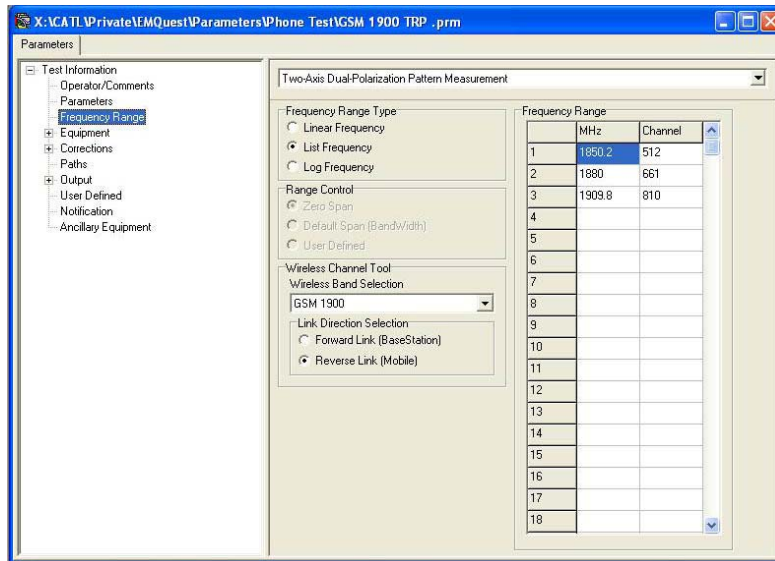


Figure 53: Frequency Range Setup Folder

3. Select the Frequency Range folder and set the desired frequencies and step size (See table 4 and table 5 below for each band’s receive channels).
4. Once the desired frequency range is inserted into the EMQuest software, select the **Equipment** folder and go to **Sensitivity** tab. Take the power level for the greatest sensitivity at bore sight and increase RF signal level of the wireless communication tester by 5 dB. For example, if the greatest sensitivity is -68.5 dB, increase by 5 dB to -63.5 dB. Insert this value into the *Initial Signal Level (Max)* field.
5. Ensure that the correct RF switching is selected for the corresponding polarization to be measured.
6. Once all values are inserted into the proper location, select the *Run Test* button on the EMQuest toolbar and follow the software queries. CDMA phones have auto-answer capabilities; therefore it may not be necessary to remove the phone from the phantom head to access the buttons.
7. When the test is finished, check the data thoroughly as it will be noted with a pass or fail. If the EUT fails at any frequency, re-check all settings and repeat the test.

For both the full TIS test and the intermediate channel tests, Freespace, SAM left ear and SAM right ear configurations for all channels and frequencies will be conducted.

9.0 Total Radiated Power (TRP) Test

WARNING

Before placing the AMS-8050 into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

This procedure applies to Radiated Power tests, also known as Total Radiated Power or TRP, for wireless handheld devices.

Required Equipment

In addition the AMS-8050 system and components, the user will need the following to complete this test.

- Windows™ Compatible Computer
- Spectrum Analyzer
- Wireless Communication Tester
- SAM Head

Pre-Calibration



All equipment must have current calibration to be effective during this test.

1. Visually inspect the AMS-8050 test system for damaged absorber material, which would compromise the test accuracy.
2. With equipment turned off, daisy-chain the wireless communication tester with the spectrum analyzer, multi-device controller and the computer system using GPIB cables.
3. Turn all test equipment on and allow it to warm up a minimum of 30 minutes.

Software Set-Up Procedure

1. Open EMQuest™
2. Select and load the appropriate parameter file for the desired cellular standard test. All parameter files are standard for each test and will not have to be modified.



Refer to the EMQuest software help file and the AMS-8050 video tutorial included with this manual for additional information regarding parameter creation.

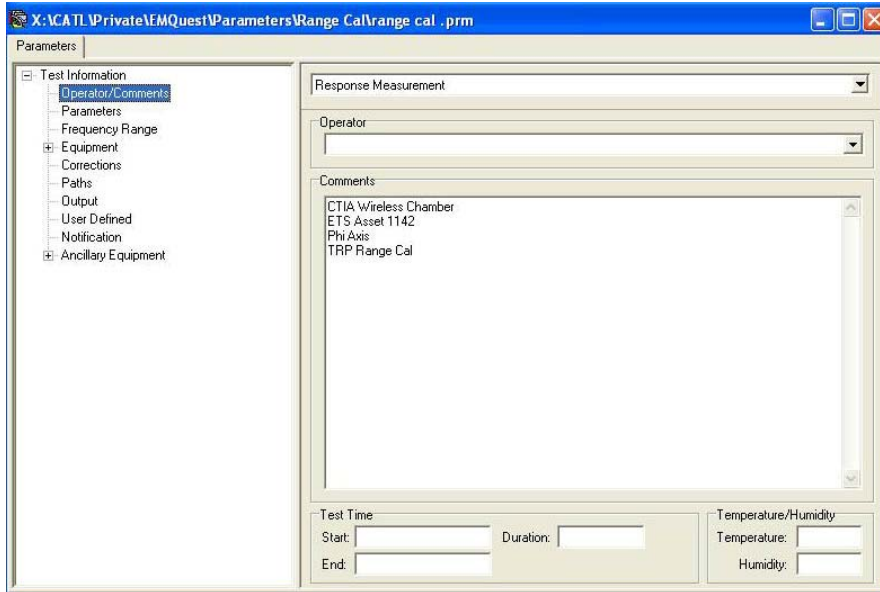


Figure 54: Setting Up the Parameter File

3. Fill in all test information fields in the Parameter file by entering the appropriate variables (i.e. EUT manufacturer, model number, test type, and serial number).

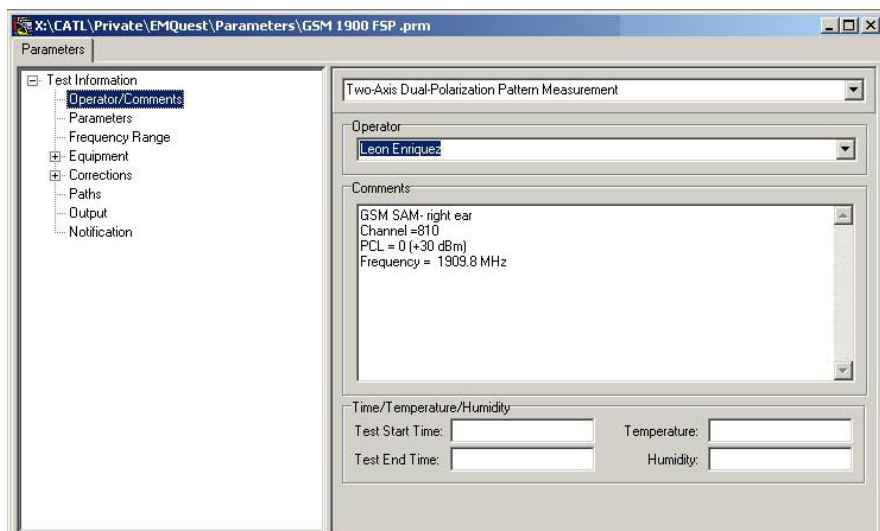


Figure 55: Parameter File, Operator/Comments

4. Open the **Test Information** table by pressing the “+” symbol to view other folders. Select the **Operator/Comments** folder and fill in the name of the operator, temperature, humidity factor, test comments (setup description, etc.) and any other variables.

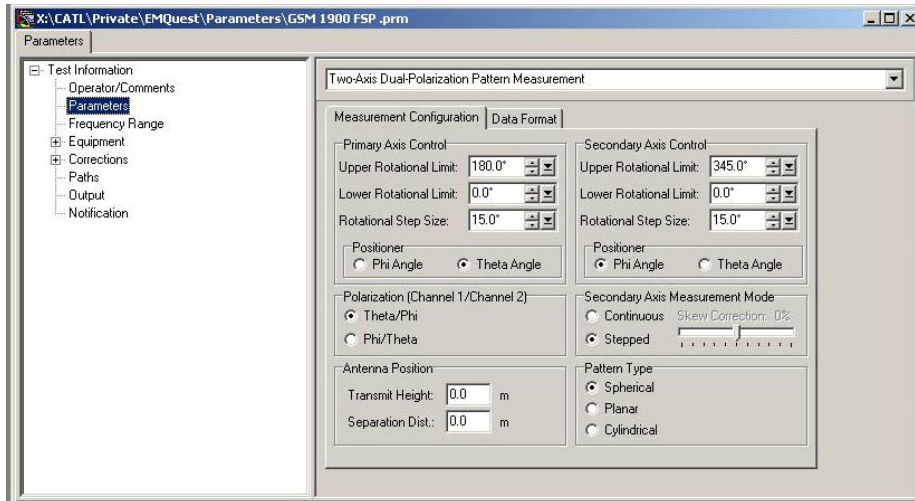


Figure 56: Parameter Folder Set Up

5. The **Parameters** folder will remain standard for each test and will not be modified once the correct parameter file is created.

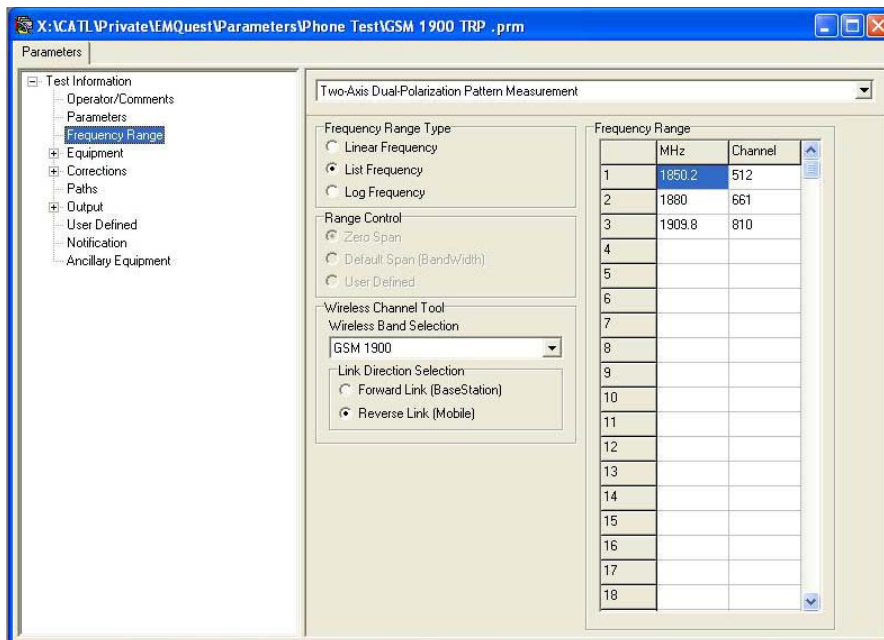


Figure 57: Frequency Range Set Up

6. Select the **Frequency Range** folder and set the desired frequencies (receive channels).
7. Select the **Equipment** folder and set the required equipment settings. The Phi and Theta positioner as well as the polarization switch settings are standard for each test.

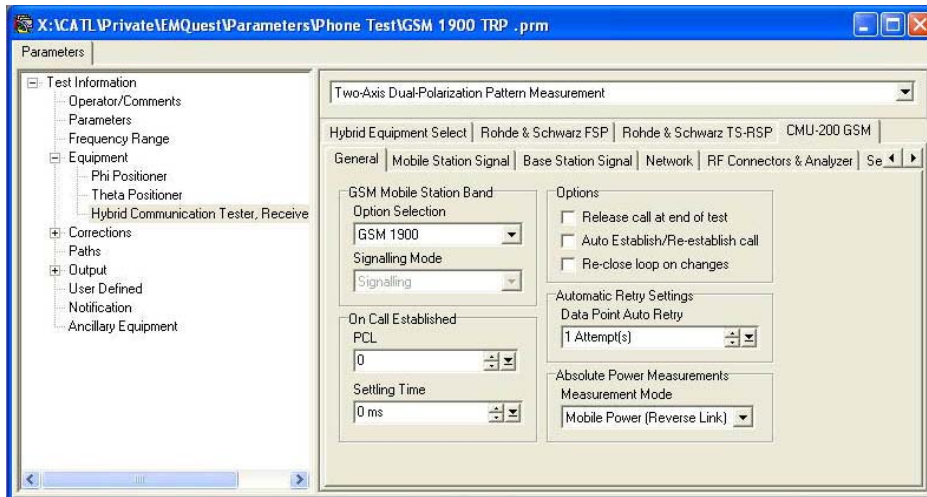


Figure 58: Equipment Set Up GSM Screen

8. It is important that adequate resolution is available to detect all peaks and nulls in the resulting signal. The specified value should be acceptable for a 501-point/per/trace analyzer. For analyzers with fewer points, reduce the span to a slightly wider than the maximum pulse width. Reference the EMQuest help file for configuration settings for a spectrum analyzer with sufficient resolution and sweep rate.
9. Set the trigger level slightly above the noise floor (5-10 dB), sufficient to avoid spurious triggers from the noise floor, but low enough to provide maximum dynamic range. For AMPS and CDMA, the trigger level is used by the average filter solely to detect a dropped call. If the signal drops below the trigger level, the software will retry the specified number of times and then pop up a dialog for user intervention.
10. Adjust the attenuation and reference level settings to give maximum dynamic range (lowest noise floor) while ensuring that the maximum signal level received stays away from the top of the spectrum analyzer graticule. Gain compression is likely if the signal gets within a few dB of or passes the top of the spectrum analyzer window. The ceiling level setting is provided for the filter to protect against this possibility. Set the ceiling at or below the top of the spectrum window for most configurations.
11. The RMS detector is preferred, as it averages many samples for each data point. The sample detector only records one sample per data point. The trace is noisier, resulting in a noisier resulting average power.

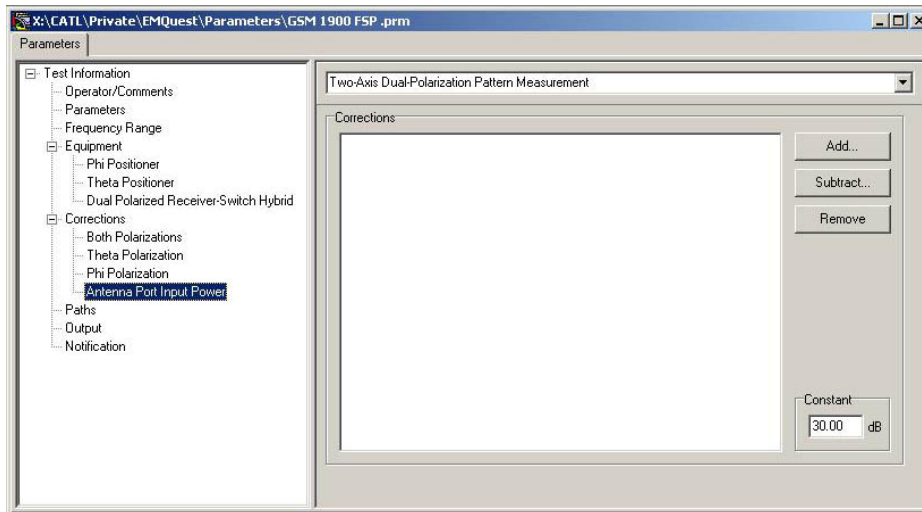


Figure 59: Correction Folder

12. Select the **Corrections** folder and enter the required range calibration and reference antenna gain corrections for each polarization. Include cable corrections, etc. as needed. Also, enter the conducted power of the EUT as the antenna port input power.

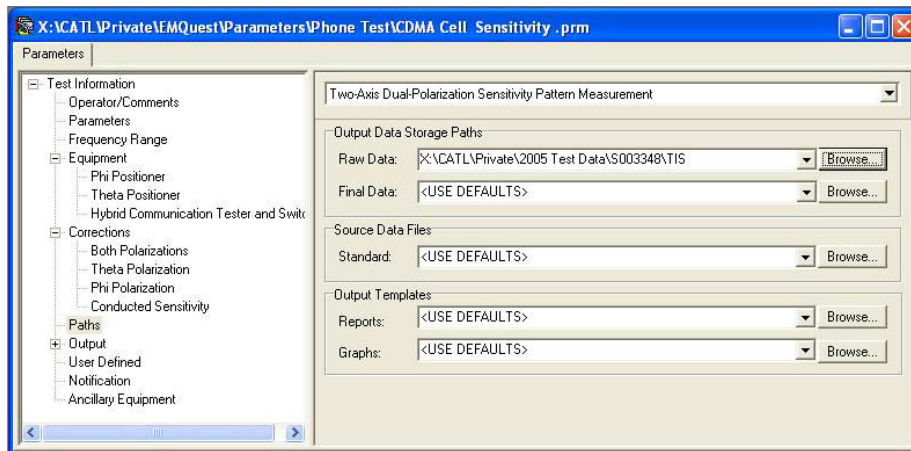


Figure 60: Paths Folder

13. Select the **Paths** folder and set your raw data path.

14. **Output** and **Notification** tabs are not required.

Hardware Set Up Procedure

With the software and wireless communication tester set-up complete, the next step is to position the phone in the chamber. It is crucial that the tests start at the correct position or the data will be misrepresented.

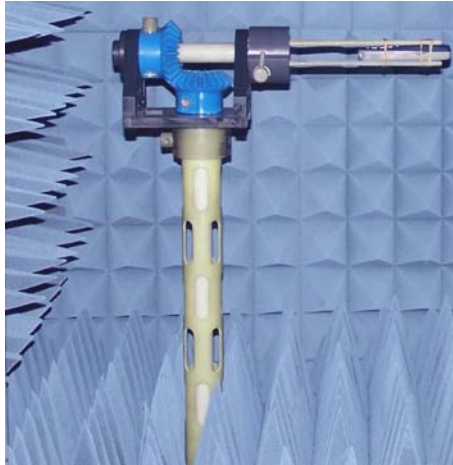


Figure 61: Free-Space Mount with EUT

The “free-space” start position will always involve the phone facing the back wall. This position is zero degrees. The earpiece is positioned directly over center of the turntable.

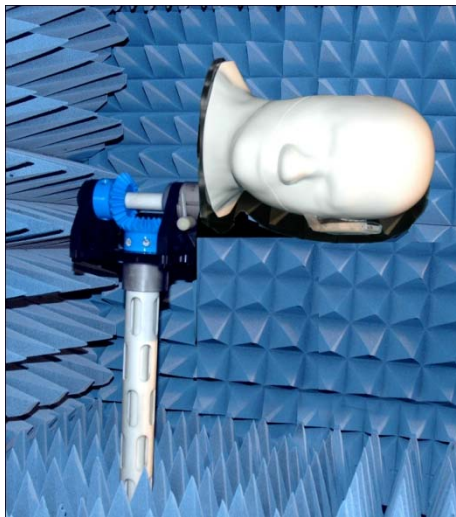
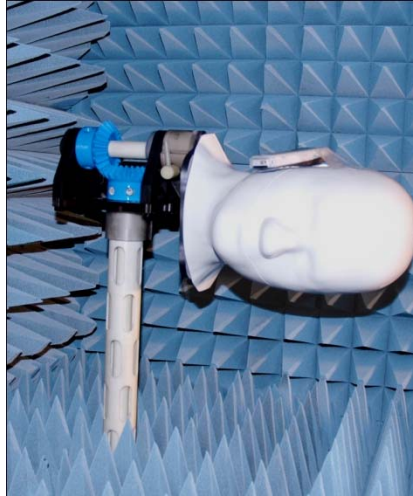


Figure 62: SAM Head Left Ear, EUT Mounted—Nose Toward Door (optional SAM head shown)

For the left ear, the start position for the SAM head is below the center of rotation, with the nose facing the back wall. By design the center of the SAM head/earpiece is directly over center of the turntable.



**Figure 63: SAM Head Right Ear, EUT Mounted—Nose Toward Door
(optional SAM head shown)**

For the right ear, the start position for the SAM head is above the center of rotation, with the nose facing the back wall. By design the center of the SAM head/earpiece is directly over center of the turntable.

1. Mount the phone on the selected positioner for the corresponding test type. Install all absorber onto turntable.



Verify the absorber sits firmly on the top of the turntable and will not damage the surrounding absorber when the turntable begins to rotate.

2. The software is ready to establish a call. Select the **Run Test** button on the EMQuest toolbar to start the TRP test and follow the software queries.
3. Repeat these steps for all frequencies and modes.



CDMA phones have auto-answer capabilities; therefore, it may not be necessary to remove the phone from the phantom head to access the buttons.



If the phone loses power/connection during the test, the software will “time-out” waiting on the wireless communication tester. Recharge the phone or switch batteries and re-establish the call before selecting **Retry**.



Typical problems associated with “time-out” failures are the result of wrong frequency/channel on the software compared to the wireless communication tester. Check both settings to determine they are the same.

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10.0 Passive Test

WARNING

Before placing the AMS-8050 into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

This procedure applies to general passive tests performed in the AMS-8050 test system.

Required Equipment

In addition to the AMS-8050 system and components, the user will need the following to complete this test:

- Windows™ Compatible Computer
- Vector Network Analyzer with Multiple Ports
- Alignment Tool, i.e. laser

Pre-Calibration



All equipment must have current calibration to be effective during this test.

1. Visually inspect the test system for damaged absorber material, which would compromise the test accuracy.
2. With equipment turned off, daisy-chain the vector network analyzer with the EMCenter Modular RF Platform and the computer system using GPIB cables.
3. Turn all test equipment on and allow it to warm up for a minimum of 30 minutes.

Range Calibration for Passive Antenna Testing

See previous sections of this manual for information regarding range calibration test procedures.



Calibration must be performed with all of the cables in the test configuration that feed the AUT from the network analyzer and measure the received signal back from dual polarized horn antenna to the network analyzer. This includes all necessary RF-connectors and rotary joints that are required to perform full 3D testing.

Software Set Up Procedure

1. Open the EMQuest™ measurement software.
2. From the toolbar select and load the appropriate parameter file for the desired test or create new parameter file.

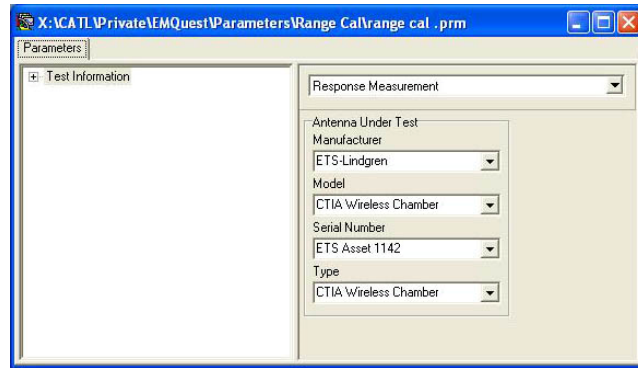


Figure 64: Parameter File

3. Fill in all test information fields in the parameter file by entering the appropriate variables (i.e. EUT manufacturer, model number, test type, and serial number).
4. Open **Test Information** folder by pressing the "+" symbol to view other folders.

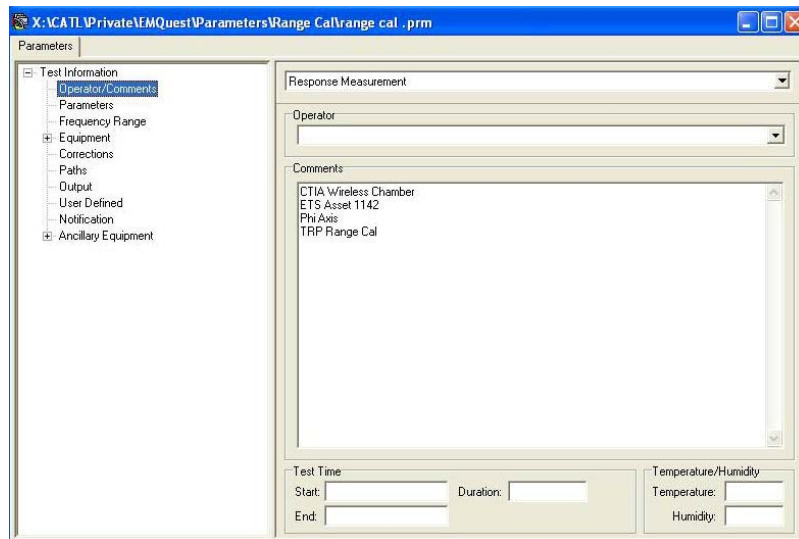


Figure 65: Operator/Comments Folder

5. Select the **Operator/Comments** folder and fill in the name of operator, temperature, humidity factor, test comments (setup description, etc.) and any other.

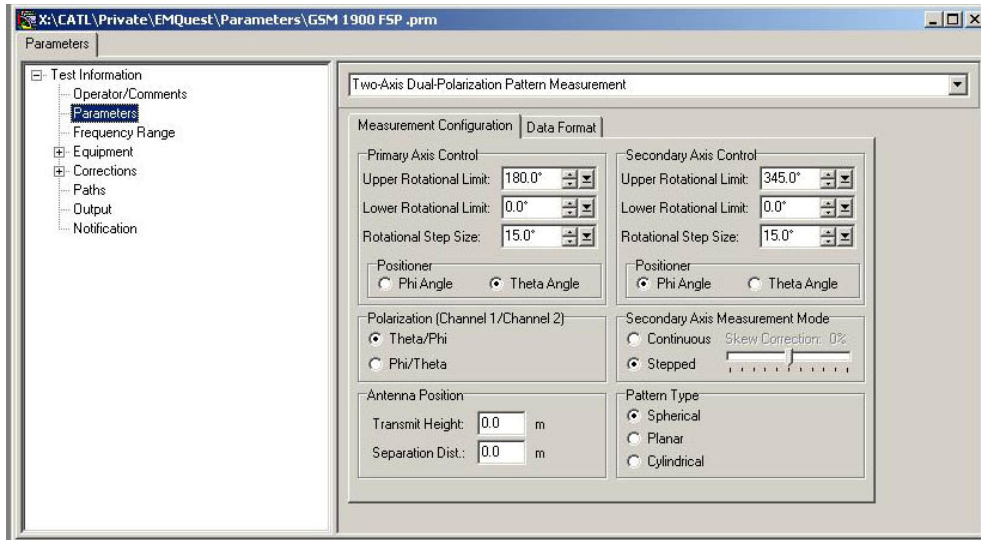


Figure 66: Parameter Folder

6. Enter the required parameters for **Parameter** folder or use pre-set parameters with your opened parameter file.

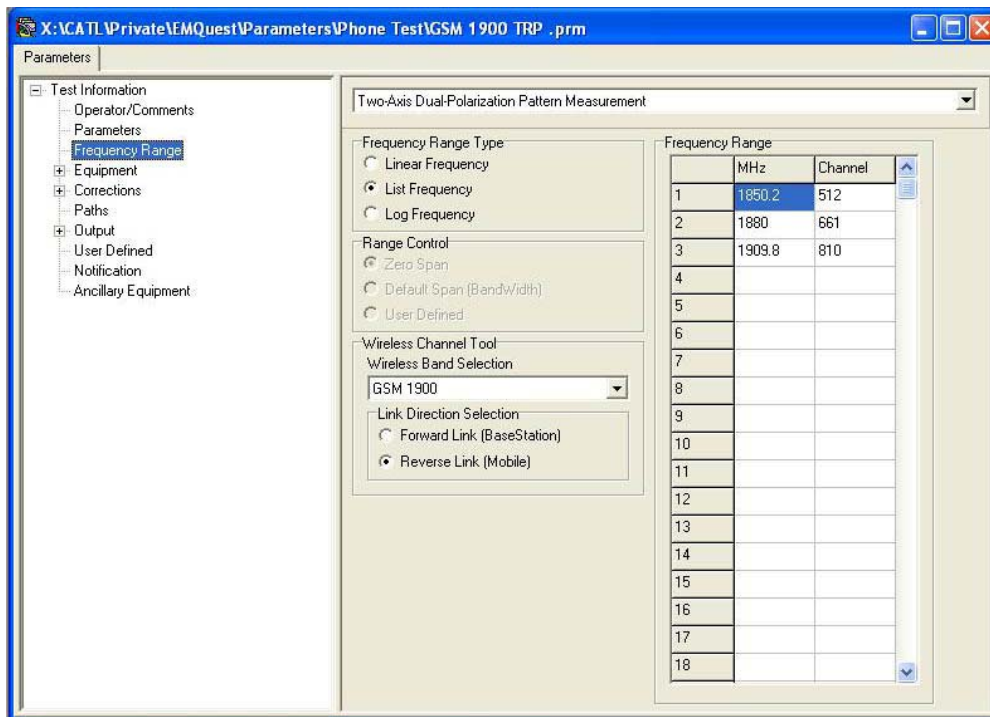


Figure 67: Frequency Range Folder

7. Select the **Frequency Range** folder and set the desired frequencies to be tested.

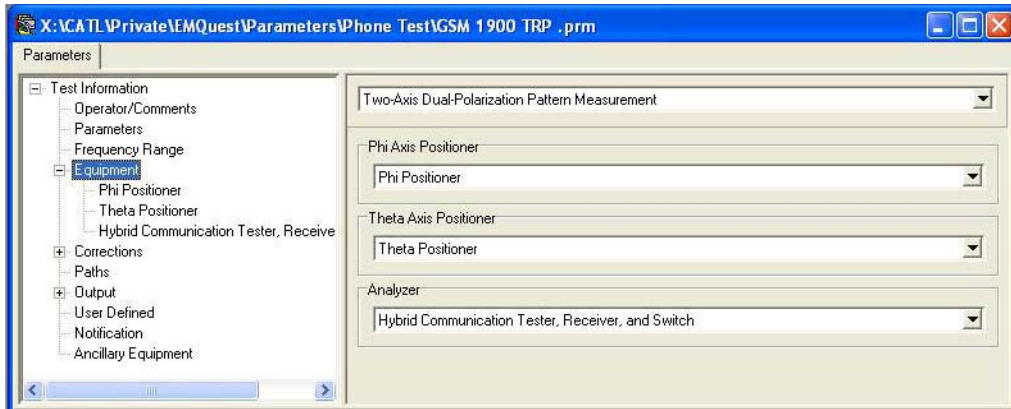


Figure 68: Equipment Folder, Equipment Settings

8. Select the **Equipment** folder and enter the equipment settings. Phi positioner, Theta positioner and the polarization switch are standard for each test and should not be modified.
9. Enter the required test parameters for the vector network analyzer such as: Points per trace, IF Bandwidth, Power and Sweep Time.



When performing passive tests the calibration setting must be set for no calibration.

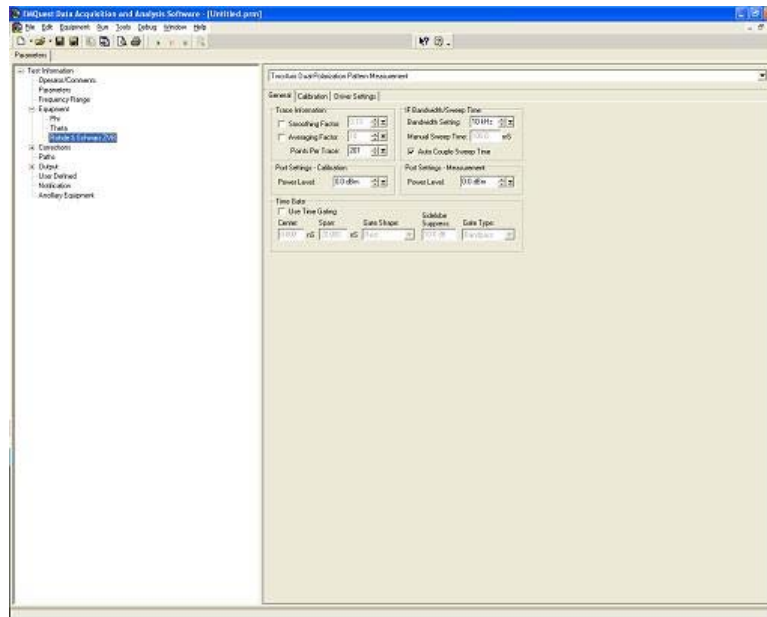


Figure 69: Test Parameter Set Up

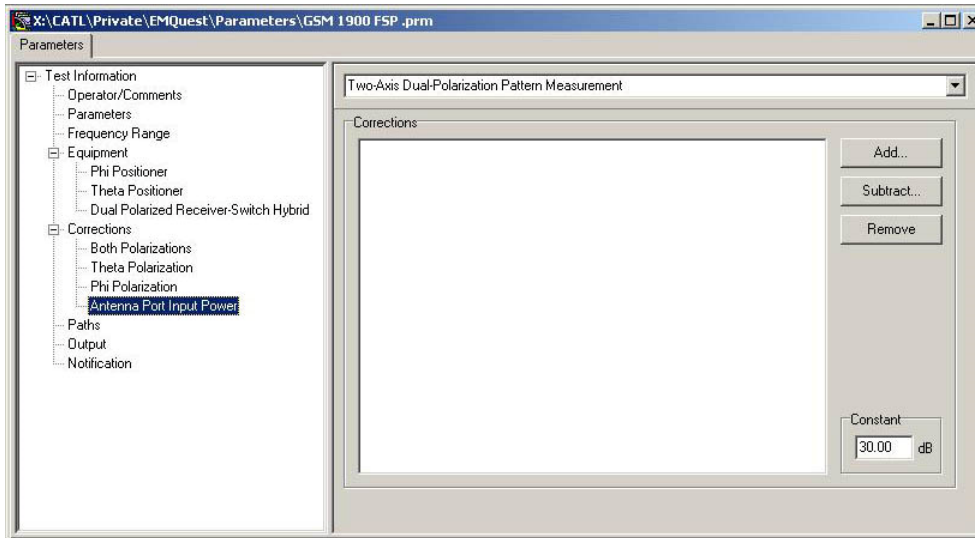


Figure 70: Corrections Folder

10. Select the **Corrections** folder and enter the required range calibration and reference antenna gain corrections for each polarization. Include any other cable corrections, etc. as needed.

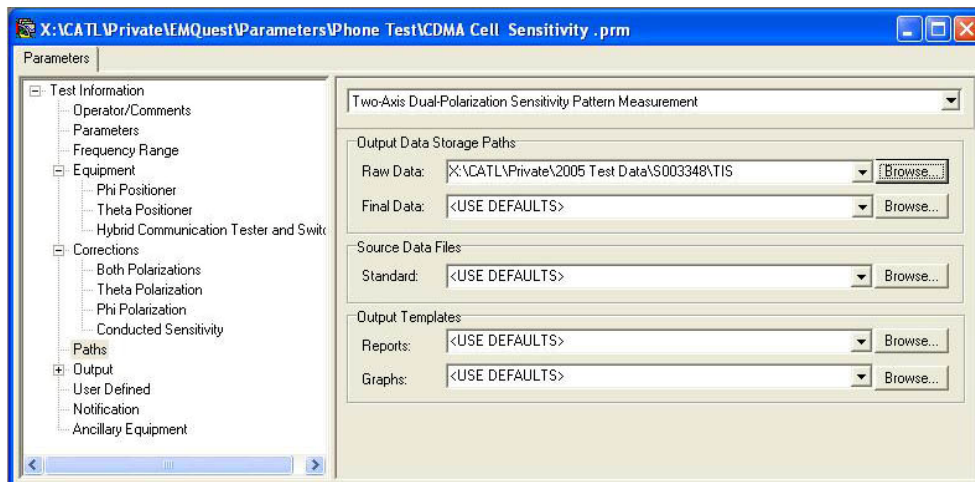


Figure 71: Paths folder

11. Select the **Paths** folder and set your raw data path.
12. The remaining folders are not required.

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Appendix A: Warranty



See the *Product Information Bulletin* included with your shipment for the complete ETS-Lindgren warranty for your AMS-8050 Antenna Measurement System.

DURATION OF WARRANTIES FOR THE AMS-8050 ANTENNA MEASUREMENT SYSTEM

All product warranties, except the warranty of title, and all remedies for warranty failures are limited to the durations outlined below for each product.

| Product Warranted | Duration of Warranty Period |
|-------------------------------|------------------------------------|
| Anechoic AMS-8050 Performance | 5 Years |
| Filters | 1 Year |
| Doors & Accessories | 1 Year |
| Positioning Equipment | 2 Years |
| Antennas | 2 Years |

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Appendix B: EC Declaration of Conformity



Declaration of Conformity

We, ETS-Lindgren, L.P., 1301 Arrow Point Drive, Cedar Park, TX, 78613, USA, declare under sole responsibility that the:

Model/Part Number: AMS-8050

Model/Part Name: Antenna Measurement System

Date of Declaration: 09 January, 2009

to which this declaration relates, meets the requirements and is in conformity with the relevant EC Directives listed below using the relevant section(s) of the following EC harmonized standards and other normative documents;

Applicable Directive(s):

Low Voltage Directive (LVD), 73/23/EEC and its amending directives

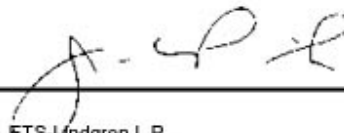
Applicable harmonized standard(s) and/or normative document(s):

IEC 61000-4-2:2000 Amendment 2 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 7 immunity test

Authorized Signatories:



ETS-Lindgren L.P.
Bryan Saylor, General Manager



ETS-Lindgren L.P.
James C. Psencik, Vice President of Engineering

The authorizing signatures on this Declaration of Conformity document authorizes ETS-Lindgren, L.P. to affix the CE mark to the indicated product. CE marks placed on these products will be distinct and visible. Other marks or inscriptions liable to be mistaken with the CE mark will not be affixed to these products.

ETS-Lindgren, L.P. has ensured that technical documentation shall remain available on premises for inspection and validation purposes for a period ending at least 10 years after the last product has been manufactured.

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