

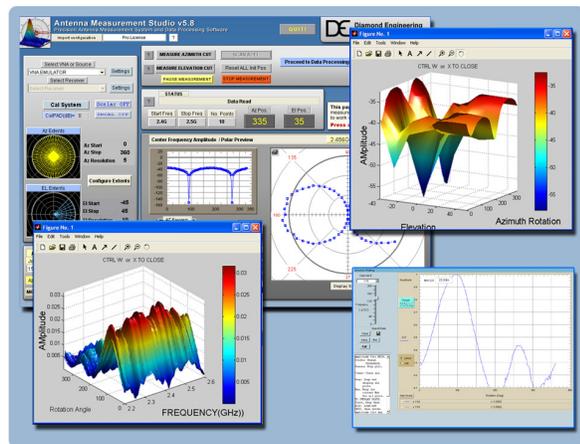
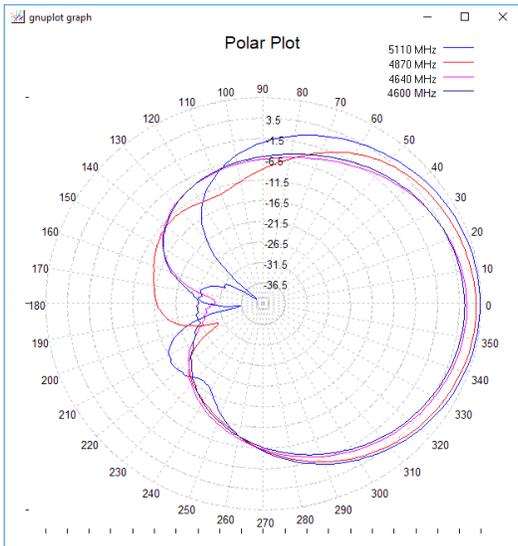


Diamond Engineering

Automated Measurement Systems

DAMS - Desktop Antenna Measurement System

x000, x100, and x250 Series



Users Manual & Setup Guide



Diamond Engineering

Automated Measurement Systems

Congratulations on your purchase!

Diamond Engineering's Desktop Antenna Measurement System has been designed to aid in the testing and development of small to medium sized antennas. Using our state of the art software, this system enables you to make many different types of measurements with complete user-definable configuration settings. The "Advanced Processing" features enable you to not only plot 3D graphs of the measurements, but also to save and recall those measurements for future use or comparison. Using the "Group Delay" function, you can calculate the exact distance to the test Antenna, identify multi-path rays, and eliminate the need for other measuring devices. Our software also allows you to export your data to a 3rd party application or spreadsheet.

This manual will fully assist you with the assembling and configuring as well as teach you how to utilize the many features of your Desktop Antenna Measurement System. To achieve the full functionality of the rotator system, it's expected the user has some working knowledge about the concepts and theories involved in microwaves and antenna design development.

We cannot emphasize the importance of fully reading and understanding this manual enough before actually using the equipment, as to avoid damaging the unit and/or possibly voiding your warranty.

Best regards,

The Diamond Engineering Team

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System Overview



System Overview **Features**

Key Features

- Light Weight.** Platform is made of high quality, light weight Acrylic material for easy portability
- Parallel Port Connectivity.** Unit easily connects to the computer using a standard 25 pin parallel cable.
- User Friendly Software.** Our software has been designed to be understood easily to ensure the shortest time to successful Antenna Measurement
- Quality Components.** The rotator unit is built only with the best of components for long lasting reliability.
- Compatibility.** Our Software supports a Wide range of network analyzers and instruments that use the GPIB method of communication.
- Phase Angle Measurement Software** can measure All four Vector S Parameters over a specified frequency range at each measurement point.
- 2-axis movement platform** has a complete range of movement from 360 Degrees Horizontal at 1/8 degrees per measurement to 45 Degrees Vertical Movement/Angle at 1 degree per step.
- DC to 18 GHz Measurement Range.** A Wide frequency use range allows for a more diversified range of antennas that can be tested with the system.
- Rotary SMA Joint.** Using a custom developed "near Zero" noise Rotary Joint the system can make accurate measurements without jeopardizing signal integrity.
- Data Processing Feature.** An advanced Software feature is included that contains Additional features such As:
 - Complete 3D Visualization for All Frequencies and Angles
 - 3D Azimuth Elevation plots for true 3D data representation.
 - Ability to save and Recall Data Sets from RAM or local Disk
 - Group Delay (distance) calculation
 - Ability to work with 4 different data sets at once
 - Ability to map over 50,000 Different measurement Points onto one 3D chart
 - Realtime Data over Movement V/S Frequency
 - Dipole Link Calculator
 - Calculator for modifying measurement results and comparing antennas
 - Export your data to a Spreadsheet or 3rd party application such as Matlab
 - Dipole Link Simulator allow creation of simulated dipole antennas

Key Features

5000, 6000 and 7000 Models

Key Features

Light Weight

Platform is made of high quality, light weight Acrylic material for easy portability.

Easy USB Connectivity

Unit easily connects to the computer using a standard USB cable.

User Friendly Software

Our software has been designed to be understood easily to ensure the shortest time to successful antenna measurement.

High Quality Components

The antenna measurement platform is built mostly with non-metallic, custom machined parts.

Widely Compatible

Our software supports a wide range of network analyzers and instruments that use the GPIB / 488.1/2 and SCPI methods of communication. TCP/IP and USB is supported on some instruments.

Phase/Angle Measurement

DAMS can measure any vector S-parameter over a specified frequency range, at each measurement point, using a VNA.

Dual-Axis Movement

360 degrees of horizontal motion at 1/8th degree per measurement and +/- 45 degrees vertical movement angle at 1 degree per step.

DC to 8, 18, 40 GHz. Measurement Ranges

Our wide frequency range allows for a diversified gamut of compatible antennas. (model dependent)

Rotary SMA Joint

Our high-performance rotary joint enables accurate measurements without jeopardizing signal integrity.

Advanced Data Processing Features

Designed for post measurement processing you can perform a range of functions such as:

- 3D visualization for all frequencies and angles
- Azimuth and elevation plots for true 3D data modeling
- Save / recall data sets from RAM or local disk
- Group delay (distance calculation)
- Excel-based reports with data
- Efficiency, radiation resistance, and AUT loss
- 4-trace 2D-plots
- Spherical 3D-plots
- Gain plots
- Simultaneously manipulate 4 different data sets
- Map over 50,000 measurement points into a single 3D-chart
- Reference antenna import feature
- 3-point gain substitution, and path loss correction methods
- Path loss calculator
- Calculator for modifying measurement results and comparing antennas
- Exports data to spreadsheet or 3rd part application (such as MatLAB)
- Dipole Link Simulator allows creation of simulated dipole antennas

System Requirements

- AMD / Intel (Core i5 or better is recommended)
- 4 GB RAM (minimum)
- 3 GB hard disk space
- 1 available USB port
- 1024 x 768 display resolution (minimum)
- Keyboard and mouse
- Compatible Network Analyzer or Power Meter/Spectrum Analyzer and Signal Generator
- PCI, USB or PC Card based name brand GPIB adapter (OR Ethernet if supported)
- Printer (if printing measured antenna plots)

Supported Instruments

If you do not see your instrument on our list, please contact us. It does not necessarily mean it is not supported.

VECTOR NETWORK ANALYZERS

ADVANTEST R376x Series
Agilent 507x Series
Agilent 836x Series PNA's
Agilent 836x Series PNA's
Agilent (HP) 8510x Series
Agilent (HP) 8714 Series
Agilent (HP) 8720 Series
Agilent (HP) 8753 Series
Agilent (HP) 8757 Series
Agilent FieldFox Series
Agilent N5320A Series PNA's
Anritsu 46xx Series Analyzers (VectorStar)
Anritsu 46xx Series Analyzers (ShockLine)
Anritsu 46xx Series Analyzers (Scorpion)
Anritsu 37xx Series Analyzers (Lightning)
Anritsu MS20xx VNA Master Series
Copper Mountain S2 / S4 VNAs
Planar TR1300 Series
Planar S5048 Series
Rohde & Schwarz ZVx Series
Rohde & Schwarz ZND Series
Rohde & Schwarz ZNB Series
Tektronix TTR500 Series

SIGNAL GENERATORS

HP 83650 Series
HP 8350 Series
Agilent N9310A Series
SMP Series
Anritsu MG36xx Series
Anritsu MG69xx Series
Rohde & Schwarz SML Series
Rohde & Schwarz SMP Series
Rohde & Schwarz SMU Series

POWER METERS

Elva DPM-10
HP436A
HP437B
Anritsu ML2438A

SPECTRUM ANALYZERS

HP8565 Series
Rohde & Schwarz FSL Series
Anritsu MS27xx Series
Anritsu MT82xx Series

OTHER / MISC

Agilent N51xx Series
Anritsu MT8860C
Anritsu S820E
Quanset QM2010 Synth



NOTE: For the most updated list of supported instruments, please visit:
<https://www.DiamondEng.net/supported-instruments/>

Platform Controller Unit

Overview

The USB Platform Controller unit is an extremely accurate microprocessor-based stepper controller. Movement signals are sent from the measurement PC to the controller unit where precision stepping sequences are generated. A development kit is included which enables you to write your own custom software to control the platform.

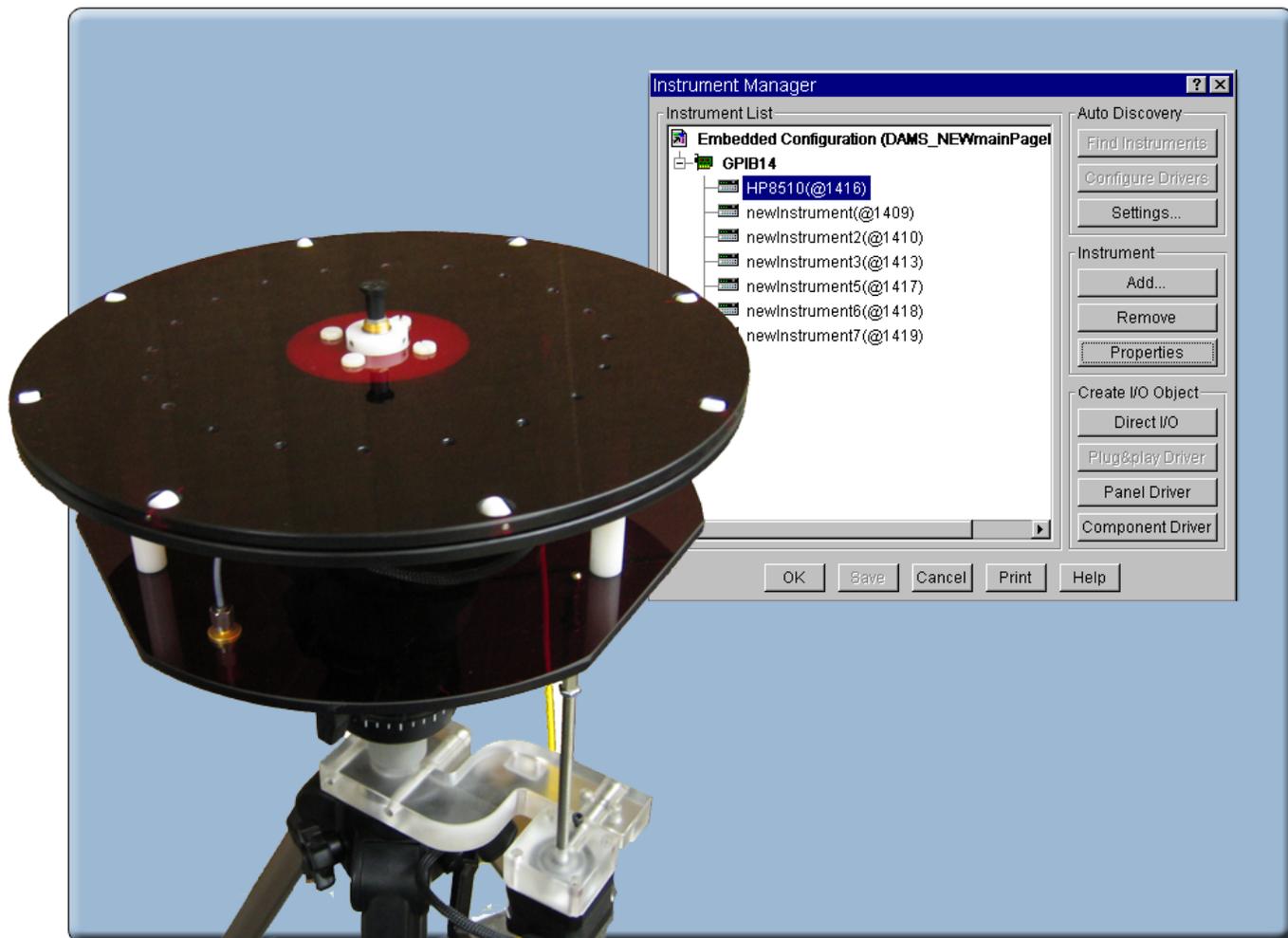
Front View



Top View



x000 Series Assembly, Installation & Configuration



DAMS x000 Series

Instructions for assembly, installation and software configuration

Package Contents

Main Components

Use the checklist below to verify all pieces are present and undamaged:

1. Positioner Platform
2. Tripod
3. Vertical assembly
4. Vertical spacer
5. Vertical actuator rod
6. 90 degree pivot **
7. USB Platform Controller
8. Hex wrench tools (SAE and metric)
9. 110/220v power supply w/ AC cord
10. USB cable
11. Laser alignment tool **
12. Two 10' ultra-low-loss cables *
13. Platform control cables
14. Digital inclinometer **

* DAMS 5000 includes low-loss cables

** Discontinued (replaced by FSM)



Assembly & Installation (Non-FSM)

Introduction

 **BEFORE YOU BEGIN:** Unpack ALL items and ensure there are no damaged or missing parts.

 **NOTE:** The x000 Series is designed for non-FSM measurements using elevation motor.

Vertical Assembly

1. Unfold tripod and extend the top half-way, then secure the height adjustment. **(Fig. 1)**
2. Take the grey vertical spacer and snap it onto the very top of the tripod neck. **(Fig. 2)**

 **IMPORTANT:** Without this piece, your unit will not make accurate vertical measurements.

3. Attach the vertical assembly onto the top of the tripod using the included hex wrench so the top edge of the vertical assembly is touching the bottom edge of the vertical spacer. **(Fig. 3)**

Fig. 1



Extend tripod

Fig. 2



Attach vertical spacer

Fig. 3



Attach vertical assembly ensuring vertical actuator rod does not hit tripod legs as it moves down

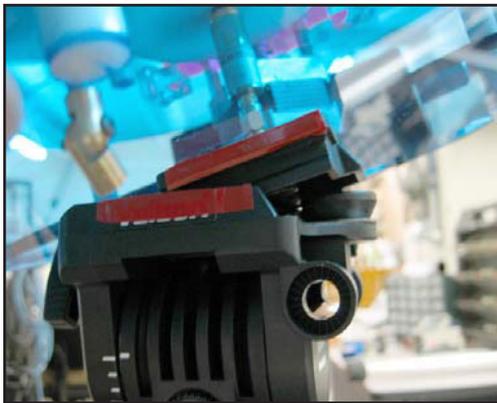
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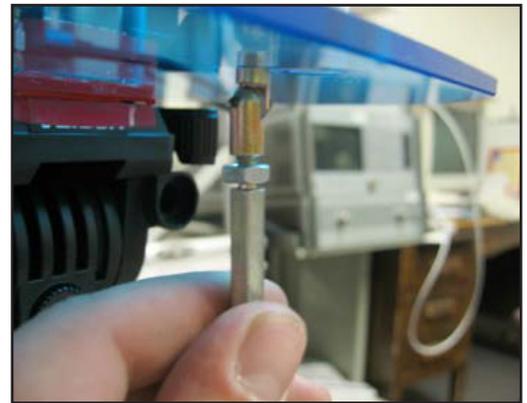
1. Ensure the azimuth setting on the tripod is unlocked.



2. Place the tripod head in a horizontal position and tighten the locking screw.



3. Align the colored tape on the platform with the tape on the tripod head and insert the platform into the head at a 30° angle. The head will automatically lock the platform into position.



4. Loosen the tilt lock screw (see Img. 2) allowing the platform to tilt. Connect the vertical actuator rod to the platform and tighten the locknut while holding the hex shaft using a wrench, ensuring the rod does not disconnect.

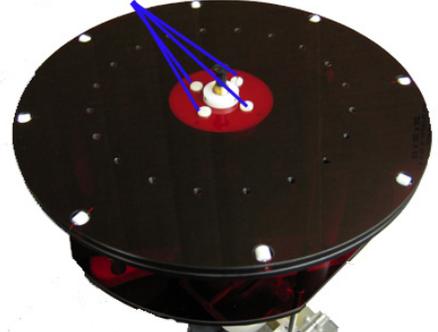
Attaching Optional Thrust Plate

Instructions

Applies to acrylic and aluminum models only.

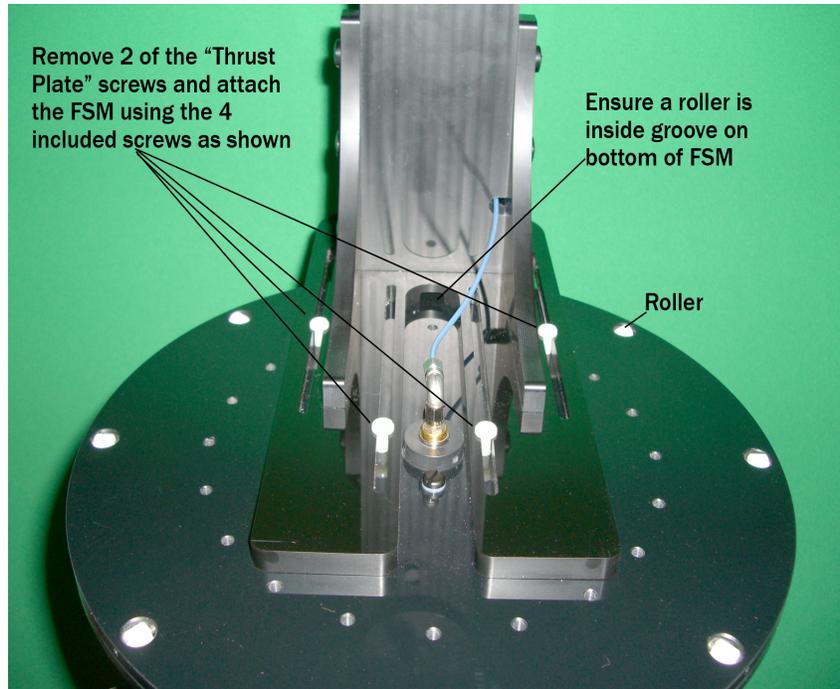
The thrust plate attaches using the four 10-32x1/4" screws. Do not overtighten screws. If using your own screws, be careful not to hit the metal bearing below.

Qty 4 10-32 x 1/4" Screws



Assembly & Installation *(with FSM-5)*

 **IMPORTANT:** For FSM-10 installation, please refer to the separate FSM-10 installation manual.



Hardware Setup

1. Setup the tripod and extend the neck upwards about 14".
2. Carefully thread the DAMS positioner onto the tripod.
3. Remove 2 of the 4 thrust plate screws to make room for the FSM mount.
4. Attach the FSM to the top of the DAMS positioner using the included screws as shown in the attached pictures. The mount is adjustable to allow you to "phase center" the antenna on the Elevation/Vertical Axis.
5. Connect the cables as shown in the photos above.

 **NOTE:** The support struts shown in the photo are not required. We've since updated with a thicker bottom plate to minimize/eliminate flexing.

Software Setup

Click "Configure Positioner" and ensure USB/Serial is selected. Place a check-mark in the FSM box. Press save, then "restart with default extents" When you restart the software, you will see the updated positioner picture.

Attaching the Cables

Cable Checklist

You should have received the following five cables with your DAMS System:

Two (2) 10-foot RF Cables SMA/2.92mm/2.4mm/ or V 1.85mm cables (or optional 20-foot cables)

One (1) USB cable (USB to Micro-USB)

Two (2) 6-meter platform control cables

Cable Connections

 **NOTE:** For FSM-5 connections, see photo on [Page 11](#).

Step 1 Connect USB cable to Platform Controller but DO NOT connect to PC.

Step 2 Connect the power supply wire to the Platform Controller.

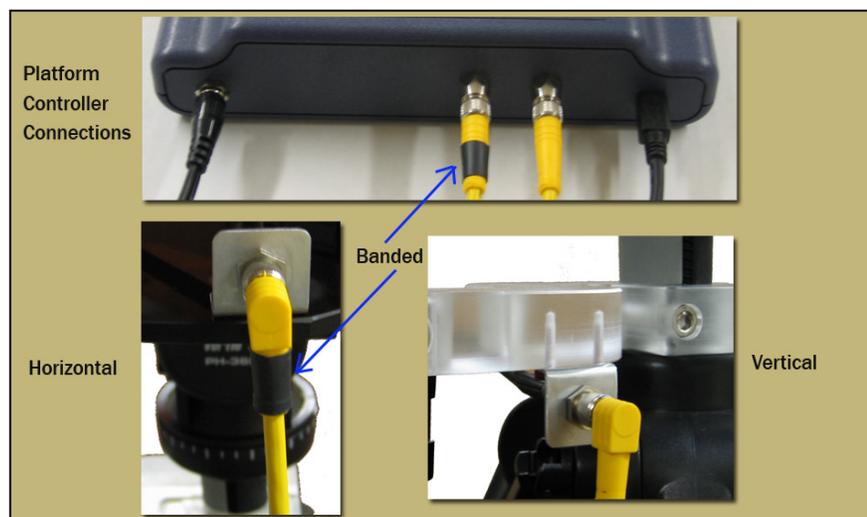
Step 3 Connect one end of calibrated SMA cable to bottom of platform.

Step 4 Attach other end of SMA cable to VNA.

 **CAUTION: USE CARE! Damaged cables will compromise results!**

Step 5 Connect straight end of the yellow cable with the black band on the connector to the "Horizontal" port on Platform Controller and non-banded cable to "vertical" port.

Step 6 Connect other ends of yellow cables to platform. The banded rightangle connector connects to turntable, and the non-banded connector connects to vertical actuator.



Software Installation & Configuration

Software Installation

 **IMPORTANT:** Administrator privileges are required to install software.

1. Place CD in CD-ROM or Insert Flash Drive, Navigate to drive and launch setup.exe
2. Click Next/OK through all setup screens.
3. Agilent Runtime and I/O libraries Setup will launch.

Windows 10 Users: you will receive an error that the operating system is not supported - ignore this error.

4. To verify installation is complete click Start Menu → Programs and ensure the folders below are present. If so, you may launch Antenna Measurement Studio.

- Agilent Vee Pro Runtime 9.3
- Agilent I/O Libraries
- DAMS

 **NOTE:** If any folders are missing, an installation error occurred. Manually install components by following instructions below.

Post Installation Instructions

A few extra steps are REQUIRED after the software has been installed

Microsoft Excel Open Excel, go to File → Options and set the default number of sheets to 3

Matlab 3D Plots Go to C:\Program Files (x86)\Agilent\Vee Pro Runtime 9.3 and right click on veerun.exe. Select the compatibility tab and select "Run as Administrator"

Entering Your License Key

1. In main screen of DAMS software, at the top of the screen, Under "DEMO LICENSE", press "system options" and select LICENSE INFO (**not** simulator license)
2. Enter the license key located on the CD holder or on the front or back of your users manual Press "Verify and Save".
3. Key has been verified should appear. Click "QUIT" and restart the software to update the license.

License Problems?

E-mail us at Support@DiamondEng.net or call (530) 626-3857 Monday - Friday, 9:00 A.M. to 5:00 P.M. (PST).

Controller Setup & USB Driver Installation

Connecting Controller and Installing USB Drivers - (USB / USB-RS232)

1. Connect DAMS Platform Controller to computer via USB Cable. A window should appear indicating a new device has been found.



IMPORTANT: When possible, always allow Windows to check for updated driver.

2. If Windows cannot find the driver, Check the box labelled "Search Manually" then click "Next".
3. Select c:\DAMS\driver (if windows does not accept this driver go to <http://www.ftdchip.com> and download the latest VCP drivers.)
4. A new window should pop up indicating another device has been found. Allow Windows to search for an updated driver if you did before. If not, repeat these steps.

Configuring DAMS Software for x000 Series Positioners

1. Start the DAMS software
2. Click the "Positioner Settings" button
3. Select the USB/Serial option in the upper right from the "Select Controller" pull down. Click the "Find" button, which should find your controller (NOTE: the controller must be on a COM port lower than COM8. If it is not, please configure the USB/Serial adapter via Control Panel → Device Manager → Ports → COM & LPT.)
4. Set "Motor Res" to .1125 and gear ratio to 14.4 on both AZ and EL fields.
5. The USB controller configuration is now complete. If no controller is found, follow the troubleshooting instructions below. (NOTE: the COM port must be 9 or lower for the software to communicate with the controller, this can be changed in device manager)
6. Press "SAVE" button, followed by "QUIT" to save changes. Restart software.

Troubleshooting

1. Check all connections between Controller and PC
2. Click Start → Control Panel → System → Hardware Tab → Device Manager
3. Expand section labeled Ports Com&LPT. DAMS Platform controller should be listed with an associated COM Port. If no controller is listed, re-install the driver. Please contact us if you need any assistance.

Unit Calibration & Positioner Verification (*non-FSM*)

Calibrating Vertical Movement to Zero Degrees

 **IMPORTANT:** For the software to move the platform correctly on the vertical axis you must have the platform at zero degrees when starting the DAMS Software, or the platform must match the vertical position shown in the software before moving vertically.

IF THE PLATFORM ANGLE AND SOFTWARE ANGLE DO NOT MATCH:

Use the Jog +/- pull-downs to move the platform to the level position. Once you have reached the desired position, press "ZERO POSITIONER" to set the current physical position as "0,0".

 **NOTE:** If you exit the software without returning to zero, you must follow the above instructions to once again re-set the positioner to zero degrees.

Verifying Positioner Connectivity and Operation

These steps will assist you with verifying the x000 Series positioner's operation with the DAMS software. All steps for installing and configuring the software and connecting cables should be completed before performing the following steps.

1. Ensure power supply is plugged in and start the DAMS Software.
2. **Elevation / Vertical Movement Test**
Select -45 from "El jog to" (*See image below*) pull-down - positioner should tilt 45 degrees towards reference antenna. Select +45 from "El jog to" pull-down and positioner should tilt all the way to +45 degrees.
3. **Azimuth / Horizontal Movement Test**
Select 180 from "Az jog to" pull-down. Positioner should rotate 180 degrees of reference antenna. Select 360 from "Az jog to" pull-down and positioner should finish the rotation to 360 degrees. (*See image below*)
4. **Resetting to 0, 0 Degrees**
After completing the tests, click  to clear all position settings and move the positioner to 0 degrees azimuth and 0 degrees elevation.

Testing and Calibration Complete

Proceed to the Antenna Measurement Studio Installation chapter to complete the installation and begin making measurements.



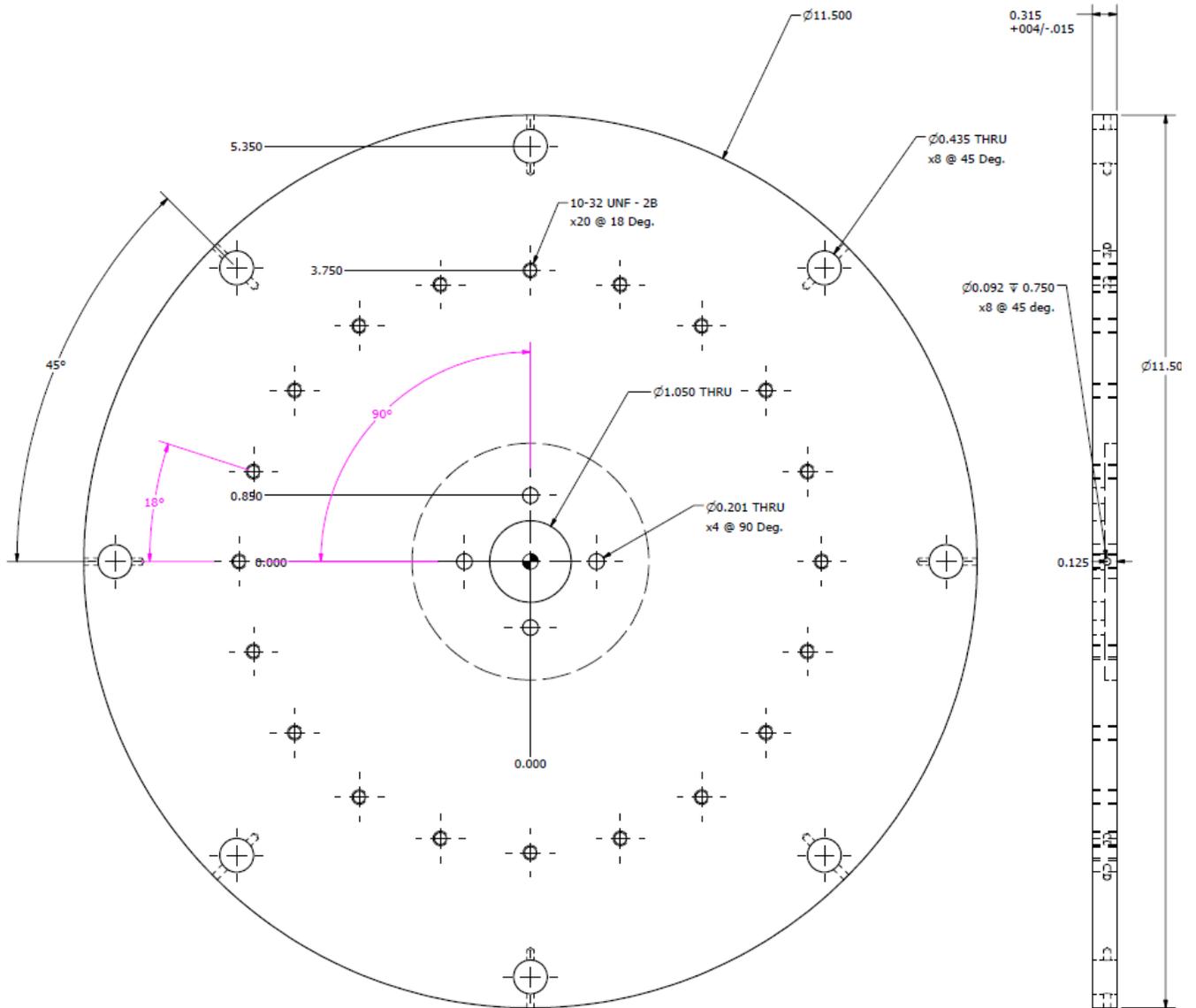
The screenshot shows a software interface with several controls for the positioner. It includes two columns of jog delta settings: Azimuth Jog delta (Jog Left and Jog Right) and Elevation Jog delta (Jog - and Jog +). Below these are two pull-down menus for 'Az Jog to' and 'El Jog to', both currently set to 0. At the bottom, there are two buttons: 'MOVE TO DIRECT POSITION' and 'ZERO POSITIONER'.

Azimuth Jog delta		Elevation Jog delta	
Jog Left	Jog Right	Jog -	Jog +
15	15	15	15
Az Jog to	0	El Jog to	0
MOVE TO DIRECT POSITION		ZERO POSITIONER	

x000 Series Plate Drawing

Plate Drawing

Use the drawing below to help design fixtures to mount on your DAMS system.



x100 Series Assembly, Installation & Configuration



DAMS x100/x100B Series

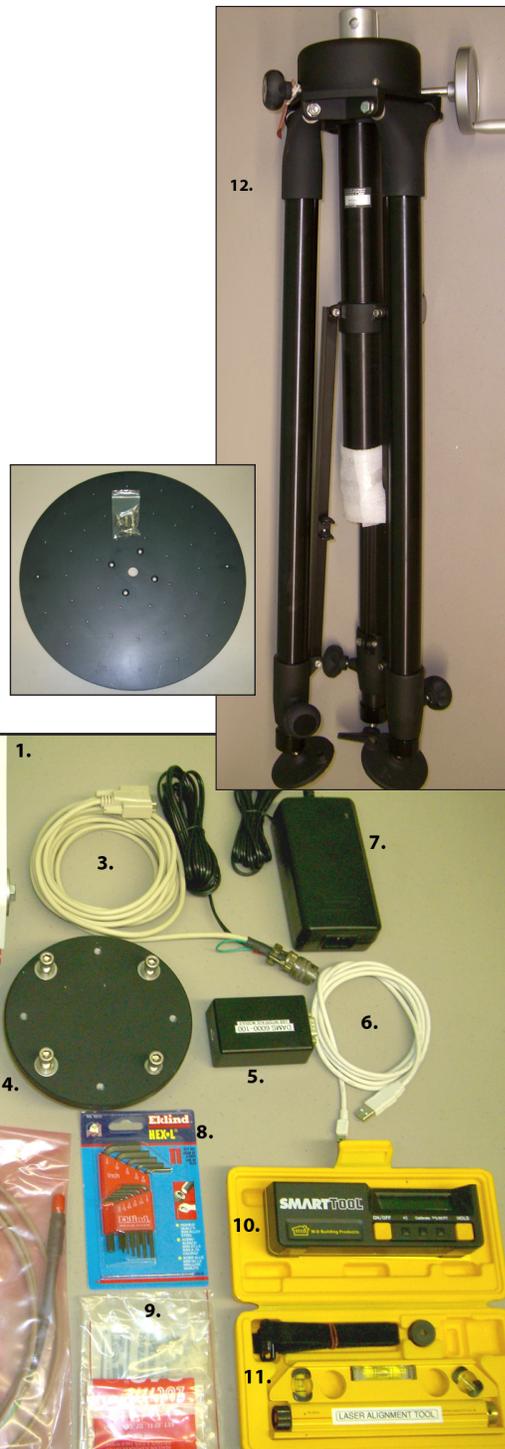
100-pound capacity positioner with an extra heavy duty tripod and measuring capabilities frequencies of up to 40 GHz

Package Contents

Main Components

Upon receiving your shipment of the DAMS x100 series, please verify you've received all items below while checking for any damages that may have occurred during the shipment process. Please contact us immediately if any missing or damaged items.

1. 100 pound positioner
2. Two 10-foot ultra low loss cables
3. Separate power and control cables
4. Tripod adapter plate
5. USB to RS232 Adapter
6. USB cable
7. 24v power supply
8. Hex wrench tools (SAE)
9. SMA saver, additional hardware
10. Digital level
11. Laser alignment tool **
12. Heavy duty tripod
13. Thrust plate
14. DAMS Manual & Software CD
(not shown)



Tripod & Positioner Assembly

Assembly Steps

 **CAUTION:** Damaging any SMA connectors during assembly may result in faulty readings.

 **BEFORE YOU BEGIN:** Unpack all items and ensure there are no damaged or missing parts.

1. Lay the positioner on its side and attach the Tripod Adapter Plate to the bottom using the four Hex-Cap Screws and included hex wrenches. Use the blue marks for proper orientation. **(Fig. 1)**
2. Unfold and stand up the tripod, then loosen the height lock and crank the height up to about 2 inches. **(Fig. 2)**
3. Place the positioner on the tripod by holding it upright and sliding the shaft on the adapter plate into the hole in the top of the tripod neck. Rotate the assembly until you can fit the red-handled hex wrench into the set screw located inside of the hole. Tighten the set screw and the positioner now should be securely mounted onto the tripod. **(Fig. 3)**

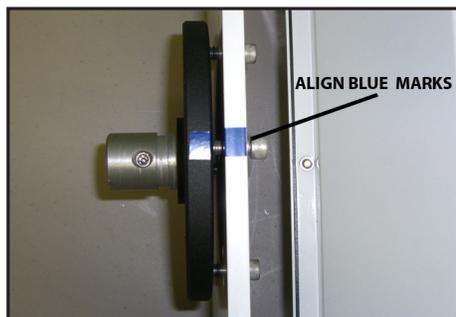


Fig. 1

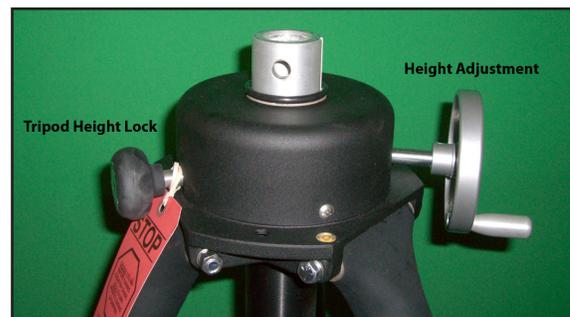


Fig. 2



Fig. 3

Attaching the Cables

1. Attach the control/power cables to the side of the positioner. **(Fig. 1)**
2. Connect the USB cable and white cable from control cable to USB interface, DO NOT connect to PC yet. **(Fig. 2)**
3. Connect power supply to power cable **(Fig. 3)**
4. Connect precision RF cable to positioner. Tighten but **do not** over-torque. **(Fig. 4)**
5. Connect other side of RF cable to ports 1 or 2 of test equipment. **(Not shown)**

Fig. 1



Fig. 2



Fig. 3



Fig. 4



Using the DAMS x100 Positioner

Assembly Steps

 **NOTE:** This section is related to the DAMS 6100 positioner ONLY. The 6100 positioner follows the same procedures as the original 5000, 6000, or 7000 positioners with exception to a few key items.

The positioner is tracked using internal, absolute encoders at zero degrees so the positioner will always be in the same position.

Before making any measurements, ensure the positioner is at 0 degrees azimuth and 0 degrees elevation by using the **Reset ALL Init Pos** button in the software. Attach your antenna to the positioner, ensuring it is properly oriented to the fixed reference antenna. The pictures below show the orientation of the positioner for the given position settings. When making a scan measurement (horizontal and vertical) the positioner will move from 0 to 360 degrees for the first cut. The positioner will then tilt and scan back from 360 degrees to 0 degrees. It will continue this pattern of motion until the measurement is complete.

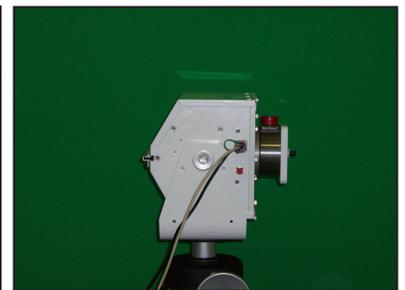
POSITIONER EXAMPLE: ELEVATION / TILT



-90 degrees elevation



0 degrees elevation



+90 degrees elevation

POSITIONER EXAMPLE: AZIMUTH / PAN



*+90 degrees elevation
0 / 360 degrees azimuth*



*+90 degrees elevation
90 degrees azimuth*



*+90 degrees elevation
180 degrees azimuth*

x100 Legacy Positioner & Tripod Specifications

Movement

Resolution:	0.1 degree both axis (6100/7100 models) 0.25 degree (5100 models)
Horizontal / Azimuth:	0 to 360 degrees
Vertical / Elevation:	-90 to +90 degrees
Horizontal / Az. torque:	50 ft-lbs.
Vertical/Elev. Torque:	150 ft-lbs.
Drivetrain:	Precision worm drive with roller bearings
Weight Capacity:	100 lbs.

Electrical

Volts:	24 VDC
Amps:	2.3
Interface:	RS232 w/USB converter

RF Connectivity

Frequencies:	DC-6 GHz (5100 model) DC-18 GHz (6100 model) DC-40 GHz (7100 model)
Rotary DUT connector:	SMA Female
Stationary Connector:	SMA Female
Rotary Joint:	S.I.C based coaxial rotary joint

Physical Specifications

Material:	Powder-coated aluminum
Weight :	44 lbs. (20 kg)
Height:	12.51" (31.8 cm)
Width:	12.61" (32 cm)
Depth:	8.87" (22.5 cm)

Tripod Specifications

Material:	Aluminum and ABS
Weight:	23 lbs. (10.4 kg)
Height Min:	33.5" (85 cm)
Height Max:	70" (178 cm)
Maximum Spread:	73" (185 cm)
Collapsed Dimensions:	40.5" x 12.5" (102 x 31.3cm)
Leg Sections:	2
Column Travel:	18" (45 cm)
Foot Plate Diameter:	4" (10 cm) (self-leveling 5/8" hole for spiking)

x100B Positioner & Tripod Specifications (2021 and later)

Movement

Resolution:	0.1 degree both axis (all x100B models)
Horizontal / Azimuth:	0 to 360 degrees
Vertical / Elevation:	-90 to +90 degrees
Horizontal / Az. torque:	50 ft-lbs.
Vertical/Elev. Torque:	90 ft-lbs.
Drivetrain:	Precision worm drive with roller bearings
Weight Capacity:	100 lbs.

Electrical

Volts:	24 VDC
Amps:	5
Interface:	RS232 w/USB converter

RF Connectivity

Frequencies:	DC-6 GHz (5100 model) DC-18 GHz (6100 model) DC-40 GHz (7100 model)
Rotary DUT connector:	SMA/2.92mm Female
Stationary Connector:	SMA/2.92mm Female
Rotary Joint:	S.I.C based coaxial rotary joint

Physical Specifications

Material:	Powder-coated aluminum
Weight :	80 lbs. (36.4 kg)
Height:	16.42" (41.7 cm)
Width:	19" (48.26 cm)
Depth:	9" (22.86 cm)

Tripod Specifications

Material:	Aluminum and ABS
Weight:	23 lbs. (10.4 kg)
Height Min:	33.5" (85 cm)
Height Max:	70" (178 cm)
Maximum Spread:	73" (185 cm)
Collapsed Dimensions:	40.5" x 12.5" (102 x 31.3cm)
Leg Sections:	2
Column Travel:	18" (45 cm)
Foot Plate Diameter:	4" (10 cm) (self-leveling 5/8" hole for spiking)

Positioner Troubleshooting

Possible Problems & Solutions

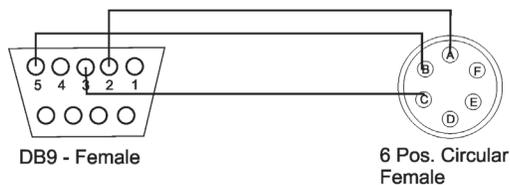
The DAMS x100 Series Positioner is a very robust and stable positioner. In the event that you believe you may have a problem with your positioner. Please check the items below. If you do not see your problem listed below or you are not able to get your problem resolved, please contact us and we will be happy to assist you with your problems.

Problem: Software message is displayed that the positioner has reached its limit.
Possible Cause: The Horizontal or Vertical tracking may be out of sync in the software?
Solution: Restart software and press **Reset ALL Init Pos** button to reset all settings.

Problem: When instructed to move, the positioner does nothing.
Possible Cause: Power is not connected? Wrong port selection? Software glitch?
Solution: Check all cables, reboot PC, disconnect and reconnect positioner power.

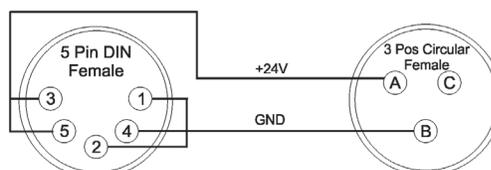
CONTROL CABLE PINOUT

X100 FUNCTION	DB9-F	6 pin Circular
	PIN	PIN
	1	
TX	2	A
RX	3	C
	4	
GROUND	5	B
	6	
	7	
	8	



POWER CABLE PINOUT

DESCRIPTION	5pos DIN Female	3 Pos. Circular- F
	PIN	PIN
+24V	3	A
+24V	5	A
GND	1	B
GND	2	B
GND	4	B



Software Installation & Configuration

Software Installation



IMPORTANT: Administrator privileges are required to install software.

1. Insert USB Drive into PC, Launch Setup.exe from flash drive
2. Click Next/OK through all setup screens.
3. Agilent Runtime and I/O libraries Setup may also launch. If so, install as well.
4. To verify installation is complete click Start Menu → Programs and ensure the folders below are present. If so, you may launch Antenna Measurement Studio.
 - Agilent Vee Pro Runtime 8.0
 - Agilent I/O Libraries
 - DAMS



NOTE: If any folders are missing, an installation error occurred - manually install components by following instructions below.

Manually Installing Runtime / IO Libraries

Antenna Measurement Studio is dependent on the application below. It is normally installed during setup, but can fail in certain situations. In this event, run this setup file individually:

Agilent I/O Libraries Start Menu → Run c:\DAMS\runtime\iolib\Setup.exe
(or launch from CD menu)

Entering Your License Key

1. In main screen of DAMS software, at the top of the screen, press "system options" and "License Information", NOT Simulator License
2. Enter the license key located on the Flash Drive Baggie or from the front or back of the users manual itself. Press "Verify and Save".
3. Notification key has been verified should appear. Next, click "QUIT" and restart the software to update the license.

License Problems?

E-mail us at Support@DiamondEng.net or call (530) 626-3857 Monday - Friday, 9:00 A.M. to 5:00 P.M. (PST).

USB Driver Installation & Configuration

Installing the USB Driver



IMPORTANT: If you ordered a pre-configured PC, you do NOT need to perform any of these steps unless you are re-installing the system.

Antenna Measurement Studio should be installed before performing the steps below.

1. Connect DAMS Platform Controller to PC using included USB cable. Notification indicating a new device has been found should appear. Allow windows to check for a driver automatically. If no internet connectivity or Windows cannot find driver, still proceed with steps 2-5.
2. Check the box labelled "Search Manually" and click "Next".
3. Select CD-ROM, click "Next"
4. Notification may appear that driver has not passed the WHQL certification. Click "Continue Anyway". Click Finish.
5. New notification indicating another device has been found should appear. Allow Windows to search for a driver if it was successful the first time. If not, repeat steps 2-5 above.
6. Open up Control Panel (Start→ Settings → Control Panel), and open System. (If using category view, you must click "Performance and Maintenance" before you can open System). Open the Hardware tab and click on "Device Manager"
7. Click the "+" sign next to "Ports COM&LPT", and the controller will listed as "USB Serial Port". Make note of the port number it shows.

Configuring DAMS Software for x100 Series Positioners

1. In Antenna Measurement Studio, click "Positioner Settings".
2. Select the x100 series from the "Interface" pull down menu.
3. Select the COM port that you previously noted from the "Port" pull down menu.
4. Under the x100 pull down menu, select your model.
5. Set "Gear Ratio" to 10 for both azimuth and elevation
6. Change "Motor Res." to 2.5 for 5100 Systems, or 1 for 6100 and 7100 and all x100b models.
7. Press the "SAVE" and "QUIT" buttons to save settings and quit.

Unit Calibration & Positioner Verification

Verifying Positioner Connectivity and Operation

These steps will assist you with verifying the x100 Series positioner's operation with the DAMS software. All previous steps for installing and configuring the software and connecting cables should be completed before performing the following steps.

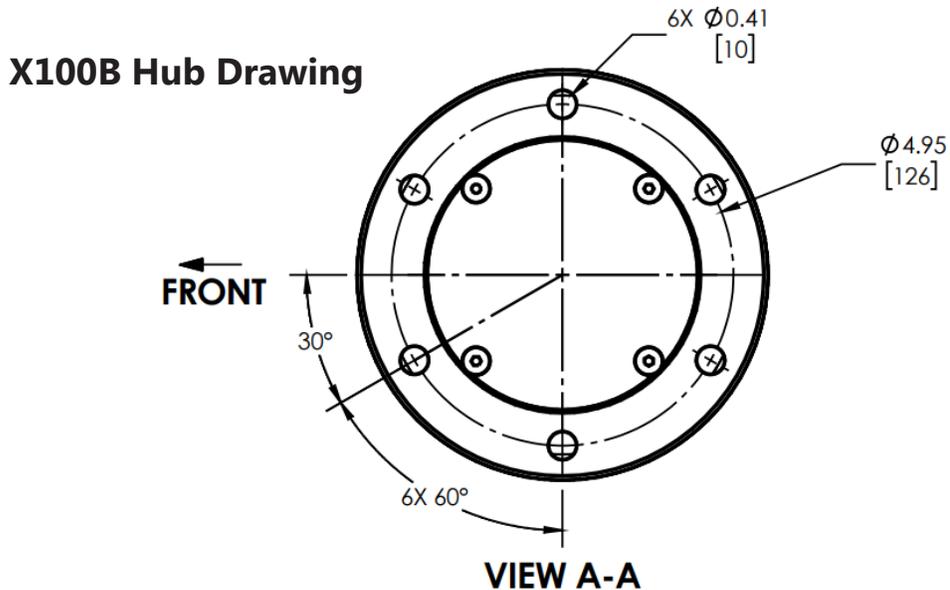
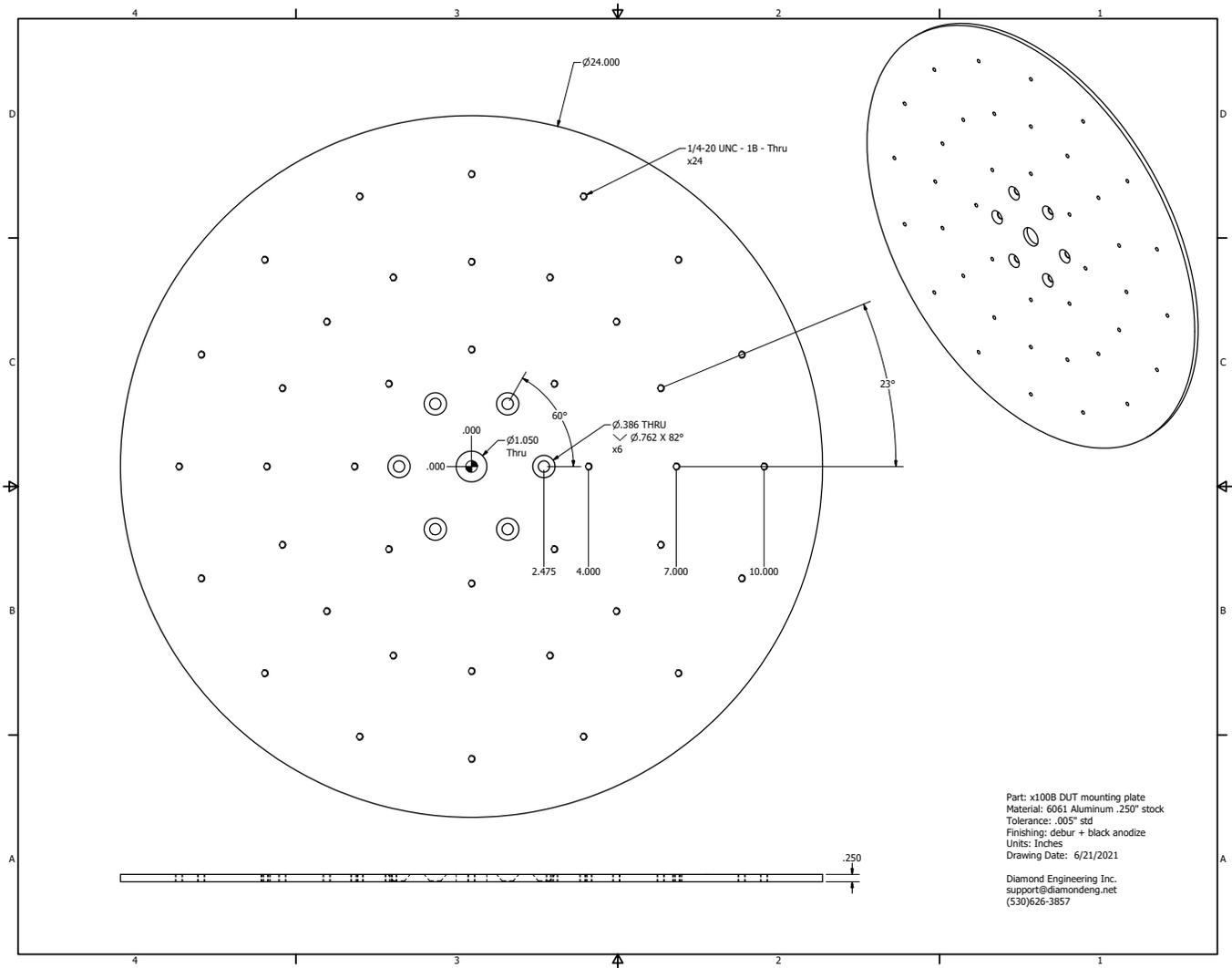
- Step 1** Ensure all cables are connected and power supply is plugged in.
- Step 2** Start the DAMS Software.
- Step 3** **Elevation / Vertical Movement Test**
Select -90 from "El jog to" pull-down - positioner should tilt 90 degrees towards reference antenna. Select +90 from "El jog to" pull-down. Positioner should tilt all the way to +90 degrees. *(See image below)*
- Step 4** **Azimuth / Horizontal Movement Test**
Select 180 from "Az jog to" pull-down. Positioner should rotate 180 degrees of reference antenna. Select 360 from "Az jog to" pull-down. Positioner should finish the rotation to 360 degrees. *(See image below)*
- Step 5** **Resetting to 0, 0 Degrees**
Click  which clears all position settings, and moves the positioner to 0 degrees azimuth and degrees elevation.

Testing and Calibration Complete

Proceed to the Antenna Measurement Studio Installation chapter to complete the installation and begin making measurements.

Azimuth Jog delta		Elevation Jog delta	
Jog Left	Jog Right	Jog -	Jog +
15	15	15	15
Az Jog to	0	El Jog to	0
MOVE TO DIRECT POSITION		ZERO POSITIONER	

x100B Plate and Hub Drawings



x250 Series Assembly, Installation & Configuration



DAMS x250 Series

250-pound capacity positioner with an extra heavy duty tripod and measuring capabilities frequencies of up to 40 GHz

Package Contents

Main Components

Upon receiving your shipment of the DAMS x100 series, please verify you've received all items below while checking for any damages that may have occurred during the shipment process. Please contact us immediately if any missing or damaged items.

1. x250 Series Positioner
2. Two 10-foot ultra low loss RF cables
3. Power and control cables
4. Tripod adapter plate
5. USB to Serial Converter cable
6. 48v power supply (*exact model may vary*)
7. Hex wrench tools (SAE)
8. SMA saver, additional hardware
9. Digital level
10. Laser alignment tool
11. Heavy duty tripod
12. Thrust / mounting plate (*not shown*)
13. DAMS Manual & Software CD (*not shown*)



Tripod & Positioner Assembly

Assembly Steps

 **CAUTION:** Damaging any SMA connectors during assembly may result in faulty readings.

 **BEFORE YOU BEGIN:** Unpack all items and ensure there are no damaged or missing parts.

1. Unfold tripod, Remove Threaded ring from adapter plate (**Fig. 1**)
2. Place the adapter plate onto the tripod- Ensure keys on adapter plate match with the tripod
Then replace the threaded ring to lock the adapter to the tripod (**Fig. 2**)
3. Have another person assist placing the x250 unit on top of the tripod, use the alignment mark to help line up the bolt holes. Use the included hardware to attach the x250 unit. (**Fig. 3**)



Fig. 1



Fig. 2



Fig. 3

Attaching the Cables

1. Attach the power and control cables to the side of the positioner. **(Fig. 1)**
2. Connect the USB adapter to the Serial End of the control cable **(Fig. 2)**
3. Connect Power cable to the power supply **(Fig. 3)**
4. See page 36 for USB adapter installation and software configuration

Fig. 1



Fig. 2



Fig. 3



Using the x250 Positioner

Operation Tips

NOTE: This section is related to the x250 positioner ONLY. The x250 positioner follows the same procedures as the original 5000, 6000, or 7000 positioners with exception to a few key items:

The units positioner is tracked using internal, absolute encoders at zero degrees so the positioner will always be in the same position, no zeroing is required

Before making any measurements, ensure the positioner is at 0 degrees azimuth and 0 degrees elevation by using the **Reset ALL Init Pos** button in the software. Attach your antenna to the positioner, ensuring it is properly oriented to the fixed reference antenna. The pictures below show the orientation of the positioner for the given position settings. When making a scan measurement (horizontal and vertical) the positioner will move from 0 to 360 degrees for the first cut. The positioner will then tilt and scan back from 360 degrees to 0 degrees. It will continue this pattern of motion until the measurement is complete.

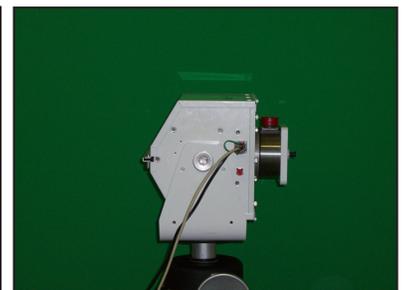
POSITIONER EXAMPLE: ELEVATION / TILT



-90 degrees elevation



0 degrees elevation



+90 degrees elevation

POSITIONER EXAMPLE: AZIMUTH / PAN



*+90 degrees elevation
0 / 360 degrees azimuth*



*+90 degrees elevation
90 degrees azimuth*



*+90 degrees elevation
180 degrees azimuth*

(x100 Model Shown)

x250 Positioner & Tripod Specifications

Movement

Resolution:	0.01 degree both axis
Horizontal / Azimuth:	0 to 360 degrees
Vertical / Elevation:	-90 to +90 degrees
Vertical/Elev. Torque:	500 ft-lbs.
Drivetrain:	Precision worm drive with roller bearings
Weight Capacity:	250 lbs.

Electrical

Volts:	48 VDC
Amps:	6
Interface:	RS232 w/USB converter

RF Connectivity

Frequencies:	DC-6 GHz (5250 model) DC-18 GHz (6250 model) DC-40 GHz (7250 model)
Rotary DUT connector:	SMA Female
Stationary Connector:	SMA Female
Rotary Joint:	S.I.C based coaxial rotary joint

Physical Specifications

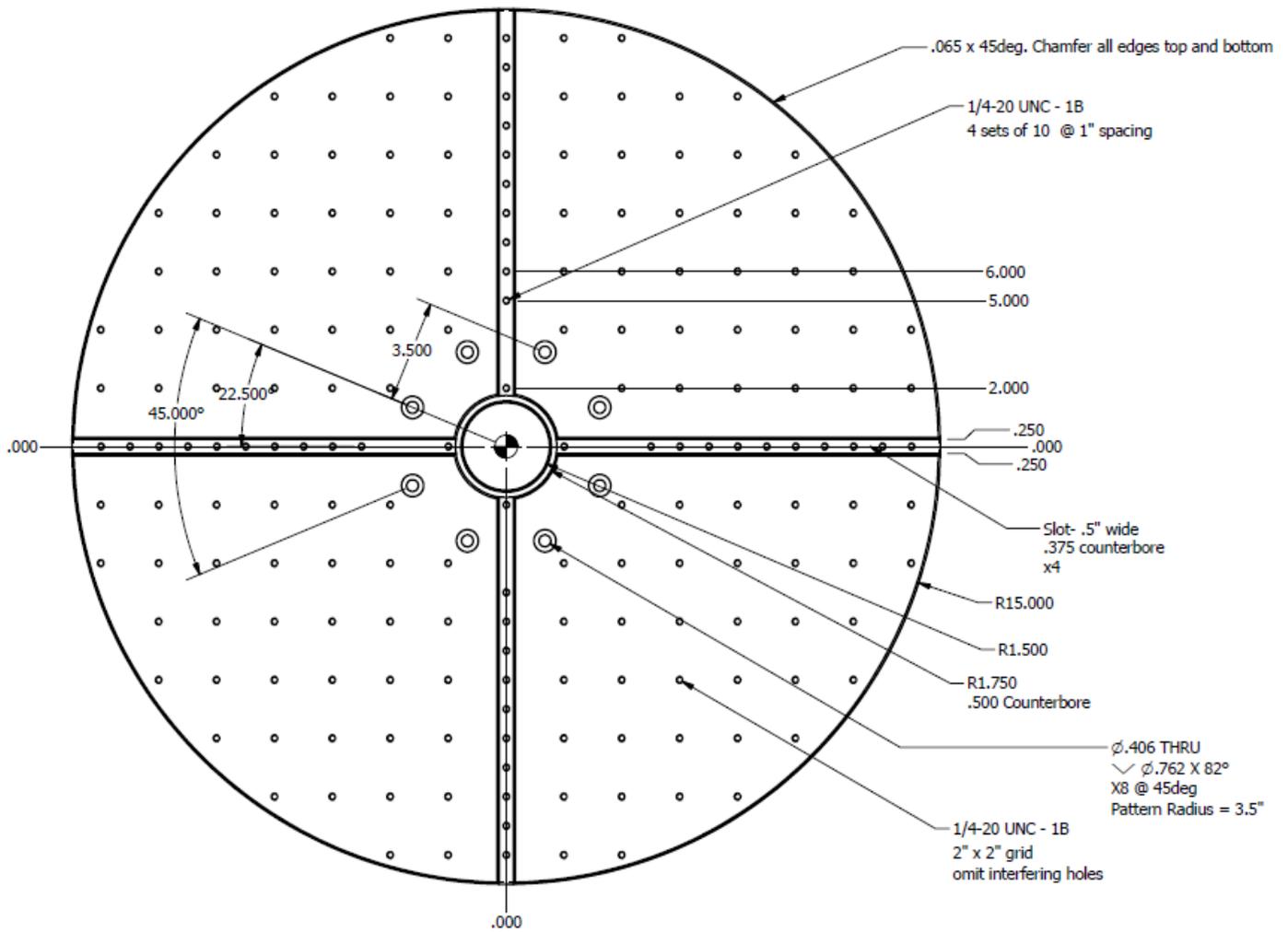
Material:	Powder-coated aluminum
Weight :	125 lbs. (20 kg)
Height:	18" (45.7cm)
Width:	20" (50.8 cm)
Depth:	12.5" (31.75 cm)

Tripod Specifications

Material:	Aluminum and ABS
Weight:	22 lbs. (10 kg)
Height Min:	25" (63.5 cm)
Height Max:	41" (104 cm)
Maximum Spread:	55" (139.7 cm)
Collapsed Dimensions:	40.5" x 12.5" (102 x 31.3 cm)
Leg Sections:	2
Foot Plate Diameter:	6" (15.2 cm) (self-leveling 5/8" hole for spiking)

x250 Thrust Plate / Mounting Plate Drawing

Units: Inches



Positioner Troubleshooting

Possible Problems & Solutions

The DAMS x100 Series Positioner is very robust and stable. If you believe you may have a problem, please check the items below. If you do not see your problem listed below or you are not able to get your problem resolved, please contact us and we will be happy to assist you.

Problem: Software message is displayed that the positioner has reached its limit.
Possible Cause: The Horizontal or Vertical tracking may be out of sync in the software?
Solution: Restart software and press  button to reset all settings.

Problem: When instructed to move, the positioner does nothing.
Possible Cause: Power is not connected? Wrong port selection? Software glitch?
Solution: Check all cables, reboot PC, disconnect and reconnect positioner power.

If the solutions above do not help, please contact us at (530)626-3857 or email us at support@diamondeng.net

Software Installation & Configuration

Software Installation



IMPORTANT: Administrator privileges are required to install software.

1. Place CD in CD-ROM. Setup should start automatically. If setup does not, click: Start Menu → Run → Browse, and locate SETUP.EXE in the CD-ROM.
2. Click Next/OK through all setup screens.
3. Agilent Runtime and I/O libraries Setup may also launch. If so, install as well.
4. To verify installation is complete click Start Menu → Programs and ensure the folders below are present. If so, you may launch Antenna Measurement Studio.
 - Agilent Vee Pro Runtime 8.0
 - Agilent I/O Libraries
 - DAMS



NOTE: If any folders are missing, an installation error occurred - manually install components by following instructions below.

Manual Installation Instructions

Antenna Measurement Studio is dependent on the application below. It is normally installed during setup, but can fail in certain situations. In this event, run this setup file individually:

Agilent I/O Libraries Start Menu → Run C:\DAMS\runtime\iolib\Setup.exe
(or launch from CD menu)

Entering Your License Key

1. Press "System Options" in the upper left corner of the software then select "license info"
2. Enter the license key located on the CD holder (in the back of the users manual), or from the back of the users manual itself. Press "Verify and Save".
3. Notification key has been verified should appear. Next, click "QUIT" and restart the software to update the license.

License Problems?

E-mail us at Support@DiamondEng.net or call (530) 626-3857 Monday - Friday, 9:00 A.M. to 5:00 P.M. (PST).

USB Driver Installation & Configuration

Installing the USB Driver

 **IMPORTANT:** If you ordered a pre-configured PC, you do NOT need to perform any of these steps unless you are re-installing the system.

Antenna Measurement Studio should be installed before performing the steps below.

1. Connect DAMS Platform Controller to PC using included USB cable. Notification indicating a new device has been found should appear. **Allow windows to check for a driver automatically. If no internet connectivity or Windows cannot find driver, still proceed with steps 2-5.**
2. Check the box labelled "Search Manually" and click "Next".
3. Select CD-ROM, click "Next"
4. Notification may appear that driver has not passed the WHQL certification. Click "Continue Anyway". Click Finish.
5. New notification indicating another device has been found should appear. Allow Windows to search for a driver if it was successful the first time. If not, repeat steps 2-5 above.
6. Open up Control Panel (Start → Settings → Control Panel), and open System. (If using category view, you must click "Performance and Maintenance" before you can open System). Open the Hardware tab and click on "Device Manager"
7. Click the "+" sign next to "Ports COM&LPT", and the controller will listed as "USB Serial Port". Make note of the port number it shows.

Configuring DAMS Software for x250 Series Positioners

1. In Antenna Measurement Studio, click "Positioner Settings".
2. Select the x100 series from the "Interface" pull down menu.
3. Select the COM port that you previously noted from the "Port" pull down menu.
4. Under the x100 pull down menu, select your model.
5. Set "Gear Ratio" to 10.
6. Change "Motor Res." to 1
7. Press the "SAVE" and "QUIT" buttons to save settings and quit.

Unit Calibration & Positioner Verification

Verifying Positioner Connectivity and Operation

These steps will assist you with verifying the x250 Series positioner's operation with the DAMS software. All previous steps for installing and configuring the software and connecting cables should be completed before performing the following steps.

Step 1 Ensure all cables are connected and power supply is plugged in.

Step 2 Start the DAMS Software.

Step 3 **Elevation / Vertical Movement Test**

Select -90 from "El jog to" pull-down - positioner should tilt 90 degrees towards reference antenna. Select +90 from "El jog to" pull-down. Positioner should tilt all the way to +90 degrees. *(See image below)*

Step 4 **Azimuth / Horizontal Movement Test**

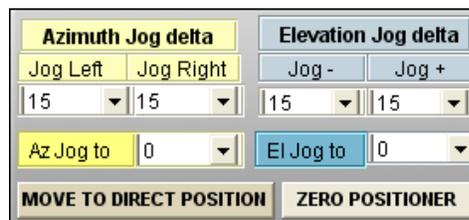
Select 180 from "Az jog to" pull-down. Positioner should rotate 180 degrees of reference antenna. Select 360 from "Az jog to" pull-down. Positioner should finish the rotation to 360 degrees. *(See image below)*

Step 5 **Resetting to 0, 0 Degrees**

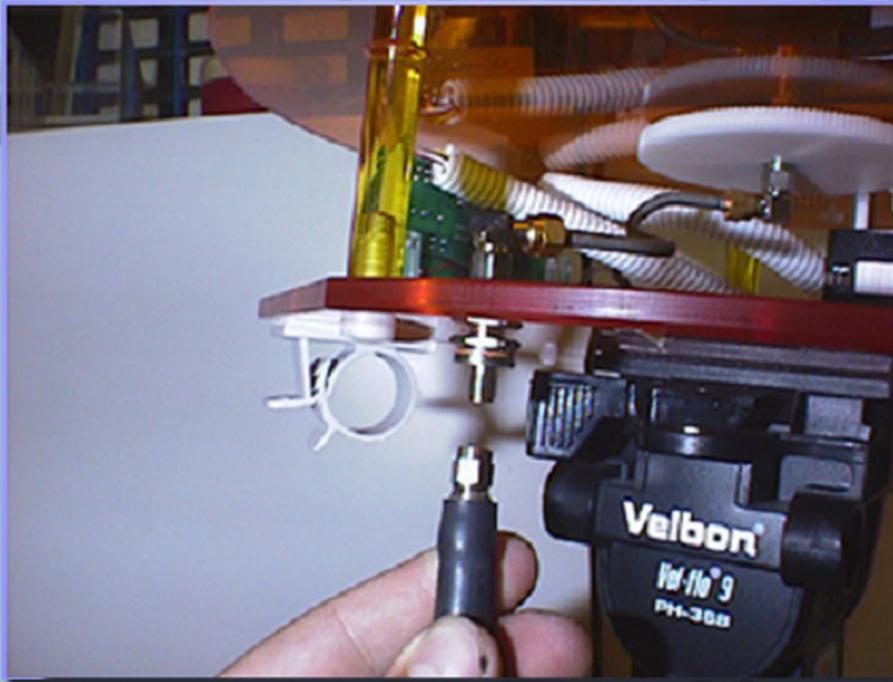
Click  which clears all position settings, and moves the positioner to 0 degrees azimuth and degrees elevation.

Testing and Calibration Complete

Proceed to the Antenna Measurement Studio Installation chapter to complete the installation and begin making measurements.



Troubleshooting & Service



General Problem Solving & Maintenance Info

General System Troubleshooting

Problem	Possible Causes	Solutions
Power supply light on but controller is not on	Power supply not connected correctly, Power Switch is not turned ON?	Check the above items and if all is correct, please contact us for service.
Controller light is on but positioner does not move	USB cable not connected? Driver not installed? Improper port selection in DAMS software?	Check all connections and reboot. Open "positioner settings" and click "Find". If controller not found, go to: Control Panel → System → Device Manager → COM Ports. Verify the DAMS Platform Controller is listed. If not, follow the "USB Driver Installation & Configuration" for x000 Series or "x100 USB Driver Installation & Configuration" for x100 Series.
Only one axis is moving	Loose cable connection? Controller error?	With the controller off, disconnect and then reconnect yellow cables.
Wrong axis moving	Reversed cable connections? Improper positioner settings?	Verify all positioner settings within the software and/or reverse yellow cables.
ERROR: Driver for [instrument] not found	Instrument not configured properly in Agilent VEE Runtime I/O configuration?	Read instrument configuration instructions. Contact us if problem persists.
Out of memory	Measuring with too many frequency points for physical resolution settings?	Reduce the number of points, or limit the AZ / EL extents.
Matlab Error	Is Agilent VEE Pro Runtime set to run as administrator?	Open C:\program files (x86)\Agilent\Vee Pro Runtime, right click veerun.exe and select properties, click the compatibility tab and select "RUN AS ADMINISTRATOR"
Excel Export Crashes	Is Excel installed on PC? Are there are least 3 sheets? Do sheet names shown in DAMS software match excel?	In Excel, click file, options and change default number of sheets. In DAMS software open excel export and click sheet names, verify the names match the default sheet names in excel.

If you are experiencing any of the above problems or an unlisted problem and cannot determine the cause, please do not hesitate to [contact us](#). We are happy to assist in resolving any issues.

Warranty, Replacement Parts & Contact Information

Warranty Information

Diamond Engineering's Antenna Measurement Systems are guaranteed from one to three years on parts and labor from the time it was received by you. If there is an issue with the product please send us a picture or write a very detailed description of the problem. If we determine that you have a faulty unit or a bad part, we will ship you a replacement part or unit along with a pre-paid self-addressed box to send the defective unit back.

Replacement Parts

If you ever need a replacement part for your unit, please call us or e-mail us for pricing information. Most repairs are covered under warranty except for damages resulting from obvious abuse or misuse of the product.

Contact Information

Visit us at <http://www.DiamondEng.net>

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