Diamond Engineering
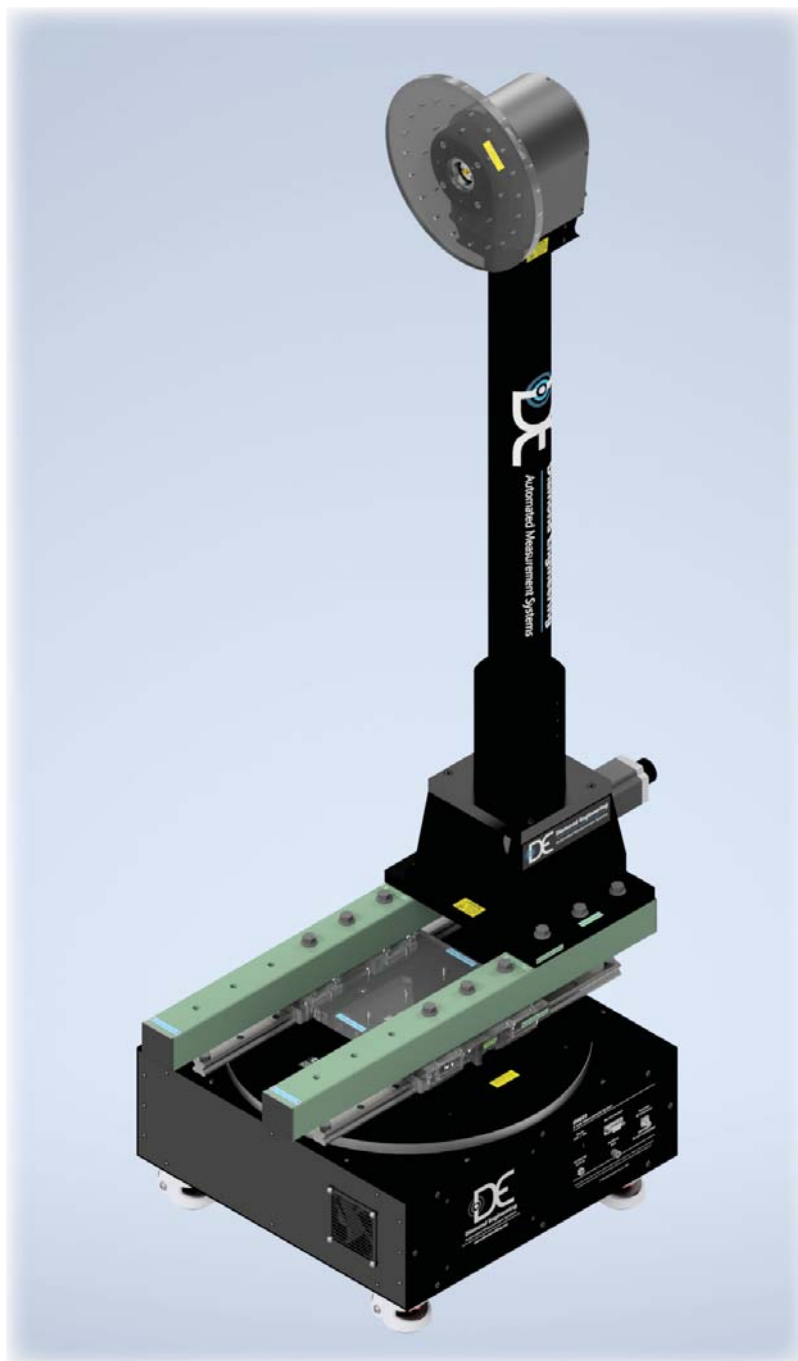Automated Measurement Systems

Installation and Configuration Guide

D6025 Multi Axis Positioner

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Diamond Engineering

Automated Measurement Systems

# System Introduction and Package Contents

Overview

The Diamond Engineering D6025 multi-axis positioner is a 2-axis positioner (EL/AZ) / (Theta/Phi) with up to two additional linear axis options (Z and X) for automated phase measurements. The positioner can interface directly with the DAMS Antenna Measurement Studio software, or can be controlled via custom software over an RS-232 communications bus.

Package Contents

- D6025 turntable base with RF components
- D6025 mast assembly
- Mast attachment base
- Two 24" fiberglass rail extensions
- One 7' Phi- / Roll-axis RF cable
- Rotary joint pre-mounted in adapter plate
- Two 10' RF cables
- Right angle RF adapter* and other RF connectors
- 24V power supply and line cord
- 10' DB9 serial cable (with USB to serial converter)
- Assembly hardware
- Laser and digital level
- AUT mounting hardware
- Tools

unless included on roll cable (not applicable to 67+ GHz systems)
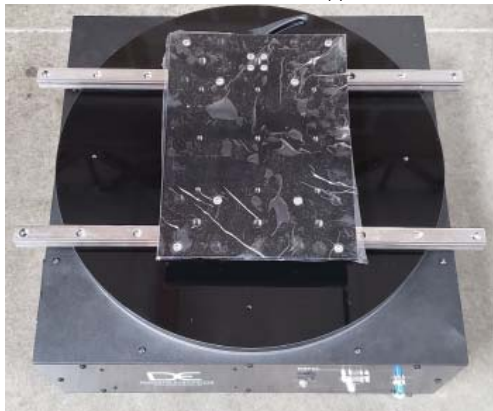
Positioner Components Overview

D6025 Turntable

1. 18" x 0.75" acrylic turntable plate
2. RF rotary joint adapter plate (with RF installed if ordered)
3. Main carriage plate (which is now clear, not black)
4. Linear guide brake (to lock rails after centering antenna)
5. Linear guide stops
6. Control panel
7. Roll-axis connector box
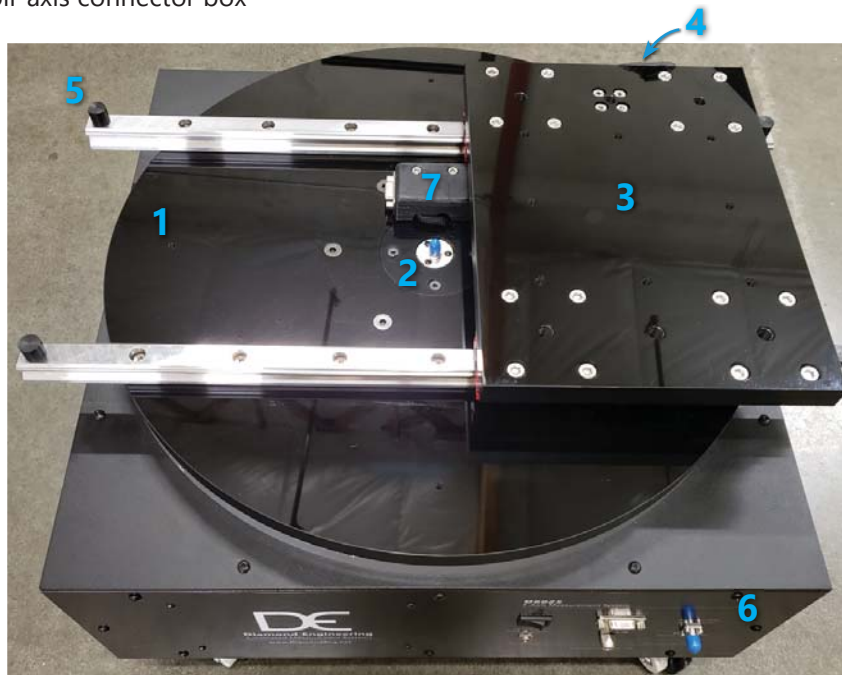
Control Panel

1. Power switch
2. 9-pin (DB9) RS-232 control connector
3. 24V 5A DC power jack (2.5mm barrel)
4. Auxiliary or Z-axis (optional)
5. RF connector (if ordered)

Hardware Assembly (2-Axis Systems)

Unpacking The System

1. Unpack all components where turntable will be installed.
2. If possible, save shipping crates and packing materials in case you need to return system for maintenance or warranty repairs.
3. **IMPORTANT:** Position turntable so **connector panel faces away** from the reference antenna.
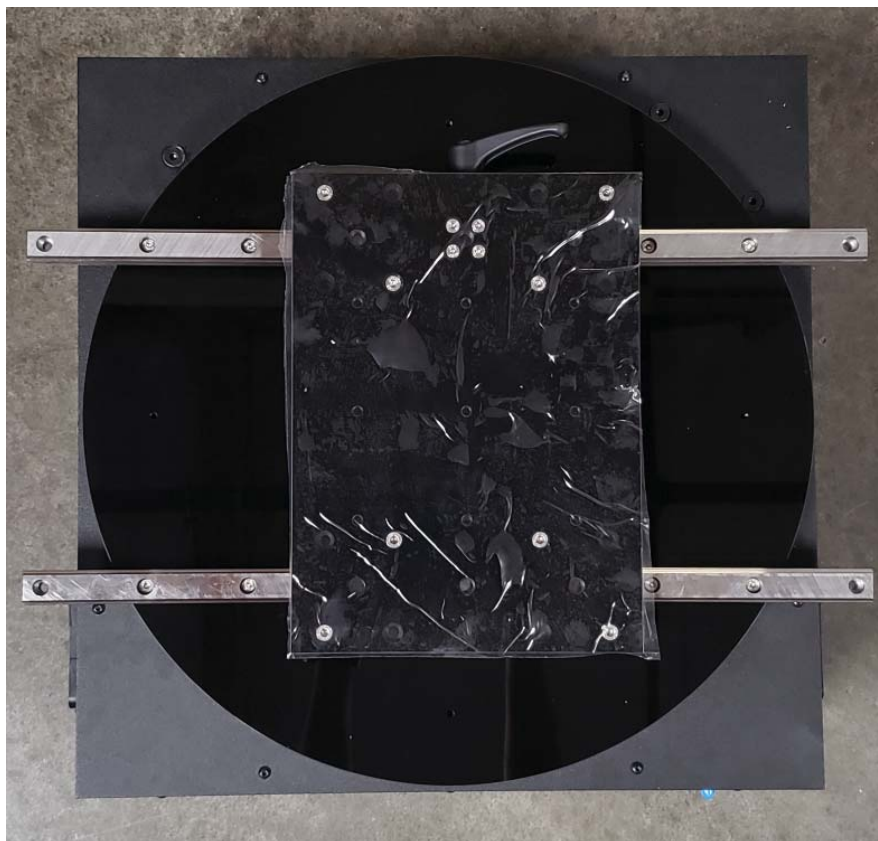
4. Rotate the orange dial located on the wheels to the right to lower the rubber feet and disabling wheel rotation.

Optional Extension Rails & Mast Base Installation

1. Using supplied hardware, attach the two green fiberglass rail extensions to the main carriage plate, following the labels for proper orientation. For initial installation we recommend using the set of holes shown in the picture #1 below.

TIP: Do not tighten the bolts completely yet - leave slightly loose until the mast base has been attached, **then** tighten completely.

2. Attach mast base assembly to the fiberglass rails using supplied hardware as shown in picture #2.

CAUTION: If you're utilizing the fiberglass rail extension and intend to use the furthest extension possible, remove the caster wheels and bolt the positioner down for optimum stability. **Extending the mast too far from the positioner can cause the positioner to become top-heavy and prone to tipping.**
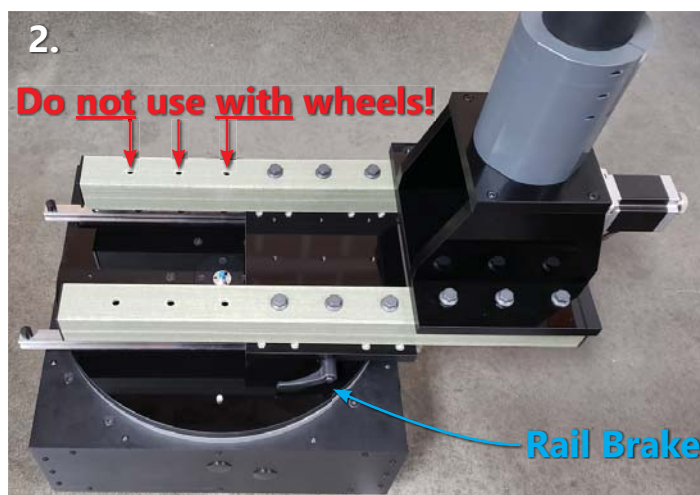
IMPORTANT: Do NOT over-tighten the gray fiberglass bolts! Never exceed more than 1/4 turn after bolt makes contact with surface.

Belt-Driven Mast Head

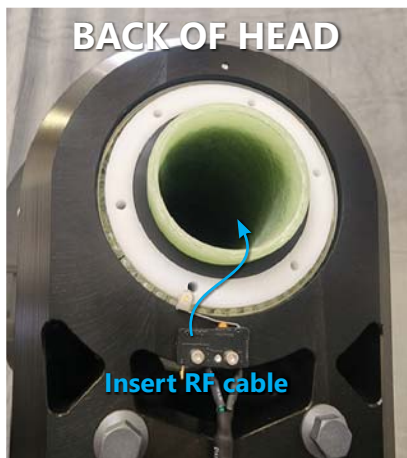### Roll Plate, RF Cable and Rotary Joint Installation

1. Unpack the pre-mounted adapter plate, 10" roll plate, roll plate screws and the 96" RF cable. (In some cases, the rotary joint may arrive pre-installed on your rotary joint adapter plate.)

2. Run RF cable through back of 2" hollow axle so it accessible from the front of the head.

3. Attach RF cable to back side of rotary joint. (Rotating portion) We recommend using RF torque wrench to ensure 8 in./lb of torque. - a 10mm wrench can be used to hold the connector in place while torquing

4. Use 4 x 8-32 x 1/2" flat head screws to mount rotary joint adapter to head

5. Attach roll plate to head using the four included 10-32 x 1" screws.

BACK OF HEAD

Insert RF cable

FRONT OF HEAD

RF cable should come out here

Pre-assembled rotary joint assembly
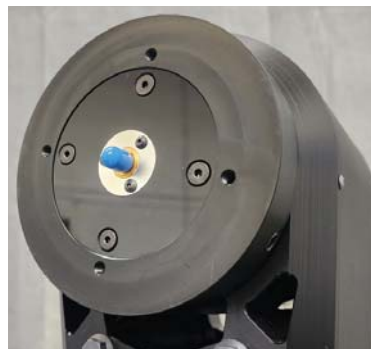
Rotary joint adapter plate after rotary joint is attached to RF cable and fastened to the front of head
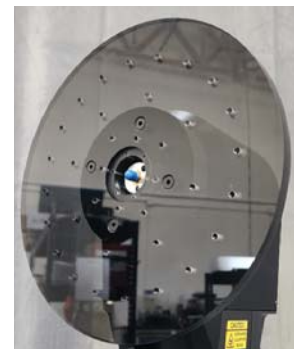
Roll plate attached to front of the head after rotary joint and adapter plate are attached

Roll Cable & Turntable RF Connections

1. First connect the right angle female connection to the motor on the bottom of the back of the mast. The connector is designated with a "Phi/Roll Axis" label. Also plug in the "Home Sensor" connection.

2. Run the cable under the carriage plate and connect the male end to the junction box near the center of the turn table on the "far side" from the mast.

3. Utilizing the provided right-angle RF connector (if not pre-installed to RF cable), attach it to the rotary joint at the center of the turntable. Use RF torque wrench to carefully attach rotary joint to RF cable. If RF torque wrench unavailable, barely torque it. The maximum torque is a mere 8 in-lbs (inch-pounds). Also attach the RF cable using same technique if separate from connector. (Not pictured)
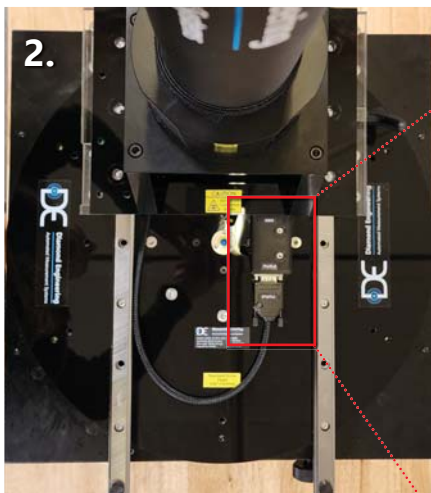
Cable Attachment

Cable Attachment

1. Attach the RS-232 control cable with USB-to-Serial adapter to the turntable.

2. Plug in power supply and connect to DC power jack.

3. Attach end of one RF cable to the D6025 and attach the other end to your network analyzer. Be sure to use a RF torque wrench if possible. If not available, be sure to not overtighten. Doing so could compromise connector performance.

Software Installation

Controller Installation

1. Ensure the Controller is Powered on.

2. Install the DAMS Measurement Software from the Included CD / USB Stick (Note: you must be administrator on the PC)

3. Connect the USB-Serial Adapter to the computer. **IMPORTANT:** If possible, let windows search for an updated driver on the internet. If windows CANNOT locate a driver Proceed with Steps 4. IF windows DOES find and install the driver proceed to step 6.

4. Choose a location for Windows to look for the driver and specify C:\DAMS\ driver. (Windows will say the driver is not certified, this is OK), press "Next" and the installation should finish.

5. Open device manager (Control Panel → System → Hardware Tab → Device Manager). Click Ports and note the COM port of the USB/Serial Converter.

Entering License Key

1. Start the DAMS Software and select "License Info" from the "System Options" pull-down in the upper left corner of the software Enter your license key as found on the back of your user's manual.

2. Additionally, If you were supplied a simulator license, select simulator license from the pull-down and enter the key

3. Press the "QUIT" button to exit and save changes,

4. Restart the software, it's now ready to use.

DAMS Software Configuration

IMPORTANT: To prevent potential damage to positioner, follow configuration instructions on the next page.

DAMS Software Configuration for D6025

Configuration for D6050 MC6 3 Axis Controller or systems manufactured after 4/2024

1. Open the DAMS Measurement software and select "positioner settings" from the upper right corner of the screen.

2. Select USB-SERIAL from "Select Controller"

3. Press "Find" to find the controller

4. Select "Move and Measure and place check mark in in D6050 and Full Spherical Mount
   NOTE: Selecting this box will auto-fill the boxes, but you still must change the settings as defined in steps 6/7

5. Enable Horizontal and Vertical Mini-Stepping (be sure to check both boxes)

6. Adjust motor resolution and gear ratio to the following values (as shown in graphic below):

AZ (Phi / roll)		EL (Theta / turntable)	
Motor Res.:	0.1125	Motor Res.:	0.1125
Gear Ratio:	36	Gear Ratio:	90

7. On the right hand side, adjust the Speed Settings on all six sliders to the following values:

Horizontal		Vertical	
Start:	500	Start:	200
Stop:	5,000	Stop:	5,000
Slope:	8	Slope:	5

8. Place check mark in "Position Tracking"

9. Press "advanced current settings" and enter settings shown on next page.

10. Place check mark un "Hardware Limits", press "Limit Switch Config" and enter settings shown on next page.

11. Verify all settings still match then Press "SAVE"
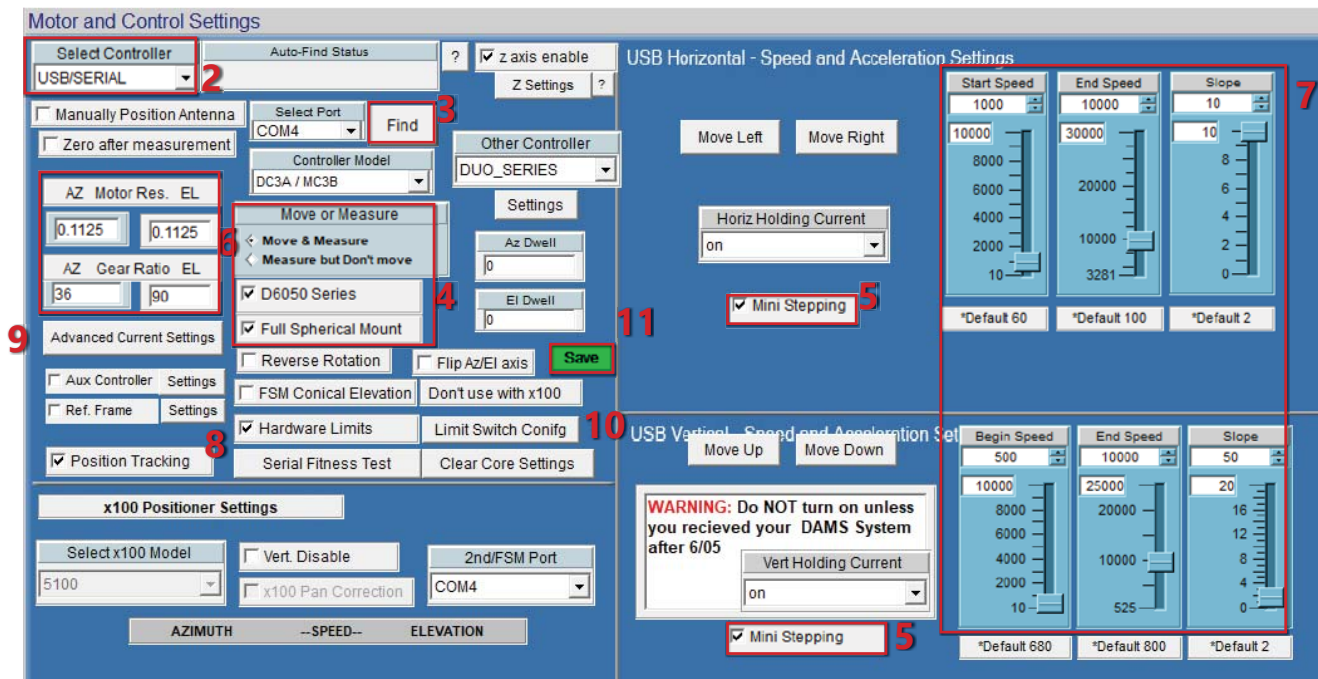
IMPORTANT MC6x Series Settings (After 4/2024)

It is necessary to set custom current settings for D6050 series with MC6x series controllers or overheating of motors may occur! Please use settings below under "Advanced Current Settings'

SEE NEXT PAGE !!!!

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High Current 3 Axis (MC3 / MC4)				
Axis	**Custom Current**	Run Current	Hold Current	Dwell
X	☑ Enabled	120	60	0
Y	☑ Enabled	150	80	0
Z	☑ Enabled	100	35	0

Advanced Current Settings

Limit Switch Settings

Configure the limit switch settings as shown to the right, if your roll axis has a roller switch on the back of the head please enable "single sensor" for the X axis, If your positioner is equipped with automated Z , please check this box

☑ Hardware Limits   Limit Switch Conifg

Limit Switch Configuration

The settings below will enable / disable the limit switch routine on any particular axis. - NOTE: for safety reasons this will NOT disable the physical limit switches themelves. on units that are equipped with them.

☑ X Limit Switch   ☑ Single Sensor   Settings

☑ Y Limit Switch   ☐ Single Sensor

☐ Z Limit Switch

OK

Basic Positioner Operation

Overview

The D6025 positioner is configured for Az/El data collection. The Phi/Roll positioner is the azimuth while the turntable is Theta/Elevation. When configured for standard operation, the turntable has a range of +/- 90 degrees and the Phi/Roll positioner has a range of either 0 to 360 or +/- 180 degrees.

Position Tracking / Zeroing   ** IMPORTANT **

The D6025 Positioner operates in an "open loop" positioning mode. This means the physical location of the turntable and roll positioner is not tracked using encoders but is tracked within the software. When the software is started, both Azimuth and Elevation are assumed to be 0 degrees. **Before making any measurements or jogging the positioner it is critical to set the positioner to it's physical 0/Center locations.**

Limit Switches

If your D6025 Turntable is NOT equipped with a slip ring, we have included two limit switches; a "HOME" limit switch (full CW rotation) and a "MAX" limit switch (full CCW rotation). These are located at roughly +/- 185 degrees respectively. These switches are critical in preventing the over-rotation of the turntable. If the turntable is over rotated, the Phi/Roll axis cable could become entangled with the centrally located RF rotary joint causing damage to the cables and/or the positioner.

If the positioner has been properly zeroed before moving or making measurements, the limit switches should never be tripped. In the event that either the home or max limit switch is triggered during a movement, it will instantly be stopped and any measurement will be cancelled. The software will then prompt you to move the turntable to either 180 degrees from the limit switch, or to a stored offset position. Once this has been done it is critical to use the Elevation Jog +/- buttons to physically center the turntable before pressing the "zero positioner" button.

The D6025 Phi/Roll-axis does not use limit switches and can be rotated unlimited times in CW or CCW direction.

Getting Started

Start software and set positioner to physical zero

After starting the software, but before making a measurement, it is important that the positioner is set to (0,0) most especially the turntable / elevation axis. There are 3 main ways to set (0,0) which are listed below:

Basic Software Zero - without storing offsets

1. Start the software.

2. Use the elevation jog buttons to orient the turntable as shown below. The roll positioner should be positioned so that the AUT bore sight is facing the stationary antenna.

3. Press the "Zero Positioner" button - select "SET ZERO" which will establish the current turntable and roll positions as zero.

The diagram below is the proper orientation for spherical measurements

Turntable control panel

-90°

Manual Control Knob

0°

±180°

+90°

Reference or Source Antenna
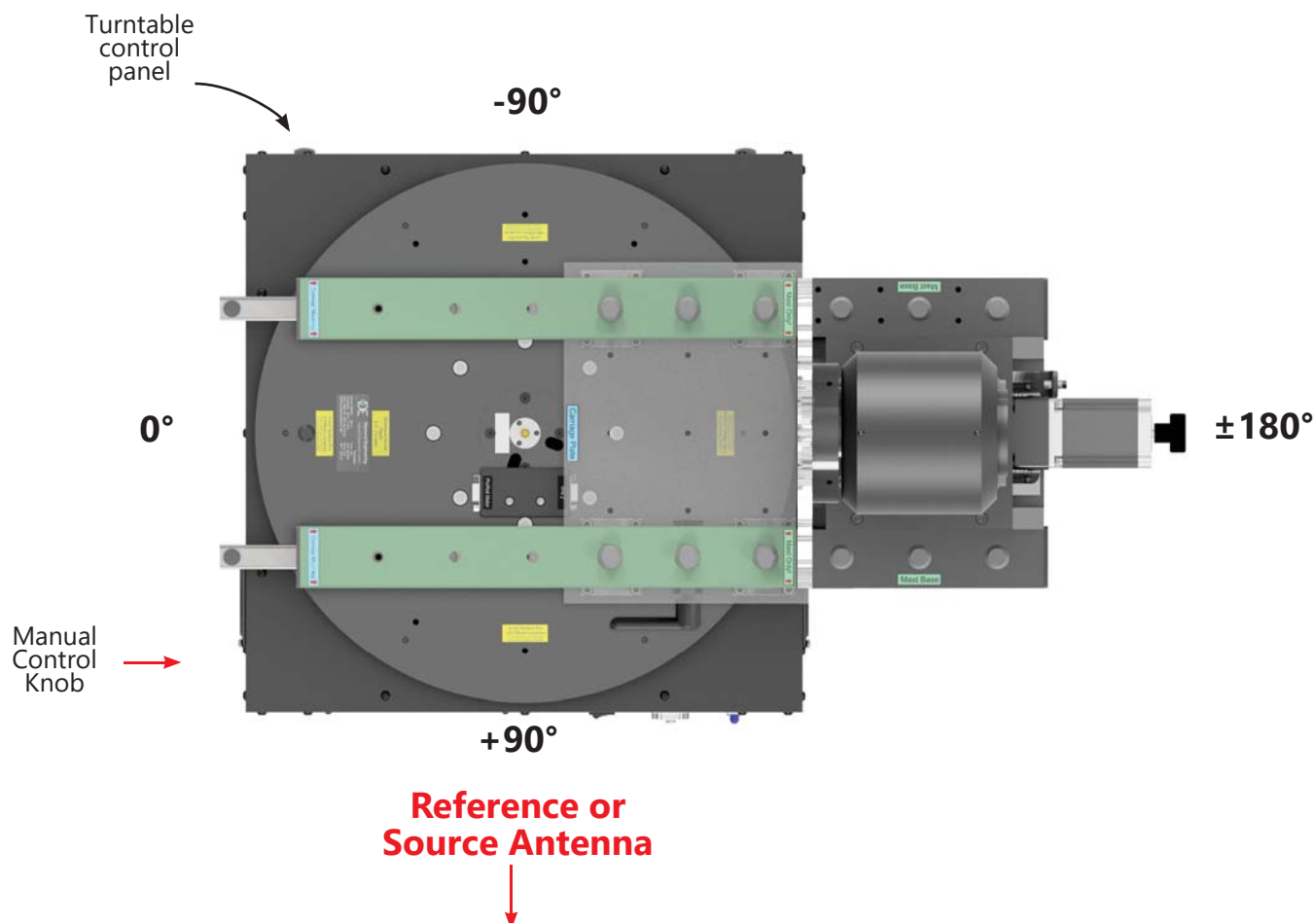
Software zero with storing offsets (Home or Max)

Home and Max limits can be used to re-position the turntable to 0 when a limit has been struck. A home offset can also be used to zero the positioner on startup.

1. After a limit has been struck and the positioner moved off the limit, use the elevation jog buttons to position the turntable to the physical 0 position as shown in the diagram.

2. Press the "Zero Positioner" button - select "SET ZERO, REC OFFSET", this will set current turntable and roll position as zero and store the offset degrees from the turntable's limit switch, the offset that is recorded is the one from the last switch that was struck.

Search for home, recall offset

When the software has just been started and you have previously set a HOME offset, the positioner can be moved to that exact position by first finding the home switch then moving the turntable the proper number of offset steps to reach the physical 0 position.

1. Have the DAMS Software running

2. Press "Zero Positioner"

3. Select "Search / move to zero"

4. The positioner will move up to 370 degrees clockwise to find the limit switch, when the switch has been found use the "Stored position" option to have the software move the turntable to the physical 0 location.

Limit (home)

Limit (max)
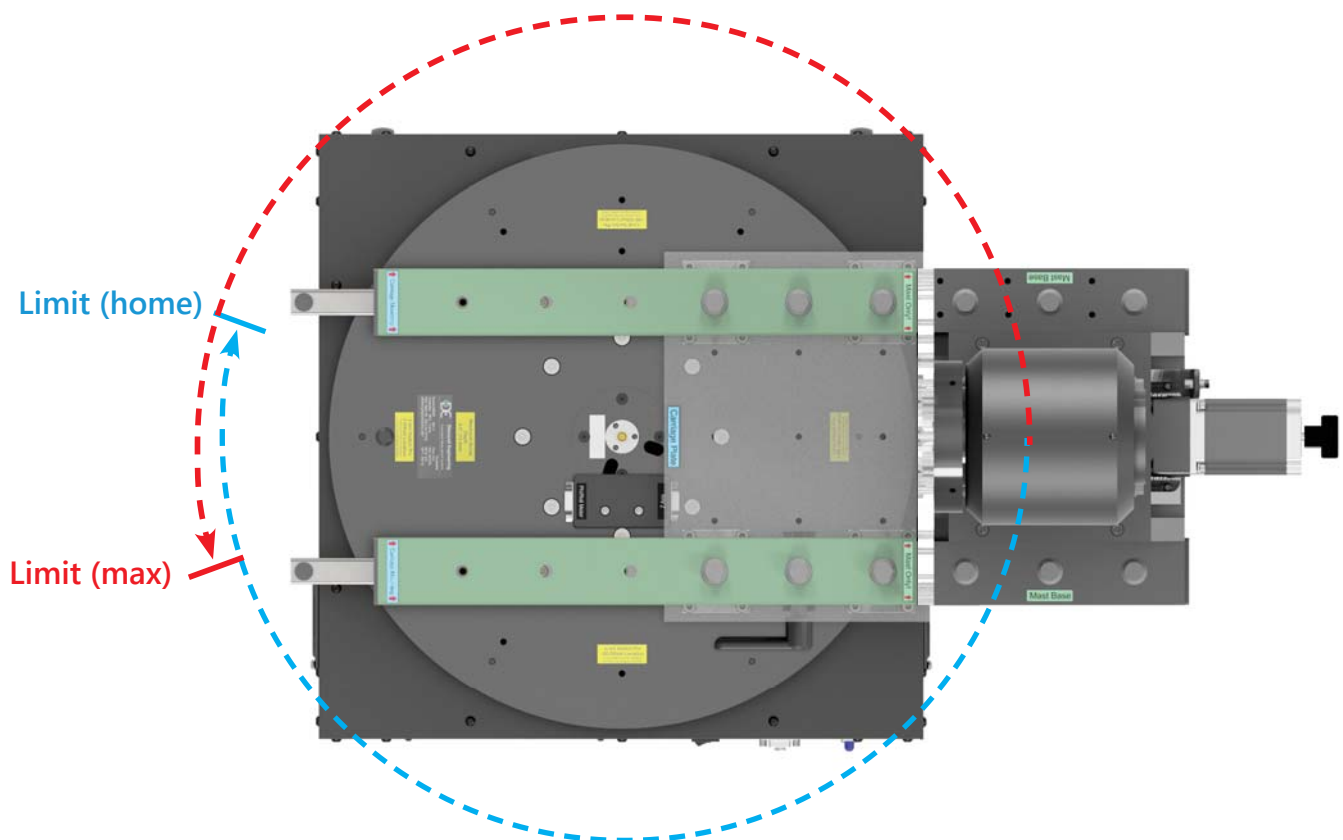
Alternative Mast Mounting

Description

If you do not wish to use the fiberglass rail extensions, the mast base can be mounted directly to the carriage plate using the alternative mast base mounting bolts. (Please note, pictured is a legacy head - your head will look more modernized.)

(Legacy control panel design shown here)

Part Drawing - Roll Plate

All units are in inches. Custom mounting solutions are available. Please contact us at support@DiamondEng.net for a quote or more information.

Ø10.000

10-32 UNF - 2B
x20

10-32 UNF - 2B
x8

4-40 UNC - 2B
.188 Radius   x3

10-32 UNF - 2B
x4

Ø1.015
.200 Counterbore

Ø.500

.375

45°

18°

Ø.201 THRU
Ø.385 X 82°
x4

3.750   2.500   1.625   .850

.000

Part Name: D6050 Roll Plate Std.
Material: .500 thk black cast acrylic stock
actual thk. ~.470"
Units: Inches
Tolerance: Std .005 unless noted
Finishing: General De-buring
Date: 2/25/2018
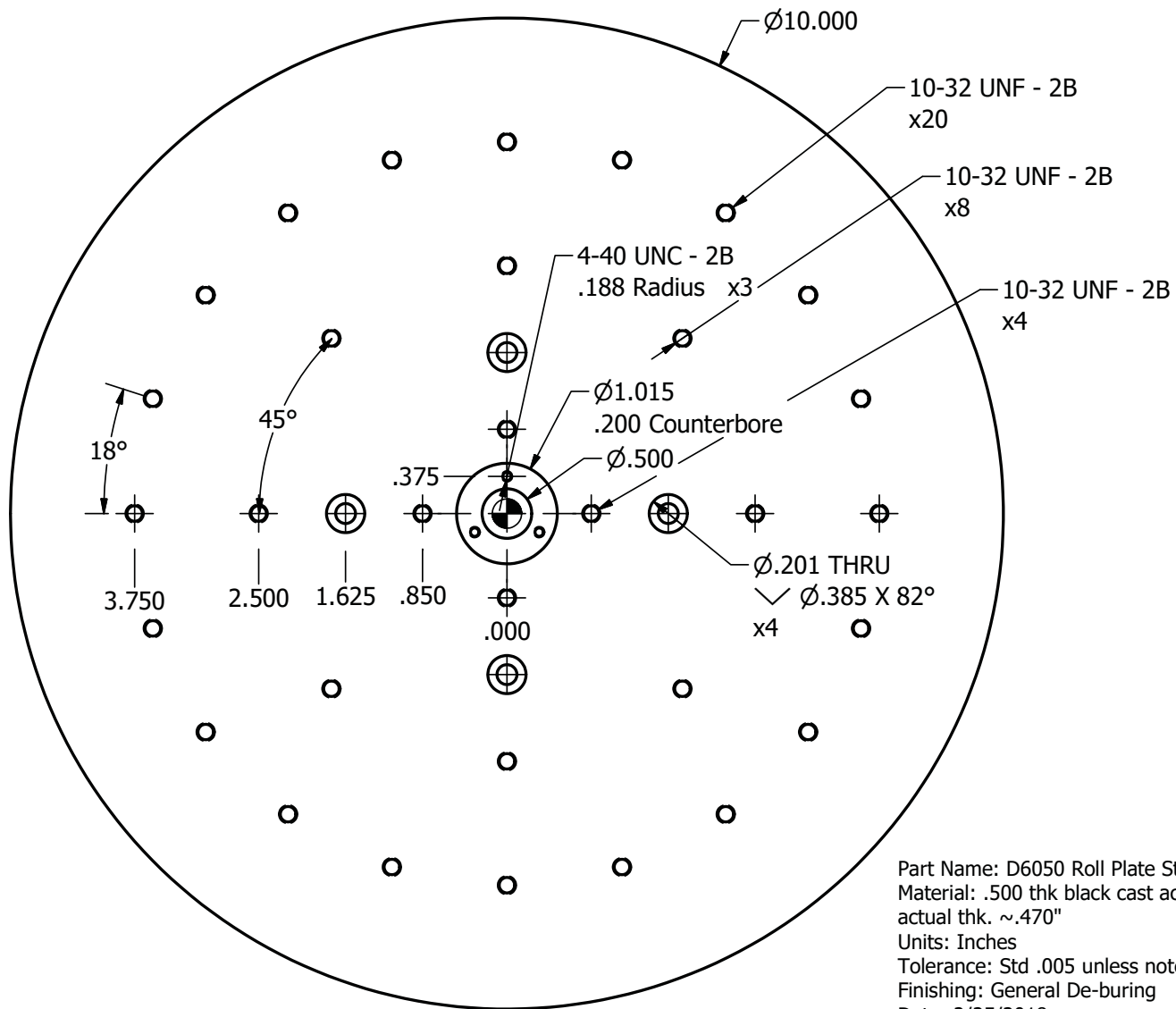
Part Drawing - Roll Plate mmW Option
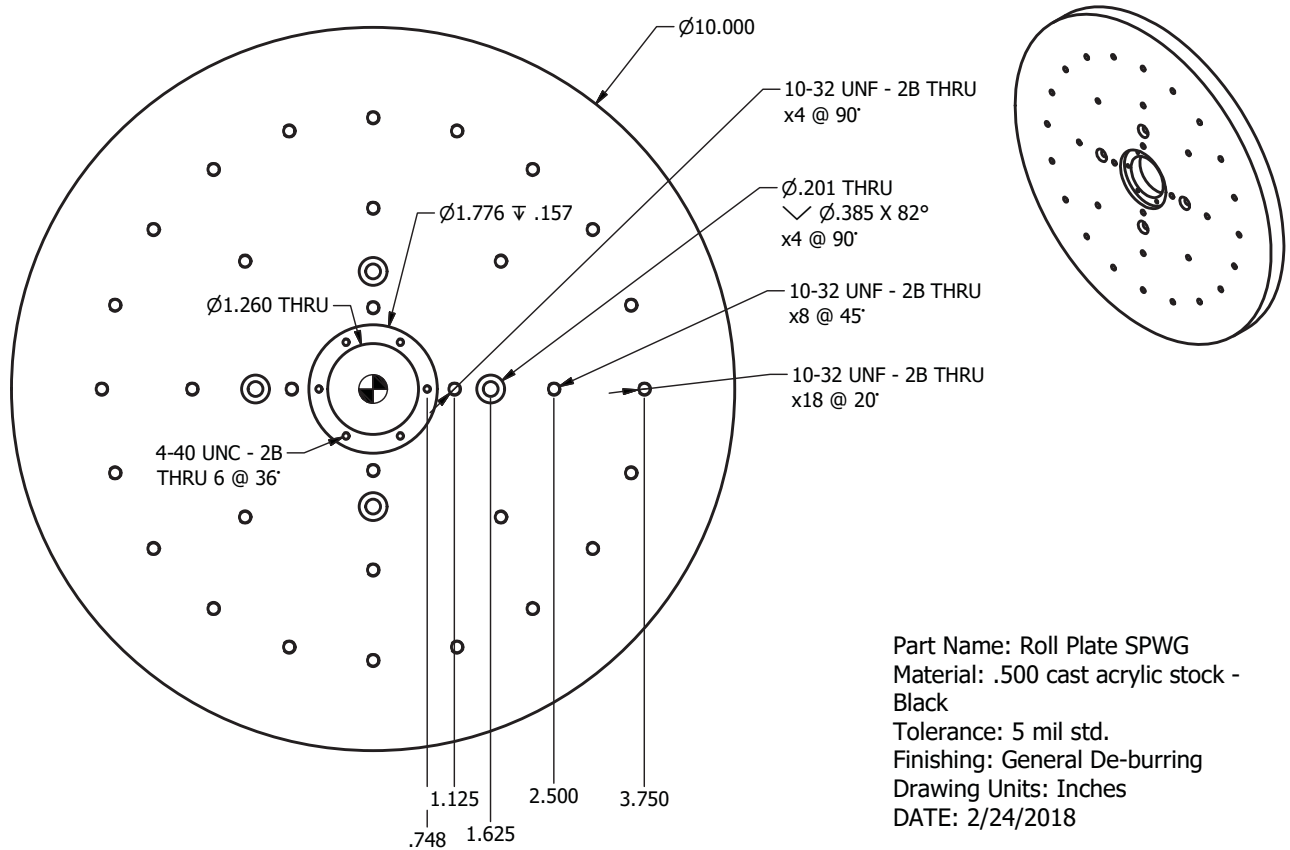
All units are in inches. Custom mounting solutions are available. Please contact us at support@DiamondEng.net for a quote or more information.

Ø10.000

10-32 UNF - 2B THRU
x4 @ 90°

Ø.201 THRU
⌵ Ø.385 X 82°
x4 @ 90°

Ø1.776 ⌵ .157

10-32 UNF - 2B THRU
x8 @ 45°

Ø1.260 THRU

10-32 UNF - 2B THRU
x18 @ 20°

4-40 UNC - 2B
THRU 6 @ 36°

1.125
.748
1.625
2.500
3.750

Part Name: Roll Plate SPWG
Material: .500 cast acrylic stock -
Black
Tolerance: 5 mil std.
Finishing: General De-burring
Drawing Units: Inches
DATE: 2/24/2018

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, please refer to the main users manual for detailed instructions.
Only one axis is moving	Loose cable connection? Controller error?	With the controller off, disconnect and then reconnect all cables.
Wrong axis moving	Reversed cable connections? Improper positioner settings?	Contact support@DiamondEng.net.
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

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