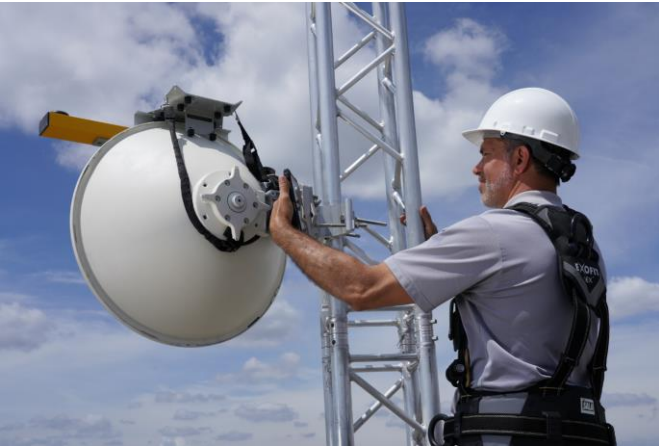




**SUNSIGHT MICROWAVE PATH
ALIGNMENT SYSTEM**

AAT Models MW15 & MW08



Document Change History


Issue	Date	Description
1	02/05/2016	Original Issue
2	02/08/2016	RF Panel Alignment instructions added
3	02/15/2016	Report generation instructions added
4	04/28/2016	Microwave Path Alignment App for tablets added Photographs reformatted
5	05/31/2016	End-to-End Microwave Alignment instructions updated Ability to add photographs to End-to-End Microwave Reports added
6	07/25/2017	MWxx Menu options defined Glossary added MW antenna tilt calibration revised MWxx tilt/roll calibration added Photo capture instructions added for all reporting methods
7	08/02/2019	Update for generic use of any Android device using Sunsight Android App. Added Retrieve Reports from Anywhere. Removed RF panel alignment instructions in favor of referencing existing instructions.

Table of Contents


Document Change History	1
<i>The Sunsight Microwave Path Alignment System</i>	5
<i>Definitions</i>	6
<i>Case contents – 2 cases per kit</i>	7
MW15/MW08 front view	8
MW15/MW08 back view	8
MW15/MW08 charge ports	9
MW15/MW08 charge ports and LASER rangefinder connector	9
<i>Using the Microwave Mount</i>	10
<i>Common Microwave Antenna Styles</i>	11
<i>Assembling the Microwave Mount - General Assembly</i>	12
<i>Shielded (“drum”) Antenna Mount Instructions</i>	13
<i>Convex Back and Unshielded Parabolic Antenna Style Mount Instructions</i>	16
<i>Convex Front Antenna Mount Instructions</i>	17
<i>Using the Clamping Mount Adapter</i>	18
<i>Using the Microwave Alignment System in the Field</i>	19
<i>Preparation before going to field</i>	19
<i>Single-ended Alignment</i>	20
At the site	20
After returning from the field	22
<i>End-to-End Alignment*</i>	26
At the site	26
After returning from the field	28
<i>Retrieving End-to-End Reports from anywhere</i>	32
<i>Aligning RF Cellular Panel Antennas</i>	32
Checking tilt and roll calibration	32
Troubleshooting	32
Use and care of the Sunsight MWxx	33
Glossary	34


Safety

The MWxx should be handled with the following considerations:


 Avoid impacting, dropping or rough handling of the MWxx, as it contains sensitive electronic components. Rough handling may result in internal component damage.

 Care should be taken to avoid impact to the black GPS antennas on the top of the MWxx.

 The MWxx is water resistant, but not waterproof. Do not submerge. All sealing caps and doors must be secured while in use, particularly during inclement weather.

 Use only the Sunsight supplied smart charger to recharge the LiFePO4 battery pack. Use of a non-approved battery charger will void the battery warranty and may damage the battery pack.

 Never attempt to recharge the batteries outdoors in inclement conditions.

 Never short the battery terminals and never attempt to disassemble the battery pack or dispose of the pack in a fire. Any exhausted battery packs must be disposed of properly. CONTACT SUNSIGHT INSTRUMENTS IF YOU ARE UNSURE OF HOW TO PROPERLY DISPOSE OF THE BATTERY.

 All internal repairs must be performed by Sunsight Instruments. Unauthorized disassembly of the MWxx may result in warranty termination.

If you suspect the MWxx is operating incorrectly, contact Sunsight Instruments

@ +1-321-244-9443, www.sunsight.com, or an authorized SunSight Instruments distributor for support.

The Sunsight Microwave Path Alignment System

The Sunsight Microwave Path Alignment System is a product used to precisely mechanically align devices in azimuth, tilt (aka elevation angle) and height. It is commonly used to align point-to-point communication links. The system consists of a measurement unit mounted on the antenna at each end of the link to be aligned. Using Sunsight's patented End-to-End Alignment* technology, the two measurement systems communicate with each other to determine the required target alignment parameters, which are azimuth, and elevation (also referred to as tilt). The users at both ends are displayed this target data as well as the actual current alignment measurements of the antennas. The user then adjusts the antenna position to match the target data and secures the antenna in the correctly aligned position. The devices (microwave antennas) can be aligned independently once the data is transmitted and the target values are obtained. The system requires no external power or disconnection of the antenna from RF sources (coax, waveguides, or radio/ODU). The alignment results are captured in a comprehensive report.

A complete job site can be measured and captured in a single comprehensive report.

Important

Each MW15 included in the Sunsight Microwave Path Alignment System may also be used independently to align single microwave antennas or cellular RF panel sites. In this way, each Sunsight Microwave Path Alignment Kit may be employed as a End-to-End alignment system, two individual microwave antenna aligners, or two complete cellular RF panel alignment systems. Instructions for use as an RF Panel alignment system can be found on the www.sunsight.com microwave support page.



**End-to-End Alignment technology is a patented design belonging to Sunsight.*

Definitions

MW15 or MW08 kit – each kit comprises two MW units, along with two sets of microwave antenna mounts, two rugged Android tablets and two RF Panel alignment mounts (MW15 only)

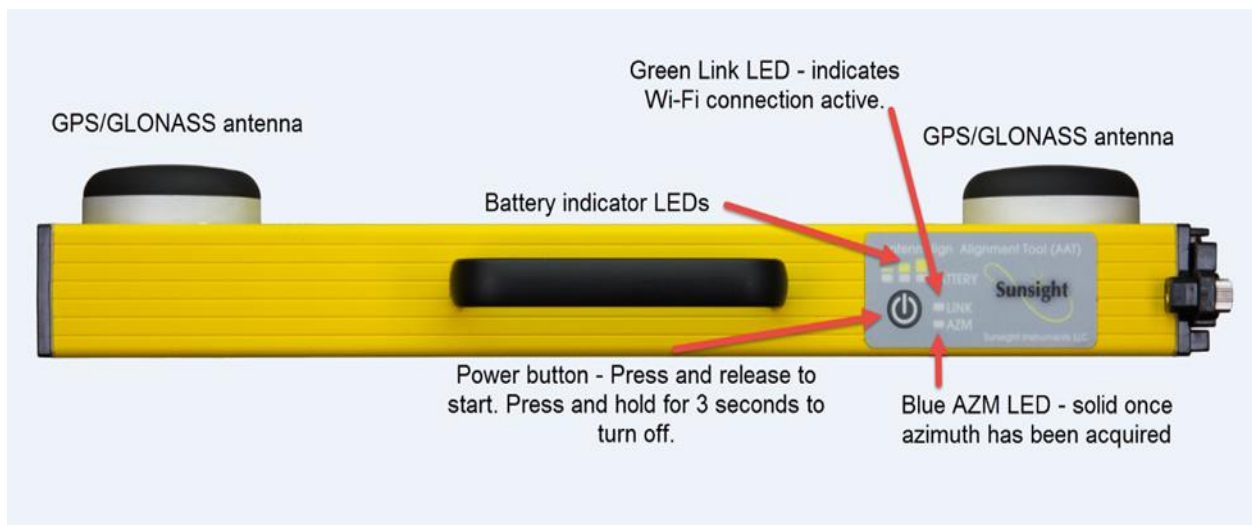
MW15 or MW08 Single Unit -- each MW Single unit comprises one MW unit, along with one set of microwave antenna mounts, one rugged Android tablet and one RF Panel alignment mount (MW15 only). A Single Unit is used to align each end of a microwave link independently (one at a time). The MW15 Single Unit can also be used to align a cellular RF panel antennas.

Tablet – the MW products come with ruggedized 4G Android tablets that use the Sunsight Android app to operate the Sunsight products. Note that any Android device (tablet or Smartphone) with Android Operating System greater than 6.0 can also be used in place of the tablets. The Sunsight Android app would need to be installed on the Android device. For the remainder of this document the term **ruggedized tablet** will mean the tablet supplied with the MW products and the term **tablet** will mean the ruggedized tablet or any other Android device running the Sunsight Android app.

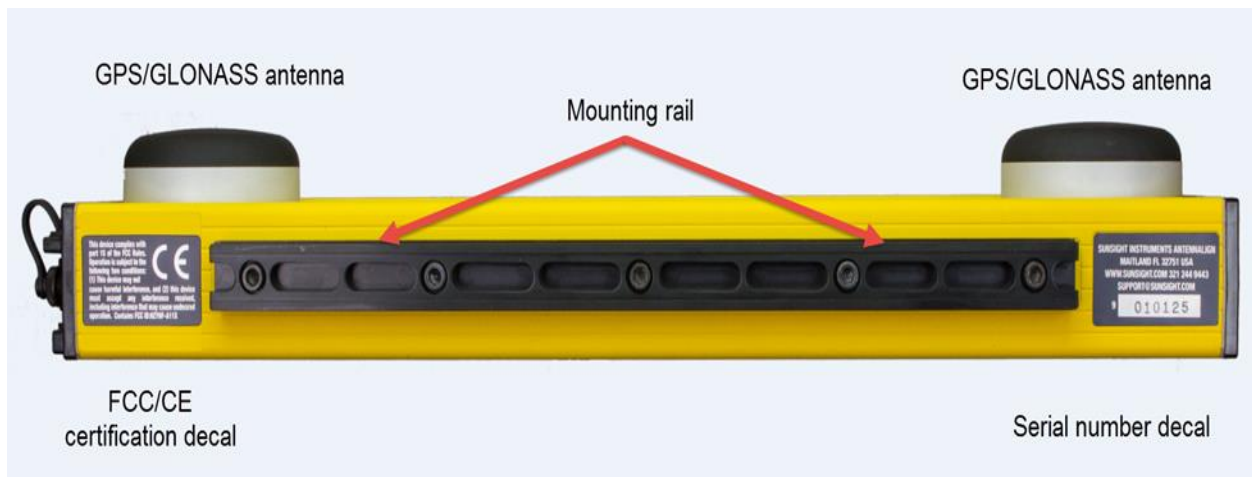
Case contents – 2 cases per kit

1. MW15 or MW08 Microwave Aligner hard case
2. MW15 or MW08 Microwave Aligner
3. Panel mount with strap – for use on standard RF panel antenna
4. Microwave mount main
5. Adjustable mount straps (3 pieces)
6. Round and funnel style adapter bracket
7. Adapter plate (3 pieces)
 - a. 4' – 12' (1.3m – 3.7m) diameter antenna adapter
 - b. 18" – 4' (0.5m – 1.3m) diameter antenna adapter
 - c. 12" – 18" (0.3m – 0.5m) diameter antenna adapter
8. Safety lanyard
9. Push/pull stick – option/discontinued
10. Electronic digital level w/soft case
11. LiFePO4 battery charger
12. Ruggedized Android tablet
13. Android tablet accessories

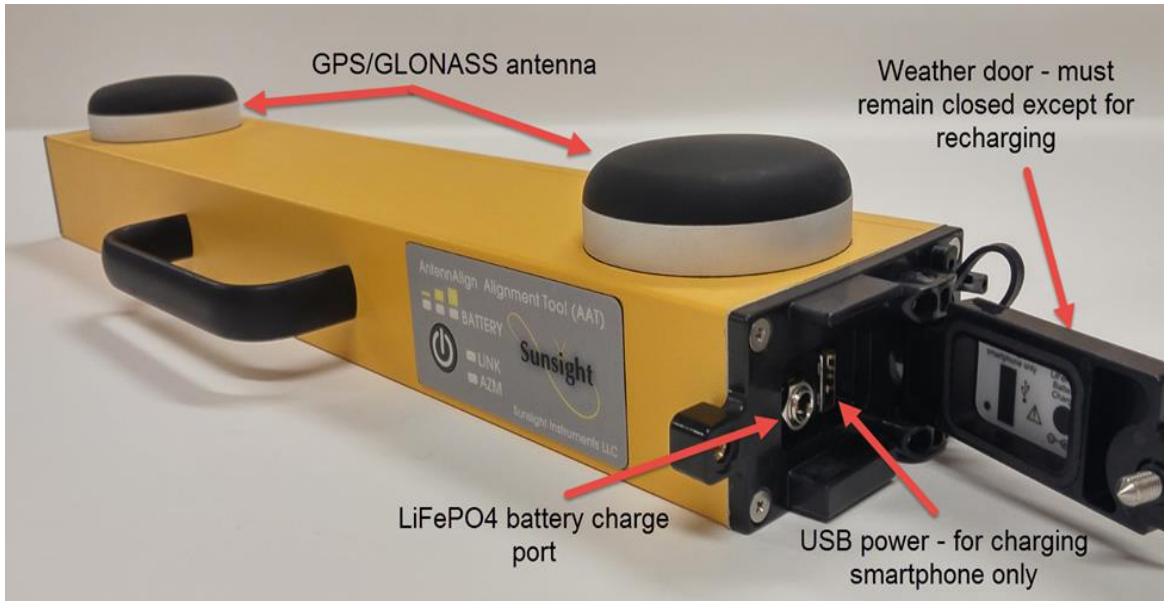




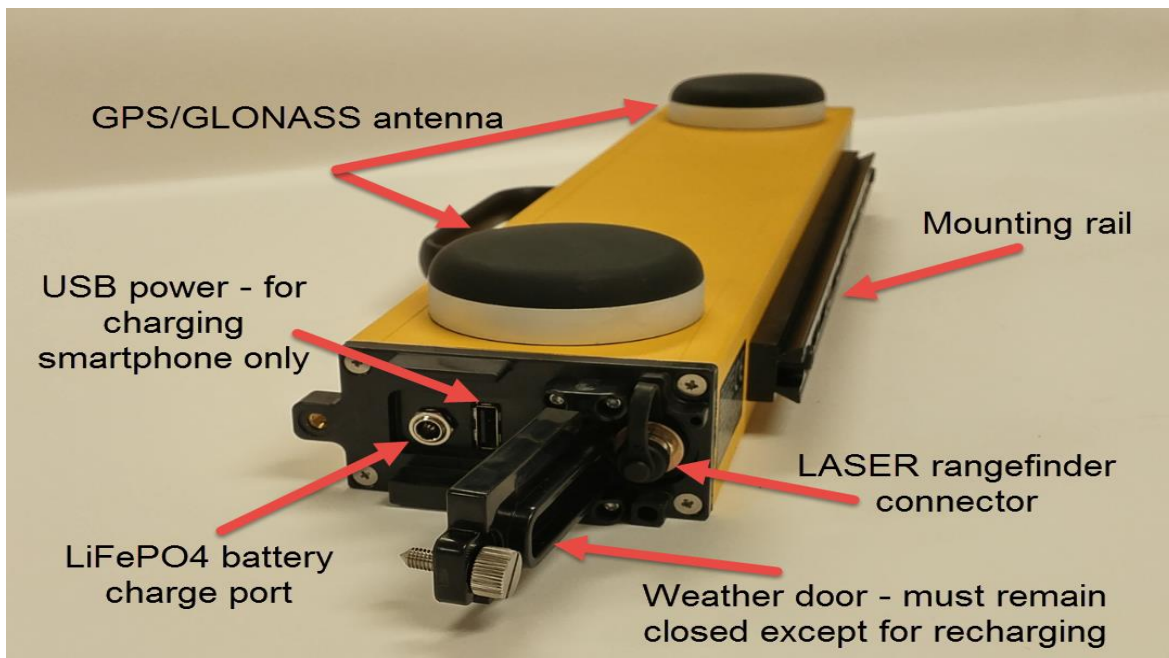
MW15/MW08 front view



MW15/MW08 back view



MW15/MW08 charge ports



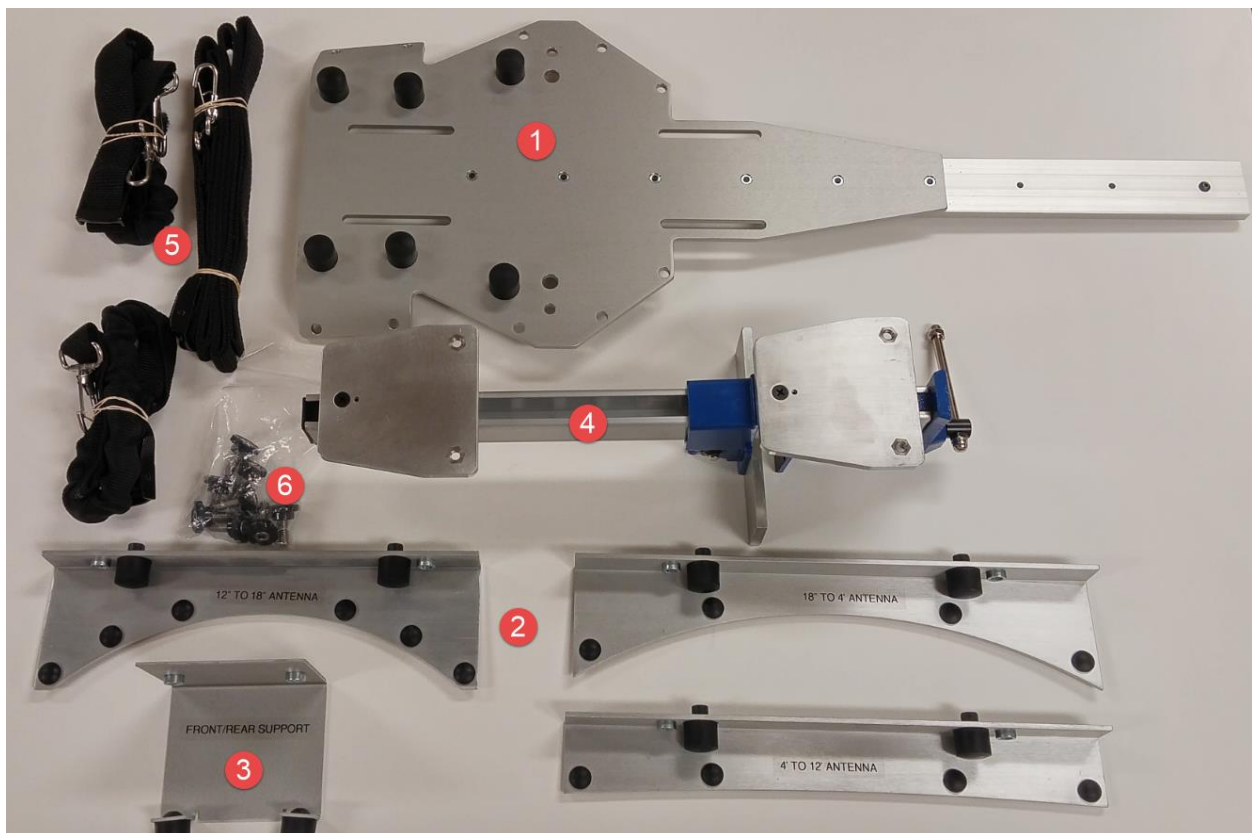
MW15/MW08 charge ports and LASER rangefinder connector

Please take time to review the following pictures, examine and assemble the mount to ensure its use is fully understood before attempting to use the mounting system in the field.

Using the Microwave Mount

There are many shapes and sizes of microwave antennas as shown on the following pages. The included microwave antenna mount is designed to be very flexible in this regard, allowing a broad range of fitment. The microwave mount consists of the following:

1. Mount main body
2. Curved front adapter bracket – 3 sizes
3. Front/Rear support bracket
4. Clamp assembly
5. Straps (x3) to secure mount to antenna
6. Thumbscrews (x8) to secure adapters to main body



*****Do not attempt to remove the rubber bumpers secured to the mount main body or adapters. Attempted removal may damage the bumpers or mount*****

Common Microwave Antenna Styles



Shielded or "Drum Style"



Convex – rounded back



Convex – round front



Parabolic



Flat Panel "Pizza Box" Antenna

Flat Panel

Assembling the Microwave Mount - General Assembly

Note: Adapter brackets may be reversed to accommodate a wide variety of antennas. Photographs below represent basic assembly procedures. Always use the proper adapter brackets to ensure the mount is sufficiently and safely supported on the antenna. Regardless of the antenna type, always secure the mount to the microwave antenna using the included elastic straps and adjustable end straps.

- 1) The elastic straps typically loop under the center of the antenna and back up to the mount. On some shielded “drum” style antennas, the strap can be wrapped around the circumference of the drum. See [Figure 1 & 2](#)

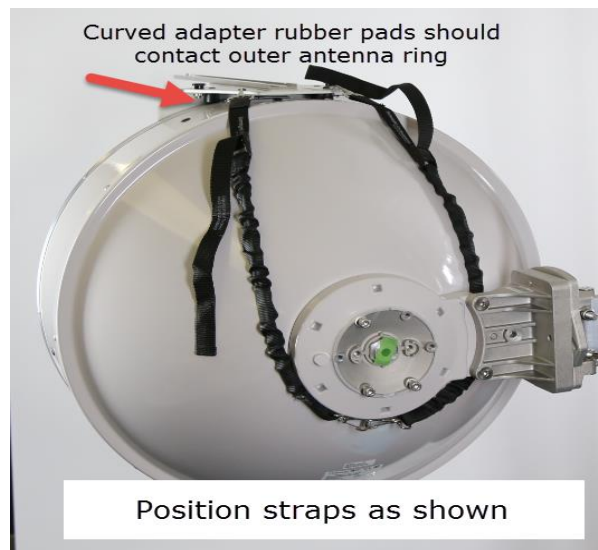


Figure 1



Figure 2

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

- 2) Use the correct straps based on the antenna's diameter. The three mount straps supplied with the microwave alignment kit can be attached end-to-end, allowing a large range of adjustment for various antenna diameters. **Always start with an elastic strap.**
- 3) Ensure the mount is secured to the antenna, adjust the straps, and ensure the sliding rail is approximately level as it is extended in front of the antenna (not drooping or pointing to the sky). The mount should be very stable. See [Figure 3](#), [Figure 6](#) & [Figure 7](#)

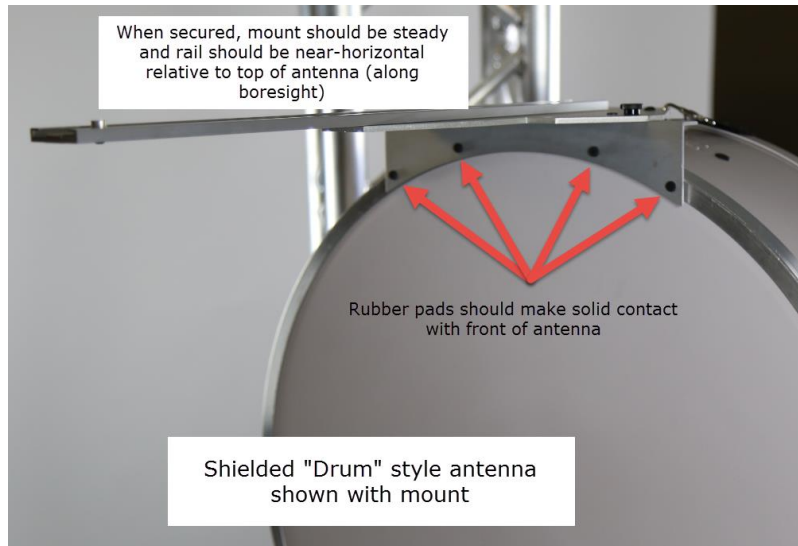


Figure 3

Shielded (“drum”) Antenna Mount Instructions

- 1) For shielded (“drum” style) antennas, configure the mount as shown below, using only the appropriate curved front adapter bracket. See [Figure 5](#). Attach the curved adapter to match the antenna diameter – three curved adapters to fit antenna diameters from 1 – 12’ are included with each unit. See [Figure 4](#)

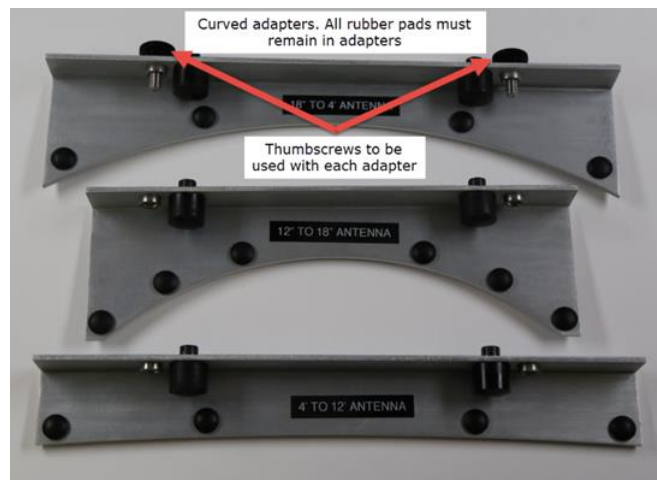


Figure 4



Figure 5

- 2) Place the mount on top of the antenna shield, making sure the rubber pads on the bottom of the mount main body make contact with the antenna and provide a good base.
- 3) Ensure that the four (or six) rubber pads in the curved adapter are tight against the face of the antenna. All curved adapter pads must be in solid contact with the antenna face. This is critical for accurate azimuth alignment of the antenna.
- 4) Clip one of the elastic antenna straps to the mount and pass the strap under the rear center section of the antenna (under the radio mounting area) and bring it back up and clip to the mount. When secured, the straps should form a "U" shape. *See Figure 6.* The three mount straps supplied with the microwave alignment kit can be attached end-to-end, allowing a large range of adjustment for various antenna diameters.
 - a. NOTE: On some shielded "drum" style antennas, the user may wrap the mount straps around the circumference of the antenna.



Figure 6

- 5) Adjust the retaining strap tension and ensure mount is steady. Check that rubber pads are touching on front, top and/or back of antenna correctly.
- 6) Make sure mount is more or less horizontal in reference to the antenna. *See [Figure 7](#)*

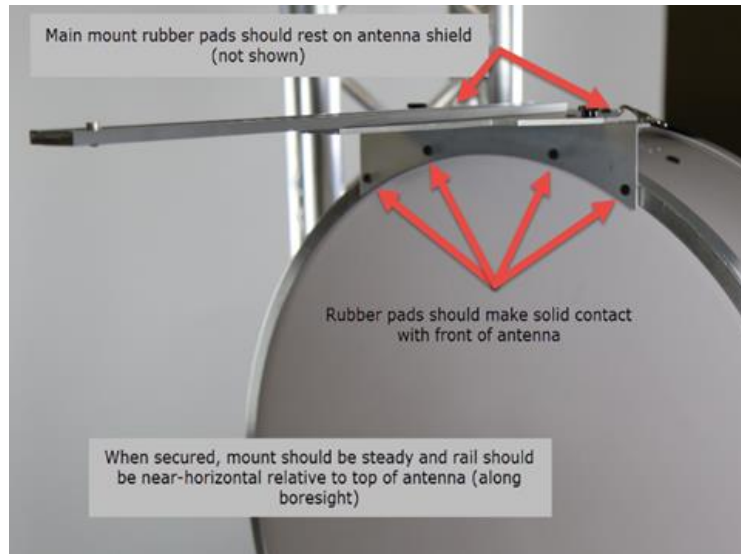


Figure 7

- 7) The mount must be positioned directly on top of the antenna with minimal side-to-side error, or “roll” error. Place the included digital level across the mount, perpendicular to sliding rail, to measure the “roll” of the mount. Adjust the mount to achieve a roll of $\pm 0.5^\circ$. *See [Figure 8](#)*

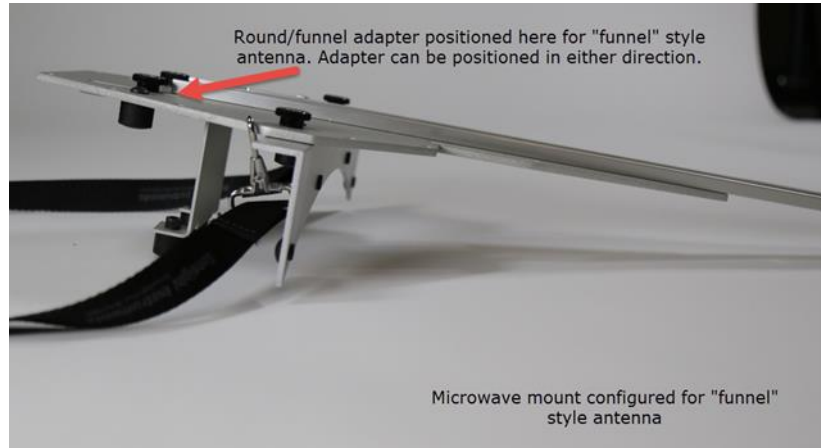


Figure 8

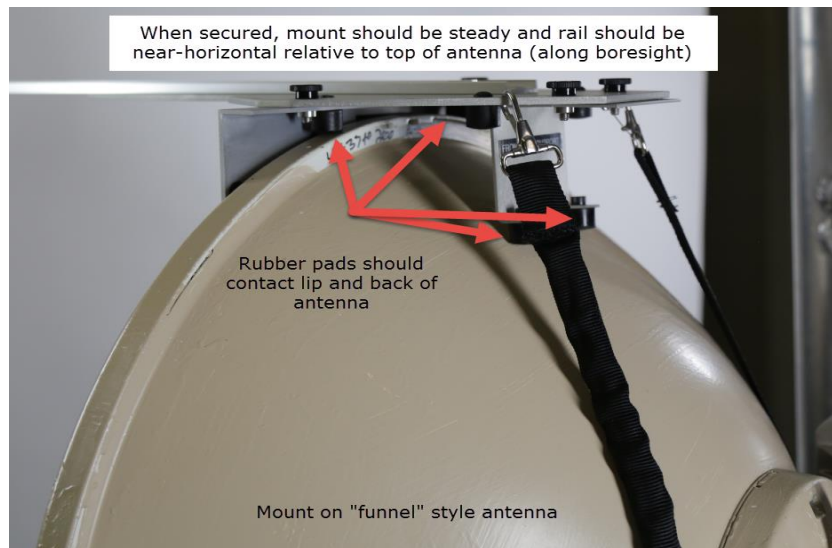
*****ALWAYS USE THE SAFETY LANYARD TO PROTECT MOUNT AND MWxx FROM ACCIDENTAL FALLS**
Note: The safety lanyard is NOT the same as the black elastic straps used to secure the mount to the antenna***

Convex Back and Unshielded Parabolic Antenna Style Mount Instructions

- 1) For convex back and unshielded parabolic antennas, configure the mount, including the front/rear support bracket as shown in [Figure 9](#)

**Figure 9**

- 2) Place the mount on top of the antenna shield, making sure the rubber pads are in contact with the edge of antenna. Slide the adjustable support bracket forward or back to bring the rubber pads in contact with the back of the antenna and in such a way that the mount is approximately horizontal relative to the antenna. Tighten thumbscrews. [See Figure 10.](#)

**Figure 10**

- 3) Clip one of the elastic antenna straps to the mount and pass the strap under the rear center section of the antenna (under the radio mounting area) and bring it back up and clip to the mount. When secured, the straps should form a "U" shape. [See Figure 6.](#) The three mount straps supplied with the microwave alignment kit can be attached end-to-end, allowing a large range of adjustment for various antenna diameters.

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

- 4) Adjust the mounting straps for tension and ensure mount is steady.
- 5) Again make sure mount is approximately horizontal relative to the antenna.
- 6) The mount must be positioned directly on top of the antenna with minimal side-to-side error, or “roll” error. Place the included digital level across the mount (perpendicular to sliding rail) to measure the “roll” of the mount. Adjust the mount to reduce roll error to within +/-0.5 degrees.
See [Figure 8](#)

*****ALWAYS USE THE SAFETY LANYARD TO PROTECT MOUNT AND MWxx FROM ACCIDENTAL FALLS**
Note: The safety lanyard is NOT the same as the black elastic straps used to secure the mount to the antenna***

Convex Front Antenna Mount Instructions

- 1) For convex front antennas (shielded and unshielded), configure the mount, including the front/rear support bracket - the front/rear support bracket is secured to the mount’s forward slides, which will allow the rubber pads to contact the antenna face. **See [Figure 11](#)**
- 2) Place the mount on top of the antenna shield ensuring that the rubber pads are in contact with the edge of antenna. Slide the support bracket forward or back to bring the rubber pads in contact with the front of the antenna and in such a way that the mount is more or less horizontal to the antenna. Secure the bracket thumbscrews.

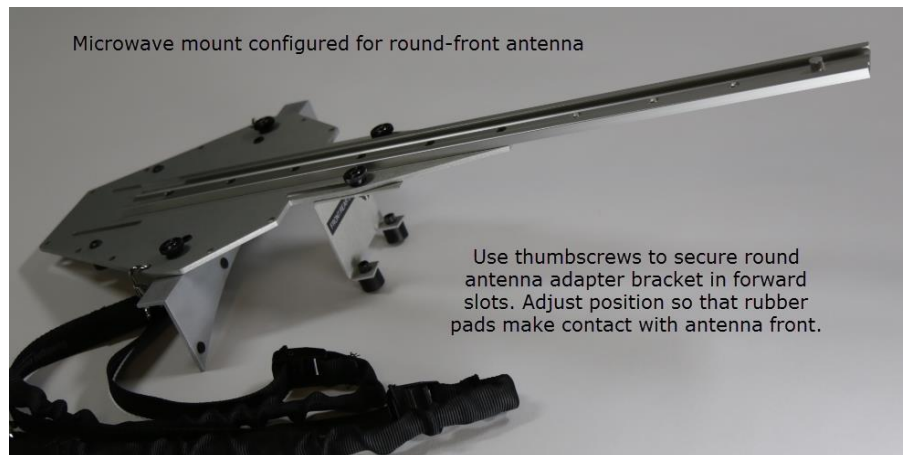


Figure 11

- 3) Clip one of the elastic antenna straps to the mount and pass the strap under the rear center section of the antenna (under the radio mounting area) and bring it back up and clip to the mount. When secured, the straps should form a “U” shape. **See [Figure 6](#)**. Straps may be clipped together end-to-end to create a longer strap for larger antennas.
- 4) Adjust the mounting strap tension and ensure mount is steady. Adjust mounting bracket, strap attachment points or strap tension as necessary.
- 5) Verify mount is more or less horizontal to the antenna. **See [Figure 7, 8 & 10](#)**
- 6) The mount must be positioned directly on top of the antenna with minimal side-to-side error, or “roll” error. Place the included digital level across the mount (perpendicular to sliding rail) to measure the “roll” of the mount. Adjust the mount to reduce roll error to within +/-0.5 degrees.
See [Figure 8](#)

*****ALWAYS USE THE SAFETY LANYARD TO PROTECT MOUNT AND MWxx FROM ACCIDENTAL FALLS**
Note: The safety lanyard is NOT the same as the black elastic straps used to secure the mount to the antenna***

Using the Clamping Mount Adapter

For microwave antennas including a lip around all or the top of the antenna, the clamping mount adapter may be used in place of the front and rear adjustable mount brackets. The clamping adapter may be adjusted from 1" - 9" width.

- 1) Secure the clamping adapter to the microwave mount main body front and rear slides using 4 included thumbscrews. The clamp fine adjustment lever should point to the rear of the mount. **See [Figure 12](#)**

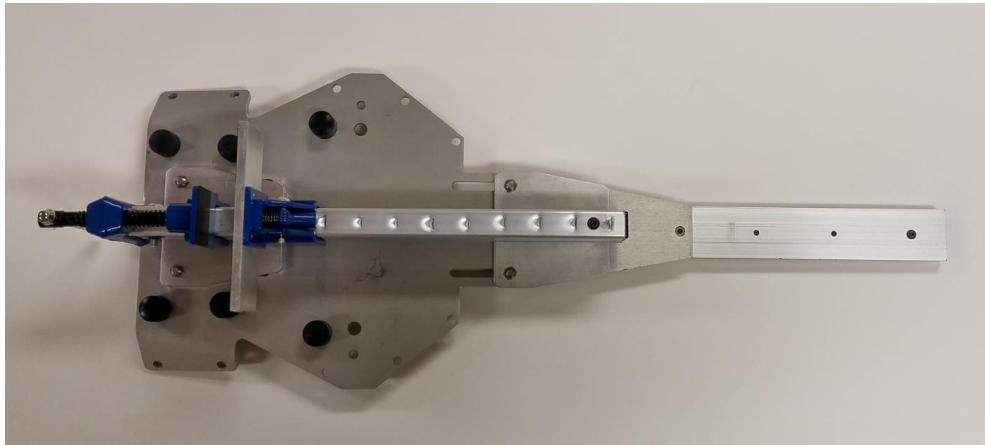


Figure 12

- 2) Adjust the clamping adapter to the width of the antenna lip. Use the coarse width adjustment lever first, then use the fine adjustment lever to secure the mount to the antenna. **See [Figure 13](#)**

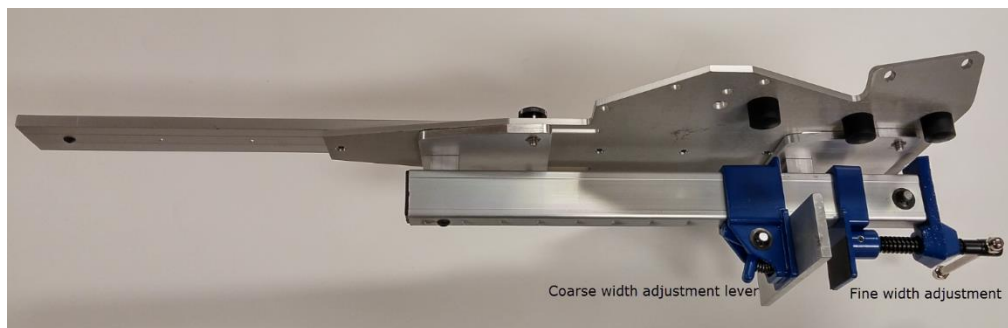


Figure 13

- 3) Clip one of the elastic antenna straps to the mount and pass the strap under the rear center section of the antenna (under the radio mounting area) and bring it back up and clip to the mount. When secured, the straps should form a "U" shape. **See [Figure 6](#)**. Straps may be clipped together end-to-end to create a longer strap for larger antennas.

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

- 4) Adjust the mounting strap tension and ensure mount is steady. Adjust mounting bracket, strap attachment points or strap tension as necessary.
- 5) Verify mount is more or less horizontal to the antenna. *See [Figure 7, 8 & 10](#)*
- 6) The mount must be positioned directly on top of the antenna with minimal side-to-side error, or “roll” error. Place the included digital level across the mount (perpendicular to sliding rail) to measure the “roll” of the mount. Adjust the mount to reduce roll error to within +/-0.5 degrees. *See [Figure 8](#)*

*****ALWAYS USE THE SAFETY LANYARD TO PROTECT MOUNT AND MWxx FROM ACCIDENTAL FALLS**
 Note: The safety lanyard is NOT the same as the black elastic straps used to secure the mount to the antenna***

Using the Microwave Alignment System in the Field

Preparation before going to field

- 1) Ensure that the main MWxx unit(s) and tablet(s) batteries are charged. If using optional LASER rangefinder, ensure that the LASER rangefinder has good AA batteries (2 required).
- 2) If performing a **Single-Ended** alignment (aligning only one end of link at a time), proceed to the [Single-Ended Alignment](#) section on [Page 19](#). Be sure to have the latitude, longitude and height of the remote antenna’s location.
- 3) If performing an **End-to-End** alignment (teams at both ends of the link and using paired MWxxs simultaneously), proceed to [End-to-End Alignment](#) section on [Page 23](#).

Single-Ended Microwave Alignment	End-to-End Microwave Alignment
MWxx and tablet (or other Android device equipped with the Sunsight Android app) are charged	Both MWxxs and tablets tablet (or other Android device equipped with the Sunsight Android app) are charged
One crew at one end of a microwave link	Crews at both ends of a microwave link
One microwave alignment kit case and contents	Both microwave alignment kit cases and contents
No SIM cards required	SIM cards must be installed and activated in tablet (or other Android device equipped with the Sunsight Android app)
Targets determined by manual input	Targets determined by location of MWxxs
Remote (other) antenna latitude, longitude and MSL height required for targeting	No remote (other) antenna location information required

See Page 19 for Single-Ended Alignment	See Page 23 for End-to-End Alignment
--	--

Single-ended Alignment

Aligning only one end of the link - i.e. no team member at remote site

*****NOTE:** The latitude, longitude and MSL height of the remote antenna must be available in order to calculate accurate target alignment data***

At the site

- 1) Perform Steps 1 – 2 under [Preparation before going to the field - Page 18](#)
- 2) Configure mount for the antenna:
 - a) Shielded (drum style) antenna - [See Pages 12 – 13](#)
 - b) Parabolic or convex back antenna - [See Pages 15 – 16](#)
 - c) Convex front antenna – [See Page 16](#)
 - d) Clamp mount – [See Page 17](#)
 - e) Flat panel or “pizza box” antenna [See Page 31](#)

*****ALWAYS USE THE SAFETY LANYARD TO PROTECT MOUNT AND MWxx FROM ACCIDENTAL FALLS**
Note: The safety lanyard is NOT the same as the black elastic straps used to secure the mount to the antenna***

- 3) Slide the MWxx into the mount rail, but do not extend to end of rail. The MWxx carry handle and power button should face the back of the antenna – except for flat panel antennas.
 - a. Flat panel antenna orientation will depend on selection and location of mount.
- 4) Power on the Sunsight ruggedized tablet (or other Android device equipped with the Sunsight Android app) and allow to run for approximately 90 seconds.
- 5) Power on the MWxx and allow boot sequence to complete. Completed boot sequence is denoted by the battery LED illuminating and a flashing blue AZM light.
- 6) Click the Sunsight **Microwave Path Alignment App** icon on the Android device
- 7) Click “Scan for AATs”
 - a. Available MWxx connections will be displayed upon completion of scan.

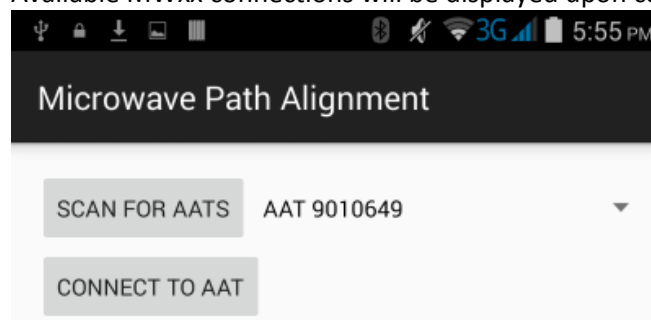


Figure 14

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

- 8) Using the drop-down menu, locate the MWxx connection matching the serial number of the MWxx being used and click “CONNECT TO AAT.” *See Figure 14*
 - a. MWxx serial number decal is located on the back of the unit and is formatted 90xxxxx
- 9) The app will open the MWxx’s website in an embedded browser. Use the app, not the tablet’s browser, to navigate the MWxx’s website.
- 10) Once logged in, tap the “**Start a Single-Ended Mode alignment session**” button.
- 11) Enter Session Info data, including the antenna diameter.
 - a. Data input is optional, excluding antenna diameter. Any information stored will be displayed on the alignment report.
- 12) Tap “Begin Session” at the bottom of the page to begin alignment.
- 13) Place the included digital level on the flat frame of the antenna (typically near the radio mount in the back/center of the antenna) and adjust the antenna so that the level indicates 90° (this will equal 0° tilt (elevation angle)). *See Figure 15*



Figure 15

- 14) Tap “**Calibrate**” at the bottom of the page, then **OK** at the prompt to save results.
 - a. NOTE: If the microwave mount is removed or repositioned, the calibration must be performed again using the “**Recalibrate Tilt**” button.
- 15) Enter the Latitude, Longitude, and MSL Height of the remote end (the other antenna) of the microwave link, then tap “**Begin Alignment**”

*** If capturing Above Ground Level (AGL) height, please see [Using the Rangefinder...](#) (Page 42).
Otherwise, continue with Step 16 below. ***

- 16) Extend the MWxx out on the mount rail until it clears any overhead obstructions.
- 17) Make sure the blue Azimuth LED is solid and not flashing. A solid blue LED indicates that the MWxx has calculated azimuth.
- 18) Adjust the antenna to closely match the target azimuth and tilt.

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

- a. Note that one or two tenths of a degree in azimuth is not critical.
 - b. Be sure to give the MWxx adequate time - up to a minute - to “settle” on an azimuth after making minor adjustments.
- 19) Once the antenna is adjusted, secure the antenna in position.
- 20) With alignment complete, the user may select one of the following:
- a. Tap “**Save Report**” to save the results. The alignment report is saved to the MWxx *only*. Reports may be generated later.
 - b. Tap “**Save Report & End Alignment**” to save the results to the MWxx and end the alignment session. Reports may be generated later.
 - c. Tap “**End Alignment**” to end the alignment session without saving a report to the MWxx. No report will be available if this option has been selected.

NOTE: Single-Ended Microwave Alignment reports may be collected from the MWxx at any time. All reports remain on the MWxx until the user manually deletes an individual report, or clears the MWxx internal memory. See [Notes regarding MWxx report generation and retrieval](#) - Page 44

- 21) The Single-Ended alignment is now complete.
- 22) Power down MWxx and tablet and secure for transport.

****See sample Single-Ended Microwave Report with Photos on Page 22 – 24****

After returning from the field

- 1) Retrieve reports from tablet/MWxx.
- 2) Charge the MWxx and tablet prior to long term storage.
- 3) Be sure to turn off data/phone plan to conserve costs. This can also be accomplished by turning off the tablet(s).

END OF SINGLE-ENDED ALIGNMENT PROCEDURE

	Manual Microwave Alignment Report Sunsight Test	Sunsight Instruments 125 Candace Drive Maitland FL 32751 321-244-9443
---	--	---

AAT 9010711			
Site Description	South Yard		
Link Name	Test Link		
Call Sign	Epsilon		
Emission Designator	12345		
Licensee Code	54321		
Antenna Make	Ubiquiti		
Antenna Model	AF5		
Antenna Diameter	0.56 m		
Radio Make	Ubiquiti		
Radio Model	AF5		
Azimuth Target / Actual	12.9	/	12.8
Downtilt Target / Actual	0.0	/	-0.1
Target Lat/Long Dec. / DMS	28.856000, 86.099000	/	28° 51' 21.6000" N, 86° 5' 56.4000" E
Lat/Long Dec. / DMS	28.644977, -81.355710	/	28° 38' 41.9180" N, 81° 21' 20.5554" W
Target MSL Height ft / m	104.99 ft	/	32.00 m
MSL Height ft / m	103.05 ft	/	31.41 m
AGL Height ft / m	-	/	-
Distance mi / km	8372.68 mi	/	13474.49 km
Orientation	Back		
Notes	Single end test		
Timestamp (UTC)	2017-07-24 15:47:20		

Note: this report was generated using Manual Alignment Mode, which means the target latitude, longitude and MSL height values were manually entered and not automatically obtained from another AAT.

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

Capture Timestamp: 2017-7-24 15:47:20 (UTC)
Site: Sunsight Test
Link Name: Test Link
Azimuth: 12.8
Downtilt: -0.1
Latitude: 28.644977 / 28° 38' 41.9180" N
Longitude: -81.35571 / 81° 21' 20.5554" W
AGL Height: Not Captured
MSL Height: 103.05 ft



Capture Timestamp: 2017-7-24 15:47:20 (UTC)
Site: SunSight Test
Link Name: Test Link
Azimuth: 12.8
Downtilt: -0.1
Latitude: 28.644977 / 28° 38' 41.9180" N
Longitude: -81.35571 / 81° 21' 20.5554" W
AGL Height: Not Captured
MSL Height: 103.05 ft



Example Single-Ended Microwave Alignment report

End-to-End Alignment*

Aligning both ends of the link simultaneously – crews at each end of the link with paired MWxxs

NOTE: End-to-End Alignment requires both tablets to have network access. SIM cards must be installed and activated in both tablets. Cellular network coverage is required.

Once both teams have completed **Steps 1 – 3** under [Preparation before going to field...](#) ([Page 18](#)), they are ready for an End-to-End alignment session.

At the site

- 1) Determine mount configuration required for antenna:
 - a. Shielded (drum style) antenna - [See Pages 12 – 13](#)
 - b. Parabolic or convex back antenna - [See Pages 15 – 16](#)
 - c. Convex front antenna – [See Page 16](#)
 - d. Clamp mount – [See Page 17](#)
 - e. Flat panel or “pizza box” antenna [See Page 31](#)
- 2) Power on MWxx and allow unit to boot up. Completed boot sequence is denoted by the battery LED illuminating and a flashing blue AZM light.
- 3) Slide the MWxx into the mount rail, but do not extend to end of rail. The MWxx carry handle and power button should face the back of the antenna.
- 4) Power on and enable Wi-Fi on the tablet, if disabled:
 - a. Click “**Settings**”
 - b. Click “**Wi-Fi**”
- 5) Click the Sunsight **Microwave Path Alignment App** icon on the tablet’s homepage
- 6) Click “Scan for AATs”
 - a. Available MWxx connections will be displayed upon completion of scan.
- 7) Locate the MWxx connection matching the serial number of the MWxx to be used and click “CONNECT TO AAT.” [See Figure 14](#)
 - a. MWxx serial number decal is located on the back of the unit and is formatted 901xxxx
- 8) The app will open the MWxx’s website in an embedded browser. Use the app, not the tablet’s browser, to navigate the MWxx’s website.
- 9) When both teams are ready, enter the user’s Log In information on the Microwave Alignment page on each tablet. Once logged in, site data for the session can be entered and submitted (optional), then the user will advance to the calibrate offset page.

***** If you do not have a username and password, register for a free account at:**

<https://sunsightuwave1.azurewebsites.net/>

The same account credentials may be used for both tablets. ***

***** If capturing the antenna Above Ground Level (AGL) height, please see [Using the Rangefinder...](#) ([Page 42](#)). Otherwise, continue with Step 10 below. *****

- 10) Extend MWxx out on rail until it clears any overhead obstructions.

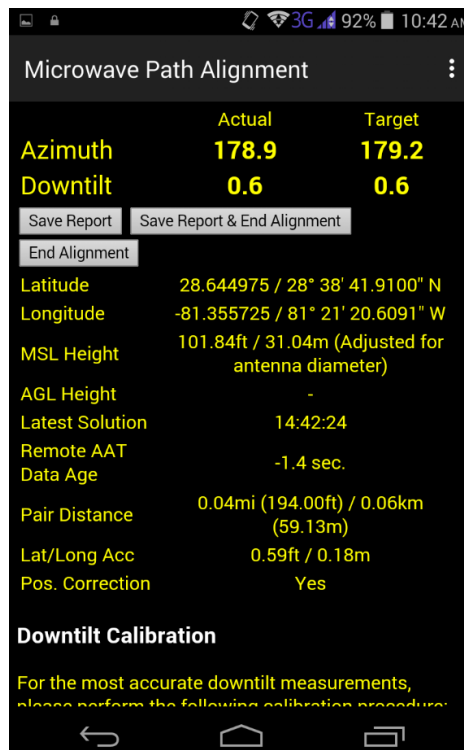


Figure 16

- 11) Place the included digital level on the flat frame of the antenna (typically near the radio mount in the back/center of the antenna) and adjust the antenna so that the level indicates 90° (this will equal 0° tilt (elevation angle)). [See Figure 15](#)
- 12) Tap **“Calibrate”** at the bottom of the page, then **OK** at the prompt to save results.
 - a. NOTE: If the microwave mount is removed or repositioned, the calibration must be performed again using the **“Recalibrate Tilt”** button.
- 13) Once both MWxxs have successfully logged in and are on the measuring page, target data will be populated for azimuth and downtilt for the link. [See Figure 16](#)
- 14) Ensure that the blue Azimuth LED on the MWxx is solid and not flashing. A solid blue LED indicates that the MWxx has calculated azimuth.
- 15) Adjust the antenna to closely match the target azimuth and tilt. Note that one or two tenths of a degree in azimuth is not critical. Be sure to give the MWxx adequate time to “settle” on an azimuth after making small adjustments (up to a minute). The user may click the “Remote MWxx” tab to see the alignment status of the remote MWxx.
- 16) Once the antenna is adjusted, lock the antenna in position and click the “Save Report” button to save the results.
 - a. The “Save Report & End Alignment” button may selected if alignment is complete.
- 17) The user will be prompted to take photographs of the jobsite. Select “Yes” to add photos or “No” to save the site report without photos. [See Figure 17](#)

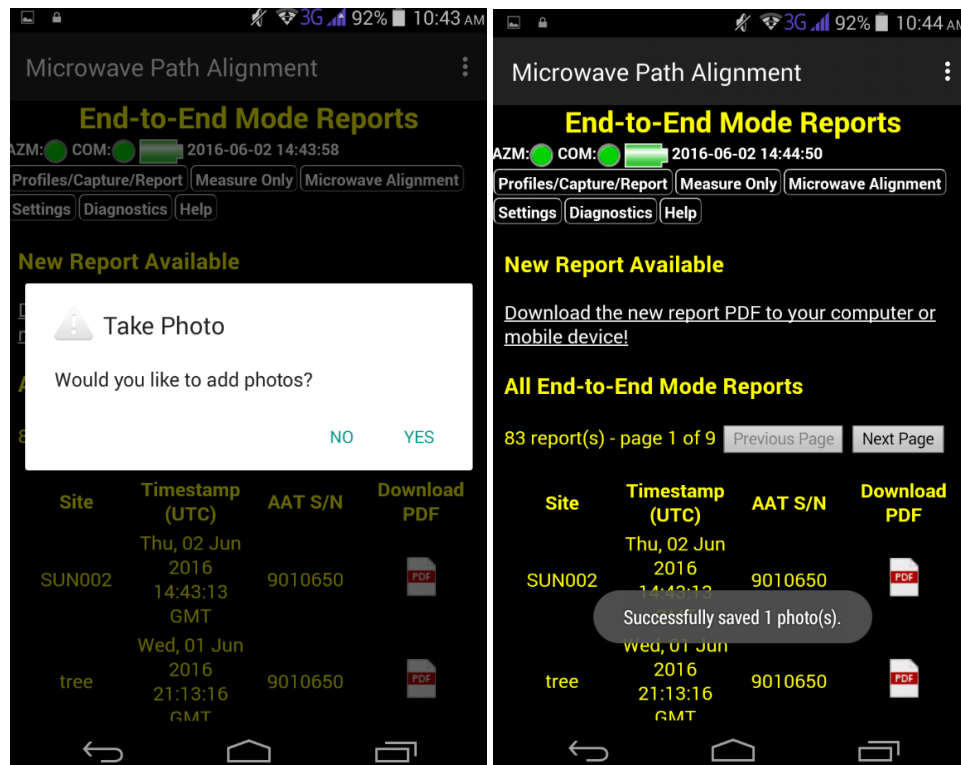


Figure 17

Figure 18

- 18) The PDF alignment report, including any site photos taken in Step 16, is saved to the cloud on the internet, ***not in the MWxx***. The user may save a copy of the report to the tablet by clicking the "Download PDF" link. *See [Figure 18](#),*

See [Page 28 - 30](#) for example End-to-End Microwave Alignment report

Completed End-to-End Microwave Alignment reports may be retrieved at any time using any device with internet access by logging in to the user's account at: <https://sunsightuwave1.azurewebsites.net/>

- 19) Power down tablet and MWxx and secure for transport.
20) The end-to-end alignment is now complete.

After returning from the field

- 1) Retrieve reports from tablet or from the cloud account. Charge the MWxx and tablets prior to long term storage.
- 2) Be sure to turn off data/phone plan to conserve costs by disabling the cellular data or

END OF END-TO-END ALIGNMENT PROCEDURE

**End-to-End Alignment technology patent pending at the time of this writing.*

Microwave Path Alignment Report

	AAT 9010711	AAT 9999999
Site	Demo	FL-SUN001
Site Description	South yard	Rooftop
Link Name	E2E demo	Sunsight
Call Sign	Alpha	W4SUN
Emission Designator	12345	11G7N0N
License Code	54321	SUNSI1
Antenna Make	Ubiquiti	CommScope
Antenna Model	AF5	SHP3-11W
Antenna Diameter	0.6 m	3.0 ft
Radio Make	Ubiquiti	DragonWave
Radio Model	AF5	Horizon Compact+
Azimuth Target / Actual	180.6 / 180.7	0.6 / 125.0
Downtilt Target / Actual	0.9 / 0.9	-0.9 / 0.0
Lat/Long (Decimal)	28.644962, -81.355710	28.644443, -81.355716
Lat/Long (DMS)	28° 38' 41.8636" N, 81° 21' 20.5547" W	28° 38' 39.9948" N, 81° 21' 20.5776" W
MSL Height Feet / Meters	102.9 ft / 31.4 m	100.0 ft / 30.5 m
AGL Height Feet / Meters		
Distance Miles / Kilometers	0.04 mi / 0.06 km	0.04 mi / 0.06 km
Orientation	Back	Demo
Notes	E2E demo mode	*** Demonstration Mode ***
Timestamp (UTC)	2017-07-24T16:01:43	2017-07-24T16:01:43

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

Capture Timestamp: 2017-07-24 16:01:45 (UTC)
Site: Demo
Link Name: E2E demo
Azimuth: 180.7
Downtilt: 0.9
Latitude: 28.644962 / 28° 38' 41.8636" N
Longitude: -81.355710 / 81° 21' 20.5547" W
AGL Height: Not Captured
MSL Height: 102.9 ft / 31.4 m



Capture Timestamp: 2017-07-24 16:01:45 (UTC)
Site: Demo
Link Name: E2E demo
Azimuth: 180.7
Downtilt: 0.9
Latitude: 28.644962 / 28° 38' 41.8636" N
Longitude: -81.355710 / 81° 21' 20.5547" W
AGL Height: Not Captured
MSL Height: 102.9 ft / 31.4 m



Example End-to-End Microwave Alignment Report with photograph attached

Retrieving End-to-End Reports from anywhere

End-to-End MWxx alignment results saved during alignment sessions can be retrieved from the following website using the same credentials used to login to the end-to-end function during end-to-end MW alignment.

<https://sunsightuwave1.azurewebsites.net/login>

Aligning RF Cellular Panel Antennas

Using the Microwave Path Alignment Kit to align RF cellular panel antennas

Each half of the MW15 Microwave Path Alignment Kit may also be used independently for RF Cellular Panel Alignment with the included RF panel antenna mount. In this mode, the MW15 acts as a standard AAT15. Instructions for use as an RF Panel alignment system can be found on the www.sunsight.com microwave support page.

Checking tilt and roll calibration

Sunsight strongly recommends that users periodically check the tilt and roll calibration of the MWxx's internal sensors. The frequency with which these checks should be performed will depend on how often the MWxx is used and how it is cared for, but calibration checks should be performed monthly, at a minimum. ***The MWxx does not require return to Sunsight for calibration.***

NOTE: For MW15 and MW08 units, remove the adapter plate on the bottom of the unit prior to checking calibration or recalibrating the unit. Note orientation of adapter plate for reinstallation after calibration checks/recalibration.

- To check calibration, place the MWxx on a **flat** surface.
- Power on and log in to the MWxx.
- On the Measure Only/Quick Capture page, set the Orientation to "Back."
- Note the tilt and roll measurements displayed - it may help to write them down.
- Turn the MWxx to face the opposite direction and note the tilt and roll measurements displayed.
- Compare the two sets of values – the numbers should be the same, but with opposite signs – I.E. if tilt displays 0.2°, it should display -0.2° when facing the opposite direction.
- If the measurements are as described above, within +/- 0.1°, the MWxx is calibrated
- If measurements are not as described above, within +/- 0.1°, calibrate the MWxx's tilt and roll sensors by following the prompts on the Tilt/Roll Calibration page.

Troubleshooting

- Checking current firmware version

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

- ✓ Log in to the MWxx ([See Pages 29 & 30](#)). Scroll to the bottom of any MWxx webpage, where the user can find the MWxx serial number and firmware version currently installed.
- The MWxx will not power on
 - ✓ Ensure that the onboard LiFePO4 battery is charged using only the approved charger. Use of any other charger or power supply may cause insufficient charge, overcharge, or electrical damage to the unit.
- Webpages not available
 - ✓ Ensure your Handheld Controller is connected to Wi-Fi hotspot **AAT 901xxxx**, where the x's represent the serial number of the MWxx. Serial number decals are located on the back of the unit, next to the mounting rail.
 - ✓ With the Handheld Controller connected to the MWxx's Wi-Fi hotspot, open a web browser and navigate to **192.168.0.50**
- The MWxx will not display azimuth
 - ✓ GPS is line-of-sight technology and, as such, both GPS antennas at the top of the MWxx must have as clear a view of the sky as possible.
 - ✓ The MWxx should always be mounted as high on the antenna to be measured as possible.
 - ✓ Use the indicators on the MWxx's **Diagnostic** page to help determine optimal placement.

Use and care of the SunSight MWxx

- The MWxx utilizes state-of-the-art GPS/GLONASS technology in order to provide highly accurate azimuth calculations. GPS and GLONASS are line-of-sight technologies. For optimal results, the GPS/GLONASS antennas at the top of the MWxx should be offered the best "view" of the sky possible. Physical obstructions over either antenna may result in difficult or no-azimuth conditions. Position the MWxx so as to eliminate or minimize physical obstructions.
- The MWxx and its accessories are weather resistant, not water-proof! Do not immerse or submerge the MWxx in liquid of any type. All access doors and caps must be in good working order and secured while the MWxx and its accessories are in use, especially in inclement weather.
- Do not store the MWxx or its accessories in a wet case. Allow the case(s) to air dry prior to storing the MWxx and its accessories.
- The MWxx housing is fabricated of aluminum for durability, but still contains highly sensitive electronic components. Avoid sharp impacts and drops.
- The MWxx and its accessories contain no user-serviceable components. Do not attempt to disassemble the MWxx for any reason. Unauthorized disassembly may result in component damage and warranty termination.

- Sunsight strives to provide the best user experience possible with our products. To that end, we continue to develop hardware and software solutions to meet the needs of our customers. Sunsight will periodically issue firmware updates to enhance performance and function of our products. To receive update notifications, please register your MWxx at: <https://www.sunsight.com/index.php/register-AAT>. Your information is never shared or sold and is used only by Sunsight to track user updates.

For questions regarding use or care of the MWxx and its accessories, please contact Sunsight Instruments Technical Support. Live technical support is available Monday – Friday from 9:00am to 6:00pm Eastern.

support@sunsight.com

1-321-244-9443 x2

Glossary

- **Azimuth** – compass heading or bearing. All Sunsight products show azimuth referenced to **true north**, not magnetic north
- **Capture** - A capture is the action of recording measurements to the MWxx. Typically, the tower technician will adjust the antenna to the required alignment values and capture (record) the results. The captured data is then used to generate reports.
- **Elevation (aka Tilt)** – Measured in degrees and refers to antenna alignment in the vertical plane. A positive tilt value indicates the face of the antenna is pointed toward the ground.
- **GPS and GLONASS** - GPS and GLONASS, also referred to as GNSS, are both satellite-based positioning systems that are used by the MWxx to determine exact latitude and longitude of the MWxx. Also, and most importantly, the satellites are used to determine the azimuth for the MWxx.
- **MW15 or MW08 kit** - each kit comprises two MW units, along with two sets of microwave antenna mounts, two rugged Android tablets and two RF Panel alignment mounts (MW15 only)
- **MW15 or MW08 Single Unit** - each MW Single unit comprises one MW unit, along with one set of microwave antenna mounts, one rugged Android tablet and one RF Panel alignment mount (MW15 only). A Single Unit is used to align each end of a microwave link independently (one at a time). The MW15 Single Unit can also be used to align a cellular RF panel antennas.
- **Report** - Reports are formatted alignment results that can be created in PDF or CSV formats. Reports can be created for one individual set of measurements (ex. one antenna) or can be created for an entire site's worth of data (several antennas on one report).
- **RF Panel Antenna** - An RF panel antenna is an antenna used for broadcasting cellular signals to handsets. They are typically mounted on towers or rooftops in a tri-sector configuration.

SUNSIGHT MICROWAVE PATH ALIGNMENT SYSTEM INSTRUCTIONS – MODELS MW15, MW08

- **Roll** – Sometimes referred to as “plumb” and measured in degrees. Refers to antenna alignment in the horizontal plane. A positive or negative roll value indicates the top of the antenna is not level.
- **Tablet** – the MW products come with ruggedized 4G Android tablets that use the Sunsight Android app to operate the Sunsight products. Note that any Android device (tablet or Smartphone) with Android Operating System greater than 6.0 can also be used in place of the tablets. The Sunsight Android app would need to be installed on the Android device.