Antenna Alignment for TrangoLink Giga and Apex products

This guide explains how to achieve the optimal antenna alignment of the microwave antenna when used with the TrangoLink Giga, GigaPlus, GigaPro, or Apex products. Before attempting to do the alignment it is highly recommended that you read this guide in detail. For specific commands please consult the manual of the product being installed

Step 1: Preparation:

Mount the antenna on the tower according to the antenna installation instructions: Ensure that the adjustment bolts move smoothly and the range of motion is sufficient for the expected angle of up and down (elevation) tilt. Ensure that the mount itself is attached securely and all safety precautions have been taken.

Step 2: Coarse Alignment:

Visually align the antenna with the far end. The most common ways to do this are :

1) If the visibility is good and the sun is in the correct position, have someone at the far end location reflect the sun with a mirror so the location is obvious.

2) If visibility is poor, use GPS coordinates and a GPS compass to aim the antenna coarsely.

Step 3: Fine Alignment.

Before conducting fine alignment, the ODUs at both ends of the link must be attached properly to the antenna via the direct mount or remote mount (using Waveguide) and the far end ODU must be powered on and transmitting. The ODU lightning surge suppressors and grounding provisions should be put in place as well before alignment. The local ODU must be powered on, but need not be transmitting.

Ensure that:

1) Frequency of the far end transmitter matches the frequency of the local receiver.
2) The TX output power is not set above the level of the license.
3) ATPC is turned OFF on the far end.
4) Alignment mode is ON – Display on ODU and IDU will update at 5 times per second.

FINE ALIGNMENT PROCEDURE

1) Adjust the azimuth over a 30 degree sweep by turning the adjustment bolt in increments of 1/10th turn to avoid missing the main lobe. When the highest signal has been found for azimuth, repeat for the elevation adjustment.
2) Turn the local transmitter on to allow alignment at the far end.
3) Move to the far end of the link and repeat step 1.
4) Lock down the antenna so no further movement can occur.
5) Install the antenna side struts supplied with the antenna.
6) Verify the RSSI remains the same and is within 2-4 dB of the expected levels.
7) Check the ODU connector seals.
8) Turn alignment mode OFF
9) The alignment is complete.

MSE BASED ALIGNMENT

Since the beamwidth of most microwave antennas is below 2 degrees (about the width of a thumb at arms length), and the sidelobes and patterns of high performance antennas are very low (< -25 dB), it can be difficult to acquire the signal at all until the main beam pattern is lined up. In addition, the RSSI detectors of the radios have a usable range that varies by model as follows:

Model	MAX RSSI	MIN RSSI
HP ODUs:	-15 dBm	-90 dBm
Apex Models:	-30 dBm	-70 dBm
GigaXX-ODU-XX models:	-30 dBm	-60 dBm

To assist in the alignment process, the MSE of the radio can also be used to conduct alignment until the RSSI is within the range above.

To perform MSE based alignment, follow this procedure:

1) Set the speed and modulation on both ends to the lowest channel bandwidth possible (depends on model) and the modulation to QPSK. This will allow the radio to lock at the lowest signal level possible.

2) Conduct the alignment as described above, but instead of aligning using the RSSI, look at the MSE of the radio through telnet or console session and watch the variation as the antenna is being adjusted. This can be done by running the *linktest 99* command which will continuously report the lock status, RSSI, and MSE in 1 second intervals. Look for the lock to go to "1" first, then for the MSE absolute value to increase as the alignment is improved. The RSSI may not be

changing during this time at all since the signal level may be below the minimum of the usable range.

3) As soon as the RSSI increases above the minimum, then RSSI based alignment may be used which has a much faster update rate and will allow for very fine adjustment until the RSSI is within 3-4 dB of the expected level.

4) Reset the speed and modulation to the intended values and confirm the MSE and RSSI are as expected.

SOME COMMON PROBLEMS:

1) Cannot achieve the expected RSSI
   a. The antennas may not be on the mainlobe
   b. ODUs may not be mounted with the same polarization at both ends.
   c. There may be Fresnel Zone encroachment that was not seen in the initial site survey. Tree growth is the most common problem and will not be seen by the pathloss analysis done prior to install. This reinforces the need for a physical site survey prior to deployment. Higher locations on the tower may be required.
   d. The Antenna is not far enough away from the roof line when mounted on a **horizontal** roof. The antenna bottom edge MUST be a minimum distance above the roof as per the following table:

Distance to Edge of Roof (ft)	Antenna Edge Height above Roof Edge (ft)
0	1
1	2
2	3
3	4
4-10	5
10-20	6
20-30	7
30+	8

   e. The same rule in (d) above applies to any objects in front of the Antenna such as HVAC units.

2) No signal can be detected
   a. Opmode is not ON. The transmitter must be active
   b. TX and RX frequencies do not match on both the radios.