Satellite Antenna Alignment

The following alignment/realignment procedures are presented in the simplest terms possible to enable the non-experienced person the opportunity to align the satellite antenna. Explanation of some "Satellite Antenna Fundamentals" are presented in a separate document of the same heading on this website to provide additional information but not clutter these instructions.

**NOTE:** If the satellite antenna was aligned and realignment is required **DO NOT** loosen any fasteners until you have marked with a pencil the current azimuth, elevation and skew position on the satellite antenna’s mount, frame, and/or arm. Pencil is used so it can be erased and you do not end up with too many old markings on the antenna which could cause confusion. Azimuth, elevation, and skew are marked so you have a point of reference to return to if after repeated adjustments you become confused. The mark should be on the fixed portion as well as the mobile portion of the adjustment, so that, after you have moved any of the three adjustments off its mark you can return to the original position by realigning the pencil mark of the fixed and mobile parts. Reasons for realigning the satellite antenna can range from services moving to a different satellite to a wind storm inadvertently moving your satellite antenna.

**CAUTION:** Never attempt to align or realign a satellite antenna in a storm (wind/rain/electrical). Doing so can cause personnel or equipment casualty. Never work alone; tell someone what you are doing. If a ladder is necessary inspect the area around the antenna for electrical wires. Insure ladders have a sound foundation and are stable.

These instructions assume you have a level / plumb antenna foundation to which your satellite antenna is mounted; your LNB is mounted and coax cable is run from the LNB to the decoder. If your antenna is an offset antenna you will need to know the value of the offset; generally, somewhere between 20 - 25 degrees. Lastly, you should have a compass, protractor, and any necessary wrenches and screw drives to loosen and re-tighten fasteners. **CAUTION:** Exercise care when loosening fasteners that the weight of the mobile section to be moved does not suddenly move and cause damage. Lastly, you will need the azimuth, elevation and skew for the satellite you want to lock onto and that's where we will begin.
OBTAINING AZIMUTH, ELEVATION AND SKEW FOR YOUR LOCATION: AFN recommends using the following web site to obtain your needed information. After selecting the correct satellite and spot beam, you will zoom into your town or possibly street, and once selected, you'll be provided with accurate information for adjusting your satellite antenna.

In your browser open a new page and type http://www.satbeams.com/footprints The link will open to a page shown here at 1 degree W (West). Advertisements may be different. 
Above the map are the different beams from that satellite and above that are various satellite locations. On the left and right end of the satellite locations are 5 and 45 degree advancements. Use these advancements to move to the satellite you desire. For this exercise I'm using NSS-6, 95 degrees East for AFN Pacific DTH. AFN Europe DTH would use Eurobird 9A at 9 degrees East. With your mouse click on the +45 arrow on the right to move the satellite locations around to get 95E. Run the mouse pointer over the satellite images until you get to NSS-6, 95E. NSS-6 appears in the center of the image and all NSS-6 beams are above the image. Use your mouse and select the NEAsia beam on NSS-6. The following image is of NSS-6, NEAsia Beam. Using the zoom slider on the left side of the image zoom in on Japan. To reposition the map hold down the left mouse button and drag the map to center Japan in the image. For this exercise I am using Yokosuka to get my settings. You'll soon learn you can zoom into your street but a city location is close enough to lock onto the satellite. Zooming into Yokosuka left mouse click on the city. An anchor marker appears and a green line going back to the satellite
appears. The green lines indicates you have a clear line-of-sight to the satellite. A red line would indicate you can not see the satellite from that location. The red line generally means the satellite is at or below the horizon and can not be seen. A information box will appear on the map with reception information. It provides signal strength of the beam and what minimum size antenna will be required to receive the signal.

To the left or right of the image you'll see the following "Reception details" box. This is the information we'll need to align the antenna to the satellite. Notice the satellite name and position as well as the beam the information is based on. From this information write down the Elevation angle, LNB Tilt (skew) and True azimuth.

For AFN Pacific DTH viewers in Korea, you use the same satellite and beam. You simply move the map to Korea and mouse click your city or town for your antenna aiming information.

For AFN Europe DTH viewers, your satellite is Eurobird 9A, 9 degrees East and your beam's name is "Europe" located on the far right of the beam information. Use the scroll bar.

ANTENNA ALIGNMENT: The best order to align the satellite antenna is the PEA method. PEA - Polarization (skew), Elevation, Azimuth. This order is a simple method and has produced good success. The method is performed twice. The first time gets you on the satellite while repeating it a second time peaks the signal for maximum signal reception. It is very important to obtain maximum signal strength so that during inclement weather you will have less likelihood of losing the signal. Both the Pacific and European DTH signal is Ku band. Ku band is a high frequency band that can be absorbed by rain. The wavelength is so small it can be absorbed by rain drops. The uplink site generally has a little overhead on uplink power which can be boosted during heavy storms but the uplink site can only do so much. If the satellite antenna is not peaked (maximum performance) and is on the fringe then a storm can cause pixilations first and then signal loss. Performing the PEA method twice provides for maximum performance and improves reliability of signal reception.

POLARIZATION: Also known as skew, is the slewing (turning) of the LNB either clockwise or counter-clockwise within the LNB's collar, or mount, to align the LNB's polarity with the satellite's polarity. Normally, skew is described as + or - degrees offset from behind the satellite antenna looking toward the satellite. + degrees is the clockwise rotation of the LNB and - degrees is the counter-clockwise rotation of the LNB. The -44.8 degrees skew
adjustment for AFN Pacific DTH is standing in front of the antenna, back towards the satellite, and rotating the LNB counter-clockwise. From the website you should have seen the satellite is Southeast of Japan; so, the LNB is rotated approximately 45 degrees counter-clockwise by loosening the collar around the LNB and rotating the LNB counter-clockwise. Tighten the retaining screw. The picture to the right shows the tightening screw and angular markings for setting skew. Not all LNB will have these angular markings. Please review "Satellite Antenna Fundamentals" for additional information concerning skew.

ELEVATION: You can use a protractor to establish the antenna's elevation. You can obtain a simple protractor from a school supply store. The protractor shown at the right is a complete circle; however, a semi-circle protractor will work as well. The key is to locate the center along the straight edge, generally marked. It is from this center point you'll suspend a weighted line. Fishing line or light string (anything thin) weighted on the end (heavy nuts or fasteners). MOST IMPORTANT: if your antenna is an offset antenna you need to know the degree of offset; generally between 22 to 25 degrees.

The image to the left shows a 22 degree offset antenna set up for 63 degrees of elevation. The dish is set at 41 degrees but the 22 degree offset makes the effective elevation 63 degrees.

Our elevation in this example is 27.8 degrees. If our antenna is a 22 degree offset we lock the elevation to 5.8 degrees. If the antenna cannot be lowered far enough without the LNB support arm interfering with the ground or other support structures turn the antenna up-side-down so that the support arm is on top. With the support arm on top add the 22 degrees to our elevation of 27.8 degrees and lock the elevation to 49.8 degrees.

The use of a weighted line and protractor to establish the antenna's elevation has the advantage of compensating for level or plumb errors. Some antennas have an elevation mechanism fixed to the dish. These devices will only be as accurate as the base or mount to which they are attached. If the foundation is not level or plumb and is off by a couple of degrees the the elevation will be off by the same amount.
AZIMUTH: The final setting before fine tuning is setting the azimuth (or antenna heading). If you visualize north at 0 degrees, east at 90 degrees, south at 180 degrees and west at 270 degrees, and then recall the satbeam map showing the green line from Yokosuka to the satellite it matches the antenna heading of 239.7 degrees for azimuth. The heading is somewhere between south at 180 and west at 270 degrees.

Select a surface that is perpendicular to the receive plane of the antenna. The LNB support arm is perpendicular and points toward the satellite. Use the side of support arm and lay the compass edge along the side of the support arm. Swing the antenna until the compass reads 239.7 degrees (approximately 240 degrees.).

At this point the antenna is pointing very close to the satellite. Insure the coaxial cable is connected between the LNB and decoder. Insure the a coaxial cable is between the decoder and the TV set. Insure the decoder and LNB power is turned on. Some decoders have the LNB power switch on the back of the decoder while others have the LNB power turned on through the software setting within the decoder. Turn on the decoder and TV set. Launch the decoder menu and go to the Dish Point menu; here you'll find signal strength and if you are locked. Even being close to the satellite you may get a lock+signal; however, fine tuning is still necessary. If you get a lock; signal not authorized you have to finish the fine tuning and then go through the Decoder Authorization procedures on MyAFN website. If you get no signal repeat the above steps for skew, elevation and azimuth. Make sure you have selected the correct satellite and verify the setting (skew, elevation and azimuth) for your location.

FINE TUNING: PATIENCE is key here. The objective is to get the maximum signal strength or quality. With the Dish Pointing menu displayed on the TV set you'll fine tune the polarization; then elevation; last, azimuth. It take 5 - 10 seconds from when a small correction is made to when it is seen on the Dish Pointing menu. This can get tiresome as a small movement may show no change, but don't give up. Starting with polarization loosen the collar until you can move the LNB but don't let the LNB be sloppy in the collar (keep it snug but able to move). Turn the LNB clockwise in small increments while checking the signal strength and then counter-clockwise in small increments while checking the signal strength. The signal strength will rise and fall, or visa versa, as you pass through the maximum strength. Lock (tighten) the LNB down where signal strength/quality is maximum. Do the same thing with elevation and then azimuth. Small adjustments up and then down on the elevation and east / west with azimuth looking for maximum strength. Again you are looking for maximum signal strength. Complete the elevation fine tuning before attempting the azimuth. You can repeat the PEA procedure as many times as you like. When you are satisfied that you have maximum strength use a pencil and mark the three axis (PEA) for future reference. Winds can easily move your antenna. But if you've marked the antenna when you have maximum signal strength you can easily use the markings to re-align the antenna if the antenna moves.