B. Antenna Stabilization Procedure

After the initial power-up and cabling has been completed, configuration of the RCP8 must be carried out in a particular order. A suggested sequence is given below, which is based on the assumption that none of the parameters are yet correct. Detailed instructions for modifying parameter values are described in Chapter 4. Most of this configuration is made through the RCP8's chat interface. You can always access this by running the rcp8 manually with the "rcp8 –int" shell command. Once the host computer interface is correctly configured, then you can access this via the **antx** program on the controlling host.

1. Disable host computer control until the positioning is stabilized. Do this by answering "No" in the "site host" section to the "Process incoming servo control packets" question. While you are in there, setup the rest of the host computer interface questions.
2. If this is a shipboard system, disable the platform stabilization until the basic antenna control is tuned up. Do this by answering "No" to the first question in the "INU" section.
3. Use the "site display" command to choose the parameters you would like to show on the front panel display.
4. Define most of the fixed information for each axis, particularly the angle source. This is performed using the "axis" command.
5. Temporarily set the elevation shutdown limits 15 degrees short of mechanical stops, leaving enough distance for the antenna to coast to a stop in case of errors. Disable soft limits. These only work when the position servo is configured. Also, set the limit switch options and polarity.
6. Now using the **setup** utility in the RCP pop-up, configure the *Interface to RCP* section to match. Once this is done, the **antx** and **antenna** utilities should function. Verify that the displayed angles match the RCP8 front panel.

The following steps are performed separately for each axis. Do the azimuth axis first. For most of the elevation axis stabilization, keep the antenna in the middle of the range, away from the stops.

1. Set the "maximum output drive voltage" to +/– 10 Volts to start. Verify that a drive of 0 will not move the antenna. Set the drive sign correctly. If you have a high-gain servo, it may go at full speed at a lower voltage, and it may move with a zero drive (because of a small A/D offset voltage). In this case, you will need to add an external resister divider to lower the drive voltage. If the voltage needs to be lowered a small amount use the drive voltage question. Below about 5 volts, Sigmet recommends the voltage divider.
2. Adjust the tachometer voltage range using the gain potentiometers on the back of the CP. The pot closer to the end of the CP controls elevation. The T units are

displayed in the RCP8 in a range of +/–100. The goal is that the maximum velocity that the antenna will ever go should be within the measured limits. Be aware that this speed may exceed the maximum velocity requested by the RCP8. Use the "monitor" command to watch this, then give drive commands like "ad 10" to give small drives. Bring the speed up to 25% of the maximum you expect, then adjust until the T display is below 25.

3. Calibrate the tachometer by getting the sign and offset right, then entering level and speeds in the "axis" command. Set the "Tach zero–delay–smoother window" to a short (0.05 second) value.
4. Determine the motor starting drives, the nominal drive slope, and the maximum angular velocity. Determine the drive sign, then set the drive slew rate fairly short (.10 second). Set the velocity feedback dead zone to 0.3, and the feedback slope to 25. The velocity servo should now be stable.
5. Set up the position servo parameters to achieve a stable motion between two positions that are separated by an angular distance. Make sure that both steps of 1 degrees and of 10 degrees perform quickly with no overshoot.

When both axes are done, perform the following:

1. Now set the final elevation shutdown limits 0.2 degrees or so short of the mechanical stops. Enable the elevation soft limits, and set them short of the shutdown limits by 0.5 degrees or so. In **setup** RCP section set the elevation limits to the same soft limits.
2. If this is a shipboard system, use the "INU" section to enable the data from the INU. See the next section.

B.1 Shipboard INU and Pedestal Alignment

Background of INU Alignment

In the best of worlds the MRU sensor is mounted with an orientation exactly matching the antenna pedestal. To do this while the ship is docked, we use a digital level to match the MRU's tilt to the pedestals tilt in both axis. Then we make the pedestal's azimuth zero when the MRU's heading is zero. The GPS antenna orientation also must match. After such an alignment, we will get the correct roll, pitch, and heading for antenna stabilization. It does not really matter that this match other parts of the ship.

Unfortunately, this is not always possible. The INU data may be shared by many different experiments. To correct for this, we need to add a pitch and roll offset for the INU in the RCP8. There is no need to use a heading offset, because we can still make the zero headings match with a pedestal offset.

INU and Pedestal Alignment Procedure

There are 5 numbers to enter into the RCP8 which need to be determined:

Azimuth Axis Input offset from true orientation.
Elevation Axis Input offset from true orientation.
INU Roll offset from true orientation.
INU Pitch offset from true orientation.
INU Heading offset from true orientation.

1. Set the INU Heading offset to zero. We will define this to be the pedestal zero azimuth.
2. Get a rough Azimuth Axis offset by manually pushing the antenna to point in the direction of the ships heading. Next adjust the offset until the pedestal azimuth reads zero on the antenna utility.
3. Make sure the INU stabilization is turned on in the RCP02. Set the elevation angle to 0 degrees in the antenna utility, place a digital level on the waveguide feed in front of the dish in a place parallel to the transmitted beam. Sweep the antenna a full 360 degrees slowly recording the tilt every 30 degrees or so. The recorded table should also show the pedestal azimuth. You can see this displayed in **antenna** by selecting Options/ "Stable Platform Params". Also monitor to make sure the RCP02 is really maintaining the earth elevation angle near zero. Plot the resulting data and fit to a sine wave with offset.
4. The fit offset gives you a rough elevation axis offset. It is not the exact offset because the beam pattern may not be exactly aligned with the feed waveguide.
5. The sine wave amplitude at 0 degrees gives you the INU Pitch offset.
6. The sine wave amplitude at 90 degrees gives you the INU Roll offset.

7. After adjusting the offsets, repeat the stabilization measurement scan to check that the corrections are complete. You may need to repeat this many times because of operator mistakes, sign confusions, and cross term contributions.
8. Run a sun calibration. Use the results of the sun calibration to fine tune the pedestal elevation offset, and pedestal azimuth offset. Check to make sure you got the signs correct.