

## TELESCOPE MOUNT WORM GEAR BACKLASH ADJUSTMENTS

This document is intended to assist in the adjustment of the worm backlash (“play”) of Vixen GP style mounts (SP, SP-DX, GP, GP-DX, GP-E, GP-D, etc.) and also including the popular Chinese clones of the Vixen mounts, such as the Synta & Jinghua CG-5, EQ-4, HEQ-5, HD, LXD-55, LXD-75, etc. The attached pictures are of a Vixen SP mount but once you understand the process, you should be able to apply it to any generally similar mount.

The fundamental mission is to adjust two basic items on each axis. One is the end-to-end play of the worm gear shaft and the other is the backlash (spacing between the axis worm wheel [the big flat gear] and axis worm gear [the skinny spiral gear]) to as small of a space as is possible, before they begin to bind together and effect the tracking smoothness of the axis. A tiny bit of space is essential for smooth operation. If the space is too large, the axis will have a lot of back and forth play. If the space is too small, the axis will bind up and the axis motor may bog down or even stall because of excess friction.

**BE WARNED THAT OVER-TIGHTENING THE WORM GEAR PRESSURE AGAINST THE WORM WHEEL CAN EASILY BEND IT AND POTENTIALLY HARM OR EVEN RUIN YOUR MOUNT FOR ASTROPHOTOGRAPHY AND MAYBE EVEN FOR VISUAL ASTRONOMY. PROCEED WITH CAUTION AND THOUGHTFULNESS!!!**

First, any axis motors will have to be removed in order to get access to the worm adjustments.

On the Vixen SP, for example, that means loosening the four small setscrews on each motor dovetail slot that are used for precision motor positioning as well as the single motor retaining screw that goes into the back.

Adjusting the worms involves adjusting the backlash in two places. The first is the shaft longitudinal play, controlled by the Free Play Adjusting Screw. You want the threaded black collar screwed in tight against the worm drive and the washers, but not so tight that it binds up the shaft. You want to get it as close as possible before binding. Then you tighten the silver lock nut and then test for binding again. You may have to play with this a bit to get it perfect.

Once you have done that, then you will be working on getting the mesh of the worm gear and the worm wheel as close as possible without binding. That spacing between the gear and wheel is controlled by the three screws that offset each other in a push-pull configuration.



**Make sure not to over-tighten the pull screw or you will bend the worm gear shaft and cause permanent damage to it.**

You will start by putting slight pressure on the three screws and constantly checking the play in the mesh by turning the worm gear shaft using a hand knob or something similar.

Continue to adjust the positions and increase the pressure of the three push-pull screws while constantly double-checking the clockwise-counterclockwise play in the worm gear by turning the worm gear shaft using your knob and your fingertips. When you are done, the three push-pull screws should be snug but not super-tight and there should only be about 45 degrees or less (1/8th turn) of clockwise-counterclockwise play in the worm shaft. It is better to have a tiny bit of play than it is to bind up the gears and possibly even bend the worm gear shaft.

When everything is adjusted to your satisfaction, carefully tighten the lock screws. Then double-check your shaft play again.

Then you can tackle the second axis!

This procedure is effectively the same for all SP/GP mounts and their clones. The screws and their locations might change a bit but the process is the same.

-Christopher Erickson  
Telecommunications Engineer  
5432 E. Northern Lights Blvd., Suite 529  
Anchorage, AK 99508  
N61° 11.710' W149° 46.723'  
[www.data-plumber.com](http://www.data-plumber.com)  
[www.roboscope.net](http://www.roboscope.net)

