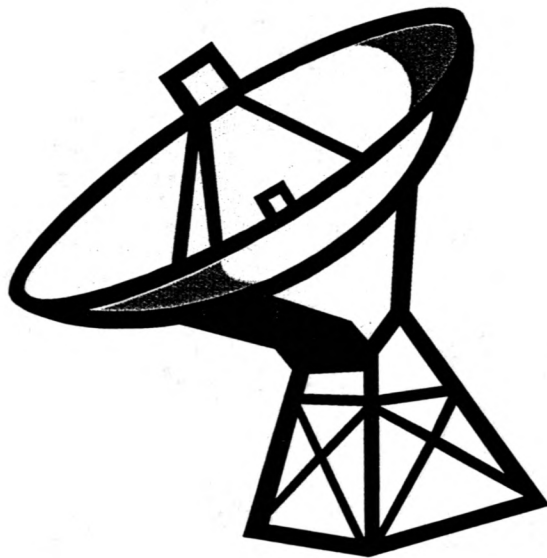


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Characterization of the VLA Servo System



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Abstract

The original E-Systems servo system for the VLA antenna is characterized. The authors (NM Tech engineering students) describe the A4 and A5 cards in detail to include input and output signals and functions of circuit elements. The operation of the position loop, rate loop, and current loop are discussed to include simulation of sine wave inputs. Finally, a trajectory generation is proposed which would reduce jerk when moving between two points. The study was initiated to address problems with obsolescence and performance. The antenna performance would be improved by a "stiffer" (higher gain) servo system and by reducing the time to offset (reference point). It might be possible to reduce offset time by increasing velocity and/or reducing jerk (derivative of acceleration).

Some unanswered questions:

1. Is it possible to improve the performance of the existing servo system without replacing the motors?
2. The study reports that the output of the motor tachometers is clipped implying limited function of the rate (velocity) loop as a result. Is there reason to improve the function of the rate loop? Can and should the expensive high-maintenance brush-type tachometers be replaced with brushless tachs or even some sort of incremental encoder?
3. How should a replacement servo control be implemented and how much would it cost?