

## A DIGITAL READOUT ANTENNA POSITION INDICATOR

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### INTRODUCTION

One of the more important parameters of EME operation is aiming the antenna at the moon. with the tight beam width of stacked antenna arrays, pointing accuracy becomes very important. This article describes a system which can obtain 1 degree positional accuracy.

### THEORY OF OPERATION

The circuit shown in Figure 1 was designed and constructed in a few hours and put into operation just prior to the first weekend of the EME contest. It consists of a precision double regulated 10.8 volt power supply to drive the precision potentiometers and a 5 volt supply to power the Digital voltmeters. Two 3 turn precision potentiometers (0.1% linearity) are mounted on the tower. One is used to indicate elevation angle and the other is used to provide azimuth readout. The elevation pot is mounted and turned much like the conventional syncro. Two fishing sinkers were attached to a 1 inch aluminum bar which acts like a pendulum. As the antenna is elevated the weight seeks gravity and turns the pot. The azimuth pot is attached to the tower with an aluminum bracket. A plastic pulley was made by a local machinist the some exact diameter as the main vertical support most. This turned out to be 2.016 inches. A 1/8 inch diameter "O" ring is used as a drive belt. This combination provides a 1 to 1 turning ratio. 10.80 volts is fed into the top of each 3 turn precision pot. By the use of high powered moth it can be shown that 10.8 divided by 3 is 3.6. Therefore, 0-360 degrees will equal 0-3.6 volts and 0-90 degrees will equal 0-.9 volts.

### CONSTRUCTION

Assembly of this indicator is straightforward and easy to do. Most of the parts can be obtained from Jameco (<http://www.jameco.com>). The digital panel meters, M1 and M2 are available from NON-LINEAR SYSTEMS The basic model number of this meter is X-30 with a -10 added for 10 volt range and a /PR added for 0.1% accuracy. These meters are available directly from the factory for \$35.00 each, plus shipping. Tel. (619) 535-2161. Layout of the components is not critical and any convenient layout should be acceptable. You might consider including the AZ/EL controls and have the complete antenna control in one box.

### ALIGNMENT AND TEST

To calibrate the readout, it is only necessary to set the output voltage to 10.80v. This voltage is critical and will partially determine the accuracy of the readout system. Connect the precision pots prior to installation on the tower. Adjust the pots and verify the meters are reading properly. note: Do not apply more than 10 volts to the meter input. No damage will occur, but the display will blank.) Standard weather proofing techniques should be used when mounting the pots on the tower. (See Figure 2.) To calibrate the AZ pot, position the antenna to the 0 degree point (North) and set the AZ pot wiper to the ground end. Connect the drive belt. As the antenna turns toward the east, the voltage on the wiper should increase. To calibrate the EL pot, position the antenna at 0 degrees and set the EL pot wiper to the ground end. Elevate the antenna and verify the wiper voltage increases. If either wiper voltage does not

increase, you are probably not set to the ground end. Reversing the outside wires on the ot should cure the problem. The digital readout was installed prior to the EME contest and the only problem I have encountered with the digital readout was a defective LSI chip in the meter. NLS supplied me with a replacement free of charge and the meter has performed completely satisfactorily since. I am completely happy with the results of this project.

73,  
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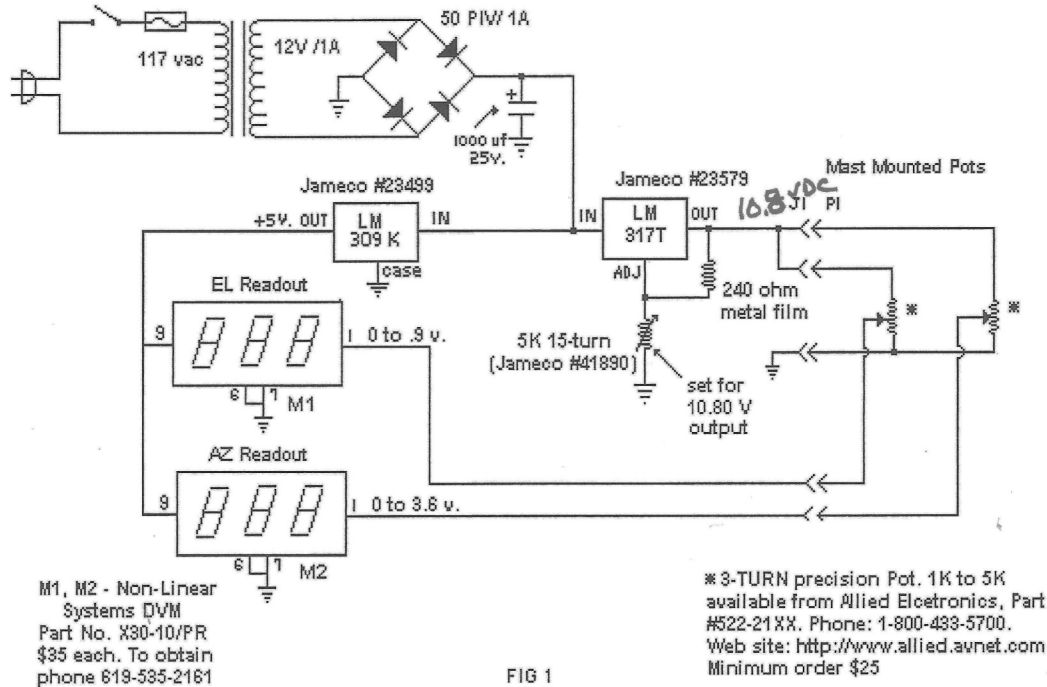


FIG 1

Typical Pot. Installation

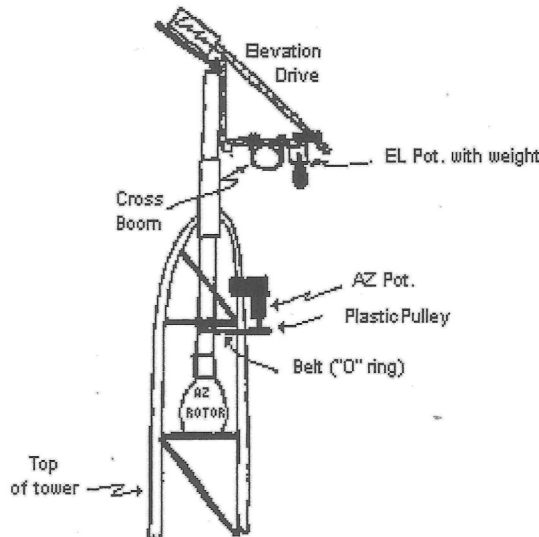


FIG. 2