

MircoStar Encoder Pot Adjustment October 6, 2001

Probably the most confusing part of installing a MicroStar Encoder is setting up the center position of the pots used in the joysticks and the trim levers. This document will outline the setup steps I use when installing an Encoder. This discussion assumes you have built the Encoder and completed the power-up tests. It is also assumed that the Encoder is installed in your radio and all of the wiring has been completed.

What is a pot? Pot is short hand for potentiometer. This is the device used for volume controls on radios and other electronic devices. This is a three-lead device and is a variable resistor. Two of the leads connect to each end of the resistor and the third lead (generally the center lead) connects to a wiper that touches the resistor at a position that depends on the position of the shaft. The trim levers and joysticks use pots to tell the Encoder where they are located. This is done by placing a DC voltage across the pot and monitoring the wiper using an voltage measuring input of the PIC (an ADC input).

It is very important that this procedure is done after the Encoder is installed in your transmitter and before you apply power with the PIC installed. If you skip this step it is very likely you will destroy the PIC!

Here is a step by step procedure:

- 1.) Remove the PIC from its socket.
- 2.) Make sure you have a battery installed or are using a power supply to power the transmitter.
- 3.) Apply power, nominally 10 volts.
- 4.) Measure the voltage on pin 36 of the PIC IC socket. [See Notes (1) and (2) below] It should be .9 volts, and when you push the Aileron stick to the left, the voltage should go down.
- 5.) First make sure the direction is correct. When you push the Aileron stick to the left, if the voltage does not go down, then you will need to reverse the wires on each end of the pot. If you used connectors to allow you to plug the pots into the encoder then you can reverse the plug to correct this problem. Make sure you remove power before you perform any operation to reverse the pot direction.
- 6.) After the direction issue if fixed, its time to set the center position. Apply power and measure the voltage on pin 36 of the PIC IC socket. . [See Notes (1) and (2) below Adjust the Aileron pot center position until you read .9 volts at stick center. UNDER NO CIRCUMSTANCES can this voltage ever exceed 5 volts or you will destroy the PIC when you install it back in the Encoder.
- 7.) That's it! Pretty simple. You need to repeat steps 4 through 6 for all channels and for all trim channels. You can guess at the center position of the non-centering channels

and the trim channels. Below is a list of the PIC IC pin numbers for each of the channels on the Encoder:

PIN number	Channel
41	CH7
42	CH6
36	Aileron
35	Elevator
30	Rudder
29	Throttle
28	Aileron Trim
27	Elevator Trim
26	Rudder Trim
25	Throttle Trim

- 8.) The direction you move the stick to cause the voltage to reduce is constant. On controls that move right and left, the left direction should always causes the voltage to reduce. On controls that move up and down, up is always the direction that should causes the value to reduce. When I say “up” I mean the direction to pull the elevator stick to cause the airplane to go up, pulling the sick back is up. In regards to the throttle, this means low throttle should cause the throttle pot voltage to go down.
- 9.) After this adjustment is completed for all channels, install the PIC microcontroller and you are ready to perform the joystick calibration procedure. You can also start the Encoder in the IO test mode and check the range of ADC values you can read on each channel. Typical values can be found in the Powered up tests section (item 11) of The Encoder document.
- 10.) While this procedure is pretty simple it can consume a bit of time. Please take your time and make sure you check every channel. A voltmeter with a small probe tip will help. The pin out for the PIC socket is shown below:

Notes:

- (1) The PIC IC socket numbers listed for each of the control pots are common to that particular pot's J2 connector signal lead. Therefore they are also common with the center lug of the pot itself. The reason this is noted, is to advise you that for ease of taking a particular reading, it may be easier for you to measure this voltage from these common points versus at the pin on the PIC socket. Some builders that intend to build a large quantity of encoders and install them may want to build a test fixture and measure this critical voltage at the J2 connector. This assumes you used connectors at J2 and not hard wired in.
- (2) Some of you may be using 10 K Ohm pots, or a combination of 5 K and 10 K pots. This is fine and no special action is required when you change the pot's resistance. You can use pots as low as 1K, but do not use pots any higher in resistance that 10K. This upper limit is due to the PIC's ADC input impedance and if you use larger pots the response will become non-linear.

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