Tuning Anilam Servo Motors

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(1988 Anilam Crusader GXM)

DISCLAIMERS & CREDIT:

- **No warranty, express or implied, is made as to the usefulness or accuracy of these instructions. They are made available only for educational purposes.** *Use at your own risk*.
- Credit is due to Tim Podgwaite, who graciously and patiently helped us through so many problems. However, these instructions are based on our notes and experience in using his suggestions. Any errors are not in any way associated with him.
- Updated 7/4/2018 with clarifications from Steve Physics.
- **These cabinets contain potentially lethal 1-phase and 3-phase high-voltages. DON'T TOUCH THINGS THAT YOU DON'T KNOW WHAT'S GOING ON!!!**
- BE CAREFUL … Be ready to hit the E-STOP. The table is very likely to run away during this process!
- There are glue dots on many potentiometers. DON'T TAKE THEM OFF, and DON'T TRY TO ADJUST THEM! The ones you need to adjust don't have glue on them.

We hope these directions help guide you as you seek to maintain your Anilam controller!

Prepare

- Unplug the linear scale connectors
  - Find the black-tab board
  - Find the 7-pin connectors on the front-edge labeled X, Y, & Z – these are the connectors for the linear scales
  - Unplug them from the black-tab board! (there is no need to unplug them elsewhere – pictures showing other connections are only for your reference)
- Turn servos on (motors may drift)
- USE THE E-STOP anytime you need to power off the mill. BOTH power off the mill AND the controller, *AND* make sure the E-STOP is set.
- *Make sure you also review the photo gallery at the bottom.*

Balance 'red-tab' board

1. Read the 'commanded movement' coming from the red-tab board to the servo drives
   1. Find the long skinny board (PCB 803) located horizontally above the servo drive boards
   2. Locate header P8 (a row of bare pins) – there is a matching width header below it (P7 – they are actually all connected … so P7-pin1 is connected to P8-pin1, etc, so that you can probe P8 and find what's happening on P7). You should see three pairs of red & black wires coming in to pins 1-6 on P7. These are the signals from the red-tab board for axes X, Y, & Z
   3. Probe the pins corresponding to the axis you're tuning (pin numbers start on the right with #1):
      1. X-axis: pins 1 (X-signal) & 2 (X-common)
      2. Y-axis: pins 3 (Y-signal) & 4 (Y-common)
      3. Z-axis: pins 5 (Z-signal) & 6 (Z-common)
2. Go to red tab board
   1. Find the axis you're working with (X, Y, or Z)
   2. Find the potentiometer marked "BAL" – located on the front edge of the board – corresponding to that axis
   3. Turn potentiometer screw until the voltage (on the proper pins on PCB803-P8) reads as close to 0mV as possible.
      - NOTE: The potentiometers do not have a linear response. In other words, the farther away from in tune you are, the more you have to turn the screw to get a noticeable response (like 1/2 turn at a time). The closer to in-tune you are, the less you have to turn the screw to get a response. When you are very close to 'in-tune', a tiny change can make a 'big' difference and throw you to the other side of tune easily. *When you are close, you have to barely 'whisper' the adjustment screw*: just barely move it at all, and it makes a significant difference. *A tiny little electronics screwdriver is helpful in gently turning the adjustment screw*. A standard size flat head screwdriver tends to bump the screw while inserting it, which can wreak havoc if you're trying to fine-tune.
      - NOTE: Perhaps the easiest way to balance the red-tab board is to *have a helper watch the servo motor, and adjust the red-tab board until the motor ceases to move*. Then, check the voltage with the voltmeter and try to get it any closer to zero that you can. *You may not be able to actually achieve 0mV*, but can usually get to some fraction of a mV close to zero. The point of tuning is not to get it 'perfect' on an older control, but to tune it to work as well as possible. The older controllers (ie the red-tab board) are often going to be a bit challenging, and likely always a little troublesome to get 'perfect'. However, tuning allows them to continue to give good and accurate service.
3. PLUG THE LINEAR SCALE CONNECTORS BACK IN!

Balance servo drive

1. Go to the servo board, where the big white connector plugs in at the very top – should have two pairs of gray and black wires coming in.
2. Read voltage on pins connected to the middle two wires – a black and a gray (I believe, starting at 1 on the left-hand pin for that connector, they are pins 3 & 4 … but trace the wires back yourself). They should be a pair bundled together as they come in.

3. Adjust potentiometer marked "BAL" on TOP edge of servo drive board until voltage reads "0."

Adjust Gain

1. Write a program to loop the axis you're working on back and forth a couple of inches at 10% (for 200IPM max speed, that would be 20IPM).
2. Make sure the Feedrate Override is at 100%.
3. Read the command voltage out:
    1. Max command voltage to the servo drives is 10V. Only a maximum of 8V is used to run in rapid, leaving the extra 2V for acceleration.
       THEREFORE … at 10%, you should see 10% of voltage (0.8V).
    2. Probe the same pins as used in balancing the red-tab board (PCB803-P7 – pins 1 & 2 for X-axis, etc.)
    3. Adjust the SIG potentiometer on the front of the servo drive board until you read the correct voltage.

Congratulations!

Photo Gallery

Click on any image for associated notes.