Setup and Configuration of the

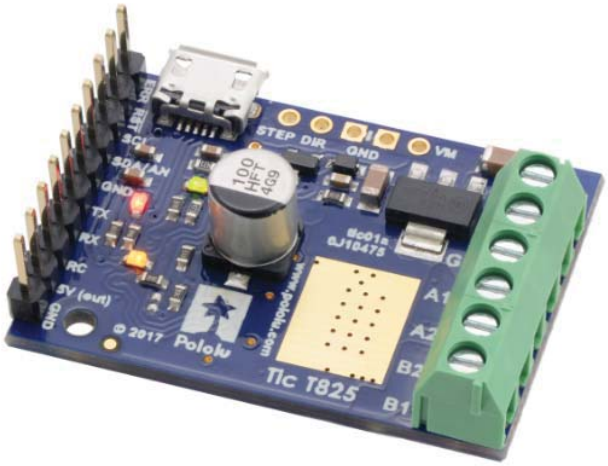
Tic T825 Controller

(Tic T825 USB Multi-Interface Stepper Controller)

Compatible Products:

Tic T825 Controller
S20-SS-MM-C
T20-SS-MM-C
P8-SS-GG-VV-ST

This note provides information regarding the Tic T825 Stepper Controller and Pololu's free stepper driver software, with the intent to allow custom control and configuration of our stepper actuator families. For the Tic T825 complete datasheet and User Guide visit Pololu's website. https://www.pololu.com/product/3130



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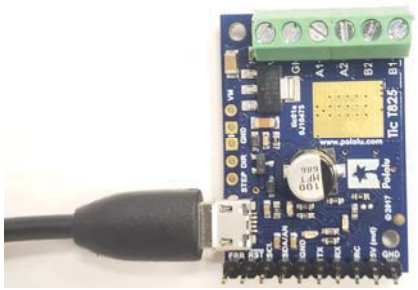
Quick Setup:

The information in this section will help in connecting your stepper motor and power supply to the Tic.

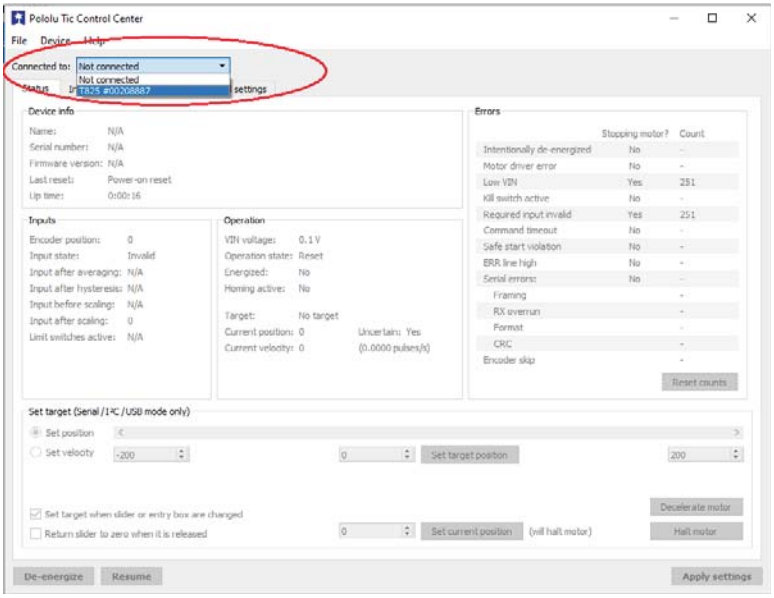
WARNING: Connecting or disconnecting a stepper motor while the Tic's motor power supply (VIN) is powered can DESTROY the motor driver. (Rewiring anything while it is powered can be problematic)

Begin by downloading the Tic Control Center software of the Pololu's website.
https://www.pololu.com/product/3130/resources

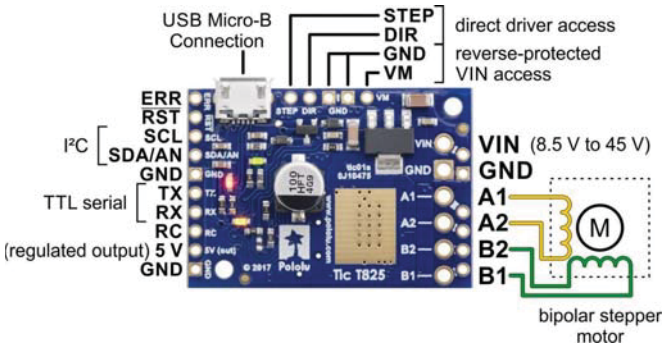
Open and run the Tic Control Center software. It is recommended to run the Tic Control Center software to make sure the software can connect to the Tic over USB. This ensures the Tic is functioning before investing more time into setup.

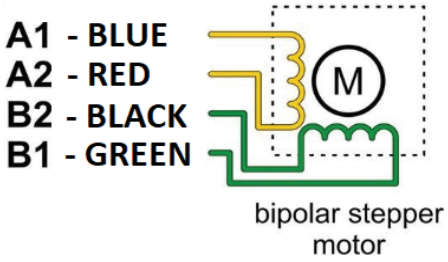


With the Tic Control Center software open and the USB connected, the Tic should automatically connect. If it does not automatically connect then use the drop down menu labelled "Connected to:" and select the Tic. The Tic should now be connected to the Tic Control Center.



Next is to connect the stepper motor wires to the Tic T825. Using the Pin layout below.

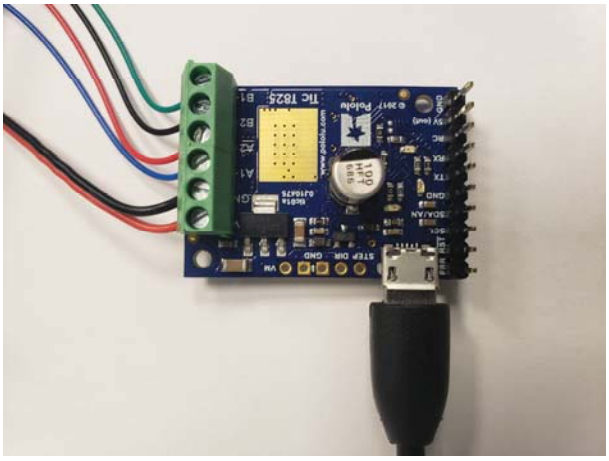




Make sure the stepper motor is connected and the wires are in the correct PIN location.

The power supply can be connected only once the stepper actuator is connected to the Tic board. Connect the power supply as shown in the image below. We recommend a 12V DC 2A Power Supply. https://www.actuonix.com/DC-Power-Supply-p/dcpowersupply.htm

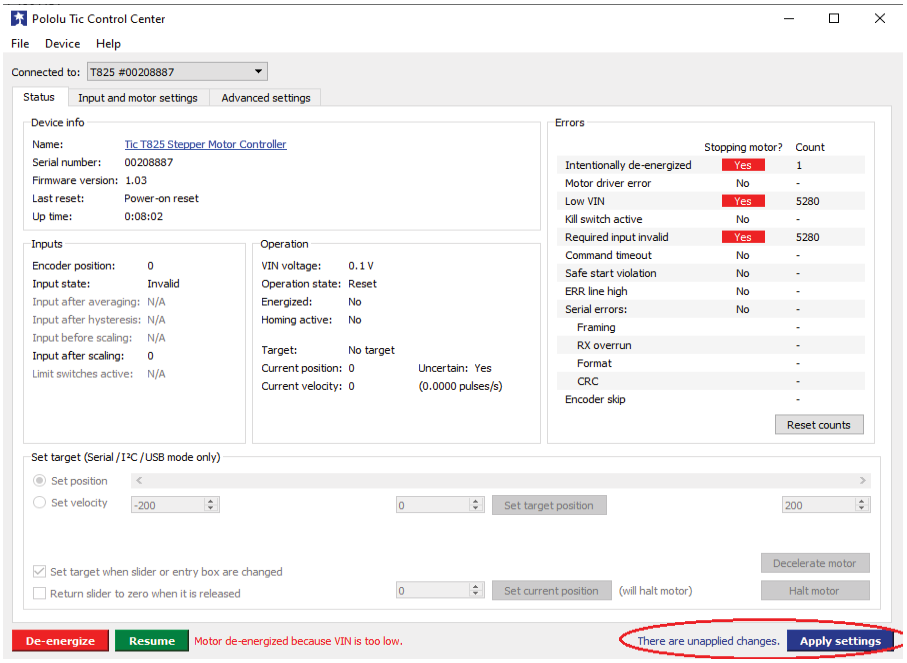
WARNING: The product is not certified for any particular high-voltage safety standard. Voltages above 30V can be extremely dangerous and should only be attempted by qualified individuals.



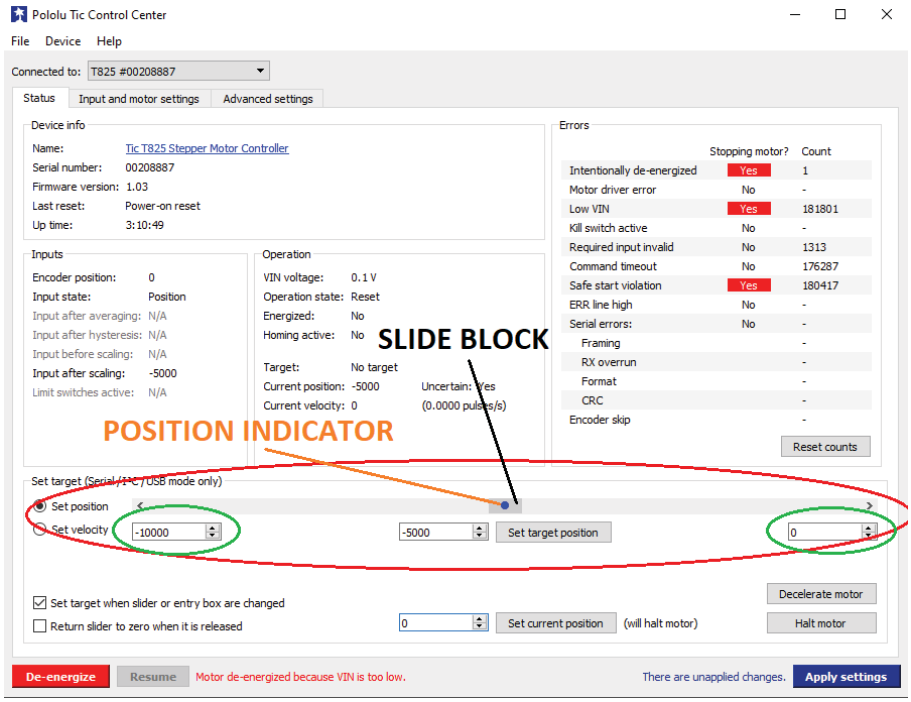
The Tic Control Center starts with default motor settings. These are found in the "Motor" block of "Input and motor settings" tab. These default settings must be changed for the Actuonix's Linear Stepper Actuator to run correctly.

Next is to download the configuration file "S20-FULL-QuickStart" from Actuonix's website.

In the Pololu Tic Software, at the top left select “File” and then select “Open settings file…” the configuration file to the Tic Control Center software. Make sure to “Apply Settings” once the config file is loaded. See image below.

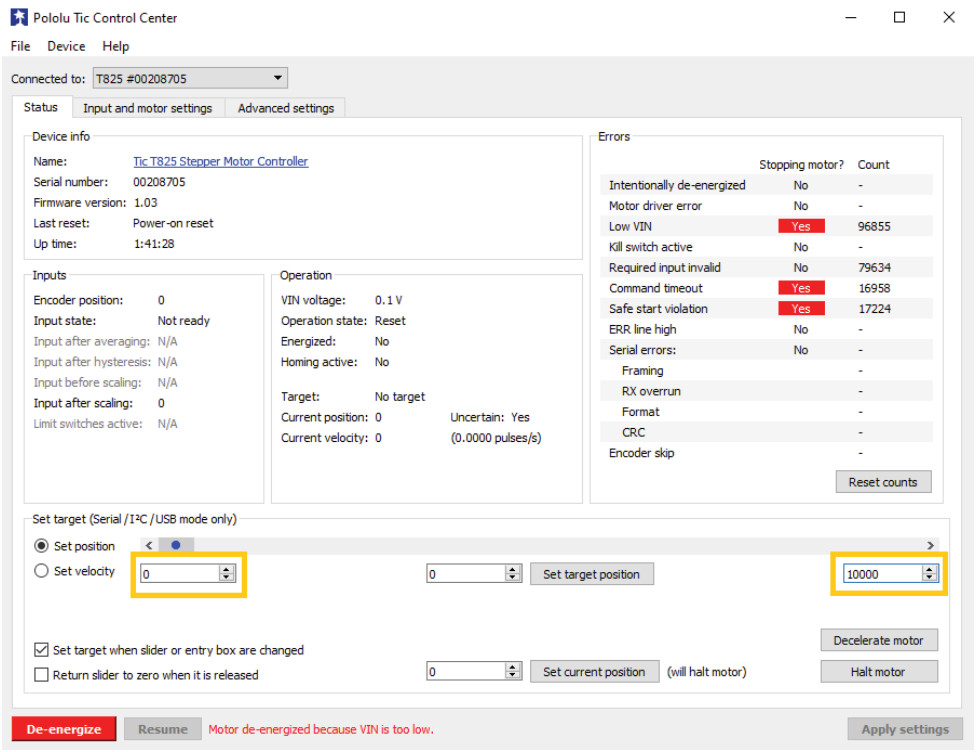


Next is to set the correct number of steps for the actuator to complete a full stroke. Each stroke length has a different number of steps required to travel its entire stroke. The slide on “Status” tab defaults from -200 steps to 200 steps. These values must be changed for the step size and given stroke length of actuator being used.



The slide bar represents the actuators stroke, where the slide block is the target position and the position indicator marks the current position. However, as there is no feedback on the stepper actuator if steps are missed the Tic Control Center software does not recognize this and the position indicator will show it has successfully hit the target position.

For the "S20-FULL-QuickStart" file the steps size is **FULL** and the total number of steps for strokes lengths of 15mm, 30mm, 50mm, and 100mm are 1500 steps, 3000 steps, 5000 steps, and 10,000 steps respectively. The number of total steps required to complete one stroke is the stroke length divided by the step size. In Table 1, the total steps required for a specific stroke length and step mode is shown.



With the correct number of steps inputted you can now move the slide block, however, before it will move the actuator you must first press "Resume" to energize (power) the motor. Actuonix's linear stepper actuator models do not contain position feedback; this is why it is required to **home** the actuator before use. To **home** the actuator it must be over stepped into either the fully extended or fully retracted position.

It is best practice to always "De-energize" the actuator after each use or during long periods of idle time.

Note: the motor movement may be opposite direction as desired, this can be changed by checking the "Invert motor direction" box in the "Input and motor settings" tab.

Stroke Length, Speed and Acceleration Customization:

This section will guide you in customizing the control and parameters of our S20 and P8-ST Actuator line using the Tic T825 control board.

The Tic T825 has a wide range of control inputs and customizable parameters. The main customizable parameters that relate directly to actuator performance include: **starting speed, max speed, acceleration, deceleration, step size, max current and number of steps**. Table 1 below shows the range of values that are acceptable inputs for the S20 and Tic T825.

Step Mode->:		Full (step size = 0.01mm)	1/2 (0.005mm)	1/4 (0.0025mm)	1/8 (0.00125mm)	1/16 (0.000625mm)	1/32 (0.0003125mm)
Stroke Length(mm)	Revolutions	Steps	Steps	Steps	Steps	Steps	Steps
15	7.5	1500	3000	6000	12000	24000	48000
30	15	3000	6000	12000	24000	48000	96000
50	25	5000	10000	20000	40000	80000	160000
100	50	10000	20000	40000	80000	160000	320000
150	75	15000	30000	60000	120000	240000	480000
Speed (mm/s), (steps/s)	speed (mm/s)	steps/s	steps/s	steps/s	steps/s	steps/s	steps/s
	1	100	200	400	800	1600	3200
	5	500	1000	2000	4000	8000	16000
	10	1000	2000	4000	8000	16000	32000
	15	1500	3000	6000	12000	24000	48000
	30	3000	6000	12000	24000	48000	96000
	40	4000	8000	16000	32000	64000	128000
	50	5000	10000	20000	40000	80000	160000
	60	6000	12000	24000	48000	96000	192000
	70	7000	14000	28000	56000	112000	224000
	80	8000	16000	32000	64000	128000	256000
Beyond Driver Limits (50000 maximum)							
Maximum Reliable Acceleration	pulses/s^2	10000	20000	40000	80000	160000	320000

Table 1: S20-38MM Actuator and Tic T825 Parameters

49:1	Step Mode->	Full ≅0.006mm	1/2 ≅0.003mm	1/4 ≅0.0015mm	1/8 ≅0.00075mm	1/16 ≅0.000375mm	1/32 ≅0.0001875mm
Stroke Length(mm)	Revolutions	steps	steps	steps	steps	steps	steps
10	1.67	1666.7	3333.3	6666.7	13333.3	26666.7	53333.3
25	4.17	4166.7	8333.3	16666.7	33333.3	66666.7	133333.3
50	8.33	8333.3	16666.7	33333.3	66666.7	133333.3	266666.7
75	12.50	12500.0	25000.0	50000.0	100000.0	200000.0	400000.0
100	16.67	16666.7	33333.3	66666.7	133333.3	266666.7	533333.3
Speed (mm/s), (steps/s)	speed (mm/s)	steps/s	steps/s	steps/s	steps/s	steps/s	steps/s
	1	167	333	667	1333	2667	5333
	5	833	1667	3333	6667	13333	26667
	10	1667	3333	6667	13333	26667	53333
	15	2500	5000	10000	20000	40000	80000
	30	5000	10000	20000	40000	80000	160000
	40	6667	13333	26667	53333	106667	213333
	50	8333	16667	33333	66667	133333	266667
	60	10000	20000	40000	80000	160000	320000
	70	11667	23333	46667	93333	186667	373333
	80	13333	26667	53333	106667	213333	426667
Beyond Driver Limits (50000 maximum)							
Maximum Reliable Acceleration	steps/s^2	10000	20000	40000	80000	160000	320000

Table 2: 49:1 Gear Ratio P8-ST and Tic T825 Parameters

165:1	Step Mode->	Full ≅0.0018mm	1/2 ≅0.00091mm	1/4 ≅0.00045mm	1/8 ≅0.00023mm	1/16 ≅0.00011mm	1/32 ≅0.000057mm
Stroke Length(mm)	Revolutions	steps	steps	steps	steps	steps	steps
10	1.67	5500	11000	22000	44000	88000	176000
25	4.17	13750	27500	55000	110000	220000	440000
50	8.33	27500	55000	110000	220000	440000	880000
75	12.50	41250	82500	165000	330000	660000	1320000
100	16.67	55000	110000	220000	440000	880000	1760000
Speed (mm/s), (steps/s)	speed (mm/s)	steps/	steps/s	steps/s	steps/s	steps/s	steps/s
	1	550	1100	2200	4400	8800	17600
	5	2750	5500	11000	22000	44000	88000
	10	5500	11000	22000	44000	88000	176000
	15	8250	16500	33000	66000	132000	264000
	30	16500	33000	66000	132000	264000	528000
	40	22000	44000	88000	176000	352000	704000
	50	27500	55000	110000	220000	440000	880000
	60	33000	66000	132000	264000	528000	1056000
	70	38500	77000	154000	308000	616000	1232000
	80	44000	88000	176000	352000	704000	1408000
Beyond Driver Limits (50000 maximum)							
Maximum Reliable Acceleration	steps/s^2	10000	20000	40000	80000	160000	320000

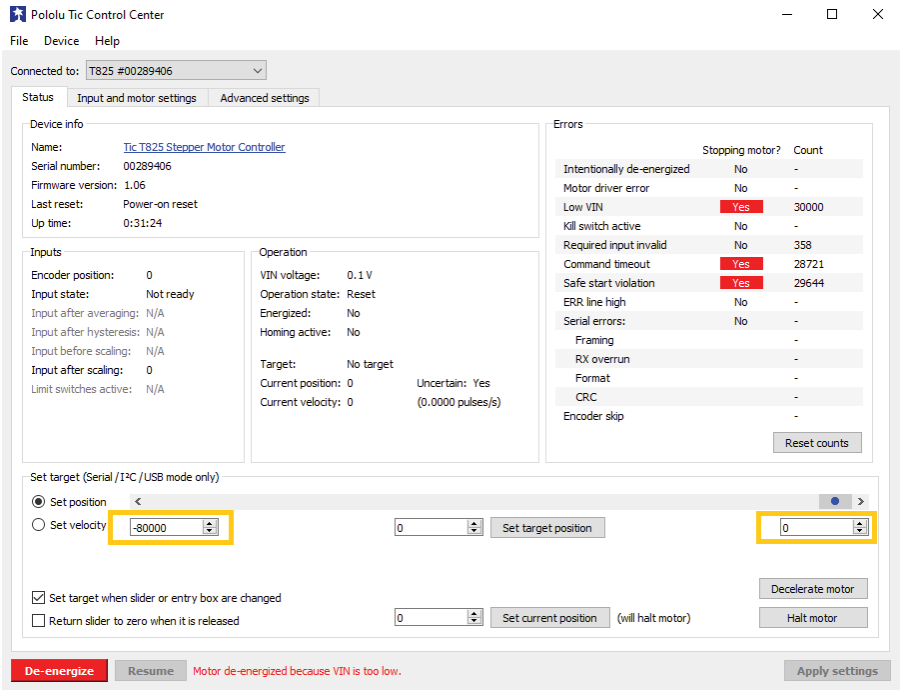
Table 3: 165:1 Gear Ratio P8-ST and Tic T825 Parameters

Parameter Setup Example

Below is an example of how one would go about modify the parameters in the Tic Control Center using the table provided. Complete the following **three** steps to successfully customize the Tic Control Center parameters.

Step Mode and Stroke Length

1) Choose a stroke length and Step Mode, enter the -value in the box beside "Set Velocity"
Ex. Stroke length 100mm and Step Mode 1/8 gives a value of 80000



Speed

2) Choose a speed in the speed column, then run along to the same Step mode column as 1),

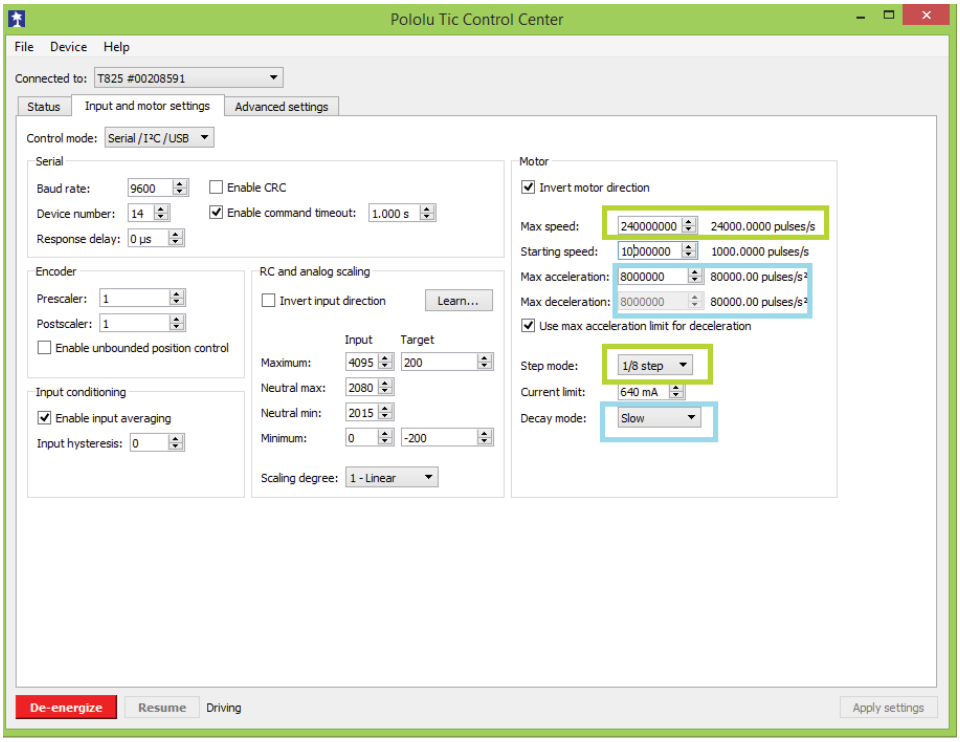
Enter this value in box beside Max speed: Ex. 30mm/s gives 24000 pulses/s

Note: you have to add zeros until the number to the right of the box is the correct value

Acceleration

3) Follow the max acceleration row over to the Step mode column, Enter this Max Acceleration value,
Enter your selected Step Mode. Enter slow for Decay mode:(this stops an annoying whining noise)

Note: Starting speed and max acceleration will need to be adjusted if measured speed is too far off from expected speed.

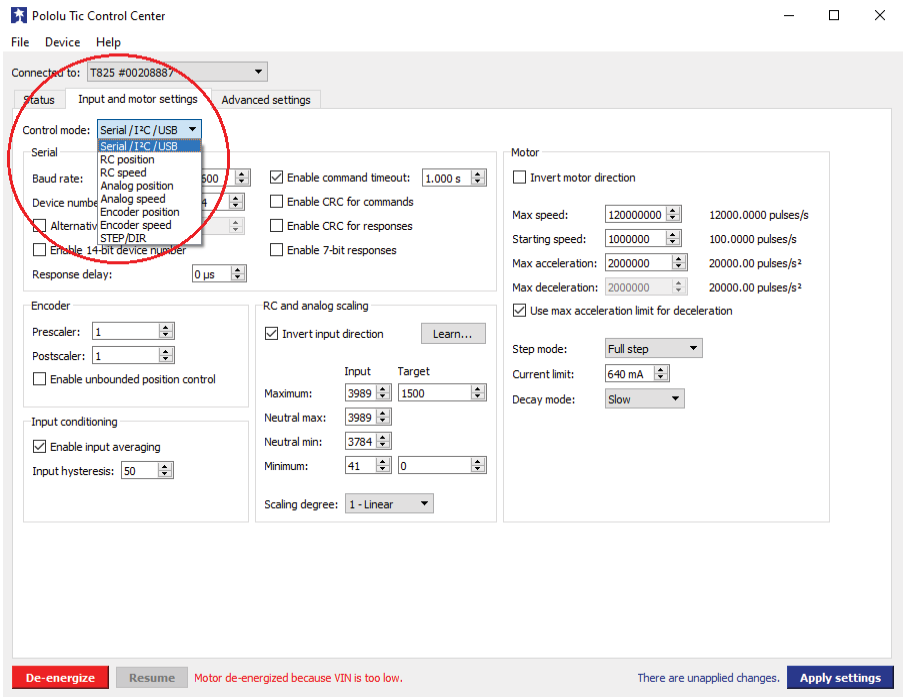


Once the parameters are set it is best to test the travel of the unit using the SLIDE BAR. Only once it is determined to be a successful set of parameters for your application should the control mode be modified.

Control Mode

For details on control modes and setup see Pololu's Tic Stepper Motor Controller User Guide. https://www.pololu.com/docs/0J71.

To modify the control mode go to the "Input and motor settings" tab. At the top left of the tab there is a drop down menu labelled "Control mode". Set the dropdown to the desired control mode.



Included in the Quick Start Configuration files are four RC position configuration files (S20-15mm-RC, S20-30mm-RC, S20-50mm-RC, and S20-100mm-RC). The files use the control mode "RC position" to drive the stepper actuator with radio control. The scaling has been predetermined through use of the "RC and analog scaling" block and the "Learn" wizard built into the Tic Control Center software. For explanation on how to use the wizard visit Pololu's website at https://www.pololu.com/docs/0J71/4.7.

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