

MiSUMi

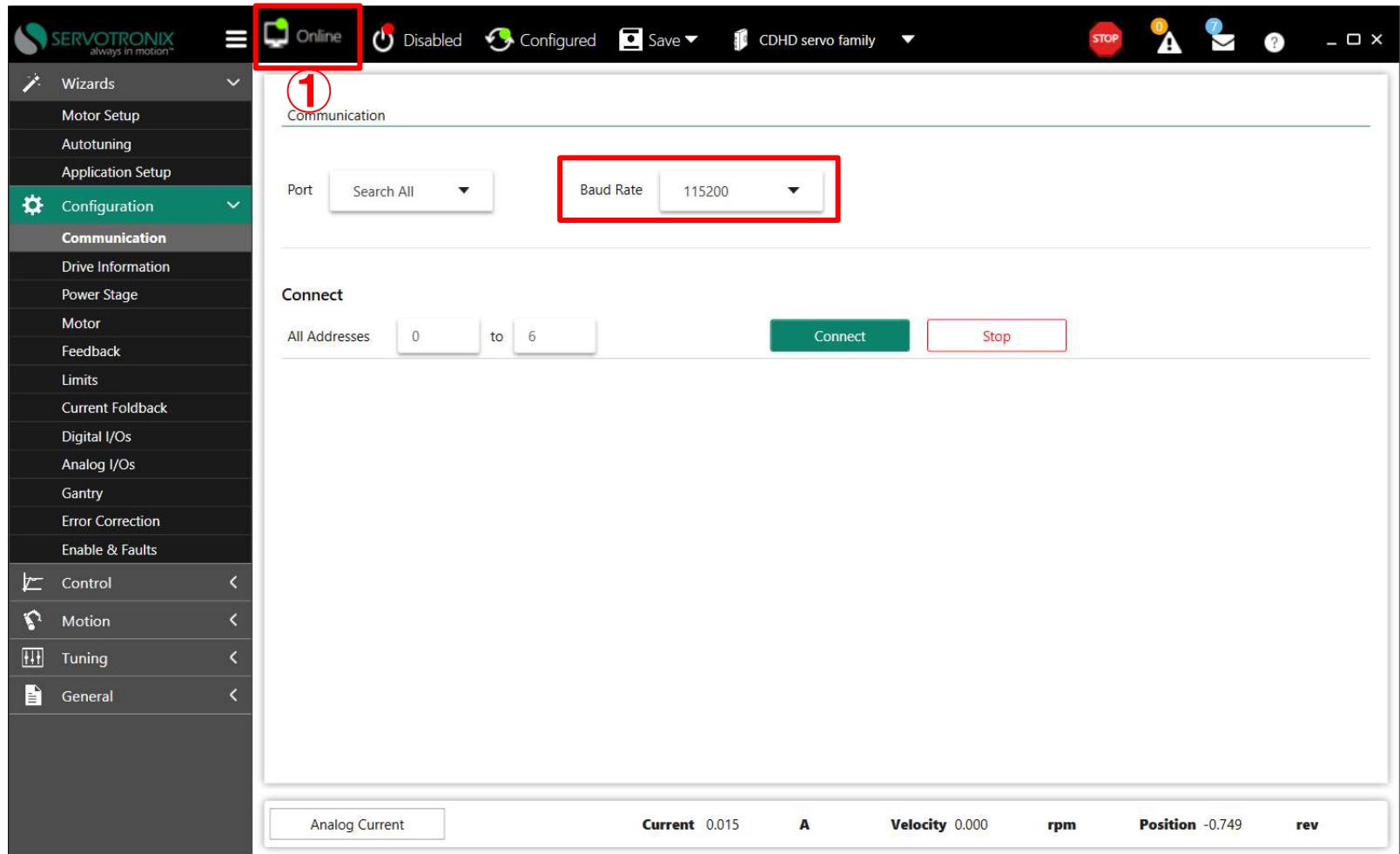
Linear Motor Actuator

SetUp Manual

Rev.1

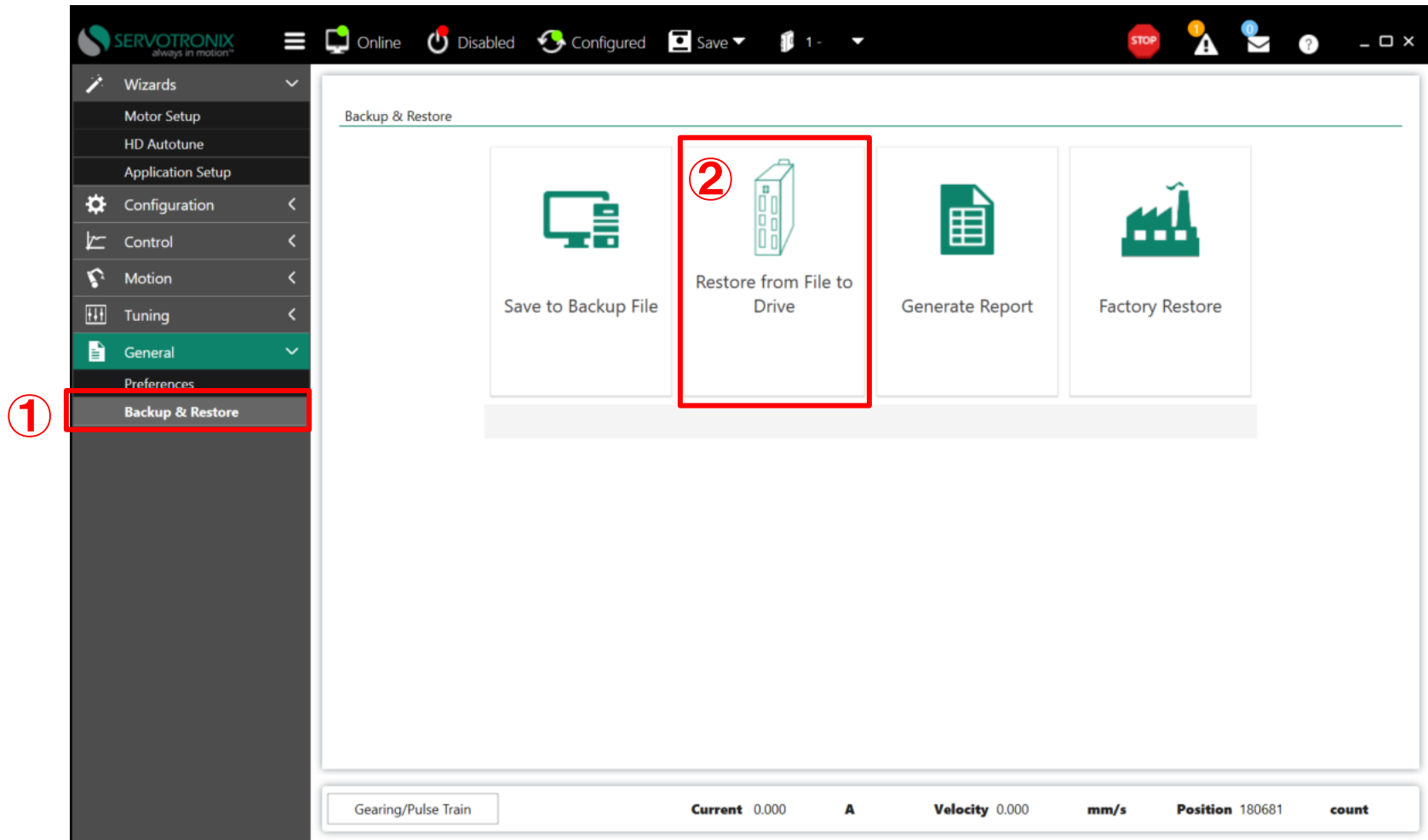
2024-07-30
IM Division
Motion Unit Team

- ① Turn on the drive and check if it changes from Offline to Online.
- ※ If you cannot change from Offline to Online, check Serial port and if “Baud Rate” value is “115200”.



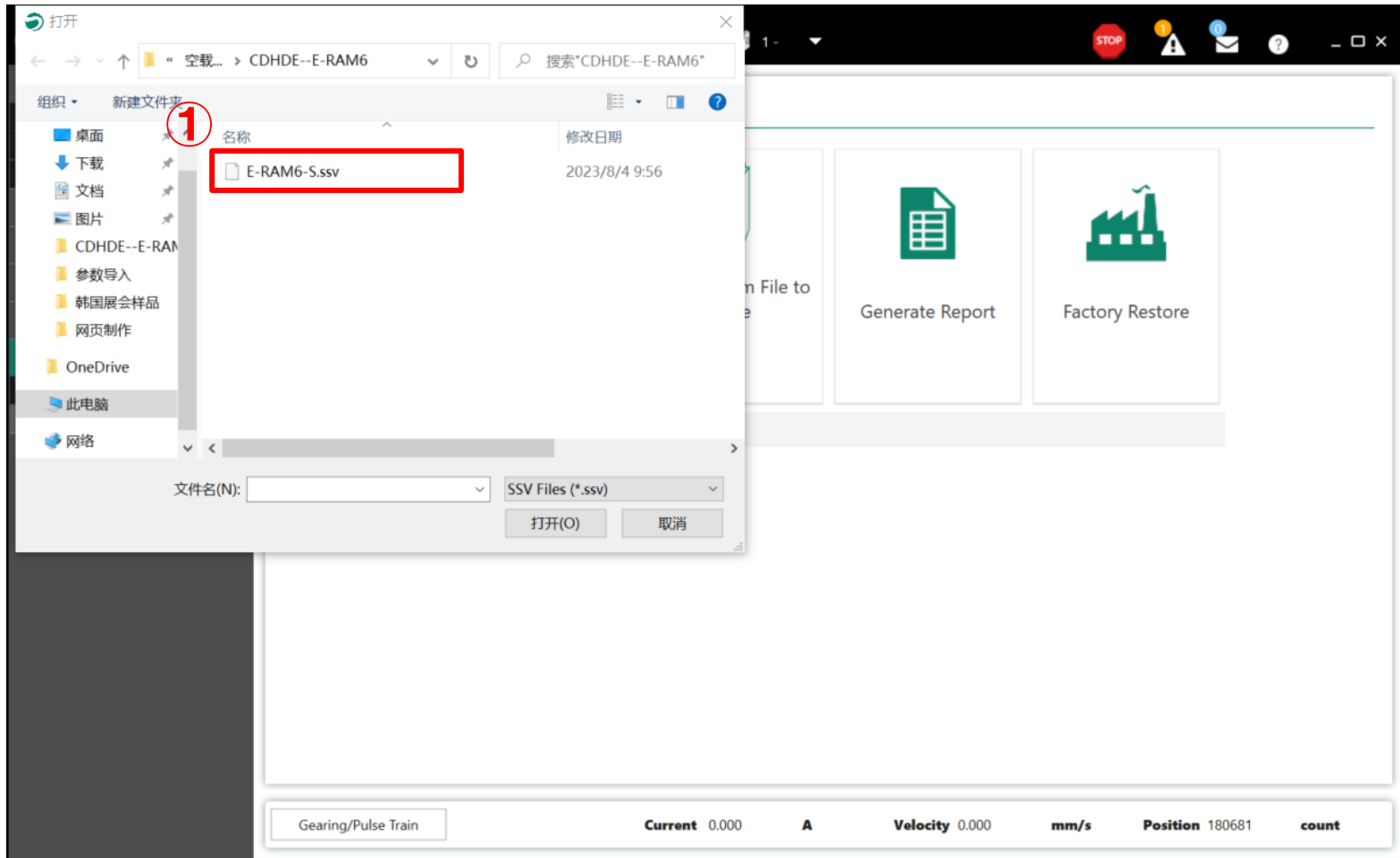
Parameter Restore

- Click ① and ②



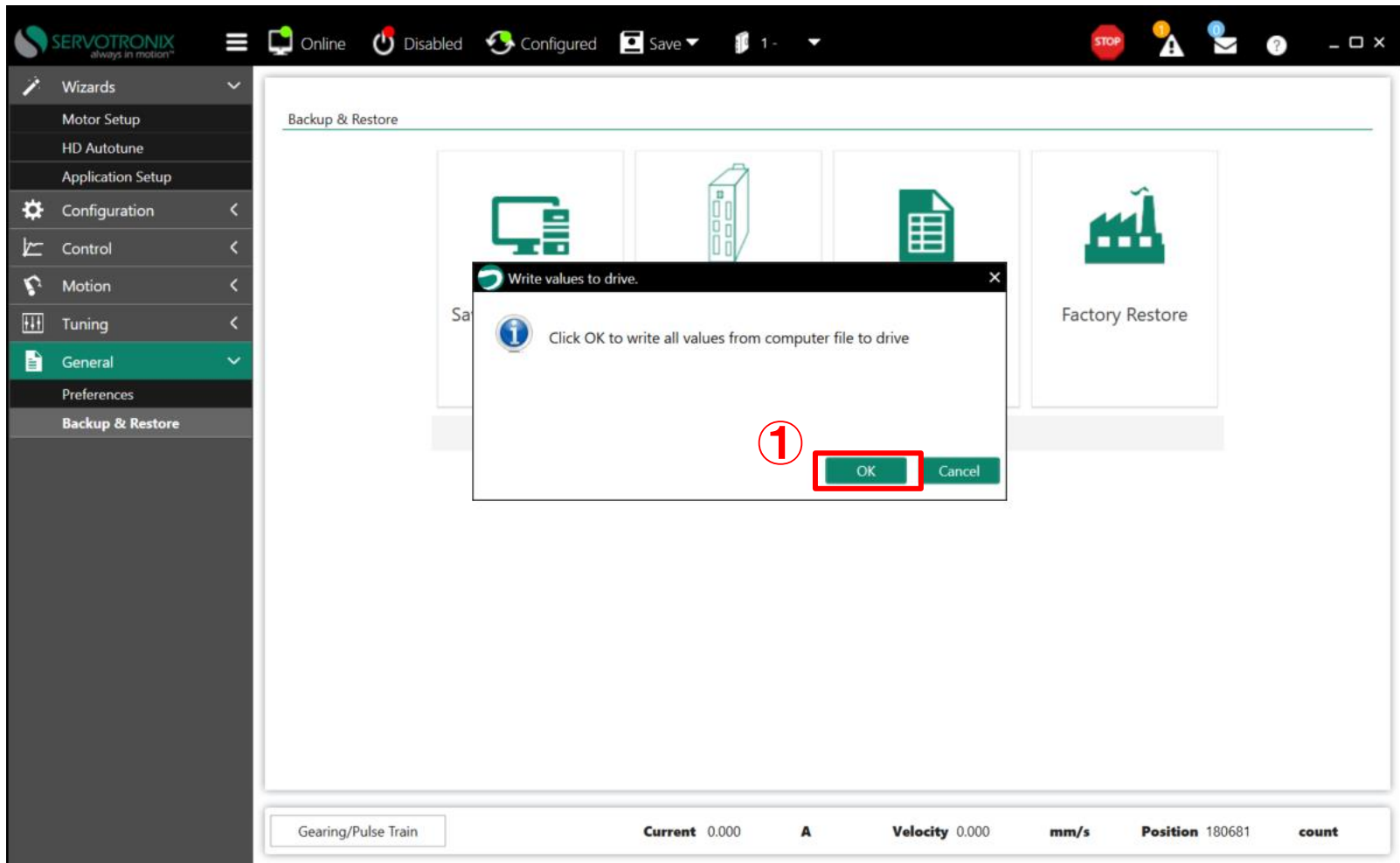
Parameter Restore

- Select basic parameter file from your local folder
- ※ The example below uses linear motor AC: E-RAM6-S, drive: EA45.
- ※ You must check the motor and drive, select the file that matches the model number, and download it to ensure normal operation of the motor.



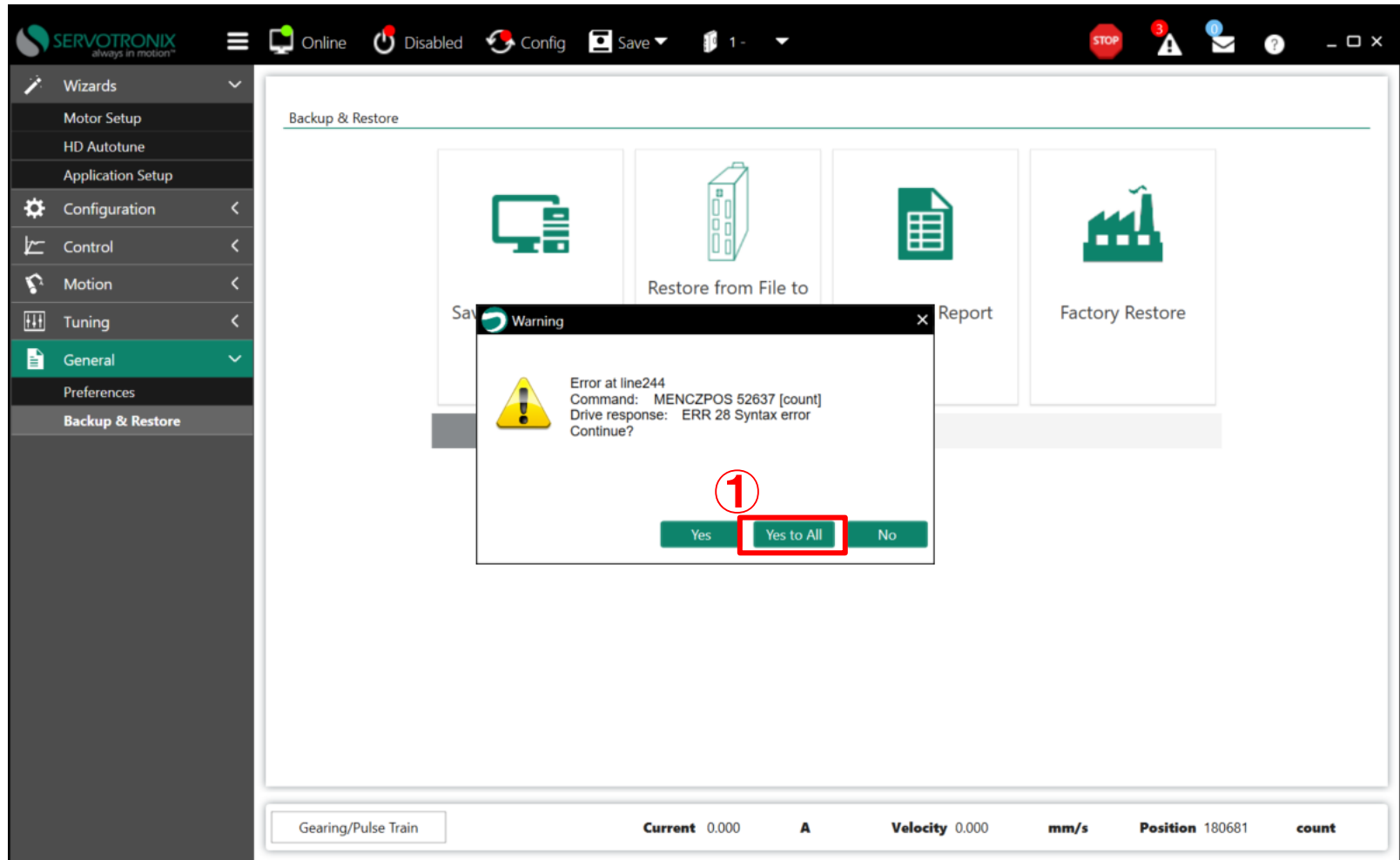
Parameter Restore

- ① Click OK to write all values from computer file to drive.



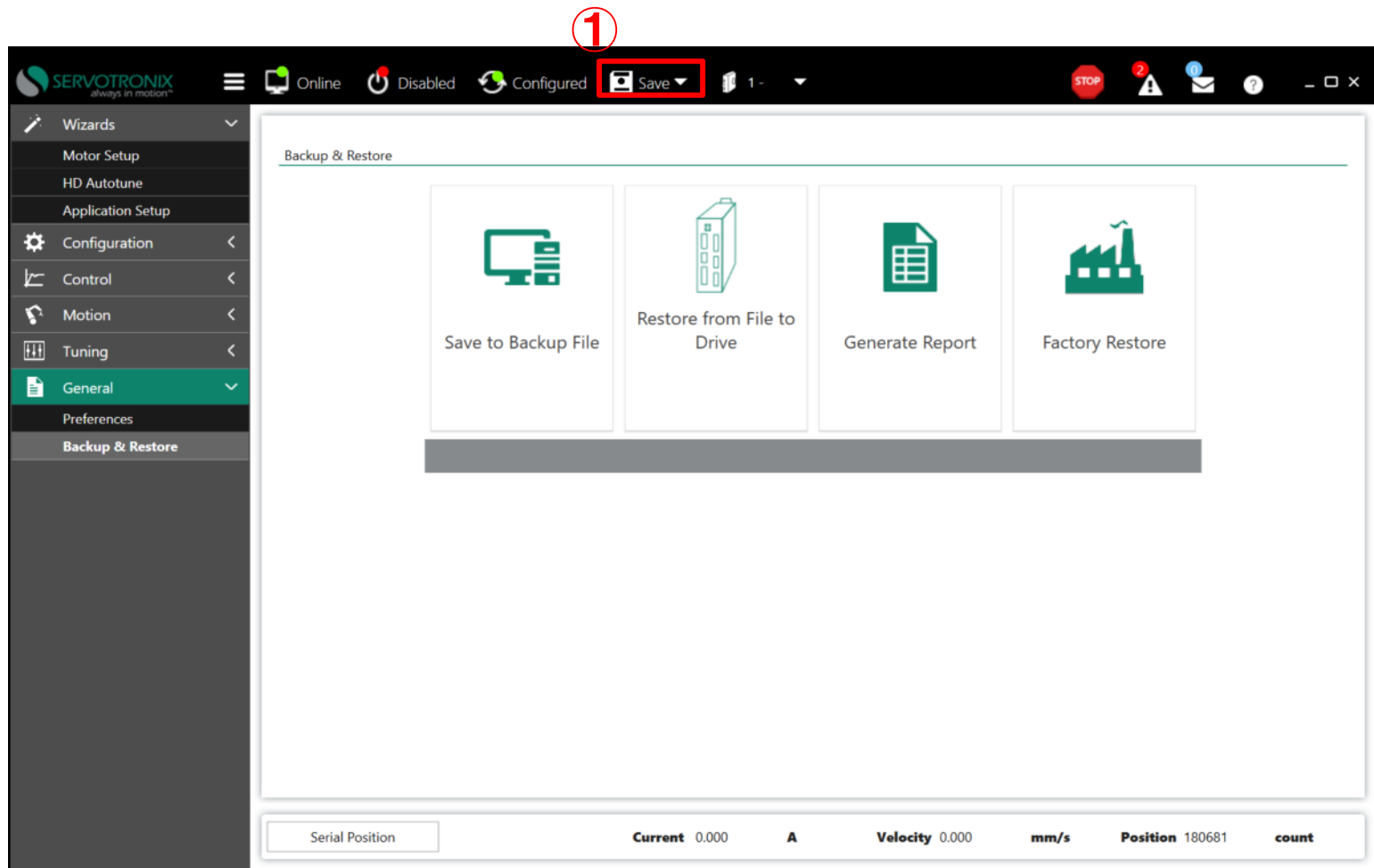
Parameter Restore

- ① Click “Yes to All” to continue



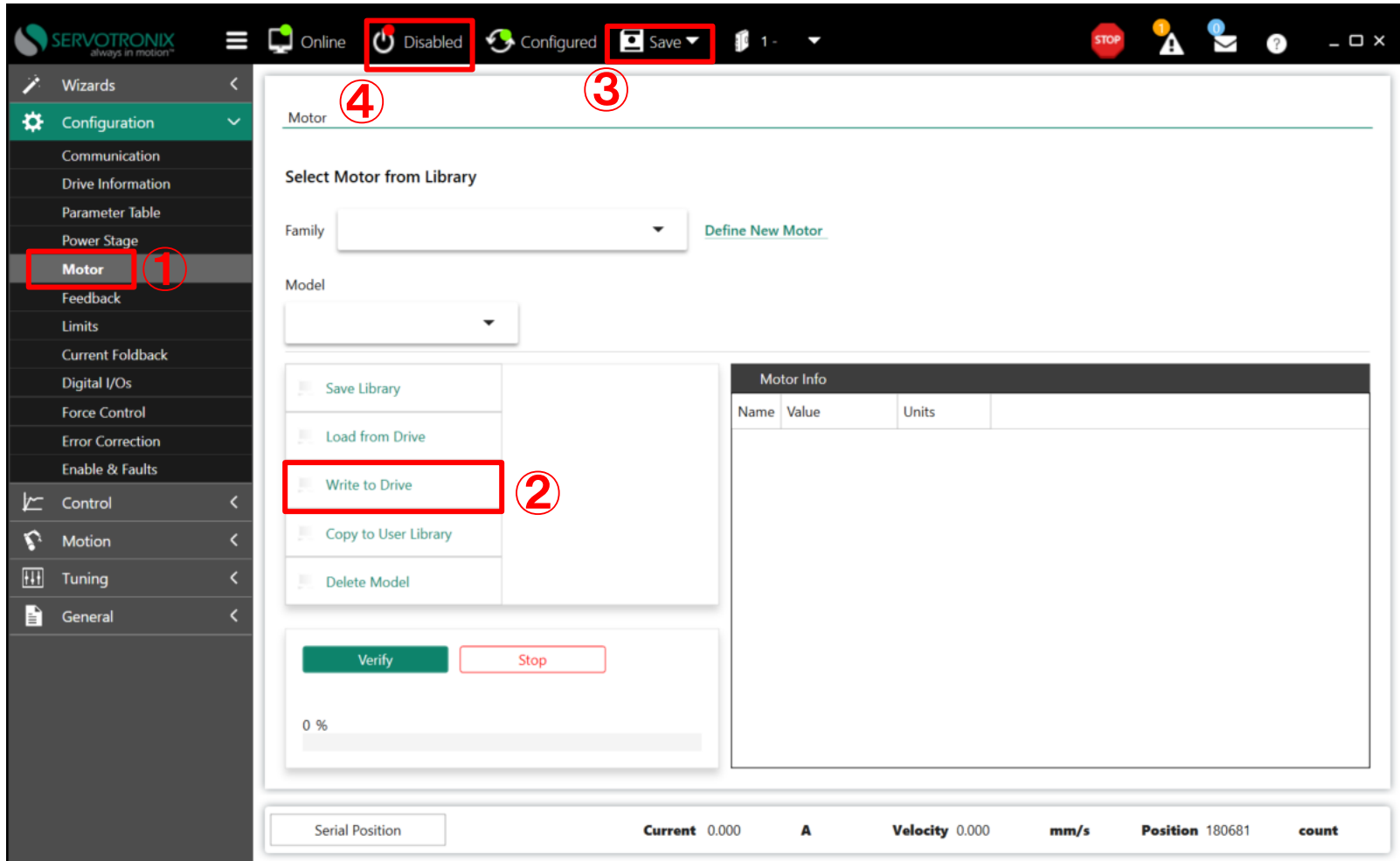
Save after restoring parameters

- Once download is complete, ① click “Save to Drive” to save it to the drive.
- Afterwards, the drive turns off.



Enter motor parameters

- Turn the power back on and click ① → ② → ③ → Save to Drive → ④



The screenshot shows the SERVOTRONIX software interface. The top status bar indicates the system is "Disabled" and "Configured". The sidebar on the left contains various settings, with "Motor" highlighted by a red box and a red circle with the number 1. The main configuration area is titled "Motor" and contains a "Select Motor from Library" section with a "Family" dropdown and a "Model" dropdown. Below this are buttons for "Save Library", "Load from Drive", "Write to Drive" (highlighted by a red box and a red circle with the number 2), "Copy to User Library", and "Delete Model". At the bottom of the main area are "Verify" and "Stop" buttons. The bottom status bar shows "Serial Position", "Current 0.000 A", "Velocity 0.000 mm/s", "Position 180681", and "count".

Motor

Select Motor from Library

Family [Define New Motor](#)

Model

[Save Library](#)

[Load from Drive](#)

[Write to Drive](#)

[Copy to User Library](#)

[Delete Model](#)

[Verify](#) [Stop](#)

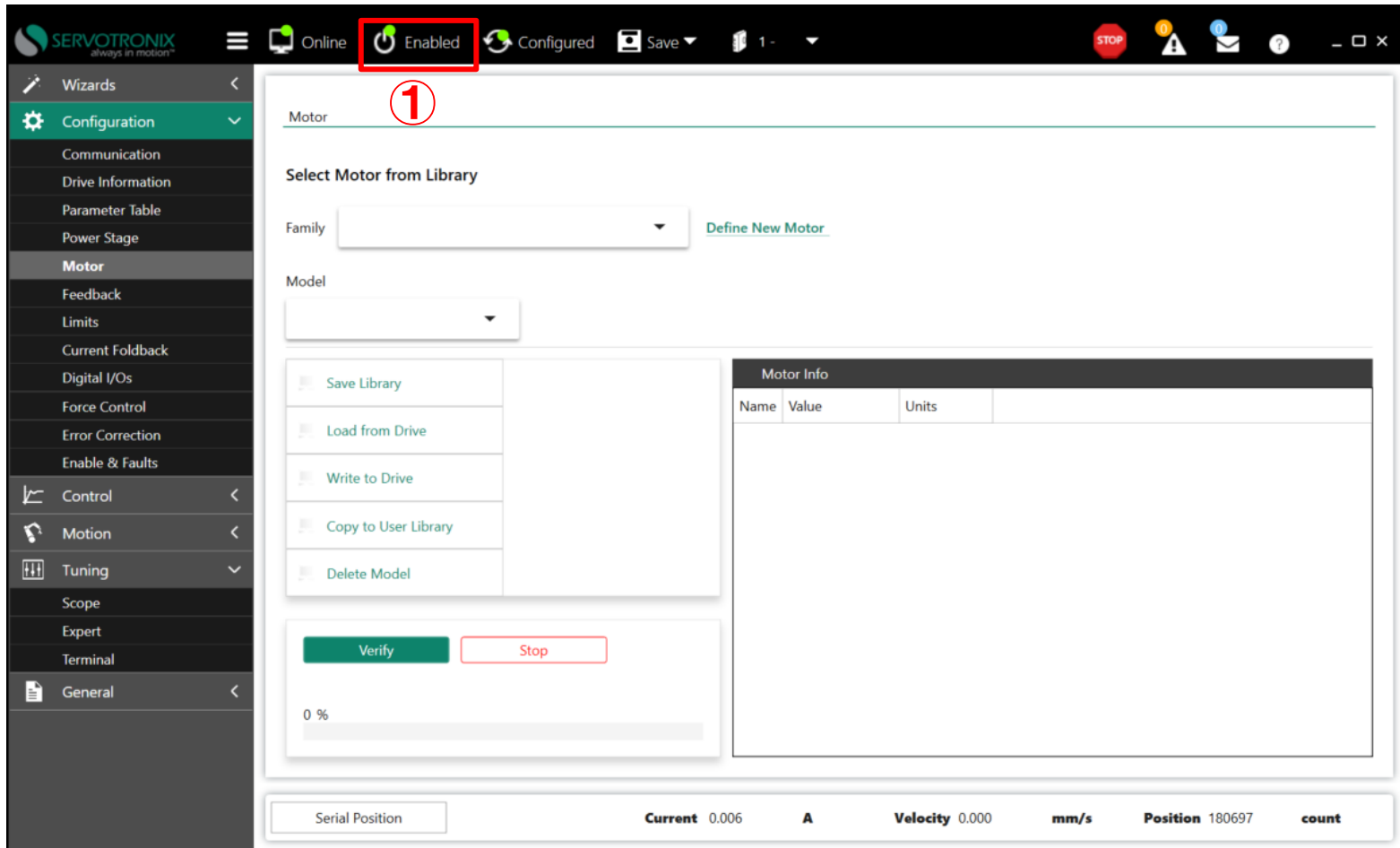
0 %

Motor Info			
Name	Value	Units	

Serial Position Current 0.000 A Velocity 0.000 mm/s Position 180681 count

Enter motor parameters

- Click ① to Disabled, the motor data has been saved so far.



The screenshot shows the SERVOTRONIX software interface. The top bar includes the SERVOTRONIX logo, a menu icon, and status indicators for 'Online', 'Enabled' (highlighted with a red box and a red circle with the number 1), 'Configured', 'Save', and a dropdown menu. The left sidebar contains various configuration options, with 'Configuration' selected. The main area is titled 'Motor' and contains a 'Select Motor from Library' section with a 'Family' dropdown and a 'Model' dropdown. Below this are buttons for 'Save Library', 'Load from Drive', 'Write to Drive', 'Copy to User Library', and 'Delete Model'. A 'Verify' button and a 'Stop' button are also present. The bottom status bar displays 'Serial Position', 'Current 0.006 A', 'Velocity 0.000 mm/s', 'Position 180697', and 'count'.

Name	Value	Units

Drive test after setup

- After completing setup, conduct a test run test to check for any problems.
 - At this time, the mover of the linear actuator must be located on the center.
- ①→② (Position: 50,000 counts) →③ (Velocity: 200mm/sec) →④→⑤ Change to Enabled →⑥ Start

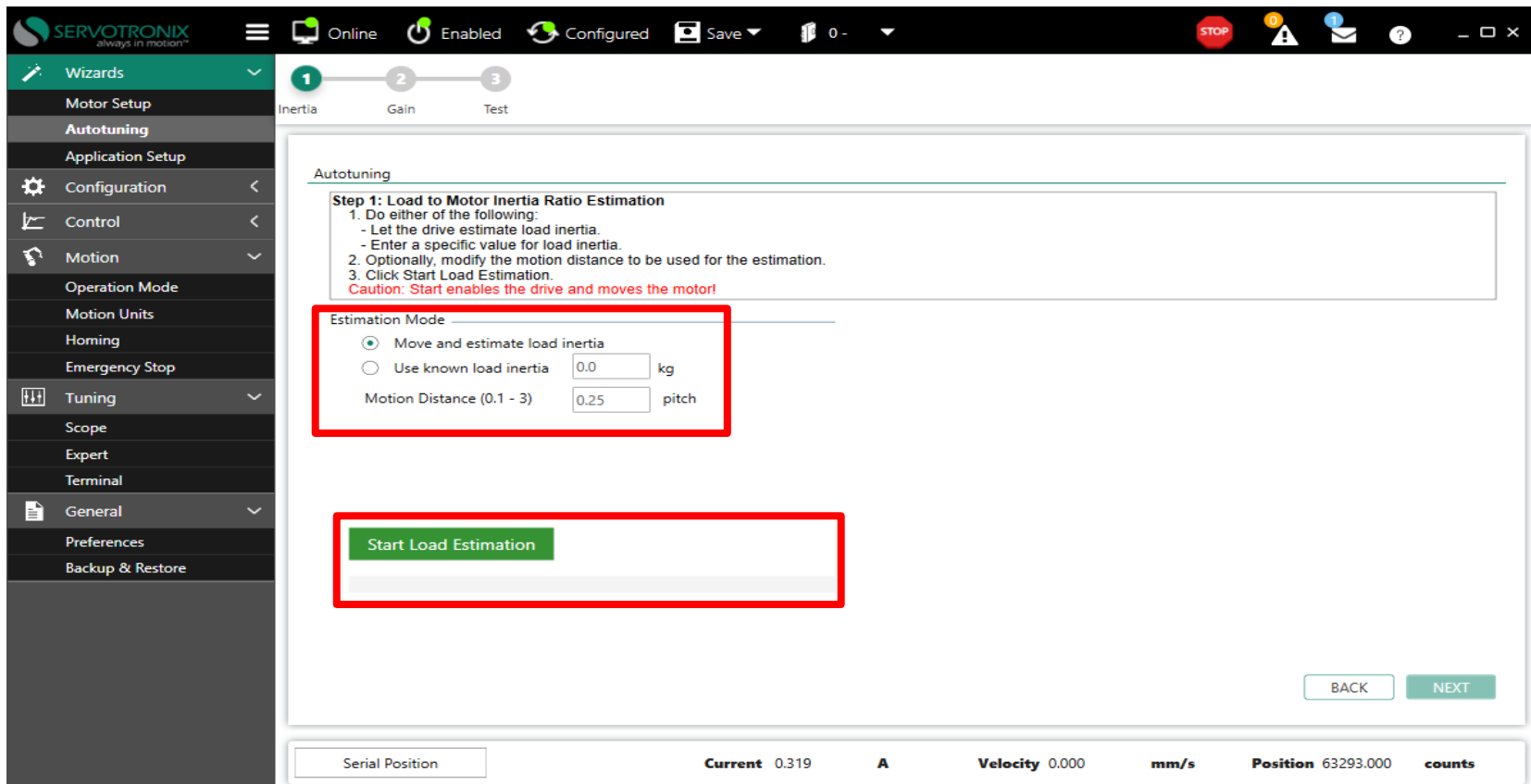
The screenshot shows the SERVOTRONIX software interface. The top status bar indicates the drive is "Disabled". The left sidebar has a "Tuning" section highlighted with a red box and number 1. Inside "Tuning", the "Scope" option is highlighted with a red box and number 2. The main workspace has a "Motion" window with a graph of Velocity (mm/s) vs Time (ms). The graph shows a trapezoidal profile. The "Motion" window has a "Position" field set to 50000 (highlighted with a red box and number 2) and a "Velocity" field set to 200 (highlighted with a red box and number 3). The "Start" button is highlighted with a red box and number 6. The "Record Variables" table is also visible, with the "IQ" variable checked (highlighted with a red box and number 4).

Select	Name	+	X
<input type="checkbox"/>	PCMD	0	1
<input type="checkbox"/>	PTVCM	0	1
<input type="checkbox"/>	PE	0	1
<input type="checkbox"/>	VCMD	0	1
<input checked="" type="checkbox"/>	IQ	0	1
<input type="checkbox"/>	V	0	1
<input type="checkbox"/>	PFB	0	1

Serial Position: _____ Current: 0.000 A Velocity: 0.000 mm/s Position: 180697 count

Servotronix Auto Tuning Method (1/5)

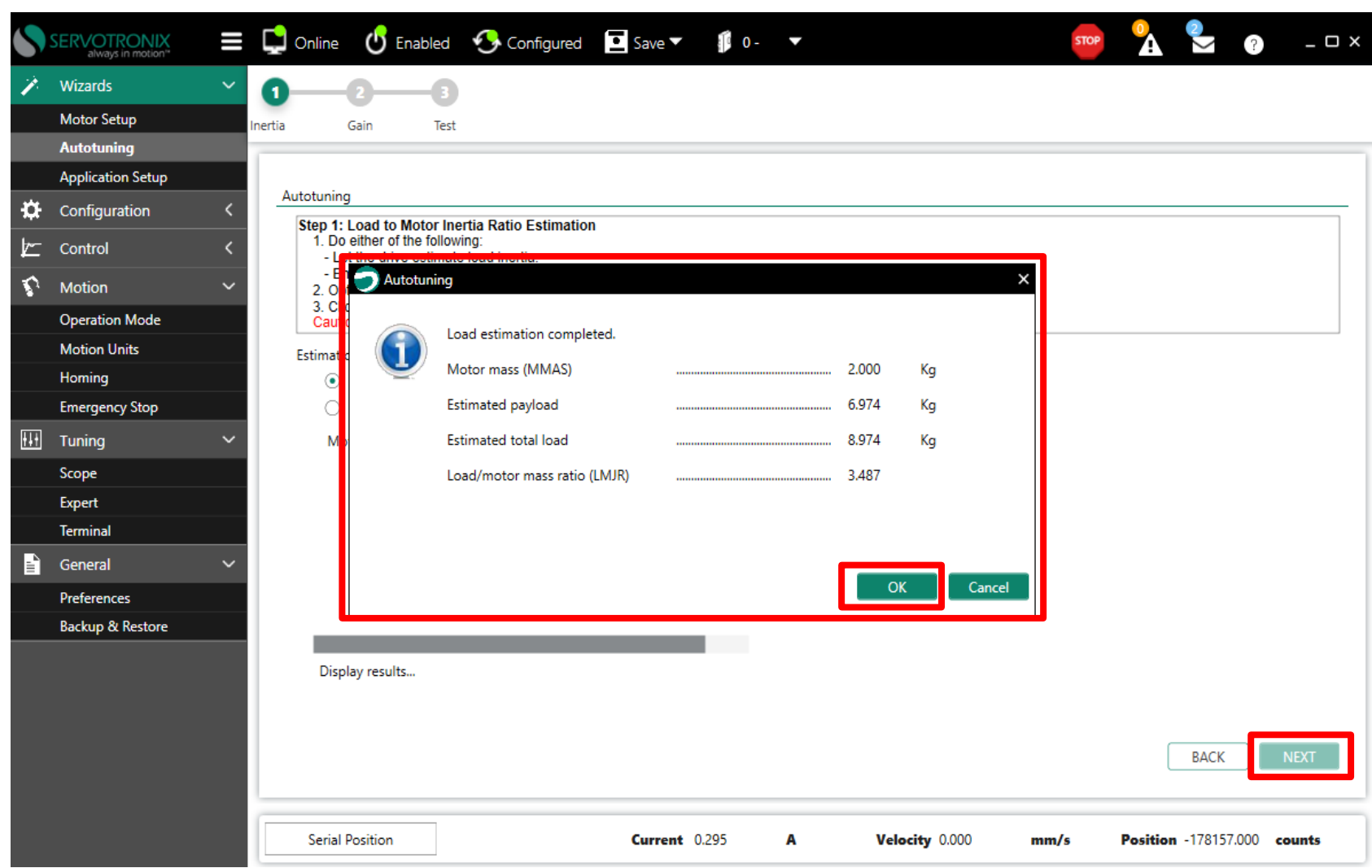
- The basic setup and single-acting operation of the motor have been completed, and if tuning is necessary, tuning is performed.
- Autotuning is available by “Wizards” -> “Autotuning”.
- If you do not know payload, check the box in front of “Move and estimate load inertia”, and the payload will be automatically found during Auto Tuning, so it does not matter if you do not know the payload.
- If you know the payload, enter “load inertia” and “Motion Distance” and click “Start Load Estimation” to automatically find them.



The screenshot shows the Servotronix Autotuning Wizard interface. The left sidebar contains a menu with options: Wizards, Motor Setup, Autotuning (selected), Application Setup, Configuration, Control, Motion, Operation Mode, Motion Units, Homing, Emergency Stop, Tuning, Scope, Expert, Terminal, General, Preferences, and Backup & Restore. The main area displays the Autotuning wizard with three steps: 1. Inertia, 2. Gain, and 3. Test. Step 1 is currently active. The wizard title is "Autotuning". The first step is "Step 1: Load to Motor Inertia Ratio Estimation". The instructions are: "1. Do either of the following: 1. Let the drive estimate load inertia. - Enter a specific value for load inertia. 2. Optionally, modify the motion distance to be used for the estimation. 3. Click Start Load Estimation. Caution: Start enables the drive and moves the motor!". The "Estimation Mode" section has two radio buttons: "Move and estimate load inertia" (selected) and "Use known load inertia". The "Use known load inertia" option has input fields for "0.0 kg" and "0.25 pitch". The "Start Load Estimation" button is highlighted with a red box. At the bottom right, there are "BACK" and "NEXT" buttons. The bottom status bar shows: Serial Position, Current 0.319 A, Velocity 0.000 mm/s, and Position 63293.000 counts.

Servotronix Auto Tuning Method (2/5)

- After payload and weight measurement are completed, click “OK” and then click “Next”



Servotronix always in motion™

Online Enabled Configured Save 0 -

Wizards

- Motor Setup
- Autotuning**
- Application Setup
- Configuration
- Control
- Motion
- Operation Mode
- Motion Units
- Homing
- Emergency Stop
- Tuning
- Scope
- Expert
- Terminal
- General
- Preferences
- Backup & Restore

1 Inertia 2 Gain 3 Test

Autotuning

Step 1: Load to Motor Inertia Ratio Estimation

1. Do either of the following:

- Let the drive estimate load inertia.
- Enter the load inertia manually.

2. OK

3. Cancel

Caution

Estimated

Motor mass (MMAS) 2.000 Kg

Estimated payload 6.974 Kg

Estimated total load 8.974 Kg

Load/motor mass ratio (LMJR) 3.487

OK Cancel

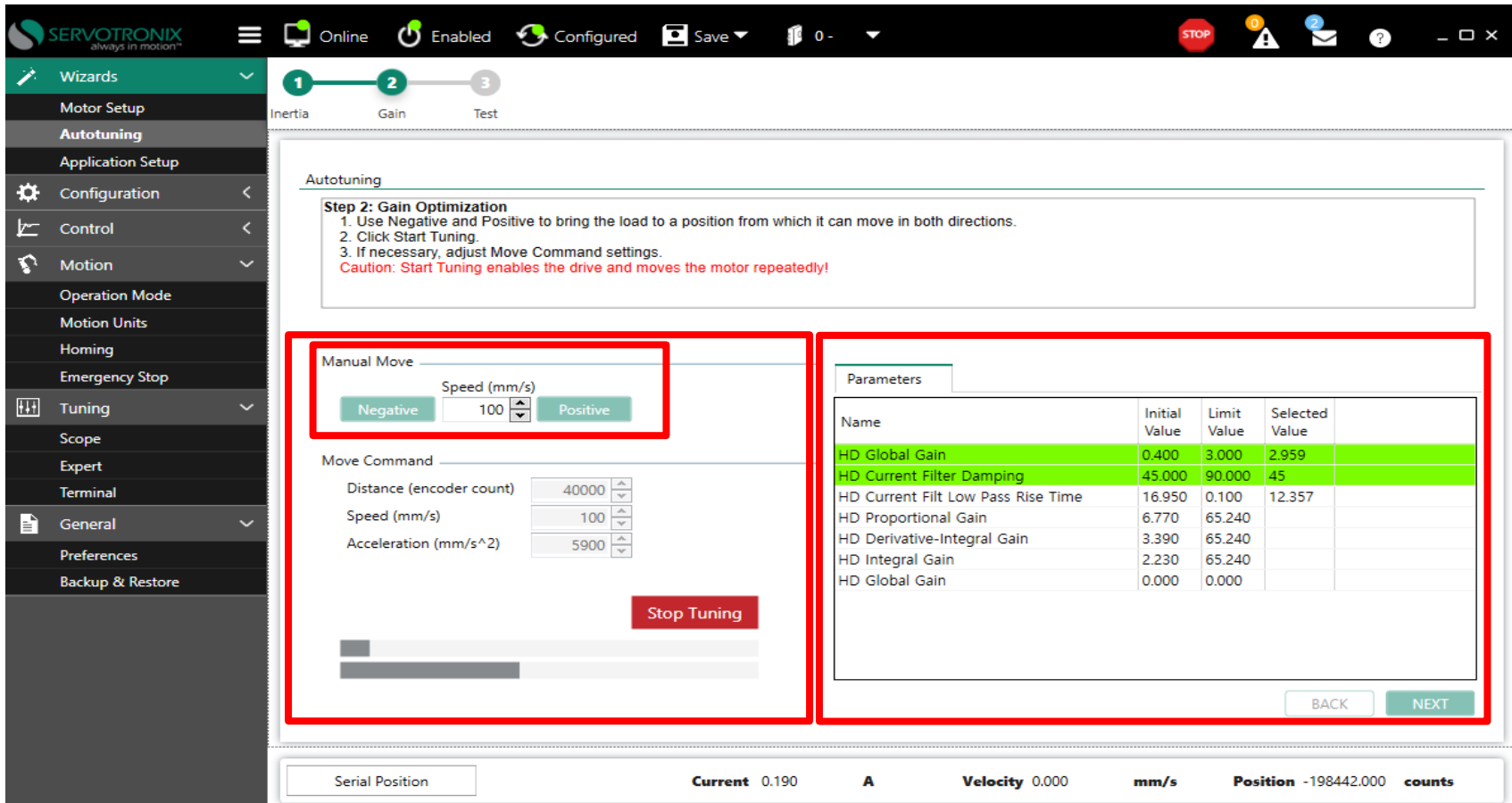
Display results...

BACK NEXT

Serial Position Current 0.295 A Velocity 0.000 mm/s Position -178157.000 counts

Servotronix Auto Tuning Method (3/5)

- After input “Speed, Distance, and Acceleration”, click “Start Tuning” to automatically proceed with Auto Tuning.
- When auto tuning is in progress, the gain values on the right automatically change as the motor operates.



Autotuning

Step 2: Gain Optimization

1. Use Negative and Positive to bring the load to a position from which it can move in both directions.
2. Click Start Tuning.
3. If necessary, adjust Move Command settings.

Caution: Start Tuning enables the drive and moves the motor repeatedly!

Manual Move

Speed (mm/s)

Negative 100 Positive

Move Command

Distance (encoder count) 40000

Speed (mm/s) 100

Acceleration (mm/s²) 5900

Stop Tuning

Parameters

Name	Initial Value	Limit Value	Selected Value
HD Global Gain	0.400	3.000	2.959
HD Current Filter Damping	45.000	90.000	45
HD Current Filt Low Pass Rise Time	16.950	0.100	12.357
HD Proportional Gain	6.770	65.240	
HD Derivative-Integral Gain	3.390	65.240	
HD Integral Gain	2.230	65.240	
HD Global Gain	0.000	0.000	

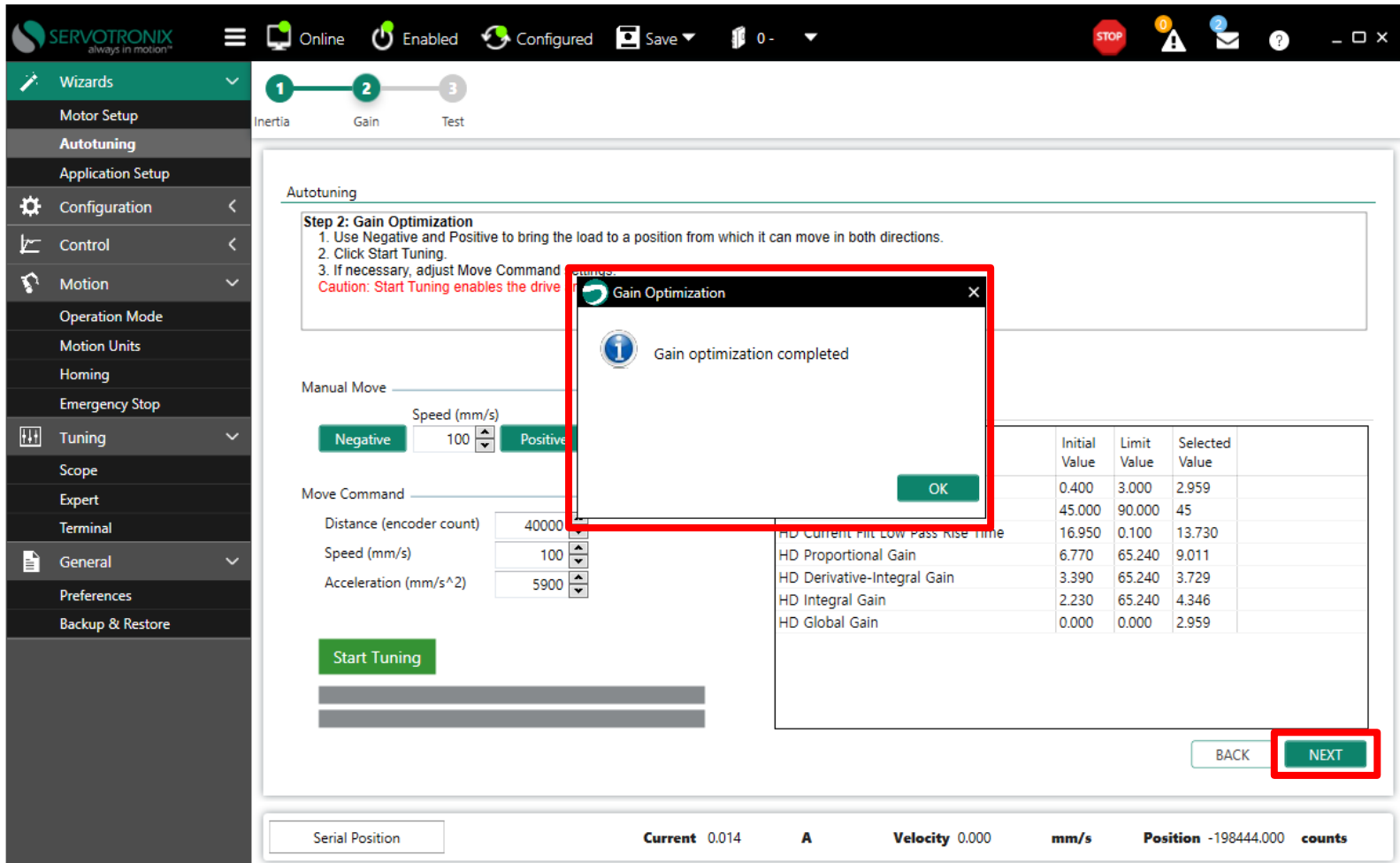
BACK NEXT

Serial Position

Current 0.190 A Velocity 0.000 mm/s Position -198442.000 counts

Servotronix Auto Tuning Method (4/5)

- When Auto Tuning is completed, check the tuning value and click “Next” to check the plot data.



Servotronix always in motion™

Online Enabled Configured Save 0 -

Wizards

- Motor Setup
- Autotuning**
- Application Setup

Configuration Control Motion Operation Mode Motion Units Homing Emergency Stop

Tuning Scope Expert Terminal General Preferences Backup & Restore

1 Inertia 2 **Gain** 3 Test

Autotuning

Step 2: Gain Optimization

1. Use Negative and Positive to bring the load to a position from which it can move in both directions.
2. Click Start Tuning.
3. If necessary, adjust Move Command.

Caution: Start Tuning enables the drive.

Manual Move

Speed (mm/s)

Negative 100 Positive

Move Command

Distance (encoder count) 40000

Speed (mm/s) 100

Acceleration (mm/s^2) 5900

Start Tuning

Gain Optimization

Gain optimization completed

OK

	Initial Value	Limit Value	Selected Value
	0.400	3.000	2.959
	45.000	90.000	45
	16.950	0.100	13.730
HD Current Filter Low Pass Rise Time	6.770	65.240	9.011
HD Proportional Gain	3.390	65.240	3.729
HD Derivative-Integral Gain	2.230	65.240	4.346
HD Integral Gain	0.000	0.000	2.959
HD Global Gain			

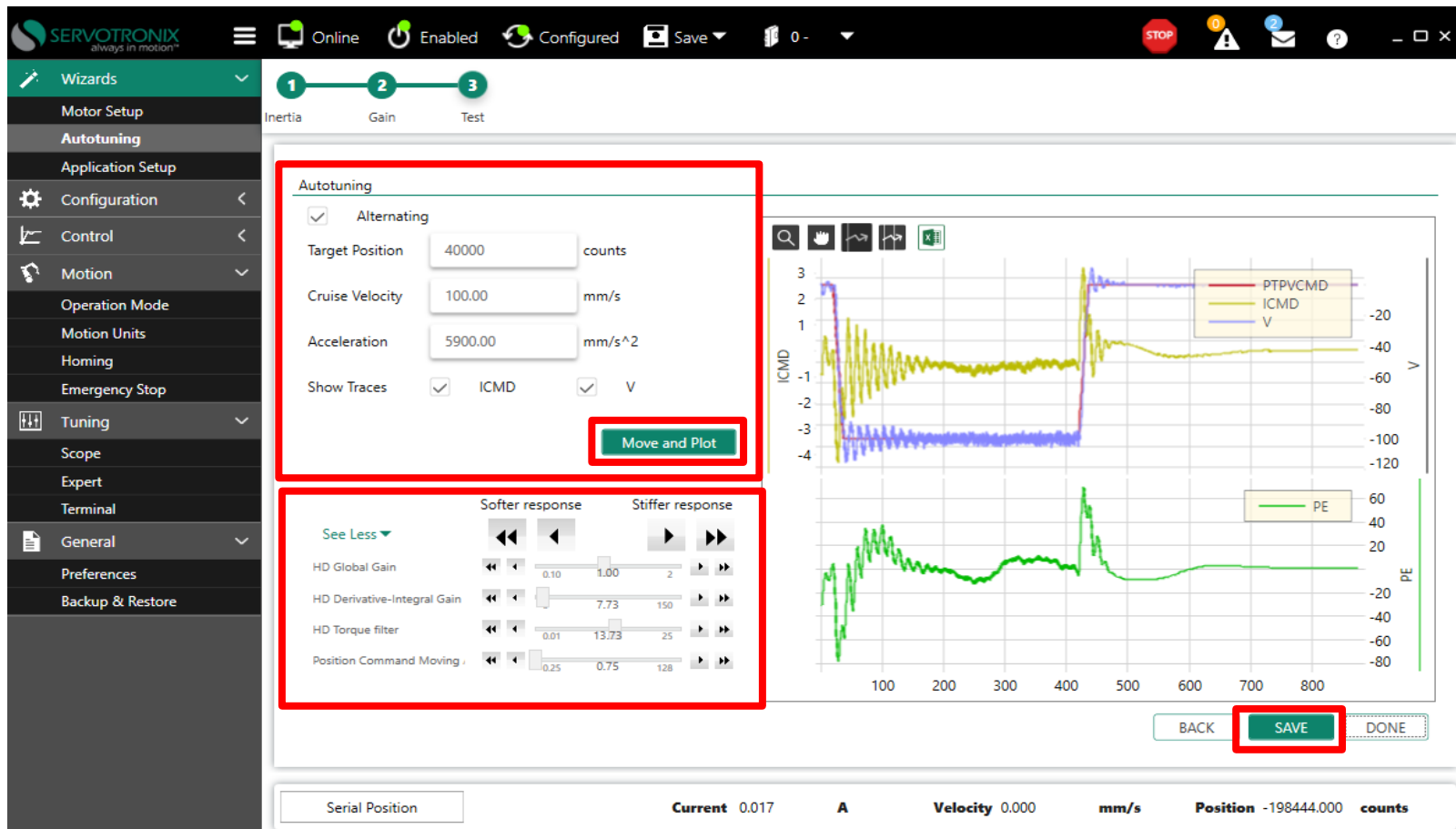
BACK **NEXT**

Serial Position

Current 0.014 A Velocity 0.000 mm/s Position -198444.000 counts

Servotronix Auto Tuning Method (5/5)

- If you want to see the tuned data, you can check the plot data. By inputting the parameters and click “Move and Plot”.
- If the plot data does not appear, you can tune the value. Change it by the plot data appears.
- Once you confirm the plot data, click “SAVE” and select “Save To Drive” to save it to the drive.

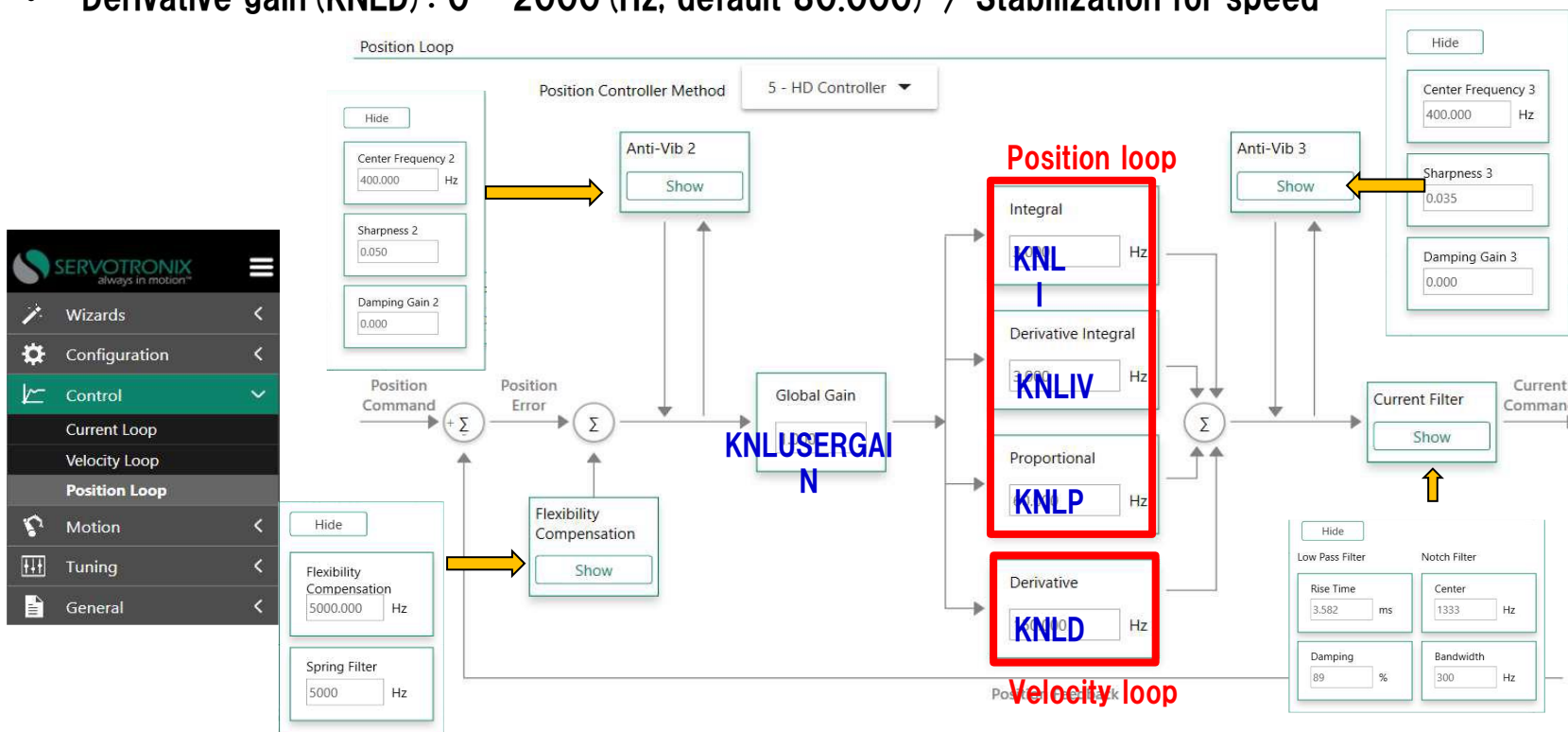


Servotronix precision tuning method (1/2)

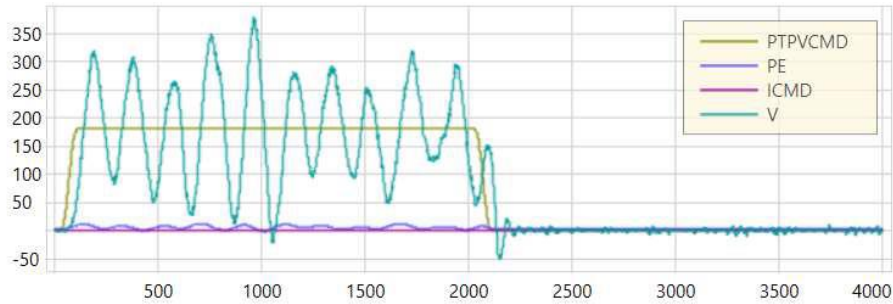
- After auto tuning, you can tune more precisely by adjusting the parameters below.

※ Description of parameters

- Global gain (KNLUSERGAIN) : HD Adaptive gain scaling factor / 0.1 ~ 3.0 (default 0.500) / Adjustment to overall system stiffness
- Integral gain (KNLI) : 0 ~ 200 (Hz, default 10.000) / Stabilize tremor when stopped
- Derivative-Integral gain (KNLIV) : 0 ~ 400 (Hz, default 40.000) / Stabilize shaking during driving and stopping
- Proportional gain (KNLP) : 0 ~ 400 (Hz, default 30.000) / Stiffness adjustment
- Derivative gain (KNLD) : 0 ~ 2000 (Hz, default 80.000) / Stabilization for speed

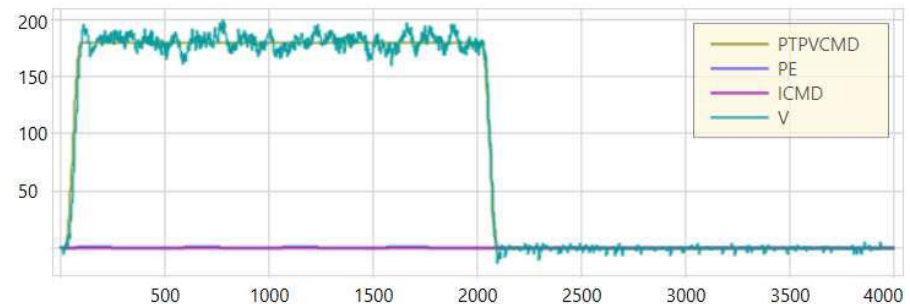


Servotronix precision tuning method (2/2)

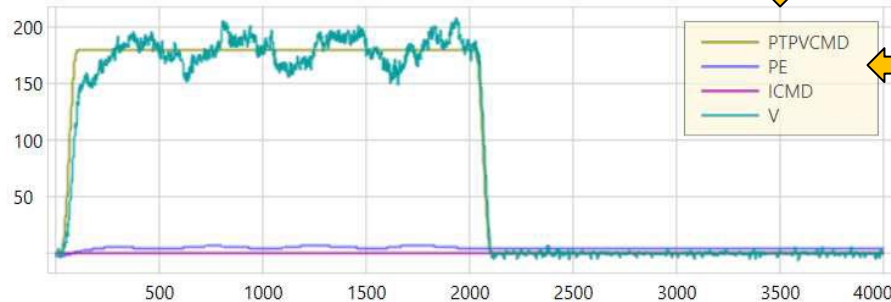


KNLP (Proportional gain) : Create motion profile and adjust stiffness
• Due to rigidity gain, the larger the value, the more vibration may occur.

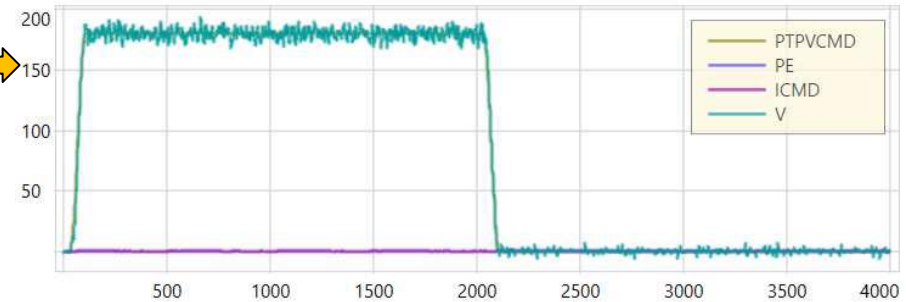
※ The value can be increased as KNLD increases.



KNLI (Integral gain) : Reduces position error and settling time
※ The value can be increased as KNLD increases.



KNLD (Derivative gain) : Motion profile tracking and stability



Derivative-Integral gain (KNLIV) :
Reduce position error (apply integral gain to KNLD)

- These are necessary actions when the alarms are appeared on the drive screen as below



Contents: Alarm due to insufficient voltage.

Action: Check the power line connected to the drive.



Contents: The phase angle for the motor to move cannot be found. (P• F repeatedly displayed)

Action: Turn off the drive, change the operator position, and then turn on the power.



Contents: Alarm due to overvoltage.

Action: Check whether a regenerative resistor needs to be connected to the drive.



Content: Feedback information not confirmed. (e•1•2•9 repeatedly displayed)

Action: Check encoder-related head, scale, and cable.



Contents: Torque control mode.

Action: If the servo does not turn on, check the control mode set in the drive.



Contents: EtherCAT control mode.

Action: If the servo does not turn on, check the control mode set in the drive.



Contents: Position control mode.

Action: If the servo does not turn on, check the control mode set in the drive.

Revision	Date	Reviser	Approver	Remark
1.0	2024.04.24	J.G.MIN	E.W.SHIN	First version