

Title: How to Tune with SigmaLogic.

Product(s): SigmaLogic, Sigma-5 Rotary Servomotor

Doc. No. SRV-84EV75

Application Overview

The majority of applications that use servomotors are sized before the design stage or proof of concept stage. For reference in sizing, please click the following links to access:

- [Yaskawa's SigmaSelect Software](#)
- [Servo Motor Sizing Concepts Article](#)

Generally, Yaskawa will allow a 20:1 inertia mismatch before any tuning is needed. This application note demonstrates how to tune an axis when Auto-tuning is not sufficient and the axis must be tuned to correctly position the load.

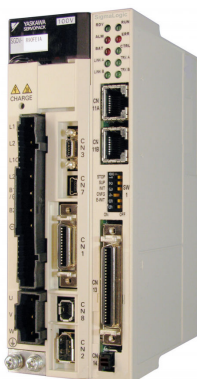


FIGURE 1 SIGMALOGIC

Application Highlights

This application note highlights the advanced techniques to tune a SigmaLogic axis. It is assumed a working configuration has already been established and tested. The following application note does not illustrate how to setup a SigmaLogic configuration.

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Doc. No. SRV-84EV75

Products Used

Component	Product and Model Number
Servopack	Sigma-5 SigmaLogic
Motor	Sigma-5
Software	LogicWorks, SigmaWin+

Application Requirements

Minimum SigmaWin+ Version Software: [5.70a](#)

Minimum LogicWorks Software: [1.1.1.2](#)

Implementation

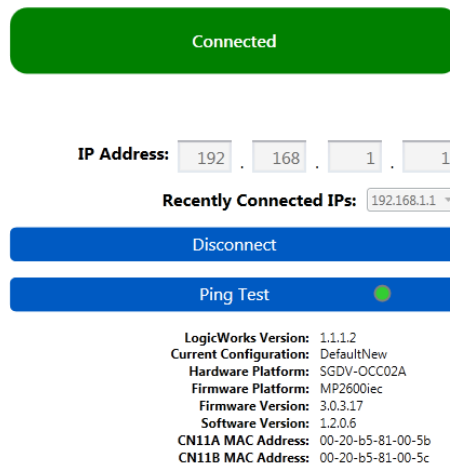
1. Connect Using LogicWorks



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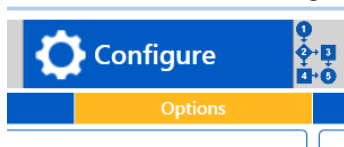
Doc. No. SRV-84EV75



- b.
- Configure the axis as needed through the Configure Tab



- a.
- Be sure to uncheck the Tuning Less parameters in the Configure Tab > Options



a.

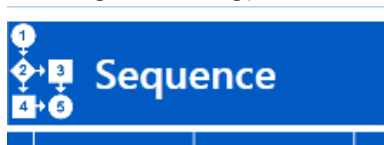
Tuning ⓘ

☐ Use Tuning-less Mode

Tuning-less Rigidity Level: Three ▾

Tuning-less Load Level: Medium ▾

- b.
- Create a sequence of moves back and forth for tuning. (similar to using SigmaWin+ > Program Jog > Tuning)



a.

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Doc. No. SRV-84EV75

<<

<

1

2

3

4

5

6

7

8

9

10

>

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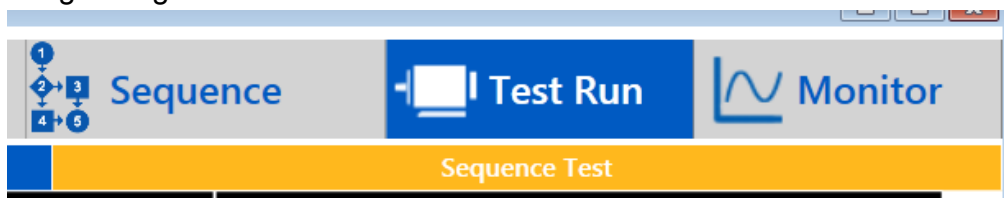
SUMMARY

Flag Reference

Summary

Step	Before The Move		The Move										After The Move									
	Wait		Set								Registration Data		Wait		Set		Time Delay		Branch		Wait	
	Flag	State	Flag	State	Move Type	Position	Accel.	Decel.	Speed	Direction	Reg. Distance	Reg. Speed	Flag	State	Flag	State	Milliseconds	Flag	State	True Jump	False Jump	
1	65	On			Relative	10	100	100	5	Positive										END	2	
2					Relative	-10	100	100	5	Positive										END	1	
3					No Move	0				Positive										END	END	

- b.
5. Under Test Run Tab > Sequence Test, Send the temporary sequence table using "Send to SigmaLogic Axis"



a.

Send to SigmaLogic Axis

b.

Send to SigmaLogic Axis

c.

Connection Status: Sending 192.168.1.1

Servo Enable ☐

Activ

Send to SigmaLogic Axis

d.

Connection Status: Connected 192.168.1.1

6. Enable Test Mode, servo on and verify the test sequence is acceptable

☒ Test Mode Enabled

Servo Enable ☒

a.

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Doc. No. SRV-84EV75



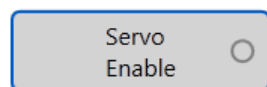
b.

7. Cancel the sequence, disable the servo and disable test mode



a.

☐ Test Mode Enabled



b.

8. On Connection tab, Send the configuration and sequence table to SigmaLogic from the Connection Tab



a.



b.

☒ Include Axis Configuration
☒ Include Sequence Table

Send to SigmaLogic Axis

c.

☒ Include Axis Configuration
☒ Include Sequence Table



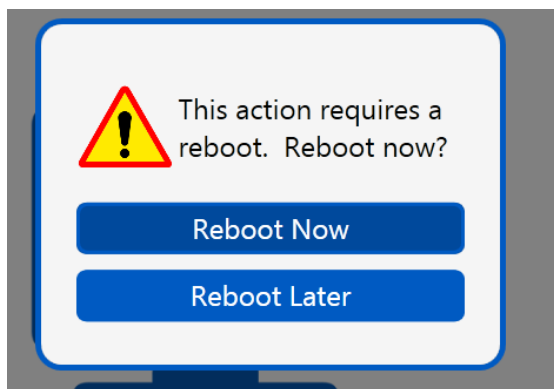
d.

9. Wait for reboot

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Doc. No. SRV-84EV75



a.

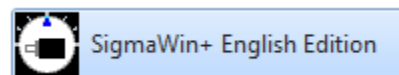
10. SigmaLogic will reboot twice

11. After the 2nd reboot, flip the stop switch on the SigmaLogic



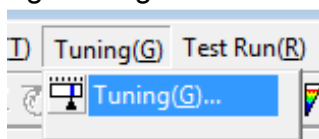
a.

12. Connect to SigmaLogic with SigmaWin+

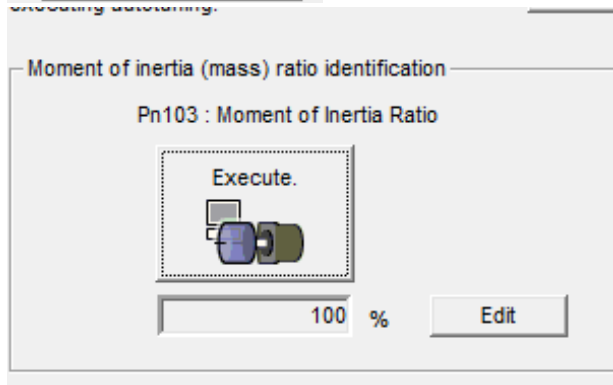


a.

13. Go through tuning screens and find the inertia Mismatch



a.



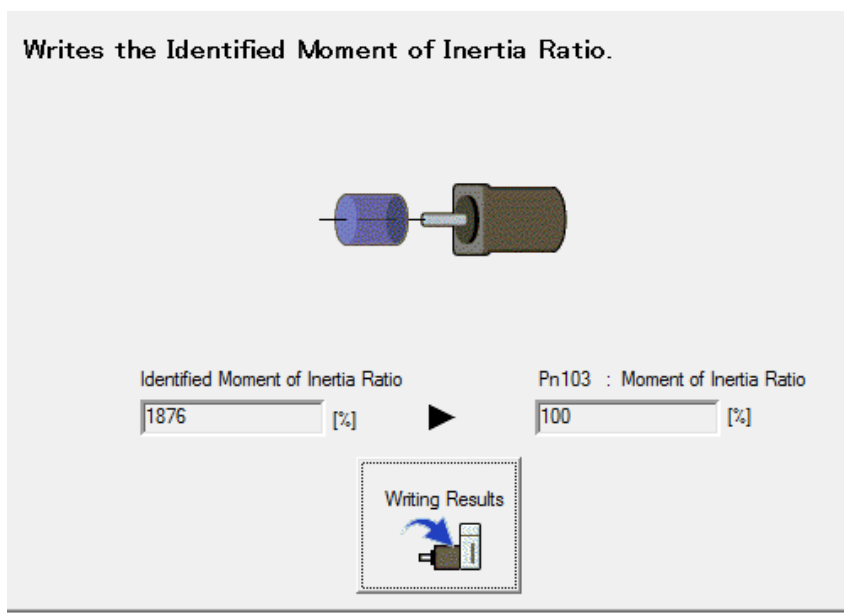
b.

14. Record this number Write this result into Pn103

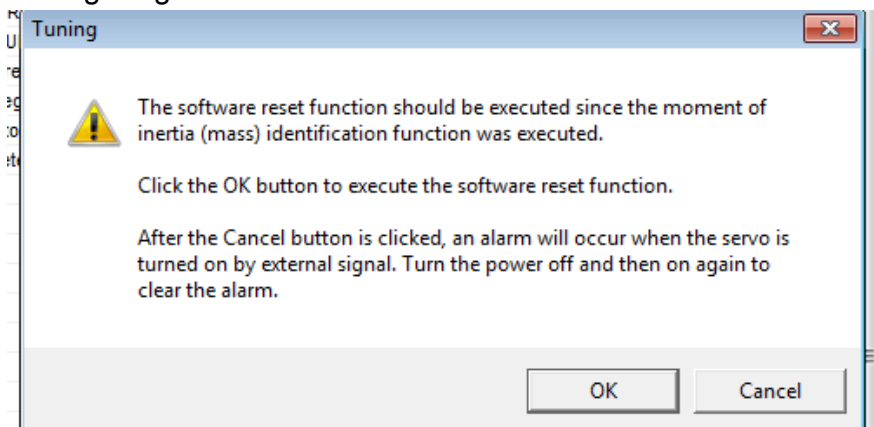
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Product(s): SigmaLogic, Sigma-5 Rotary Servomotor

Doc. No. SRV-84EV75



- a.
15. Reboot through SigmaWin+

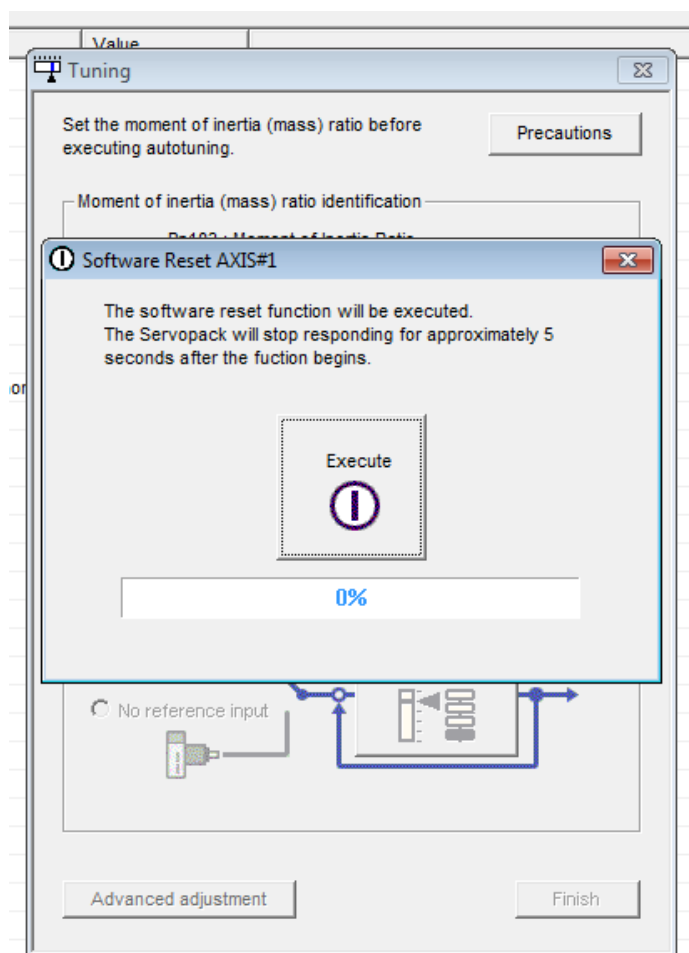


a.

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Product(s): SigmaLogic, Sigma-5 Rotary Servomotor

Doc. No. SRV-84EV75



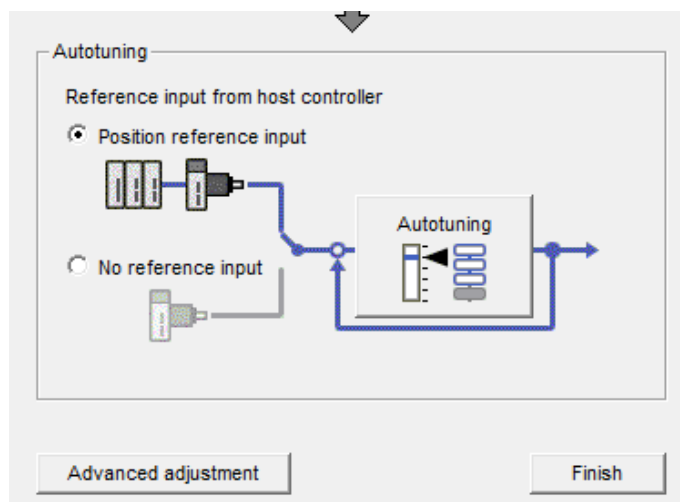
b.

16. Return to the tuning screens and perform tuning via a position reference (host)

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Product(s): SigmaLogic, Sigma-5 Rotary Servomotor

Doc. No. SRV-84EV75



a.

17. Flip the Stop Switch to Off position and cycle power to the SigmaLogic



a.

18. After the 2nd reboot, the SigmaLogic will re-write Pn103 to the default number as it was before executing the Moment of Inertia

19. In SigmaWin+, perform auto tuning from a Position reference input and choose the mode and mechanism selection

Title: How to Tune with SigmaLogic.

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Doc. No. SRV-84EV75

Autotuning - Setting Conditions AXIS#1

Set conditions.

Mode selection

2:For positioning

A gain adjustment specialized for positioning will be executed. In addition, the following automatic adjustments can be executed: Model following control, notch filter, anti-resonance control, and vibration suppression.

Mechanism selection

3:Rigid model

Executes adjustment suitable for a high-rigidity mechanism, such as rigid model.

Tuning parameters

☐ Start tuning using the default settings.

Next > Cancel

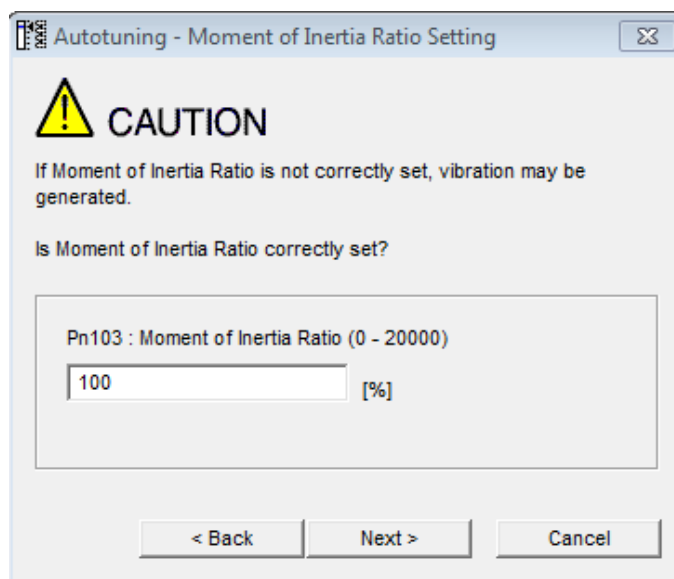
a.

20. Click Next. Do not check Start tuning using default settings because they are already default
21. Write the correct moment of inertia value in the next screen

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Product(s): SigmaLogic, Sigma-5 Rotary Servomotor

Doc. No. SRV-84EV75



Autotuning - Moment of Inertia Ratio Setting

CAUTION

If Moment of Inertia Ratio is not correctly set, vibration may be generated.

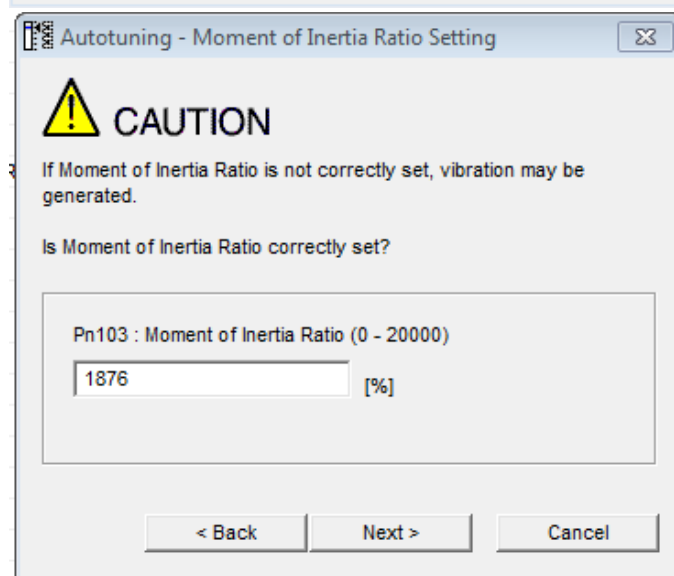
Is Moment of Inertia Ratio correctly set?

Pn103 : Moment of Inertia Ratio (0 - 20000)

100 [%]

< Back Next > Cancel

a.



Autotuning - Moment of Inertia Ratio Setting

CAUTION

If Moment of Inertia Ratio is not correctly set, vibration may be generated.

Is Moment of Inertia Ratio correctly set?

Pn103 : Moment of Inertia Ratio (0 - 20000)

1876 [%]

< Back Next > Cancel

b.

22. Back in LogicWorks, connect, enable test mode, servo on and start the sequence

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Doc. No. SRV-84EV75

LogicWorks-[UNTITLED]

File Connection Configure Sequence Test Run Monitor

Step	Motor Test										Sequence Test												
	Before The Move		The Move							Registration Data		After The Move		Wait		Set		Time Delay		Branch		Wait	
	Flag	State	Flag	State	Move Type	Position	Accel.	Decel.	Speed	Direction	Reg. Distance	Reg. Speed	Flag	State	Flag	State	Milliseconds	Flag	State	True Jump	False Jump		
1	65	On			Relative	10	100	100	5	Positive										END	2		
2					Relative	-10	100	100	5	Positive										END	1		
3					No Move	0				Positive										END	END		
4					No Move	0				Positive										END	END		
5					No Move	0				Positive										END	END		
6					No Move	0				Positive										END	END		
7					No Move	0				Positive										END	END		
8					No Move	0				Positive										END	END		
9					No Move	0				Positive										END	END		
10					No Move	0				Positive										END	END		
11					No Move	0				Positive										END	END		
12					No Move	0				Positive										END	END		
13					No Move	0				Positive										END	END		
14					No Move	0				Positive										END	END		
15					No Move	0				Positive										END	END		

☒ Test Mode Enabled

Starting Step:

Active Step:

State:

Servo Enable ☒

Send to SigmaLogic Axis

Pos OverTravel (P-OT) ☐ Main Power ☒ Neg OverTravel (N-OT) ☐ E-Stop (HBB) ☐

Flag Reference

Connection Status: Connected 192.168.1.1 TEST MODE CPU Status: Running Press F1 for Help Axis Status: ☒

a. 23. Start tuning when the sequence is running from LogicWorks

Autotuning - Automatic setting AXIS#1

Waiting for execution

Oscillation level measurement

Gain search behaviour evaluation

Tuning completed

Notch filter ☐ Anti-res Adj ☐ Vib Suppress ☐

Precautions

Start tuning

Mode selection

2: For positioning

Mechanism selection

3: Rigid model

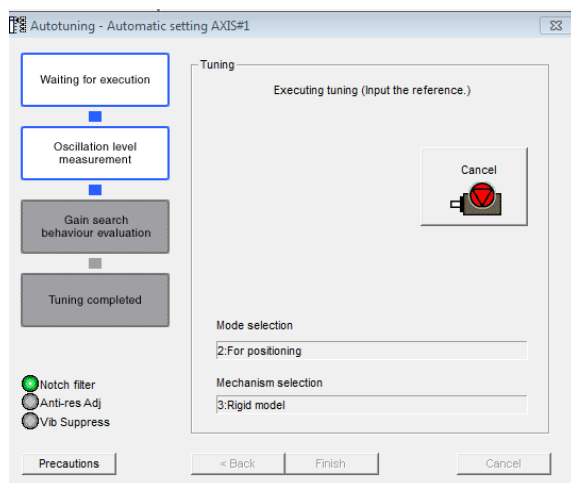
< Back Finish Cancel

a.

Title: How to Tune with SigmaLogic.

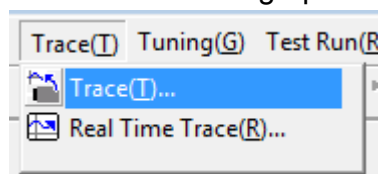
Product(s): SigmaLogic, Sigma-5 Rotary Servomotor

Doc. No. SRV-84EV75

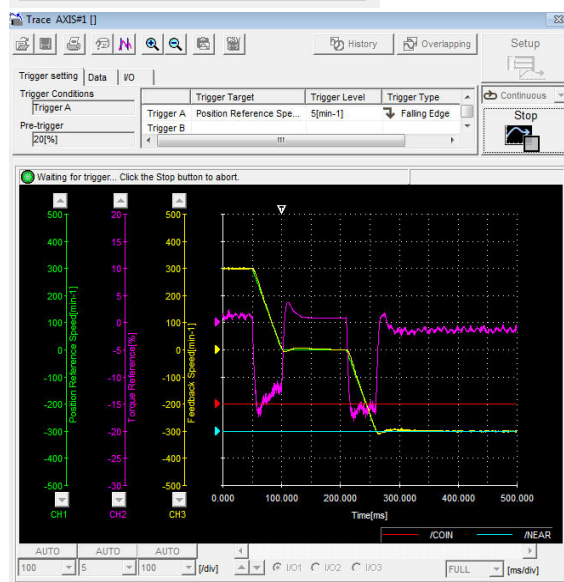


b.

24. Use the Trace Feature to graphically see what tuning is doing



a.

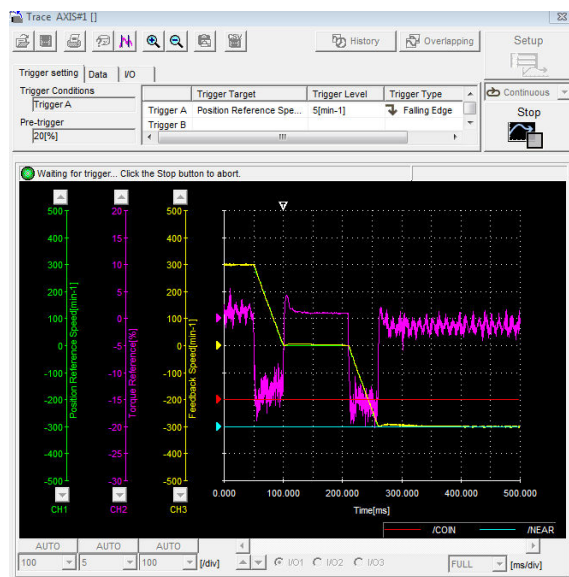


b.

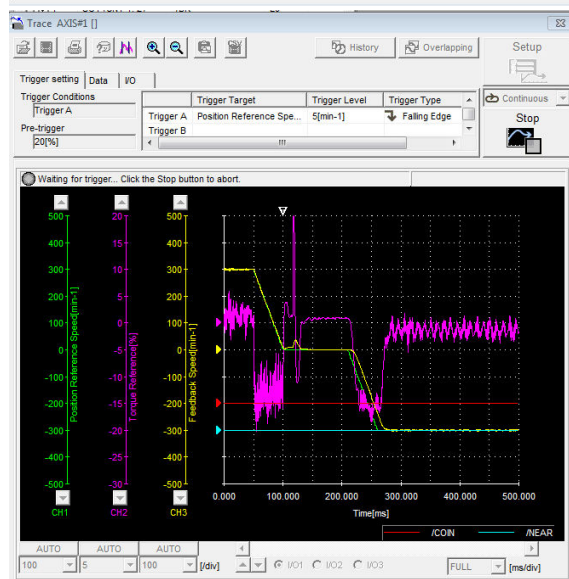
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Product(s): SigmaLogic, Sigma-5 Rotary Servomotor

Doc. No. SRV-84EV75



c.

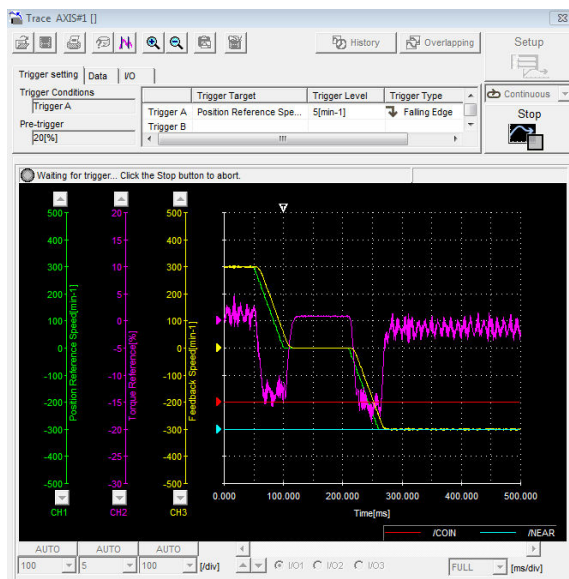


d.

Title: How to Tune with SigmaLogic.

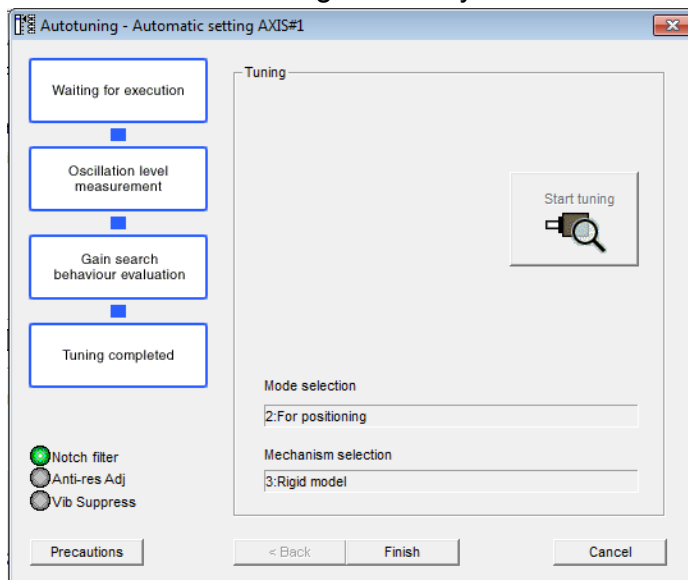
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Doc. No. SRV-84EV75



e.
f.

25. Tuning should finish with new gains ready

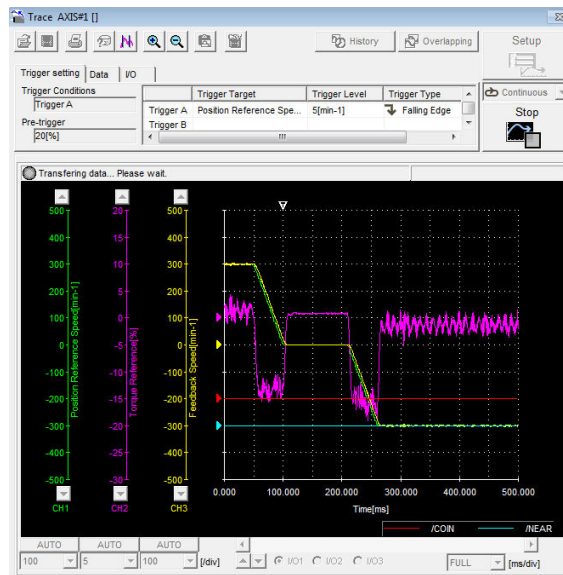


a.

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Doc. No. SRV-84EV75



b.

26. In SigmaWin+, click finish for both screens

27. Edit parameters and save parameters

28. Close all dialogs in SigmaWin+

29. In LogicWorks, cancel the sequence, disable the servo and disable test mode

☐ Test Mode Enabled

Starting Step:

1

Servo
Enable

Active Step:

0

State:

Idle

Send to SigmaLogic
Axis

☐ Pos Over
☐ Neg Over

a.

b.

30. Click on the Configure Tab and find the Import Settings at the bottom right corner

Import Settings

Import SigmaWin+ File

a.

31. Click on Import and import the saved parameter sigmawin+ file

a.

20150716_Tuning Sample for FAQusr usr

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32. Click Connection tab and Send
 - a. Send to SigmaLogic Axis

☒ Include Axis Configuration
☒ Include Sequence Table



- b.
33. Reboot SigmaLogic
 - a. This will signal SigmaLogic to reboot twice

TESTING NEW GAINS ON SYSTEM

1. Test new gains
 - a. Connect
 - b. Test Run Tab
 - c. Test Mode Enabled
 - d. Servo Enable
 - e. Start Sequence
 - f. Digital Input 1
 - g. Verify motion is with new gains versus old ones by performance