

Operational Manual Of EL5 Software





Operational Manual of EI5 Software

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Operational Manual of EI5 Software

Chapter 1 Introduction

This software can run in Windows XP, Windows Vista, Win7. The computer make data exchanged and debug EL5 series driver by series port communication. Please read the operation specification of driver when using.

1. System composition

This software is matched with EL5 series driver, can't be used for other driver.

2. Running condition

CPU: above 1.5GHz

RAM: above 256M

Hard disk capacity: above 10G

Displayer: resolution 1024*768, color 24 bit

Communication interface: normal series or USB series adapter

Note: because of the update of software version, the chart maybe different and actual.

Protuner for EL5 series is a software tool designed to configure and tune the Leadshine EL5 series digital servo driver. The user can tune the velocity/current loop and adjust the position loop parameters in this software.

1.1 Workspace



1.2 Menus and Toolbar

Menus and toolbars are at the top of the workspace. You can click menu bar to view the pull-down menu. The toolbar below the menu offers the common commands.

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Leads	nine		Operational Manual of EI5 Softwar
Menu	Pull Down	Toolbar	Function
Communication ->	Connect to Driver	1	communication setup dialog box, you can select the parameter of communication and connect computer to driver
	Exit		Read, display, modify the parameter of driver, save the value of parameter to project file or local disk
Display ->	Parameter Manage	2	Save current values of parameter, write parameter to EEPROM
	Save the value of Parameter	save	Save driver current parameter, write parameter to using EEPROM
	Waveform Curve		Monitor current running state, debugging
	Run Test		Run the driver, debug the parameters to make performance better.
	Alarm	save	Check the alarm history of driver
	Environment Parameter Setup		Communication delay setup
	Encoder Manage		Setup encoder each parameter
Tools->	Debug Tool		Fast set specify address parameter. convenience to professional fast setup
Language->	Simplified Chinese		Switch the software to Chinese version
	English		Switch software to English version
Help->	Operation Specification		Open help document of operation
	Platform Information		Check current software, driver software version, hardware, version, motor model information.
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Unload:

Upload the values of driver to the computer.

Download:

Make the modified values of parameter downloaded to the driver.

Save:

Save current values of parameter(no download to eeprom of driver)

Parameter Compare:

Compare the difference of parameter value of two projects and display it out.

Reset:

Reset all values of parameter to defaults

Help

Check the explanation of parameters.

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In this window, you can set the values of this kind of parameter. You can set the control mode, etc.

Gain adjustment

Select Parameter N.	. ParameterName	Value	Range	Default	Units	Remark
Pr1.00	1 st gain of position loop	0	0 ~ 30000	320	0.1/s	No
Pr1.01	1st gain of velocity loop	0	1 ~ 32767	180	0.1Hz	No
Pr1.02	1st velocity loop integration ti	0	1~10000	310	0.1ms	No
Pr1.03	1st velocity detection filter	0	0~10000	15	-	No
Pr1.04	1 st torque filter	0	0 ~ 2500	126	0.01ms	No
Pr1.05	2nd position loop gain	0	0 ~ 30000	380	0.1/s	No
Pr1.06	2nd velocity loop gain	0	1 ~ 32767	180	0.1Hz	No
Pr1.07	2nd velocity loop integration ti	0	1~10000	10000	0.1ms	No
Pr1.08	2nd velocity detection filter	0	0 ~ 31	15	-	No
Pr1.09	2nd torque filter	0	0 ~ 2500	126	0.01ms	No
Pr1.10	Velocity feed forward gain	0	0 ~ 1000	300	0.10%	No
Pr1.11	Velocity feed forward filter tim	0	0 ~ 6400	50	0.01ms	No
Pr1.12	Torque feed forward gain	0	0 ~ 1000	0	0.10%	No
Pr1.13	Torque feed forward filter	0	0 ~ 6400	0	0.01ms	No
Pr1.14	2nd gain setup	0	0~1	1	-	No
Pr1.15	Control switching mode	0	0~10	0	-	No
Pr1.17	Control switching level	0	0 ~ 20000	50	mode	No
Pr1.18	Control switch hysteresis	0	0 ~ 20000	33	mode	No
Pr1.19	Gain switching time	0	0 ~ 10000	33	0.1ms	No
Pr1.33	Speed given filter	0	0 ~ 10000	0	0.01ms	No
Pr1.35	Position command digital filter	0	0 ~ 200	0	50ns	Power off
Pr1.36	Encoder feedback pulse digit	0	0 ~ 200	0	50ns	Power off
Pr1.37	Special function register	0	0 ~ 32767	0	_	No



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Classify Select Pa	arameter N	ParameterName	Value	Range	Default	Units	Remark
Setting Pr?	2.01	1st notch frequency	0	50 ~ 2000	2000	Hz	No
ment Pr2	2.02	1 st notch width	0	0~20	2	-	No
ression Pr2	2.03	1st notch depth	0	0~99	0	-	No
Pr2	2.04	2nd notch frequency	0	50~2000	2000	Hz	No
4 Pr2	2.05	2nd notch width	0	0 ~ 20	2	(, _ ,)	No
Pr2	2.06	2nd notch depth	0	0~99	0	-	No
Pr2	2.22	Positonal command smoothin	0	0 ~ 32767	0	0.1ms	Close e
Pr2	2.23	Positional command FIR filter	0	0~5000	0	0.1ms	Colse e

In this window, you can set the values of parameter about vibration and disturbance suppression.

Velocity torque control

Parameter N	ParameterName	Value	Range	Default	Units	Remark
Pr3.00	Velocity setup internal and ext	0	0~3	0	-	No
Pr3.01	Speed command direction ap	0	0~1	0		No
Pr3.02	Speed command input gain	0	10 ~ 2000	500	rpm/V	No
Pr3.03	Speed command input reversal	0	0~1	0	-	No
Pr3.04	1 st speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.05	2nd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.06	3rd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.07	4th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.08	5th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.09	6th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.10	7th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.11	8th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.12	Acceleration time setup	0	$0 \simeq 10000$	100	ms/(1000r	No
Pr3.13	Deceleration time setup	0	$0 \simeq 10000$	100	ms/(1000r	No
Pr3.14	Sigmoid acceleration/deceler	0	0 ~ 1000	0	ms	No
Pr3.16	Zero-clamp level	0	$0 \simeq 2000$	30	r/min	No
Pr3.17	Torque command internal and	0	0~2	0	-	No
Pr3.18	Torque command direction se	0	0~1	0	-	No
Pr3.19	Torque command input gain	0	10~100	30	0.1\/100%	No
Pr3.20	Torque command input revers	0	0~1	0	-	No
Pr3.21	Speed limit value 1	0	0 ~ 5000	0	r/min	No
Pr3.24	Motor rotate maximum speed I	0	0~5000	0	r/min	No

In this parameter window, you can set the values of parameter about velocity / torque control.

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		ane cercompare	C Asset	reth		
lassify Select Parameter N	I ParameterName	Value	Range	Default	Units	Remark
tting Pr4.00	SI1 input selection	0	0 ~ FFFFFF	000303H	-	Hexade
Pr4.01	SI 2 input selection	0	0 ~ FFFFFF	008181H	-	Hexade
Pr4.02	SI 3 input selection	0	0 ~ FFFFFF	008282H	-	Hexadeo
Pr4.03	SI 4 input selection	0	0 ~ FFFFFF	009191H	-	Hexadeo
Pr4.04	SI 5 input selection	0	0 ~ FFFFFF	000007H	-	Hexadeo
Pr4.10	SO1 output selection	0	0 ~ FFFFFF	000101h	-	Hexader
Pr4.11	SO 2 output selection	0	0 ~ FFFFFF	000202h	-	Hexader
Pr4.12	SO 3 output selection	0	0 ~ FFFFFF	000704h	-	Hexader
Pr4.13	SO 4 output selection	0	0 ~ FEFEFE	000303h	-	Hexader
Pr4.22	Analog input 1(AI 1) offset setup	0	-1860 ~ 1860	0	5.37mv	No
Pr4.23	Analog input 1 (AI 1) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.28	Analog input 3(AI 3) offset setup	0	-1860 ~ 1860	0	5.37mv	No
Pr4.29	Analog input 3(AI 3) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.31	Positioning complete range	0	0~10000	10	Pulse	Encoder
Pr4.32	Positioning complete output s	0	0~3	0	-	No
Pr4.33	INP hold time	0	0 ~ 30000	0	-	No
Pr4.34	Zero-speed	0	10 ~ 2000	50	r/min	No
Pr4.35	Speed coincidence range	0	10 ~ 2000	50	r/min	No
Pr4.36	At-speed	0	10 ~ 2000	1000	r/min	No
Pr4.37	Mechanical brake action at st	0	0 ~ 3000	0	ms	No
Pr4.38	Mechanical brake action at ru	0	0 ~ 3000	0	ms	No
Pr4.39	Brake release speed setup	0	30 ~ 3000	30	r/min	No
Pr4.43	E-stop function selection	0	0~1	0	-	No

In this window, you can set the values of parameter about input/output setting, speed zero clamping, etc.

Extension setting

alact Parametern	I ParameterName	Value	Range	Default	Units	Remark
Pr5.00	2nd numerator of electronic ge	0	1 ~ 32767	1		No
Pr5.01	3rd numerator of electronic gear	0	1 ~ 32767	1	-	No
Pr5.02	4th numerator of electronic gear	0	1 ~ 32767	1		No
Pr5.03	Denominator of pulse output d	0	1 ~ 2500	2500	-	Encode
Pr5.06	Sequence at servo-off	0	0~1	0	-	No
Pr5.08	Main power off LV trip selection	0	0~1	0	-	No
Pr5.09	Main power off detection time	0	70 ~ 2000	70	ms	No
Pr5.13	Pr5.13 Over-speed level setup		0~5000	0	r/min	No
Pr5.15	I/E reading filter	0	0 ~ 255	0	0.1ms	Powero
Pr5.20	Position setup unit select	ñ	0~2	ů.	-	Powero
Pr5.28	LED initial status	ñ	0~35	1	-	No
Pr5.29	BS232 communication baud r	ñ	0~31	5	-	Powero
Pr5.30	BS485 communication baud r	ñ	0~15	2	-	Powero
Pr5.31	Axis address	ñ	0~127	ī	-	Powero
Pr5 32	Command pulse input maximu	ñ	250 ~ 4000	600	KH7	No
Pr5 35	Front nanel lock setun	0	0~1	0	-	No
110.00	Tomparenteeroerap	•				110
				_		
						Ľ

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		ata					
ReadFile SaveA	s 🔳 Vnload 🦊	Download Save Reramet	.erCompare {	🕈 Reset 🕐 Hely	,		
Classify Select	Parameter N	ParameterName	Value	Range	Default	Units	Rem
Setting	Pr6.03	JOG trial run command torque	0	0~100	0	%	No
djustment	Pr6.04	JOG trial run command speed	0	-5000 ~ 5000	300	r/min	No
ionSuppression twTereneControl	Pr6.05	Position 3rd gain valid time	0	0~10000	0	ms	No
Setting	Pr6.06	Position 3rd gain scale factor	0	50 ~ 1000	100	%	No
onSetting	Pr6.07	Torque command additional value	0	-100 ~ 100	0	%	No
orySetting	Pr6.08	Positive direction torque compen	0	-100 ~ 100	0	%	No
	Pr6.09	Negative direction torque compe	0	-100 ~ 100	0	%	No
	Pr6.11	Current response setup	0	50 ~ 100	100	%	No
	Pr6.14	Emergency stop time at alarm	0	0~1000	200	ms	No
	Pr6.20	Trial running distance	0	0~1200	10	0.1rev	No
	Pr6.21	Trial running wait time	0	0 ~ 32767	100	ms	No
	Pr6.22	Trial running cycle times	0	0 ~ 32767	1	times	No
	Pr6.33	Reserved parameter	0	0 ~ 32767	0	-	No

In this window, you can set the values of parameter about special setting, trial run parameter, etc.

Factory setup

ssify Select Parameter 1	J ParameterName	Value	Range	Default	Units	Remar
Pr7.00	Current loop gain	0	100 ~ 5000	2000	Hz	No
stment Pr7.01	Current loop integral time	0	1~10000	20	0.1ms	No
nSuppression Pr7.02	Motor rotor initial position Angl	0	0 ~ 360	0	-	Powe
etting Pr7.05	Motor pole pairs	0	1~20	4	-	Powe
Setting Pr7.06	Motor phase resistor	0	1~10000	100	0.01 വ	Powe
ting Pr7.07	Motor D/Q inductance	0	1~10000	700	0.01mH	Powe
Pr7.08	Motor back EMF coefficient	0	100 ~ 10000	1000	0.1\//(100	Powe
Pr7.09	Motor torque coefficient	0	1~1000	80	0.01N.m/A	Powe
Pr7.10	Motor rated speed	0	100 ~ 6000	2000	r/min	Powe
Pr7.11	Motor Maximum speed	0	100 ~ 6000	2500	r/min	Powe
Pr7.12	Motor rated current	0	1 ~ 3000	280	0.01A	Powe
Pr7.13	Motor rotor inertia	0	1 ~ 32767	250	0.01Ka.cm2	Powe
Pr7.14	Motor power selection	0	10 ~ 32767	750	W	Powe
Pr7.15	Motor model input	0	0 ~ 7FFF	3	-	Hexa
Pr7.16	Encoder selection	0	0~512	0	-	Powe
Pr7.17	Motor maximum current	0	1~500	300	%	Powe
Pr7.18	Encoder Index Angle compen	0	0 ~ 360	0	-	No

In this window, you can set the values of parameter about motor setting.

If the motor isn't included in motor library, then you can match this motor through modifying the parameter of Pr7.00 - Pr7.16. First, set Pr7.15=0, then set other parameters according to the specification of motor. In general, we can't see all the parameters like the picture above, we can make some operation to see all of them, just refer to the appendix about how to find the hidden parameter.

Notice:

Restart the driver to make some modified values of parameter available.



2.4 Waveform Curve

If you want to see the data of running when the motor is running, for example, the driver and motor are running with see the data of actual speed, you can click to analysis the data.



Read

Upload the saved ".wave" file from the computer



Save current record wave as waveform file.



Acquire the segment data. You can change the history sampling interval, 1*0.125ms indicate each grid means 0.125ms.



Acquire real-time sampling data, you can change the real-time sampling interval (ms), 100ms indicate each grid means 100ms .



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Start sampling;

Suspend/Continue:

Suspend sampling, it's different from stop, the sampling wave continue after suspend, continue sampling from suspend place in the last time.

Sampling interval:

The time value of sampling interval.

Sampling setup:

Continue reading segment sampling data.

Chapter 3 Run Test

There are two modes in run test, one is velocity mode while other is position mode. Switching the mode need to power off and restart after switching.

Velocity Mode Tuning Window



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In position mode, the parameter what you need to adjust is 1st position loop gain, velocity, ratio of inertia, acceleration and deceleration time, etc. you can setup real-time auto adjust mode, then adjust real-time auto adjust rigid. You need to decrease the rigid if the noise exists while it means the stiffness is too big.

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4.2 History alarm

The history alarm can mostly record 13 alarms, Click read history alarm will appear all of history alarm numbers and alarm name. Click alarm name to display alarm reason and process method. When the number of alarm exceed 13 alarms, you need to click clear history alarm, it will clear all of history alarms.

Current Alarm	History Alarm S	ervo Stop Reason	
SerialNumber	AlarmNumber	AlarmName	Alarm Reason And Disposalroute
0	Err180	Position error o	
1	Err180	Position error o	
2	Err180	Position error o	
3	Err180	Position error o	
4	Err180	Position error o	
5	Err180	Position error o	
6	Err160	Position error o	
7	Err180	Position error o	
8	Err180	Position error o	
9	Err180	Position error o	
10	Err180	Position error o	
11	Err160	Position error o	
12	Err180	Position error o	
			N
<		>	<
Ra	ad History Alarm	Clear History Al	arm

The reasons of servo stop running

Alarm	X
Current Alarm History Alarm Servo Stop Reason	
Teason Code:2 Reason Code:2 Reason Name:No enable signal Reason Describe:COM- no connect servo;	
Analysis	
Click analysis, the window will appear about the reason of no running.	
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In this window, you can set the values of parameter about encoder information. If the motor isn't high accuracy encoder, you won't see the encode parameter setup window.

4.4 Tool

Universal tuning software

💑 Leadshine	Tools					
-Communication- Port: COM1	Eaudrate 384	00 💌 Databit: 8	▼ Stopbit: 1	▼ Pa	rity: Hone 💌 State:Close	(Open)
Test 1 NO.: 01	© Read: 01 C Write: 01	Address:	Return HEX:	DEC:	BIN:	Send
Test 2 NO. : 01	⑦ Read: 01 ○ Write: 01	Address:	Return HEX:	DEC:	BIN:	Send
NO. : 01	 Read: 01 Write: 01 	Address:	Return HEX:	DEC:	BIN:	Send
NO. : 01	 ● Read: 01 ○ Write: 01 	Address:	Return HEX:	DEC:	EIN:	Send
NO.: 01	 G Read: 01 C Write: 01 	Address:	Return HEX:	DEC:	BIN:	Send

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Chapter 5 Configuring the Driver

Before running EL5 series driver, the user need to select different work mode according to mechanical system and the application, while different work mode need to wire in different way, please refer to user manual. when driver wiring connecting was finished, you can tune the parameter with ProTuner software.

5.1 Torque mode

The command of torque mode is analog input, via AI3 send $\pm 10V$ analog input signal, in torque mode, we can't see waveform curve, but we can setup related parameter with torque mode. In parameter manage window

onator Hanaga							
ReadFile 💾 SaveAs	T Unload	Download 🔤 Save 👫 Part	uneterCompare	🔗 Rezet 🕐	Help		
Classify Select	Parameter N	ParameterName	Value	Range	Default	Units	Remark
BasicSetting	Pr0.01	Control mode	2	0~5	0	-	Power of
ainAdjustment	Pr0.02	Real-time auto-gain tuning mo	0	0~2	0	-	No
ibrationSuppression elocityTorqueControl	Pr0.03	Real-time auto-gain tuning stiff	0	0 ~ 31	11	-	No
lonitorSetting	Pr0.04	Ratio of inertia.	0	0 ~ 10000	250	%	No
xtensionSetting	Pr0.06	Command pulse polar setup	0	0~1	0		Power of
actorySetting	Pr0.07	Command pulse input mode s	0	0~3	3	-	Power of
	Pr0.08	Command pulse counts per o	0	0 ~ 32767	0	Pulse	Powero
	Pr0.09	1st numerator of electronic gear	0	1 ~ 32767	1		No
	Pr0.10	Denominator of electronic gear	0	1 ~ 32767	1	-	No
	Pr0.11	Output pulse counts per one m	0	1 ~ 2500	2500	P/rev	Powero
	Pr0.12	Pulse output logic reverse	0	0~1	0	-	Powero
	Pr0.13	1 st torque limit	0	0 ~ 500	300	-	No
	Pr0.14	Position deviation setup	0	0 ~ 500	200	0.1 rev	Encoder
	Pr0.16	Extenal regenerative resistor	0	10 ~ 50 0	50	Ω	Powero
	Pr0.17	Regeneration discharge resis	0	10 ~ 5000	50	W	Powero
	Pr0.18	Vibration suppression - N after	0	0 ~ 1000	10	Pulse	Encoder
	Pr0.19	Microseismic inhibition	0	0 ~ 1000	10	0.1 Pulse	Encoder
	1						
Add Custom							

In basic setting parameter, you need to set Pr0.01=2, then in monitor setting, you need to setup Pr4.00=030000, to make motor enable, then you need to download and save the new value to the driver, then restart the new values of parameter to make them available.

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rameter Lanage							
🔁 ReadFile 💾 SaveAs 🥤	🕇 Unload 🚽	Download 🔤 Save 👫 Para	ameterCompare	💣 Restore 🔵 H	elp		
Classify Select	Parameter N	ParameterName	Value	Range	Default	Units	Remark
asicSetting	Pr4.00	SI1 input selection	30303	0 ~ FFFFFF	000303H	-	Hexade
ainAdjustment	Pr4.01	SI 2 input selection	0	0 ~ FFFFFF	008181H		Hexade
brationSuppression	Pr4.02	SI 3 input selection	0	0 ~ FFFFFF	008282H	-	Hexade
locityTorqueControl	Pr4.03	SI 4 input selection	0	0 ~ FFFFFF	009191H	-	Hexade
onitorSetting	Pr4.04	SI 5 input selection	7	0 ~ FFFFFF	000007H	-	Hexade
ensionSetting	Pr4.10	SO1 output selection	101	0 ~ FFFFFF	000101h	-	Hexade
ecialSetting	Pr4.11	SO 2 output selection	202	0 ~ FFFFFF	000202h	-	Hexade
ctorySetting	Pr4.12	SO 3 output selection	704	0 ~ FFFFFF	000704h	-	Hexade
	Pr4.13	SO 4 output selection	303	0 ~ FFFFFF	000303h		Hexade
	Pr4.22	Analog input 1(AI 1) offset setup	-8	-1860 ~ 1860	0	5.37mv	No
	Pr4.23	Analog input 1(Al 1) filter	0	0 ~ 6400	0	0.01ms	No
	Pr4.28	Analog input 3(AI 3) offset setup	-12	-1860 ~ 1860	0	5.37mv	No
	Pr4.29	Analog input 3(AI 3) filter	0	0 ~ 6400	0	0.01ms	No
	Pr4.31	Positioning complete range	10	0~10000	10	Pulse	Encode
	Pr4.32	Positioning complete output s	0	0~3	0	-	No
	Pr4.33	INP hold time	0	0 ~ 30000	0	-	No
	Pr4.34	Zero-speed	50	10 ~ 2000	50	r/min	No
	Pr4.35	Speed coincidence range	50	10 ~ 2000	50	r/min	No
	Pr4.36	At-speed	1000	10~2000	1000	r/min	No
	Pr4.37	Mechanical brake action at st	0	0 ~ 3000	0	ms	No
	Pr4.38	Mechanical brake action at ru	0	0 ~ 3000	0	ms	No
	Pr4.39	Brake release speed setup	30	30 ~ 3000	30	r/min	No
	Pr4 43	E-stop function selection	0	0~1	0	-	No
Add Custom					1.0000000000000		

Then , you need to in torque control parameter setup Pr3.17=0.

Classify Select	Parameter N	ParameterName	Value	Range	Default	Units	Rema
nioCotting	Pr3.00	Velocity setup internal and ext	1	0~3	D	-	No
asicoetung ainódiustmont	Pr3.01	Speed command direction ap	0	0~1	0	3 <u>-</u> 9	No
brationSuppression	Pr3.02	Speed command input gain	100	10 ~ 2000	500	rpm/V	No
alocityTorqueControl	Pr3.03	Speed command input reversal	0	0~1	0	-	No
onitorSetting	Pr3.04	1st speed setup	2000	-5000 ~ 5000	0	r/min	No
tensionSetting	Pr3.05	2nd speed setup	0	-5000 ~ 5000	0	r/min	No
pecialSetting	Pr3.06	3rd speed setup	0	-5000 ~ 5000	0	v/min	No
ictory/Setting	Pr3.07	4th speed setup	0	-5000 ~ 5000	0	r/min	No
	Pr3.08	5th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.0 Pr3.1	Pr3.09	6th speed setup	0	-5000 ~ 5000	0	1/min	No
	Pr3.10	7th speed setup	0	-5000 ~ 5000	0	r/min	No
	Pr3.11	8th speed setup	0	-5000 ~ 5000	0	r/min	No
	Pr3.12	Acceleration time setup	50	0 ~ 10000	100	ms/(1000r	No
	Pr3.13	Deceleration time setup	100	0 ~ 10000	100	ms/(1000r	No
	Pr3.14	Sigmoid acceleration/deceler	0	0~1000	0	ms	No
	Pr3.16	Zero-clamp level	30	10 ~ 2000	30	r/min	No
	Pr3.17	Torque command internal and	0	0~2	0	-	No
	Pr3.18	Torque command direction se	0	0~1	0		No
	Pr3.19	Torque command input gain	100	10~100	30	0.1\/100%	No
	Pr3.20	Torque command input revers	0	0~1	0	-	No
	Pr3.21	Speed limit value 1	4000	0 ~ 5000	0	r/min	No
	Pr3.24	Motor rotate maximum speed I	4000	0 ~ 5000	0	r/min	No

When you have finished the above all of these parameters setting, you can give analog signal to drive by CN1 port. The motor will work in torque mode, if you aren't satisfied with the performance of motor, you can continue adjusting related torque parameter.

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					Defect	11.3.	Deved
Classify Select	Parameter N	ParameteriName	Value	- Range	Delault	Units	Remark
asicSetting	Pr7.00	Current loop gain	1100	100 ~ 5000	2000	Hz	No
ainAdjustment ührationSunnression	Pr7.01	Current loop integral time	1100	1 ~ 10000	20	U.1ms	No
elocityTorqueControl	Pr7.02	Motor rotor initial position Angl	U	0 ~ 360	U	-	Powero
onitorSetting	Pr7.05	Motor pole pairs	4	1~20	4	-	Powero
necialSetting	Pr7.06	Motor phase resistor	300	1~10000	100	0.01 Ω	Powero
actorySetting	Pr7.07	Motor D/Q inductance	600	1~10000	700	0.01mH	Powero
	Pr7.08	Motor back EMF coefficient	325	100 ~ 10000	1000	0.1\/(100	Power o
	Pr7.09	Motor torque coefficient	65	1~1000	80	0.01N.m/A	Powero
	Pr7.10	Motor rated speed	3000	100~6000	2000	r/min	Powero
	Pr7.11	Motor Maximum speed	4000	100 ~ 6000	2500	r/min	Power o
	Pr7.12	Motor rated current	320	1 ~ 3000	280	0.01A	Power o
	Pr7.13	Motor rotor inertia	200	1 ~ 32767	250	0.01Kg.cm2	Powero
	Pr7.14	Motor power selection	750	10 ~ 32767	750	W	Power c
	Pr7.15	Motor model input	0	0 ~ 7FFF	3	-	Hexade
	Pr7.16	Encoder selection	16	0~512	0	-	Power o
	Pr7.17	Motor maximum current	300	1 ~ 500	300	%	Power o
	Pr7.18	Encoder index Angle compen	0	0 ~ 360	0	-	No

You can adjust the gain of current loop gain pr7.00 and current loop integral time pr7.01. in general, you can't see the parameter except pr7.15 and pr7.16, so refer to the appendix on how to find the hidden parameter.

5.2 Velocity mode

First, you need to modify the parameter value of control mode in parameter manage window, make the value of control mode to 1. then in monitor setting, you need to setup Pr4.00=000300,make the motor enable, then you need to download and save the new value to the driver, then restart the new values of parameter to make them available.

BasicSatting SanAcjuttment Pt0 01 Control mode 1 0.*2 0 = BasicSatting SanAcjuttment Pt0 02 Real-time euto-gain tuning mo. 2 0.*2 0 = Pt0 02 Real-time euto-gain tuning mo. 2 0.*2 0 = Pt0 03 Real-time euto-gain tuning mo. 2 0.*2 0 = Pt0 03 Real-time euto-gain tuning mo. 2 0.*2 0 = Pt0 04 Retion Gamesia 0.0*3 1 1 = Pt0 05 Command pulse polar setup 0 0.*10000 250 % Pt0 05 Command pulse polar setup 0 0.*1000 250 % Pt0 05 Command pulse counts paro. 0 0.*32787 0 P Pt0 05 Command pulse counts paro. 0 0.*32787 1 = Pt0 05 Command pulse counts paro. 0 0.*1 0 0 = Pt0 10 Denominetor of electronic gear 1	ter N ParameterN	lame	Value	Range	Default	Units	Remar
Priore Ped-Imme auto-gain funning mou. 2 0 * 2 0 * 2 Tendonoppression Ped-Imme auto-gain funning mou. 16 0 * 31 11 - Tendonoppression Ped-08 Real-Imme auto-gain funning mou. 2 0 * 2 0 - Encody TorqueControl Ped-08 Real-Imme auto-gain funning mou. 250 0 * 10000 250 % United Setting Ped-04 Real-origination functional funct	Control mod	le	1	0~2	0	-	Power
Einstlönsfurgerssion Pr0.03 Peel-time auto-gein tuning stitt. 16 0 **31 11 beröghtrague deckytrague kontenstring Pr0.04 Reito of inertie 250 0 **10000 250 % onter Setting Pr0.06 Command pulse polar setup 0 0 **1 0 pecialSetting Pr0.06 Command pulse polar setup 0 0 **3 3 pecialSetting Pr0.08 Command pulse polar setup 0 0 **32767 0 P pedia/Setting Pr0.09 1 strumeretor of electronic gear 1 1 *32767 1 Pr0.10 Denominator of electronic gear 1 1 *32767 1 Pr0.11 Output pulse counts per one 200 0 **10 0 Pr0.12 Pulse countput counts per one 200 0 **10 0 - Pr0.13 1 strorque limit 300 0 **500 300 - Pr0.16 Extensite segeneratind schonestors geres 50 <	Real-time a	uto-gain tuning mo	2	0~2	0	-	No
alcotyTorqueControl Pr0.04 Patio of methe 250 0 ~ 10000 250 % alcotyTorqueControl Pr0.06 Command pulse polor setup 0 0 ~ 1 0 - atensionSerting Pr0.07 Command pulse polor setup 0 0 ~ 1 0 - atensionSerting Pr0.08 Command pulse polar setup 0 0 ~ 32787 0 P actavidSetting Pr0.08 Command pulse counts paro 0 ~ 32787 1 - Pr0.11 Outputse counts promemetor of electronic gear 1 ~ 32787 1 - Pr0.12 Pulse output logic reverse 0 1 ~ 2500 2500 P Pr0.12 Pulse output logic reverse 0 0 ~ 1 0 - - Pr0.13 1 storque limit 300 0 ~ 500 300 - Pr0.14 Poestion devetaion setup 200 0 ~ 500 30 - Pr0.14 Poestion 50 10 ~ 500 50 4 Pr0.17 P	Real-time a	uto-gain tuning stiff	16	0 ~ 31	11	-	No
Pr0.06 Command pulse polor setup 0 0 ~1 0 precalisating Pr0.06 Command pulse polor mode s. 3 0 ~3 3 secaliSating Pr0.08 Command pulse polor mode s. 3 0 ~3 3 secaliSating Pr0.08 Command pulse polor mode s. 0 0 ~32767 0 P odarySating Pr0.10 Denominator of electronic gear 1 1 ~32767 1 - Pr0.10 Denominator of electronic gear 1 1 ~32767 1 - Pr0.11 Output pulse counts per one m. 2500 1 ~2500 2500 P Pr0.12 Pulse output logic reverse 0 0 ~7500 20 - Pr0.13 1stlorage limit 300 0 ~500 200 0 - Pr0.13 1stlorage limit 300 0 ~500 20 0 - Pr0.13 Plateo registro resistor 50 10 ~500 50 4 -	Ratio of iner	tia	250	0~10000	250	%	No
densionSering Pr0.07 Command guise input mode s3 0 ~ 3 3	Command p	oulse polar setup	0	0~1	0	-	Power
becallSetting Pr0.08 Command julies counts per 0. 0 0 * 32767 0 Pr actorySetting Pr0.09 1 strumeetror of electronic gear 1 1 * 32767 1 - Pr0.10 Demoninetor of electronic gear 1 * 32767 1 - Pr0.10 Demoninetor of electronic gear 1 * 32767 1 - Pr0.11 Output plass counts per one m. 2500 2500 2500 P Pr0.12 Pulse output logic reverse 0 0 **10 0 - Pr0.13 1 strongue limit 300 0 500 200 0* Pr0.14 Position devision setup 200 0 * 500 200 0* Pr0.15 Extendit agenerative resistor 50 10 * 500 50 4 Pr0.18 Vibration suppression - S after. 10 0 * 1000 10 P Pr0.18 Vibration suppression - S after. 10 0 * 1000 10 P	Command p	ulse input mode s	3	0~3	3	-	Power
vectorySetting Pr0.09 1 strummeretor of electronic gear 1 * 32767 1 - Pr0.10 Denominater of electronic gear 1 * 32767 1 - Pr0.11 Output pulse counts per one m. 2500 1 * 2500 2500 P/ Pr0.12 Pulse output pulse counts per one m. 2500 1 * 2500 300 - Pr0.13 Tatorique limit 300 0 * 500 300 - Pr0.14 Position devision setup 200 0 * 500 50 Q Pr0.14 Position devision setup 200 0 * 500 50 Q Pr0.15 Extensition setup 200 0 * 500 50 Q Pr0.17 Regeneration discharge resitsch 50 10 * 500 50 W Pr0.18 Vibration suppression - S after 10 0 * 1000 10 P Pr0.19 Vibration suppression - S after 10 0 * 1000 10 P	Command p	ulse counts per o	0	0 ~ 32767	0	Pulse	Power
Pr010 Denominator of electronic gear 1 1 ~ 32767 1 − Pr011 Output base counts pare norm 2.500 2500 2500 P Pr012 Putase output logic reverse 0 0 ~ 1 0 − Pr013 1 storage limit 300 0 ~ 500 300 − Pr014 Position davietion setup 200 0 ~ 500 200 0 Pr014 Position davietion setup 50 10 ~ 500 50 2 Pr017 Regenerative resistor 50 10 ~ 5000 50 Q Pr018 Vibration suppression - N after 10 0 ~ 1000 10 P Pr018 Vibration suppression - S after 10 0 ~ 1000 10 P	1 st numerate	or of electronic gear	1	1 ~ 32767	1	-	No
Pr011 Output pulse counts per one m	Denominato	or of electronic gear	1	1 ~ 32767	1	-	No
Pr012 Pulas output/logic reverse 0 0"1 0 − Pr013 1 storpatient 300 0 ~ 500 300 − Pr014 Position dsvieton setup 200 0 ~ 500 200 0 Pr015 Extend regenerative resistor	Output pulse	e counts per one m	2500	1 ~ 2500	2500	P/rev	Power
Pr013 1 storague limit 300 0 ~ 500 200 Pr014 Position deviation setup 200 0 ~ 500 200 0 Pr015 Extendir regenerative resistor 50 10 ~ 500 50 4 Pr017 Regenerative resistor 50 10 ~ 500 50 W Pr018 Vibration suppression N fact 10 ~ 7000 10 P Pr019 Vibration suppression N effer 10 0 ~ 1000 10 P	Pulse output	t logic reverse	0	0~1	0	-	Power
Pr014 Position deviation satup 200 0. [∞] 500 200 0.0 [∞] Pr018 Extended regenerative resistor 50 10 [∞] 500 50 40 Pr017 Regeneration discharge resist 50 10 [∞] 5000 50 40 Pr018 Vibration suppression - N after 10 0 [∞] 1000 10 Pr Pr019 Vibration suppression - S after 10 0 [∞] 1000 10 Pr	1 st torque lin	mit	300	0 ~ 500	300	-	No
Pr018 Extend regenerative reastor	Position dev	viation setup	200	0 ~ 500	200	0.1 rev	Encod
Pr0.17 Peggeneration of sischaroparesis	Extenal rege	enerative resistor	50	10~500	50	Ω	Power
Pr0.18 Vibration suppression - N after 10 0 ~ 1000 10 Pr0 Pr0.19 Vibration suppression - S after 10 0 ~ 1000 10 Pr0	Regeneratio	on discharge resis	50	10~5000	50	W	Power
Pr0.19 Vibration suppression - S after 10 0 ~ 1000 10 Pr	Vibration su	ppression - N after	10	0~1000	10	Pulse	Encod
	Vibration su	ppression - S after	10	0~1000	10	Pulse	Encod

Click->Display will appear menu, select Run test, click the left key "Run test" to appear velocity mode window, you can also click Toolbar button , it will display velocity mode window. If you doesn't modify the parameter value of control mode, you can also click Velocity Mode to switch to velocity mode window.



You can select different operation mode in real-time automatic adjustment mode, generally select **Locate** mode, if you want to adjust gain parameter by yourself, you can select **Manual** mode, then you can adjust related parameter step by step until to system requirement.

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You can adjust velocity loop gain and integration time constant for tunning velocity loop and it is also very important to set ratio of inertia.

RealtimeAutomaticAdjustmentMode	Locate 🔍 🔻	
RealtimeAutomaticAdjustmentRigid	Manual Standard Locate	

In **Manual** mode, you can setup VP, VI, and other related parameter. During tuning velocity loop, you can adjust Vi to a very small value in advance and hold it constant, then you can enlarge the value of Vp until system oscillation occurs, at this moment you can enlarge the value of Vi slowly until oscillation occurs. Then the basic adjustment of system finished.

In **Locate** mode. It is unavailable to modify the value of pr1.00- 1.14, we just change the value of real-time automatic adjustment rigid, firstly we select a smaller value.



Then we continue increasing system rigid, then the velocity error become smaller and smaller.



We continue increasing the rigid of system, then the velocity loop gain Vp become bigger and bigger, the integration time constant Vi become smaller and smaller, the velocity error become close to zero. But the noise of motor occurs if the rigid becomes bigger, so just make sure there is no noise. Finally, the basic setting for velocity loop is finished **in Locate mode**.





5.3 Position mode

Position Loop Tuning

First, you need to modify the parameter value of control mode in parameter manage window, make the value of control mode to 0. then in monitor setting, you need to setup Pr4.00=000003,make the motor enable, then you need to download and save the new value to the driver, then restart the new values of parameter to make them available.

Classify Select Parameter N	ParameterName	Value	Range	Default	Units	Rema
sicSetting Pr0.01	Control mode	0	0~2	0	-	Power
Adjustment Pr0.02	Real-time auto-gain tuning mo	2	0~2	0	-	No
ationSuppression Pr0.03	Real-time auto-gain tuning stiff	16	0 ~ 31	11	-	No
cityTorqueControl Pr0.04	Ratio of inertia	250	0~10000	250	%	No
itorSetting Pr0.06	Command pulse polar setup	0	0~1	0	-	Powe
ensionSetting Pr0.07	Command pulse input mode s	3	0~3	3	-	Powe
cialSetting Pr0.08	Command pulse counts per o	0	0 ~ 32767	0	Pulse	Powe
storySetting Pr0.09	1 st numerator of electronic gear	1	1 ~ 32767	1	-	No
Pr0.10	Denominator of electronic gear	1	1 ~ 32767	1	-	No
Pr0.11	Output pulse counts per one m	2500	1 ~ 2500	2500	P/rev	Powe
Pr0.12	Pulse output logic reverse	0	0~1	0	-	Powe
Pr0.13	1 st torque limit	300	0~500	300	-	No
Pr0.14	Position deviation setup	200	0~500	200	0.1 rev	Enco
Pr0.16	Extenal regenerative resistor	50	10~500	50	Q	Powe
Pr0.17	Regeneration discharge resis	50	10~5000	50	W	Powe
Pr0.18	Vibration suppression - N after	10	0~1000	10	Pulse	Enco
Pr0.19	Vibration suppression - S after	10	0~1000	10	Pulse	Enco
Add Custon				_		

Click->Display will display the menu of pull down, select Run test, click the left key Run test will display position mode window, you can also directly click Toolbar button to display position mode window, if you doesn't modify the parameter value of control mode, you can also click Position Mode to switch to velocity mode window.



Tuning Position Loop Parameters

You can select different operation mode in real-time automatic adjustment mode, generally select **Locate** mode. If you want to adjust gain parameter by yourself, you can select **Manual** mode, then you can adjust related parameter step by step until system requirement.

You can adjust position loop gain, velocity integration time constant and ratio of inertia for tunning position loop tuning. If you need stronger rigid, you only need adjust ratio of inertia, then adjust gain and integration



In **Manual** mode, you can setup Kp, Ki and other related parameters. During tuning position loop, you can adjust KI to a very small value in advance and hold it constant, then you can enlarge the value of Kp parameter slowly until system oscillation occurs, at this moment you can enlarge the value of Vi parameter slowly until system oscillation occurs, at this moment the basic adjustment of system finished.

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In **Locate** mode. It is unavailable to modify the value of pr1.00- 1.14, we just change the value of real-time automatic adjustment rigid, firstly we select a smaller value.



Then we continue increasing system rigid, then the position error become smaller and smaller.





We continue increasing the rigid of system, then the position loop gain Kp become bigger and bigger, the integration time constant Vi become smaller and smaller, the position error become close to zero.



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But the noise of motor occurs if the rigid becomes bigger, so just make sure there is no noise. Finally, the basic setting for position loop is finished **in Locate mode**.

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How to find the hidden parameter of ProTuner

1. Run the software of ProTuner , we just find part of the parameter :

			_				_
arameter Manage							
📄 ReadFile 💾 SaveAs	t Unload	Download ave Save 2 Par	meterCompare	🧬 Reset 🌔	Help		
Classify Select	Parameter N	ParameterName	Value	Ronge	Default	Units	Remark
BasicSetting	Pr0.01	Control mode	1	0~5	0	-	Power of
GainAdjustment	Pr0.02	Real-time auto-gain tuning mo	2	0~2	0	-	No
VibrationSuppression ValoriteTermeControl	Pr0.03	Real-time auto-gain tuning stiff	11	0~31	11	-	No
MonitorSetting	Pr0.04	Ratio of inertia	250	0~10000	250	%	No
ExtensionSetting	Pr0.06	Command pulse polar setup	0	0~1	0	-	Power of
FactorySetting	Pr0.07	Command pulse input mode s	3	0~3	3	-	Power of
	Pr0.08	Command pulse counts per o	0	0~32767	0	Pulse	Power of
	Pr0.09	1st numerator of electronic gear	1	1~32767	1	-	No
	Pr0.10	Denominator of electronic gear	1	1 ~ 32767	1	-	No
	Pr0.11	Output pulse counts per one m	2500	1~2500	2500	P/rev	Power of
	Pr0.12	Pulse output logic reverse	0	0~1	0	-	Power of
	Pr0.13	1st torque limit	300	0~500	300	-	No
	Pr0.14	Position deviation setup	200	0~500	200	0.1rev	Encoder
	Pr0.16	Extend regenerative resistor	50	10~500	50	Ω	Power of
	Pr0.17	Regeneration discharge resis	50	10~5000	50	W	Power of
	Pr0.18	Vibration suppression - N after	0	0~1000	10	Pulse	Encoder
	Pr0.19	Microseismic inhibition	0	0~1000	10	0.1Pulse	Encoder

- $2. \quad Now here is the way to find all of them:$
 - a. Click "factorysetting":

			•	~ _		Lu a	0
Classify Select Pa	rameter N	ParameterName	Value	Hange	Detault	Units	Remark
Abitast Historyperation of a historyperation of a historyperation and historyperation	216	Encoder selection	0	0~512	0		Power of
Add Custon	, .						, 100%

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Operational Manual of EI5 Software

How to debug the parameter of driver matched with different servo motor

Sometimes, we use different motor with EL5 servo motor. Then we need to set the different value of motor parameter for different motor.

So, we give you some examples for debugging the parameter.

A. Set the 400w servo motor for 400w servo driver.

If the 400w white motor is like this (the motor is with 10 poles):



Here is the step to modify the values of parameters for matching this white motor with driver: 1. **Modify the value of pr7.15 to f.**

The 400W servo motor is included in the motor library, so you just need to modify the parameter of pr7.15, modify pr7.15 to make pr7.15 = f, while the driver should be powered on and connected to the software Protuner when you modify the value of parameter.

2. Download the new value of parameters to the driver and save it, and restart the driver to make the new value worked.

NOTICE : If the 400w motor isn't the white motor which looks like the picture above, just contact the provider of motor to get the information of motor specification.

B. Set the motor which is not included in motor library.

1. Modify the value of pr7.15 to 0.

Sometimes servo motor isn't included in motor library, so you need to modify the parameter of pr7.15 to 0, and then you can set other parameters to match the motor with driver.

2. Modify the values of other parameters : pr7.00 - pr7.14

In general, the parameters pr7.00- pr7.14 are hidden, you can't see them. You need to do some operation to find them, refer to the appendix on how to find the hidden parameters. And then, modify the parameters after you find all the parameters. The driver should be powered on and connected to the software Protuner when you modify them.

You need to refer to the specification of motor, get the information below:

motor pole pairs, motor phase resistor, motor D/Q inductance, motor back EMF coefficient, motor torque coefficient, motor rated speed, motor maximum speed, motor rated current, motor rotor inertia ,motor power selection.

Then, set the value of motor specification to pr7.02 – pr7.14

3. Download the new value of parameters

Download the new values to the driver and save it, and restart the driver to make the new value worked.

NOTICE: Contact the provider of motor for specification of motor.



How to modify the new values of parameter to the driver

Sometimes, we need to restart the driver to make it available after modifying the values of parameter, so it is very important to follow the right step. You need to do the operation with the steps below:

1. Modify the value of parameter.

2. Click "download ":						
🚮 Leadshine EL5Series						
Communication Display Tools	Language Help					
🜁 🛒 🔛 🎯 💈	Save					
Parameter Manage	_					
ReadFile PaveAs	🕂 Unload 📮	Download Save Rer	meterCompare 🧃	🖗 Reset 🜔 Help		
Classify Select	Parameter N	ParameterName	Value	Range	Default	Units
BasicSetting	Pr7.00	Current loop gain	1000	100 ~ 5000	2000	Hz
GainAdjustment	Pr7.01	Current loop integral time	1000	1~10000	20	0.1 m
3. Click "save":						
Communication Display Tools	Save					
Parameter Manage						
ReadFile 💾 SaveAs 4	Unload 🚽	Download Save Save Raray	eterCompare ⊘	🖗 Reset 🕐 Help		
Classify Select	Parameter N	ParameterName	Value	Range	Default	Units
BasicSetting	Pr7.00	Current loop gain	1000	100 ~ 5000	2000	Hz
GainAdjustment	Pr7.01	Current loop integral time	1000	1~10000	20	0.1ms
a ribiacionaubliession	D 7 00		0	0.02.000	0	

4. And you can see the information like this below:

Parameter Manage							_ 🗆 🗙
ReadFile 💾 SaveAs	Unlo	ad Dovnload Save §	ParameterCompare ,	🖉 Reset 🕗	Help		
Classify Select	Parame	ter N ParameterName	Value	Range	Default	Units	Remar
BasicSetting	Pr7.00	Current loop gain	1000	100 ~ 5000	2000	Hz	No
GainAdjustment	Pr7.01	Save Successful	×	1~10000	20	0.1ms	No
VibrationSuppression ValegiteTexeueControl	Pr7.02			0 ~ 360	0	-	Power
MonitorSetting	Pr7.03	Save driver current setting s	accessful !	0 ~ 32767	0	-	Power
ExtensionSetting	Pr7.04	ž		0 ~ 32767	0	-	Power
FactorySetting	Pr7.05			1~20	4	-	Power
	Pr7.06		确定	1~10000	100	0.01 Ω	Power
	Pr7.07			1 ~ 10000	700	0.01mH	Power
	Pr7.08	Motor back EMF coeffic	ient 400	100 ~ 10000	1000	0.1V/(100	Power

5. Then you can power off the driver and restart it again, then the new value is available.

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