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Table of Contents

Chapter 1 Introduction	4
1.1 Workspace	4
1.2 Menus and Toolbar	4
Chapter 2 Using the software	6
2.1 Connecting driver	6
2.2 Off-line using	6
2.3 Parameter Management	7
Basic setting	8
Gain adjustment	8
Vibration suppression	9
Velocity torque control	9
Monitor setup	10
Extension setting	10
Special setting	11
Factory setup	11
2.4 Wave Show	12
Chapter 3 Run Test	13
Position Mode Tuning Window	13
Chapter 4 Alarm and Tool	15
4.1 Current alarm	15
4.2 History alarm	15
4.3 The reasons of servo stop running	16
4.4 Tool	16
Chapter 5 Configuring the Driver	17
5.1 Setup progress	17
5.2 Torque mode	20
5.2.1 Setup progress—Control Mode window	20
5.2.2 Setup progress—Command Source window	20
5.2.3 Setup progress—IO Setting window	21
5.2.4 Save the setting	
5.2.5 Operation	21
5.3 Velocity mode	23
5.3.1 Setup progress—Control Mode window	23
5.3.2 Setup progress—Command Source window	23
5.3.3 Setup progress—IO Setting window	27
5.3.4 Save the setting	27
5.3.5 Operation	27
5.4 Position mode	27
5.4.1 Setup progress—Control Mode window	28
5.4.2 Setup progress—Command Source window	28
5.4.3 Setup progress—Electronic Gear window	30
5.4.4 Setup progress—Encoder Output window	31
5.4.5 Setup progress—IO Setting window	31
5.4.6 Save the setting	31

Leadshine

Operational Manual of ELP Software

5.4.7 Operation	31
5.5 Performance adjustment	32
5.5.1 Inertia ratio identification	32
5.5.2 Gain adjustment	33
Appendix	
How to find the hidden parameter of ProTuner	
How to modify the new values of parameter to the driver	40
Contact Us	41



Chapter 1 Introduction

This software can run in Windows XP, Windows Vista, Win7. The computer make data exchanged and debug ELP series driver by series port communication. Please read the operation specification of driver when using.
1. System composition
This software is matched with ELP 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 ELP series is a software tool designed to configure and tune the Leadshine ELP series digital servo driver. The user can tune the velocity/current loop and adjust the position loop parameters in this software.



1.2 Menus and Toolbar

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

Menu	Pull Down	Toolbar	Function
		1 11.	

n Leadshir	le		Operational Manual of ELP Software
System ->	Connect		Communication setup dialog box, users 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
Functions ->	Save Parameter		Save parameter into Non-Volatile Memory
	Software Reset		Software reset to make the parameters setting valid instead of restart power-supply
Language->	Chinese		Switch the software to Chinese version
	English		Switch the software to English version
Tools->	Debug Tool		Fast set specify address parameter. convenience to professional fast setup
Parameter Manage	Read parameter file	هًا	Reading parameter setup from the folder (the project file from PC computer)
	Save parameter		Make the current values of parameter saved as project file; while users can write note before
	Upload	1	Upload the parameters values of driver to the computer.
	Download		Make the modified values of parameter downloaded to the driver.
	Parameter compare	₿	Compare the difference of parameter value of two projects and display it out.
	Save to Driver		Save parameter into Non-Volatile Memory
	Factory Reset	0	Reset all values of parameter to defaults
	Help	?	Check the explanation of parameters
Run Testing	Run Test	€	Run the driver, debug the parameters to performance better.
Wave Show	Wave Show		Monitor current running state, debugging
Alarm Info	Alarm Info		Check the alarm history of driver

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2.1 Connecting driver

Click "**UI**" to connect driver and PC computer.

🕢 Leadshine Motion Studio		- • ×
System Funtions Language To	ols About	
V 🖸 🖻 🕑 🗉		雷 長 智 能 Leadshine
RS400 General Setup Progress Configuration Performance adjustment Run Motion Performance adjustment Motion	Comm Connect Online Mode Communication Mode CommPort COM16 Refresh Series High Voltage Serve	
	Drive model RS400 Motor Model ACM6004L2H-60-1 Ports IN:9,OUT:6 Soft Version 1.01	
Comm:Offline Servo:Disa	Connect Offline Mode	mail:tech@leadshine.com

If the driver is power off, click "Offline Mode".

In general, if the driver is power on, set Comm Port, like the picture above, then click "Connect" to enter the interface.

Note:

Before clicking the Connect button, please make sure:

1) The RS232 cable has been connected between the drive and the PC's USB port.

Operational Manual of ELP Software

2) The drive has been powered on and the green LED is on.

The motor is unnecessary connecting to the drive if users just want to change the parameters but not tuning.

2.2 Off-line using

Users can operate software as no connection between driver and PC computer, users can see the parameter value of projects which is saved in PC.



2.3 Parameter Management

Parameter Manage							X
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Read parameters file:

Reading parameter setup from the folder (the project file from PC computer)

Save parameters:

Make the current values of parameter saved as project file; while users can write note before save it so that other users can clearly know some effect of this project.

Unload:

Upload the parameters values of driver to the computer.

Download: Make the modified values of parameter downloaded to the driver.

Parameter Compare:

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

Save To Driver: Save parameter into Non-Volatile Memory

Factory Reset: Reset all values of parameter to defaults

Help

Check the explanation of parameters.



Basic setting

Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr0.00	Model following control	0	0	2000	1	0.1Hz	None
Pr2.Vibration Restrain Function	Pr0.01	Control mode	0	0	10	0	-	valid after restart
Pr3.Speed, Torque Control	Pr0.02	Real-time auto-gain t	2	0	2	2	-	None
Pr4.I/F Monitor Setting	Pr0.03	Stiffness at real-time	70	50	80	70	-	None
Pr5.Extended Setup Pr6.Special Setup	Pr0.04	Inertia ratio	100	0	10000	250	%	None
Pr7.Factory setting	Pr0.06	Command pulse rotat	0	0	1	0	-	valid after restart
, <u> </u>	Pr0.07	Command pulse input	3	0	3	3	-	valid after restart
	Pr0.08	Command pulse cou	0	0	8388608	10000	Pulse	valid after restart
	Pr0.09	1st numerator of elect	1	1	10737418	1	-	None
	Pr0.10	Denominator of electr	1	1	10737418	1	-	None
	Pr0.11	Output pulse counts p	2500	1	2500	2500	P/rev	valid after restart
	Pr0.12	Reversal of pulse out	0	0	1	0	-	valid after restart
	Pr0.13	1st torque limit	300	0	500	300	-	None
	Pr0.14	Position deviation ex	200	0	500	200	0.1rev	Encoder units
	Pr0.15	Absolute encoder set	0	0	15	0	-	None
	Pr0.16	External regenerative	100	40	500	100	Ω	valid after restart
	Pr0.17	Regenerative dischar	50	20	5000	50	W	valid after restart

In this window, users can set the values of this kind of parameter. Users can set the control mode, etc.

Gain adjustment

Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr1.00	1st position loop gain	75	0	30000	320	0.1/s	None
Pr2.Vibration Restrain Function	Pr1.01	1st velocity loop gain	60	1	32767	180	0.1Hz	None
Pr3.Speed, Torque Control	Pr1.02	1st time constant of v	900	1	10000	310	0.1ms	None
Pr4.I/F Monitor Setting	Pr1.03	1st filter of velocity det	15	0	10000	15	-	None
Pr5.Extended Setup Pr6.Special Setup	Pr1.04	1st time constant of to	400	0	2500	126	0.01ms	None
Pr7.Factory setting	Pr1.05	2nd position loop gain	95	0	30000	380	0.1/s	None
	Pr1.06	2nd velocity loop gain	60	1	32767	180	0.1Hz	None
	Pr1.07	2nd time constant of v	10000	1	10000	10000	0.1ms	None
	Pr1.08	2nd filter of velocity d	15	0	31	15	-	None
	Pr1.09	2nd time constant of t	400	0	2500	126	0.01ms	None
	Pr1.10	Velocity feed forward	300	0	1000	300	0.001	None
	Pr1.11	Velocity feed forward	50	0	6400	50	0.01ms	None
	Pr1.12	Torque feed forward	0	0	1000	0	0.001	None
	Pr1.13	Torque feed forward f	0	0	6400	0	0.01ms	None
	Pr1.15	Control switching mode	10	0	10	0	-	None
	Pr1.17	Control switching level	50	0	20000	50	-	None
	Pr1.18	Control switch hystere	33	0	20000	33	-	None
	Pr1.19	Gain switching time	33	0	10000	33	0.1ms	None
	Pr1.35	Positional command f	0	0	200	0	0.05ns	valid after restar
	Pr1.37	Special function regis	0	0	7FFF	0	-	None

In this window, users can set the values of parameter about gain adjustment.



Vibration suppression

arameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
0.Basic setting 1.Gain adjustment	Pr2.00	Adaptive filter mode s	0	0	4	0	-	None
2. Vibration Restrain Function	Pr2.01	1st notch frequency	2000	50	2000	2000	Hz	None
3.Speed, Torque Control	Pr2.02	1st notch width selecti	2	0	20	2	-	None
4.I/F Monitor Setting	Pr2.03	1st notch depth select	0	0	99	0	-	None
5.Extended Setup 6.Special Setup	Pr2.04	2nd notch frequency	2000	50	2000	2000	Hz	None
7.Factory setting	Pr2.05	2nd notch width select	2	0	20	2	-	None
	Pr2.06	2nd notch depth sele	0	0	99	0	-	None
	Pr2.07	3rd notch frequency	2000	50	2000	2000	Hz	None
	Pr2.08	3rd notch width selecti	2	0	20	2	-	None
	Pr2.09	3rd notch depth selec	0	0	99	0	-	None
	Pr2.14	1st damping frequency	0	0	2000	0	0.1Hz	None
	Pr2.16	2nd damping frequen	0	0	2000	0	0.1Hz	None
	Pr2.22	Positional command	0	0	32767	0	0.1ms	None
	Pr2.23	Positional command	0	0	10000	0	0.1ms	None

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

Velocity torque control

3 🖪 1 🚹	a r	2 0						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
≥r0.Basic setting ≥r1.Gain adjustment	Pr3.00	Velocity setup interna	0	0	3	0	-	None
r2.Vibration Restrain Function	Pr3.01	Speed command rot	0	0	1	0	-	None
r3.Speed, Torque Control	Pr3.02	Speed command inp	500	10	2000	500	rpm/V	None
Pr4.I/F Monitor Setting	Pr3.03	Speed command rev	0	0	1	0	-	None
r5.Extended Setup r6.Special Setup	Pr3.04	1st speed setup	0	-10000	10000	0	r/min	None
r7.Factory setting	Pr3.05	2nd speed setup	0	-10000	10000	0	r/min	None
	Pr3.06	3rd speed setup	0	-10000	10000	0	r/min	None
	Pr3.07	4th speed setup	0	-10000	10000	0	r/min	None
	Pr3.08	5th speed setup	0	-10000	10000	0	r/min	None
	Pr3.09	6th speed setup	0	-10000	10000	0	r/min	None
	Pr3.10	7th speed setup	0	-10000	10000	0	r/min	None
	Pr3.11	8th speed setup	0	-10000	10000	0	r/min	None
	Pr3.12	time setup acceleration	100	0	10000	100	ms/(1	None
	Pr3.13	time setup decelerati	100	0	10000	100	ms/(1	None
	Pr3.14	Sigmoid acceleration	0	0	1000	0	ms	Valid after serv
	Pr3.15	Speed zero-clamp fu	0	0	3	0	-	None
	Pr3.16	Speed zero-clamp le	30	0	2000	30	r/min	None
	Pr3.17	Torque command int	0	0	2	0	-	None
	Pr3.18	Torque command dir	0	0	1	0	-	None
	Pr3.19	Torque command inp	30	10	100	30	0.1V/1	None
	Pr3.20	Torque command inp	0	0	1	0	-	None

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



Monitor setup

Pr4.01 input selection SI2 0 0 FF 0 - Hexadecim Pr2.Vibration Restrain Function Pr4.02 input selection SI3 0 0 FF 0 - Hexadecim Pr4.01 input selection SI3 0 0 FF 0 - Hexadecim Pr4.02 input selection SI3 0 0 FF 0 - Hexadecim Pr4.03 input selection SI5 0 0 FF 0 - Hexadecim Pr4.04 input selection SI6 0 0 FF 0 - Hexadecim Pr4.05 input selection SI7 0 0 FF 0 - Hexadecim Pr4.06 input selection SI8 0 0 FF 0 - Hexadecim Pr4.01 output selection S01 1 0 FF 0 - Hexadecim Pr4.10 output selection S02 2 0 FF 1 - Hexadecim Pr4.11 output selection S03 4 0 FF<			2 0						
Pr1.Gain adjustment Pr2.Vibration Restrain Function Pr3.Speed, Torque Control Pr4.01 input selection SI2 00FF3-Hexadecim Hexadecim Hexadecim Pr4.02 input selection SI3 000FF0-Hexadecim Hexadecim Hexadecim Pr4.02 input selection SI3 000FF0-Hexadecim Hexadecim Pr4.03Pr4.02input selection SI3 000FF0-Hexadecim Hexadecim Pr4.04Pr4.03input selection SI3 00FF0-Hexadecim Hexadecim Pr4.04Pr4.04input selection SI600FF0-Hexadecim Hexadecim Pr4.05Pr4.05input selection SI600FF0-Hexadecim Hexadecim Pr4.06Pr4.06input selection SI700FF0-Hexadecim Hexadecim Pr4.06Pr4.06input selection SI800FF0-Hexadecim Pr4.06Pr4.06input selection SI900FF0-Hexadecim Pr4.06Pr4.07input selection S0110FF0-Hexadecim Pr4.06Pr4.08input selection S0220FF0-Hexadecim Pr4.11Pr4.14output selection S0340FF3-Hexadecim Pr4.22Pr4.14output selection S0510FF3-Hexadecim Pr4.22Pr4.14output selection S05		Number	Name	Value	Min	Мах	Default	Unit	Remark
Pr2.Vibration Restrain Function Pr4.01 input selection Sl2 0 0 FF 0 - Hexadecim Pr3.Speed, Torque Control Pr4.02 input selection Sl3 0 0 FF 0 - Hexadecim Pr4.02 input selection Sl3 0 0 FF 0 - Hexadecim Pr4.03 input selection Sl4 0 0 FF 0 - Hexadecim Pr5.Extended Setup Pr4.04 input selection Sl5 0 0 FF 0 - Hexadecim Pr4.05 input selection Sl6 0 0 FF 0 - Hexadecim Pr4.06 input selection Sl7 0 0 FF 0 - Hexadecim Pr4.07 input selection Sl8 0 0 FF 0 - Hexadecim Pr4.10 output selection SO1 1 0 FF 0 - Hexadecim Pr4.10 output selection SO2 2 0 FF 1 - Hexadecim Pr4.11 <t< td=""><td></td><td>Pr4.00</td><td>input selection SI1</td><td>3</td><td>0</td><td>FF</td><td>3</td><td>—</td><td>Hexadecimal,</td></t<>		Pr4.00	input selection SI1	3	0	FF	3	—	Hexadecimal,
Pr4.0F Input selection SI4 0 0 FF 0 - Hexadecim Pr5.Extended Setup Pr4.03 input selection SI5 0 0 FF 0 - Hexadecim Pr4.04 input selection SI5 0 0 FF 0 - Hexadecim Pr4.05 input selection SI6 0 0 FF 0 - Hexadecim Pr4.05 input selection SI7 0 0 FF 0 - Hexadecim Pr4.05 input selection SI8 0 0 FF 0 - Hexadecim Pr4.06 input selection SI8 0 0 FF 0 - Hexadecim Pr4.07 input selection SO1 1 0 FF 0 - Hexadecim Pr4.10 output selection SO2 2 0 FF 1 - Hexadecim Pr4.11 output selection SO3 4 0 FF 3 -		Pr4.01	input selection SI2	0	0	FF	0	-	Hexadecimal,
Pr6.5 Extended Setup Pr4.03 input selection SI4 0 0 Pr 0 - Hexadecim Pr6.5 Special Setup Pr4.04 input selection SI5 0 0 FF 0 - Hexadecim Pr4.05 input selection SI6 0 0 FF 0 - Hexadecim Pr4.05 input selection SI6 0 0 FF 0 - Hexadecim Pr4.06 input selection SI7 0 0 FF 0 - Hexadecim Pr4.07 input selection SI8 0 0 FF 0 - Hexadecim Pr4.08 input selection S01 1 0 FF 0 - Hexadecim Pr4.10 output selection S02 2 0 FF 1 - Hexadecim Pr4.12 output selection S03 4 0 FF 3 - Hexadecim Pr4.14 output selection S05 1 0 FF 3 - Hexadecim Pr4.13 output selection S05 1		Pr4.02	input selection SI3	0	0	FF	0	-	Hexadecimal,
Pr4.04 input selection SI5 0 0 FF 0 - Hexadecim Pr4.05 input selection SI6 0 0 FF 0 - Hexadecim Pr4.06 input selection SI7 0 0 FF 0 - Hexadecim Pr4.07 input selection SI8 0 0 FF 0 - Hexadecim Pr4.08 input selection SI9 0 0 FF 0 - Hexadecim Pr4.10 output selection SI9 0 0 FF 0 - Hexadecim Pr4.10 output selection SO1 1 0 FF 0 - Hexadecim Pr4.11 output selection SO2 2 0 FF 1 - Hexadecim Pr4.12 output selection SO3 4 0 FF 3 - Hexadecim Pr4.13 output selection SO5 1 0 FF 3 - Hexadecim Pr4.14 output selection SO5 1 0 FF 3 -		Pr4.03	input selection SI4	0	0	FF	0	-	Hexadecimal,
Pr4.05 input selection SI6 0 0 FF 0 - Hexadecim Pr4.06 input selection SI7 0 0 FF 0 - Hexadecim Pr4.07 input selection SI8 0 0 FF 0 - Hexadecim Pr4.08 input selection SI9 0 0 FF 0 - Hexadecim Pr4.09 output selection S09 0 0 FF 0 - Hexadecim Pr4.09 output selection S01 1 0 FF 0 - Hexadecim Pr4.10 output selection S02 2 0 FF 1 - Hexadecim Pr4.11 output selection S03 4 0 FF 2 - Hexadecim Pr4.12 output selection S03 4 0 FF 3 - Hexadecim Pr4.13 output selection S05 1 0 FF 3 - Hexadecim Pr4.14 output selection S06 3 0 FF 3 -		Pr4.04	input selection SI5	0	0	FF	0	-	Hexadecimal,
Pr4.07input selection S1800FF0-HexadecimPr4.08input selection S1900FF0-HexadecimPr4.10output selection S0110FF1-HexadecimPr4.11output selection S0220FF2-HexadecimPr4.12output selection S0340FF4-HexadecimPr4.13output selection S0430FF3-HexadecimPr4.14output selection S0510FF1-HexadecimPr4.15output selection S0630FF3-HexadecimPr4.15output selection S0630FF3-HexadecimPr4.24Analog input 1(Al 1) of0-1860186005.37mvNonePr4.24Analog input 1(Al 1) o001000.1/VNonePr4.28Analog input 3(Al 3) of0-1860186005.37mvNone		Pr4.05	input selection SI6	0	0	FF	0	-	Hexadecimal,
Pr4.08input selection SI900FF0-HexadecimPr4.10output selection SO110FF1-HexadecimPr4.11output selection SO220FF2-HexadecimPr4.12output selection SO340FF4-HexadecimPr4.13output selection SO430FF3-HexadecimPr4.14output selection SO510FF1-HexadecimPr4.15output selection SO630FF3-HexadecimPr4.15output selection SO630FF3-HexadecimPr4.15output selection SO630FF3-HexadecimPr4.24Analog input 1(Al 1) of0-1860186005.37mvNonePr4.24Analog input 1(Al 1) o001000.1/VNonePr4.28Analog input 3(Al 3) of0-1860186005.37mvNone		Pr4.06	input selection SI7	0	0	FF	0	-	Hexadecimal,
Pr4.10 output selection SO1 1 0 FF 1 - Hexadecim Pr4.11 output selection SO2 2 0 FF 2 - Hexadecim Pr4.12 output selection SO3 4 0 FF 4 - Hexadecim Pr4.12 output selection SO3 4 0 FF 3 - Hexadecim Pr4.13 output selection SO4 3 0 FF 3 - Hexadecim Pr4.14 output selection SO5 1 0 FF 3 - Hexadecim Pr4.15 output selection SO6 3 0 FF 3 - Hexadecim Pr4.15 output selection SO6 3 0 FF 3 - Hexadecim Pr4.22 Analog input 1(Al 1) of 0 -1860 1860 0 5.37mv None Pr4.23 Analog input 1(Al 1) o 0 0 100 0.1/v None Pr4.24 Analog input 3(Al 3) of 0 -1860 1860 0		Pr4.07	input selection SI8	0	0	FF	0	-	Hexadecimal,
Pr4.11 output selection SO2 2 0 FF 2 - Hexadecim Pr4.12 output selection SO3 4 0 FF 4 - Hexadecim Pr4.12 output selection SO3 4 0 FF 3 - Hexadecim Pr4.13 output selection SO4 3 0 FF 3 - Hexadecim Pr4.14 output selection SO5 1 0 FF 3 - Hexadecim Pr4.15 output selection SO6 3 0 FF 3 - Hexadecim Pr4.24 Analog input 1(Al 1) of 0 -1860 1860 0 5.37mv None Pr4.24 Analog input 1(Al 1) o 0 0 100 0.1/∨ None Pr4.28 Analog input 3(Al 3) of 0 -1860 1860 0 5.37mv None		Pr4.08	input selection SI9	0	0	FF	0	-	Hexadecimal,
Pr4.12 output selection SO3 4 0 FF 4 - Hexadecim Pr4.13 output selection SO4 3 0 FF 3 - Hexadecim Pr4.14 output selection SO5 1 0 FF 1 - Hexadecim Pr4.14 output selection SO5 1 0 FF 3 - Hexadecim Pr4.15 output selection SO6 3 0 FF 3 - Hexadecim Pr4.24 Analog input 1(Al 1) of 0 -1860 1860 0 5.37m∨ None Pr4.24 Analog input 1(Al 1) fill 0 0 100 0.1/∨ None Pr4.28 Analog input 3(Al 3) of 0 -1860 1860 0.1/∨ None		Pr4.10	output selection SO1	1	0	FF	1	-	Hexadecimal,
Pr4.13 output selection SO4 3 0 FF 3 - Hexadecim Pr4.14 output selection SO5 1 0 FF 1 - Hexadecim Pr4.15 output selection SO6 3 0 FF 3 - Hexadecim Pr4.25 Analog input 1(Al 1) of 0 -1860 1860 0 5.37m∨ None Pr4.23 Analog input 1(Al 1) fill 0 0 6400 0 0.01ms None Pr4.24 Analog input 1(Al 1) o 0 0 100 0.1∨ None Pr4.28 Analog input 3(Al 3) of 0 -1860 1860 0 5.37m∨ None		Pr4.11	output selection SO2	2	0	FF	2	-	Hexadecimal,
Pr4.14 output selection SO5 1 0 FF 1 - Hexadecim Pr4.15 output selection SO6 3 0 FF 3 - Hexadecim Pr4.22 Analog input 1(Al 1) of 0 -1860 1860 0 5.37m∨ None Pr4.23 Analog input 1(Al 1) fill 0 0 6400 0 0.01ms None Pr4.24 Analog input 1(Al 1) o 0 0 100 0.1∨ None Pr4.28 Analog input 3(Al 3) of 0 -1860 1860 0 5.37m∨ None		Pr4.12	output selection SO3	4	0	FF	4	-	Hexadecimal,
Pr4.15 output selection SO6 3 0 FF 3 — Hexadecim Pr4.22 Analog input 1(Al 1) of 0 -1860 1860 0 5.37mv None Pr4.23 Analog input 1(Al 1) filt 0 0 6400 0 0.01ms None Pr4.24 Analog input 1(Al 1) o 0 0 100 0 0.1V None Pr4.28 Analog input 3(Al 3) of 0 -1860 1860 0 5.37mv None		Pr4.13	output selection SO4	3	0	FF	3	-	Hexadecimal,
Pr4.22 Analog input 1(AI 1) of 0 -1860 1860 0 5.37mv None Pr4.23 Analog input 1(AI 1) filt 0 0 6400 0 0.01ms None Pr4.24 Analog input 1(AI 1) o 0 0 100 0 0.1V None Pr4.28 Analog input 3(AI 3) of 0 -1860 1860 0 5.37mv None		Pr4.14	output selection SO5	1	0	FF	1	-	Hexadecimal,
Pr4.23 Analog input 1 (AI 1) filt 0 0 6400 0 0.01ms None Pr4.24 Analog input 1 (AI 1) o 0 0 100 0 0.1V None Pr4.28 Analog input 3 (AI 3) of 0 -1860 1860 0 5.37mv None		Pr4.15	output selection SO6	3	0	FF	3	-	Hexadecimal,
Pr4.24 Analog input 1(Al 1) o 0 0 100 0 0.1∨ None Pr4.28 Analog input 3(Al 3) of 0 -1860 1860 0 5.37m∨ None		Pr4.22	Analog input 1(AI 1) of	0	-1860	1860	0	5.37mv	None
Pr4.28 Analog input 3(AI 3) of 0 -1860 1860 0 5.37m∨ None		Pr4.23	Analog input 1(AI 1) filt	0	0	6400	0	0.01ms	None
······		Pr4.24	Analog input 1(Al 1) o	0	0	100	0	0.1V	None
Pr4.29 Analog input 3(AL3) filt 0 0 6400 0 0.001ms None		Pr4.28	Analog input 3(AI 3) of	0	-1860	1860	0	5.37mv	None
		Pr4.29	Analog input 3(AI 3) filt	0	0	6400	0	0.01ms	None
Pr4.30 Analog input 3(AI 3) o 0 0 100 0 0.1∨ None		Pr4.30	Analog input 3(AI 3) o	0	0	100	0	0.1V	None

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

Extension setting

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Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr5.00	2nd numerator of elec	10000	0	8388608	10000	-	None
r2.Vibration Restrain Function	Pr5.01	3rd numerator of elect	1	1	10737418	1	-	None
r3.Speed, Torque Control	Pr5.02	4th numerator of elect	1	1	10737418	1	-	None
r4.I/F Monitor Setting r5.Extended Setup	Pr5.04	Inhabit input setup	0	0	2	0	-	None
r6.Special Setup	Pr5.06	Sequence at servo-off	0	0	1	0	-	None
Pr7.Factory setting	Pr5.07	Main power off seque	0	0	9	0	-	None
	Pr5.08	Main power off LV trip	0	0	1	0	-	None
	Pr5.09	Main power off detecti	70	70	2000	70	ms	None
	Pr5.10	Dynamic braking mo	0	0	2	0	-	valid after resta
	Pr5.11	Torque setup for eme	0	0	500	0	%	None
	Pr5.12	Over-load level setup	0	0	115	0	%	None
	Pr5.13	Over-speed level set	0	0	10000	0	r/min	None
	Pr5.15	I/F reading filter	0	0	255	0	0.1ms	valid after resta
	Pr5.17	Counter clear input se	3	0	4	3	-	None
	Pr5.20	Position setup unit sel	2	0	2	2	-	None
	Pr5.21	Selection of torque limit	0	0	6	0	-	None
	Pr5.22	2nd torque limit	300	0	500	300	%	None
	Pr5.23	Torque limit switching	0	0	99	0	ms/10	None
	Pr5.24	Torque limit switching	0	0	99	0	ms/10	None
	Pr5.28	LED initial status	1	0	35	1	-	None
	Pr5.29	RS485 communicatio	53	0	255	53		None

In this window, users can set the values of parameter about extended function.



Special setting

Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr6.01	Encoder zero positio	0	0	360	0	-	valid after restart
Pr2.Vibration Restrain Function	Pr6.03	JOG trial run comman	0	0	100	0	%	None
Pr3.Speed, Torque Control	Pr6.04	JOG trial run comman	1000	0	10000	400	r/min	None
Pr4.I/F Monitor Setting	Pr6.05	Position 3rd gain vali	0	0	10000	0	ms	None
Pr5.Extended Setup Pr6.Special Setup	Pr6.06	Position 3rd gain scal	100	50	1000	100	%	None
Pr7.Factory setting	Pr6.07	Torque command ad	0	-100	100	0	%	None
	Pr6.08	Positive direction torq	0	-100	100	0	%	None
	Pr6.09	Negative direction tor	0	-100	100	0	%	None
	Pr6.10	Function expansion s	0	0	63	0	-	None
	Pr6.11	Current response setup	100	50	100	100	%	None
	Pr6.14	Emergency stop time	0	0	1000	0	ms	None
	Pr6.20	Distance of trial running	10	0	1200	10	0.1rev	None
	Pr6.21	Waiting time of trial ru	100	0	10000	100	ms	None
	Pr6.22	Cycling times of trial r	5	0	10000	5	-	None
	Pr6.25	Acceleration of trial ru	100	0	10000	200	-	None
	Pr6.63	Position upper Limit o	0	0	32766	0	r	valid after restart

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

Factory setup

ă 🖪 🕆 🖬		20						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr7.00	Current loop gain	1500	100	5000	1000	Hz	None
Pr2.Vibration Restrain Function	Pr7.01	Current loop integral ti	500	1	10000	500	0.1ms	None
Pr3.Speed, Torque Control	Pr7.02	Motor rotor initial posit	177	0	360	0	-	valid after resta
Pr4.I/F Monitor Setting	Pr7.03	Reserved parameters	0	0	32767	0	-	valid after resta
Pr5.Extended Setup Pr6.Special Setup	Pr7.04	Reserved parameters	0	0	32767	0	-	valid after resta
Pr7.Factory setting	Pr7.05	Motor pole pairs	4	1	20	4	-	valid after resta
	Pr7.06	Motor phase resistor	300	1	10000	100	0.01 <mark>Ω</mark>	valid after resta
	Pr7.07	Motor D/Q inductance	630	1	10000	700	0.01mH	valid after resta
	Pr7.08	Motor back EMF coef	420	100	10000	1000	0.1V/(valid after resta
	Pr7.09	Motor torque coefficient	35	1	1000	80	0.01N	valid after resta
	Pr7.10	Motor rated speed	3000	100	10000	2000	r/min	valid after resta
	Pr7.11	Motor maximum speed	5000	100	10000	2500	r/min	valid after resta
	Pr7.12	Motor rated current	400	1	3000	280	0.01A	valid after resta
	Pr7.13	Motor rotor interia	32	1	32767	250	0.01K	valid after resta
	Pr7.14	Motor power selection	400	10	32767	750	W	valid after resta
	Pr7.15	Motor model input	26	0	7FFF	200	-	Hexadecimal,
	Pr7.16	Encoder selection	0	0	200	0	-	valid after resta
	Pr7.17	Motor maximum current	300	1	500	300	%	valid after resta
	Pr7.18	Encoder index angle	177	0	360	0	-	None
	Pr7.19	Reserved parameters	1	0	500	1	-	None
	Pr7.20	Drive model input	0	-32767	32767	0	-	Hexadecimal,

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

If the motor isn't included in motor library, then users 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.

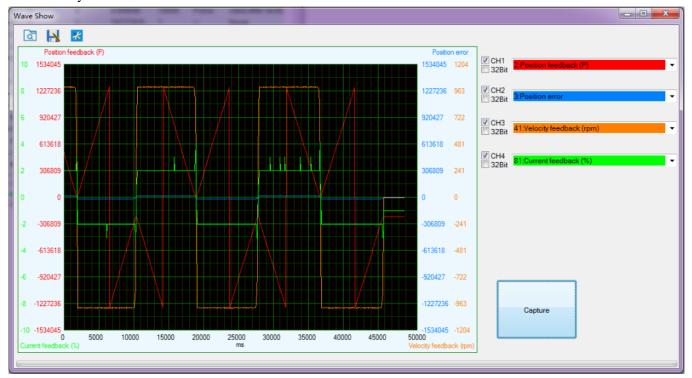
In general, we can't see all the parameters like the picture above, we can make some operation to see all of them, just refer to the appendix about how to find the hidden parameter.



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

2.4 Wave Show

If users want to see monitor the status of performance when the motor is running, for example, the driver and motor are running position feedback, position error, velocity feedback and current feedback, users can click to analysis these data.



ه

Load wave file from the computer.



Save current wave record as wave file.



Wave capture setting.

Sampling interval:

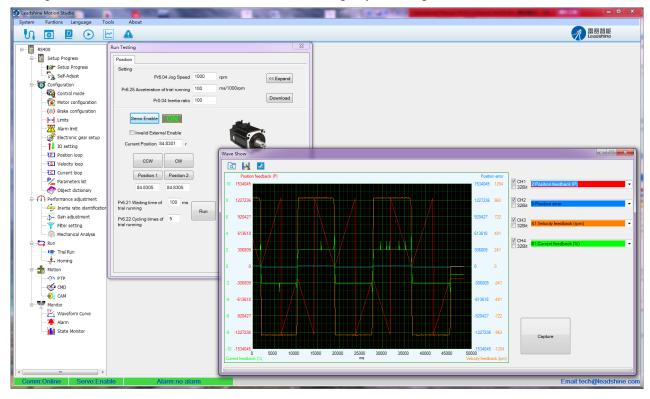
The time value of sampling interval.



There is position mode in run testing.

Position Mode Tuning Window

In position mode, the parameter what users need to adjust is Jog Speed, ACC time, Inertia ratio, etc. users can setup real-time auto adjust mode, then adjust real-time auto adjust rigidity. Users need to decrease the rigidity for better performance. If the noise exists while it means the rigidity is too big.



1. Set parameters for run testing:

Specially pay attention to Pr0.03 Stiffness and Pr0.04 Inertia ratio which strongly corresponding to better performance

2、Run testing guidance

Click button "Servo enable"

Click "CCW" to make motor run to CCW direction, click "Position 1" to save the testing position limit 1 Click "CW" to make motor run to CW direction, click "Position 2" to save the testing position limit 2 Click "Run" to start Testing progress

3. During the Run Testing progress, the wave show monitor the performance of the current parameters setting.

n Testing)				2
Position					
Setting				1	
	Pr6.0)4 Jog Speed	1000	rpm	<< Expand
Pr6.25	Acceleration o	f trial running	200	ms/1000rpm	
	Pr0.0	4 Inertia ratio	250]	Download
s	ervo Enable	ON			
				and a	
	Invalid Externa	al Enable		19	
Curre	ent Position 56	.9990 r			SP.
[0.11		U	
l	CCW	CW			
	Position 1	Position 2			
	56.9989	56.9989			
	Vaiting time of	100 ms			
trial runn	iing		Run		
Pr6.22 C trial runr	ycling times of iing	2			



4.1 Current alarm

Click the "

Then the window showing like this:

A	larm						×
	Current History	Cause of non-rotation					
	Alarm Code	Alarm Name	Alarm ID	Alarm Reason	Alarm Check	Alarm Handle	
	Err000	no alarm					

Users can see the alarms after power on, the alarm will be eliminated after power off .

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, users need to click clear history alarm, it will clear all of history alarms.

	History	Cause of non-rotation						
arm Co	ode	Alarm Name	Alarm ID	Alarm Reason	Alarm Check	Alarm Handle		
150		encoder line brea						
240		CRC verification e						
150		encoder line brea						
150		encoder line brea						
000		no alarm						
000		no alarm						
000		no alarm						
000		no alarm						
000		no alarm						
000		no alarm						
			•					•
			Alarm ID	Name			Value	-
			0	Error Time(s)			213	
			1	Speed of Positio	n Command(rpm)		0	
			2	Relative Position	Error(P)		0	
			3	Speed Comman	d(rpm)		0	
			4	Motor Speed(rpr	n)		0	E
			5	Alarm Motor Tor	que(0.10%)		0	
			6	AlarmCurrentPha	aseU(0.10%)		0	
			7	AlarmCurrentPha	aseW(0.10%)		0	
			8	Alarm DC Bus Vo	oltage(0.1V)		283	
			9	Alarm Driver Ten	nperature(°C)		1	
			10	Alarm Pulse Inst			21474	
			11	Alarm Pulse Fee	dbackAlarm Pulse Inte	erfere	124645	-



4.3 The reasons of servo stop running

A	Alarm								
ſ	Current History	Cause of non-rotation							
	Alarm Code	Alarm Name	Comment						
	Err002	No signal for servo-enable	No signal for servo-enable						
	•		4						
			Analyze						

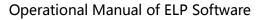
Click analysis, the window will appear about the reason of no running.

4.4 Tool

Serial port tool

Tools		
Communication	۱	
Port: COM1	. 💌 Baudrate 38400 💌 Databit: 🖉 💌 Stopbit: 1 💌 Parity: Mone 💌 State:Close	Open
NO.: 01	@ Read: 01 Address 20 Return HEX: DEC: EIN:	Send
NO.: 01	© Read: 01 Address 21 Return HEX: DEC: EIN:	Send
NO. : 01	@ Read: D1 Address 22 Return HEX: DEC: BIN:	Send
NO. : 01	6 Read: 01 Address 23 Return HEX: DEC: BIN:	Send
NO.: 01	6 Read: 01 Address 24 Return MEX: DEC: BIN: DEC: BIN:	Send
NO.: 01	@ Read: D1 Address 25 Return HEX: DEC: EIN: C Write: DD	Send
NO.: 01	6 Read: 01 Address 28 Return HEX: DEC: EIN:	Send
NO. : 01	6 Read: 01 Address 27 Return HEX: DEC: ELN: ELN:	Send
NO. : 01	6 Resd: 01 C Write: 00 Address 28 Return MEX: DEC: ELN:	Send
NO. : 01	6 Read: 01 Address 29 Return HEX: DEC: EIN:	Send
	Save Settings	

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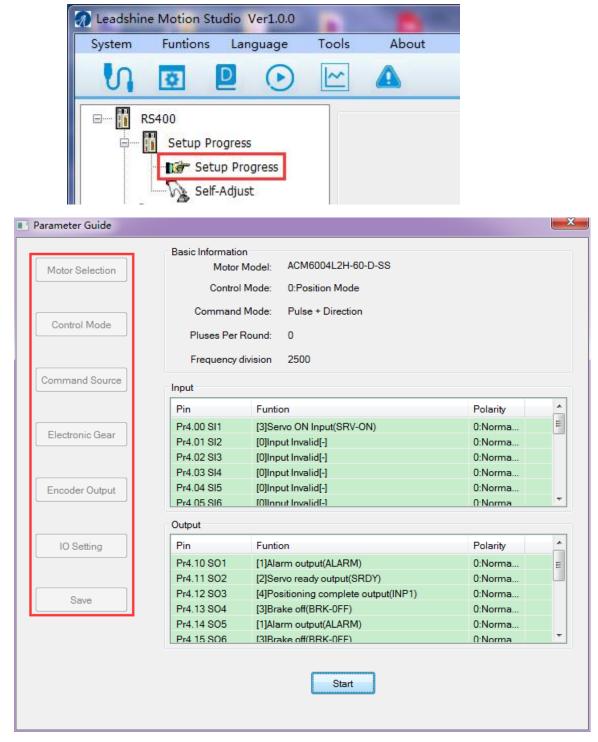


Chapter 5 Configuring the Driver

5.1 Setup progress

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The debug software for ELP series is newly designed. To configure a new drive, users can follow the *Setup Progress* to set the parameters for special application.



To follow the setup progress, there are 6 steps :

1. Motor Selection



The motor model is automatically detect by serial communication of encoder, so users could go to the 2^{nd} Step—> Control Mode

2. Control Mode

There are 3 modes for selection, select the control mode according to mechanical system and the application.

- Position Mode: Mainly for positioning application. (Pulse+Direction / CW+CCW/A+B phase)
- Velocity Mode: Mainly for velocity application. (Analog / Internal Speed / Analog and Internal Speed)
- Torque Mode: Mainly for torque application. (Analog)

Parameter Guide		×
Motor Selection Control Mode	Pr0.01 Control mode 0:Position Mode 🔹	
Command Source		
Electronic Gear		
Encoder Output		
IO Setting		
Save		
	Back Next	

3. Command Source

Select the command source according to the control mode and controller command source. The command source for each control mode is showing as follows:

- Position Mode: (Pulse+Direction / CW+CCW/A+B phase)
- Velocity Mode: (Analog / Internal Speed / Analog and Internal Speed)
- Torque Mode: (Analog)

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4. Electronic Gear

When the transmission structure is screw:

Pulses per round = Screw lead / Pulse equivalent

When the transmission structure is rack and pinion:

Pulses per round = (Modulus*Number of pinion*Helical angle*3.1415627) / (Gear ratio*Pulse equivalent)

5. Encoder Output

The output pulses counts per motor revolution = Pulses Per Round / 4

6. IO Setting

There are 9 inputs, the function of general-purpose input is selected by parameters. **Inputs functions:**

Servo-ON, Alarm clear, Positive/Negative Limit, Control mode switching, Gain switching, Deviation counter clear, Command pulse inhibition, Electronic gear switching, Torque limit switching, Speed zero clamp, Speed command sign input, Torque command sign input, E-STOP, Inertia ratio switching, Internal speed selection.

There are 6 outputs, the function of general-purpose input is selected by parameters.

Outputs functions:

Alarm output, Servo-Ready, Positioning complete, At-speed, Zero-speed, Velocity consistent, Positional command ON/OFF, Servo-ON, Home-OK.

The polarity of inputs and outputs can be configured as normally open or normally closed. If users select normally open, the external connection is needed. If users select normally closed, the external connection is no need.

7. Save

After the all the configuration, users should save the parameters into NVM. (Non-Volatile Memory)



Before running ELP series driver, users 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, users can tune the parameter with ProTuner software.

5.2 Torque mode

The command resource of torque mode is *Analog Input*, via AI3 send $\pm 10V$ analog input signal, in torque mode, users can't see waveform curve, but users can setup related parameters with torque mode.

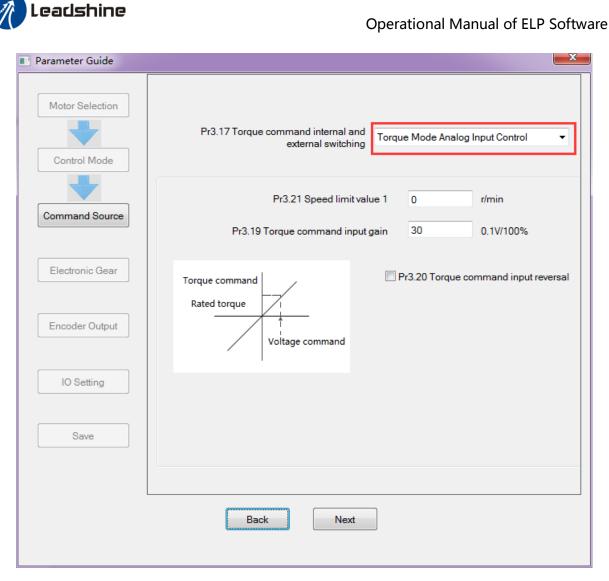
5.2.1 Setup progress —Control Mode window

Parameter Guide		x
Motor Selection Control Mode	Pr0.01 Control mode	
Command Source		
Electronic Gear		
Encoder Output		
IO Setting		
Save		
	Back Next	

In setup progress—Control Mode window, users need to set Pr0.01=2 to select Torque Mode.

5.2.2 Setup progress —Command Source window

Users need select the Torque Mode Analog Input Control as command resource for torque mode; (待替换)



5.2.3 Setup progress — IO Setting window

Then in setup progress—IO Setting(Input) window, users need select Pr4.00 SI1 as *Servo ON Input* to make motor enable.

Users can select SI2~SI9 input as other functions. Such as : Alarm clear, Positive limit, Negative limit . etc

Then in setup progress—IO Setting(Output) window, users can select SO1~SO6 output as other functions. Such as : *Alarm output*, *Servo ready output*. etc

5.2.4 Save the setting

After the all the configuration, users should save the parameters into NVM. (Non-Volatile Memory) Then users need to download and save the new settings to the driver, then restart the power supply or software reset to make new values of parameters valid.

5.2.5 Operation

When users have finished the above all of these parameters setting, users can give analog input AI3 signal to drive by CN1 port. The motor will work in torque mode, if users aren't satisfied with the performance of motor, users can continue adjusting related torque parameter.

About the tuning of current loop gain

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



arameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark
r0.Basic setting	Pr7.00	Current loop gain	1500	100	5000	1000	Hz	None
r1.Gain adjustment r2.Vibration Restrain Function	Pr7.01	Current loop integral time	500	1	10000	500	0.1ms	None
3.Speed, Torque Control	Pr7.02	Motor rotor initial position a	177	0	360	0	-	valid afte
r4.I/F Monitor Setting	Pr7.03	Reserved parameters	0	0	32767	0	-	valid afte
5.Extended Setup 6.Special Setup	Pr7.04	Reserved parameters	0	0	32767	0	-	valid afte
r8.Special Setup r7.Factory setting	Pr7.05	Motor pole pairs	4	1	20	4	-	valid afte
	Pr7.06	Motor phase resistor	300	1	10000	100	0.01 <mark>Ω</mark>	valid afte
	Pr7.07	Motor D/Q inductance	630	1	10000	700	0.01mH	valid afte
	Pr7.08	Motor back EMF coefficient	420	100	10000	1000	0.1V/(valid afte
	Pr7.09	Motor torque coefficient	35	1	1000	80	0.01N	valid afte
	Pr7.10	Motor rated speed	3000	100	10000	2000	r/min	valid afte
	Pr7.11	Motor maximum speed	5000	100	10000	2500	r/min	valid afte
	Pr7.12	Motor rated current	400	1	3000	280	0.01A	valid afte
	Pr7.13	Motor rotor interia	32	1	32767	250	0.01K	valid afte
	Pr7.14	Motor power selection	400	10	32767	750	W	valid afte
	Pr7.15	Motor model input	26	0	7FFF	200	-	Hexadeo
	Pr7.16	Encoder selection	0	0	200	0	-	valid afte
	Pr7.17	Motor maximum current	300	1	500	300	%	valid afte
	Pr7.18	Encoder index angle comp	177	0	360	0	-	None
	Pr7.19	Reserved parameters	1	0	500	1	-	None
	Pr7.20	Drive model input	0	-32767	32767	0	_	Hexadeo



5.3 Velocity mode

The command resource of velocity mode is *Analog input / Internal Speed / Internal Speed and Analog*, via AI1 send ± 10 V analog input signal, in velocity mode, users can setup related parameters with velocity mode.

5.3.1 Setup progress — Control Mode window

Parameter Guide		×
Motor Selection	Pr0.01 Control mode 1:Velocity Mode 🗸	
a . 11		

In setup progress—Control Mode window, users need to set Pr0.01=1 to select Velocity Mode.

5.3.2 Setup progress —Command Source window

Users select the command resource for velocity mode

A : Select Pr3.00—Analog Input as velocity mode command resource

The command of speed mode is *Analog Input*, via AI1 send $\pm 10V$ analog input signal, in speed mode, we can setup related parameter with speed mode.

Then set other parameters related to Velocity Mode—Analog Input, such as Pr3.02 Speed command input gain, Pr3.12~Pr3.14(Acc and Dec), Pr3.15 Speed zero-clamp function selection, Pr3.16 Speed zero-clamp level.

Parameter Guide		×
Motor Selection	Pr3.00 Velocity setup Analog Input	
Control Mode	Pr3.02 Speed command input 300 rpm/V Velocity command	
Command Source	CurrentVoltage V	
Command Source	Pr3.03 Speed command reversal input Acc Dec Config	
Electronic Gear	Pr3.12 Acceleration time setup 100 ms	
Encoder Output	Pr3.13 Deceleration time setup 100 ms Pr3.14 Sigmoid acceleration/deceleration 0 ms time setup	
	Zero Speed Clamp Config	
IO Setting	Pr3.15 Speed zero-clamp function selection 2:Pr3.16 Set zero speed	
	Pr3.16 Speed zero-clamp level 30	
Save		
	Back Next	



Pr3.00	Speed setup, Inte	rnal /External	F	Range	unit	default	Related control mode
P15.00	switching			0 -3	-	0	S
This drive contact in	r is equipped with inte	rnal speed setup funct	ion s	so that u	isers can con	trol the sp	eed with
Setup va		ethod					
0	Analog speed co						_
1	~ .	ommand 1st to 4th spe	ed(F	PR3.04-	PR3.07)		
2	*	ommand 1st to 3rd spe					
2	Analog speed co						
3		ommand 1st to 8th spe					
	ship between Pr3.00 l					the inter	nal
	speed selection 1-3 a					1	tion of
Setup	selection 1 of internal command	selection 2 of intern command speed	nai		on 3 of al command	Speed	tion of
value	speed(INTSPD1)	(INTSPD2)			(INTSPD3)	comm	
1	OFF	OFF		NO ef		1st sp	beed
	ON	OFF				2nd s	peed
	OFF	ON				3rd s	peed
	ON	ON				4th sp	
2	OFF	OFF				1st sp	
	ON	OFF				2nd s	•
	OFF	ON				3rd s	
	ON	ON				Analo comm	og speed nand
3	The same as [Pr3.00	The same as [Pr3.00=1]				1st to speed	
	OFF	OFF		ON		5th s	
	ON	OFF		ON		6th s	
	OFF	ON		ON		7th sp	
D 2 02	Transformed and an		Ra	ange unit d		default	Related control mode
Pr3.02	Input gain of spee	ed command	10 -	2000	(r/min)/v	500	S T
	the voltage applied to t	he analog speed comm	nand	l (SPR),	set up the co	onversion	gain to
	nmand speed.	1	1	•	. 1 1		
	set up "slope" of relat						, with
Notice:	erault 18 set to F15.02-	500(1/1111)/ v, fience in	iput		ecomes 5000	/1/111111.	
	apply more than ±10V	to the speed command	d inn	out(SPR).		
	sers compose a position	-	-			e driver in	velocity
	ode, the setup of Pr3.02						•
3. Pay an	extra attention to oscill	ation caused by larger	setu	up of Pr	3.02.		
		Positive direction					
		Speed (r/min)					
		3000 →	/				
	Slope at ex-fact		Con -300	0	- put voltage (V)		
		Ne	egativ	e direction	n		



Dr2 02	Pr3.03 Reversal of speed command input		command input	Range	unit	default	R contr	elate ol m	
P15.05			command input	0 -1	-	0		S	
Specify the polarity of the voltage applied to the analog speed command (SPR).									
Setup va	value Motor rotating direction								
0		Non-reversal	[+ voltage] ->[+ direction]	[- voltage] → [-direction]]
1		reversal	[+ voltage] \rightarrow [- direction] [- voltage] \rightarrow [+direction]]
Caution:	When	n users compose th	e servo drive system with thi	s driver se	t to ve	locity cont	rol m	ode	

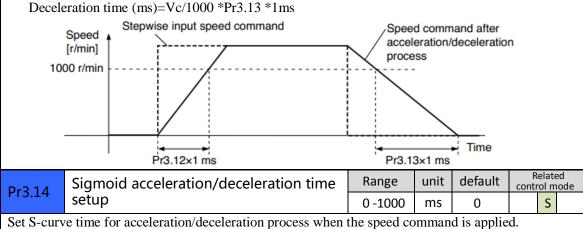
Caution: When users compose the servo drive system with this driver set to velocity control mode and external positioning unit, the motor might perform an abnormal action if the polarity of the speed command signal from the unit and the polarity of this parameter setup does not match.

Pr3.12	time setup acceleration	Range	unit	default	Related control mode
PIS.12 time setup acceleration		0 -10000	Ms(1000r/min)	100	S
Pr3.13	time setup deceleration	Range	unit	default	Related control mode
P15.15	time setup deceleration	0 -10000	Ms(1000r/min)	100	S

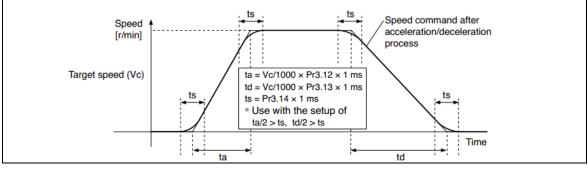
Set up acceleration/deceleration processing time in response to the speed command input. Set the time required for the speed command(stepwise input)to reach 1000r/min to Pr3.12 Acceleration time setup. Also set the time required for the speed command to reach from 1000r/min to 0 r/min, to Pr3.13 Deceleration time setup.

Assuming that the target value of the speed command is Vc(r/min), the time required for acceleration/deceleration can be computed from the formula shown below.

Acceleration time (ms)=Vc/1000 *Pr3.12 *1ms



Set S-curve time for acceleration/deceleration process when the speed command is applied. According to Pr3.12 Acceleration time setup and Pr3.13 Deceleration time setup, set up sigmoid time with time width centering the inflection point of acceleration/deceleration.





Pr3.15	Speed zero-clamp function selection	Range	unit	default	Related control mode			
FIJ.LJ	speed zero-clamp function selection	0 -3	-	0	S			
	3.15=0, the function of zero clamp is forbidden.							
velocity which is controlled by the analog voltage input 1 even if the velocity is less than 10								
rpm. The motor runs no matter what the value of Pr3.16 is. The actual velocity is controlled by								
external the analog voltage input.								
2. If Pr3	3.15=1 and the input signal of Zero Speed is ava	ilable in the	same tim	e, the fund	ction of zero			
clam	p works. It means motor will stop rotating in ser	vo-on cond	ition no n	natter what	the			
veloc	city of motor is, and motor stop rotating no matte	er what the	value of P	r3.16 is.				
3. If Pr.	3.15=2, the function of zero clamp belongs to the	ne value of I	Pr3.16. If	the actual	velocity is			
less t	han the value of Pr3.16, the motor will stop rota	ting in serv	o-on cond	lition.				
Pr3.16	Speed zero-clamp level	Range	unit	default	Related control mode			
P15.10	Speed zero-clamp level	0 -20000	r/min	30	S			
When ana	log speed given value under speed control mode	loss than z	aro speed	clamp law	al catur			

When analog speed given value under speed control mode less than zero speed clamp level setup, speed command will set to 0 strongly.

B : Select Pr3.00—8 Internal Speed as velocity mode command resource

Motor Selection		Velocity set	up 8 Inte	ernal Spe	eed		•	
Motor Selection	Internal Speed							
	Pr3.04 1st speed	100	rpm	Pr3	.08 5th spe	ed	500	rpm
Control Mode	Pr3.05 2nd speed	200	rpm	Pr3	.09 6th spe	ed	600	rpm
	Pr3.06 3rd speed	300	rpm	Pr3	.10 7th spe	ed	700	rpm
Command Source	Pr3.07 4th speed	400	rpm	Pr3	.11 8th spe	ed	800	rpm
Encoder Output	Acc and Dec Setting				100			
	Pr3.12 Acceler	ation time s	etup		100	ms/1	000rpm	
IO Setting	Pr3.13 Decele	ration time	setup		100	100 ms/1000rpm		
	Pr3.14 Sigmoi time setup	d accelerati	on/decelera	tion	30 ms			
Save								
	D	ick	Next					

Then set other parameters related to Velocity Mode—8 Internal Speed, such as Pr3.04~Pr3.11, Pr3.12~Pr3.14(Acc and Dec)



5.3.3 Setup progress — IO Setting window

A, For Analog Input as velocity mode command resource

In setup progress—IO Setting(Input) window , users need select Pr4.00 SI1 as *Servo ON Input* to make motor enable.

Users can select SI2~SI9 input as other functions. Such as : Alarm clear, Positive limit, Negative limit . etc

In setup progress—IO Setting(Output) window, users can select SO1~SO6 output as other functions. Such as : *Alarm output*, *Servo ready output*. etc

B、 For 8 Internal Speed as velocity mode command resource

In setup progress—IO Setting(Input) window, users need select Pr4.00 SI1 as *Servo ON Input* to make motor enable.

Users need select SI2~SI4 inputs as Selection 1~3 input of internal command speed

Selection 1 of internal command speed(INTSPD1)	Selection 2 of internal command speed (INTSPD2)	Selection 3 of internal command speed (INTSPD3)	Selection of Speed command
OFF	OFF	OFF	1st speed
ON	OFF	OFF	2nd speed
OFF	ON	OFF	3rd speed
ON	ON	OFF	4th speed
OFF	OFF	ON	5th speed
ON	OFF	ON	6th speed
OFF	ON	ON	7th speed
ON	ON	ON	8th speed

Users can select SI5~SI9 input as other functions. Such as : Alarm clear, Positive limit, Negative limit . etc

In setup progress—IO Setting(Output) window, users can select SO1~SO6 output as other functions. Such as : *Alarm output*, *Servo ready output*. etc

5.3.4 Save the setting

After the all the configuration, users should save the parameters into NVM. (Non-Volatile Memory) Then users need to download and save the new settings to the driver, then restart the power supply or software reset to make new values of parameters valid.

5.3.5 Operation

When users have finished the above all of these parameters setting .

A **v** For Analog Input as velocity mode command resource

Users can give analog input AI1 signal to drive by CN1 port. The motor will work in speed mode, if users aren't satisfied with the performance of motor, users can continue adjusting related speed parameter.

B、 For 8 Internal Speed as velocity mode command resource

Users can select one of 8 internal speed by SI inputs signal of CN1 port. The motor will work in speed mode, if users aren't satisfied with the performance of motor, users can continue adjusting related speed parameter.

5.4 Position mode

The command resource of velocity mode is Pulse+Direction / CW + CCW / A + B phase, in position mode, users can setup related parameter with position mode.

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5.4.1 Setup progress —Control Mode window

Parameter Guide			X
Motor Selection Control Mode	Pr0.01 Control mode	0:Position Mode	-

In setup progress—Control Mode window, users need to set Pr0.01=0 to select Position Mode.

5.4.2 Setup progress —Command Source window

Users select the command resource for position mode

Parameter Guide		
Motor Selection	Pr0.07 Command	
Control Mode	Pulse + Direction	Positive direction command Negative direction command PULS PULS SIBN "H"
Command Source	© cw+ccw	
Electronic Gear	◯ A Phase + B Phase	-+ +- 80" -+ +- 80" PULS PULS SIBN SIBN
Encoder Output	🔲 Pr0.06 Comma	nd pulse rotational direction setup
·	Pr0.00 Model following contr	ol Pr0.02 Real-time auto-gain tuning
IO Setting	1	0.1Hz 2:Position 🔻
	Pr1.35 Positional command	filter setup
	0	Hz
Save		
	Back	Next

Then set other parameters related to Position Mode, such as Pr0.06 Command Pulse Rotational Direction Setup, Pr0.00 Mode loop gain, Pr0.02 Real-time Auto-gain Tuning, Pr1.35 Positional command filter setup.

Pr0.06*	Command Pulse Rotational Direction	Range	unit	default		Related control mode		
	Setup	0 -1	-	0	Р			
Set comma	and pulse input rotate direction, command pulse i	input type						

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Pr0.07*	Comma	and Pulse Input N	Inde Setun		Ran	ge	unit	de	fault		ated ol mode
F10.07	Comme		ioue Setup		0 -3	3	-		3	Р	
Pr0.06	Pr0.07	Command Puls	e Format	Sigr	nal	Posit Direc Com			Dire	ative ction imand	
0	0 or 2	90 phase difference 2-phase pulse(A phase +B phase)		Pulse sign				t ^{t1} t ¹ t ¹ t ¹ t ¹ t ¹ B相比A相滞后90°		 90°	
	1		Positive direction pulse + Pulse sign			t2 t2					
	3	Pulse + sign		Pulse sign		t4 t5 t6 t6 t6					
1	0 or 2	90 phase differenc 2 phase pulse(A ph phase)		Pulse sign	!	A相 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		t1 B相	 00°		
	1	Positive direction p negative direction		Pulse sign		t2 t2				_	
	3	Pulse + sign		Pulse sign			t5 "L"	t6			
Command	l pulse inp	ut signal allow large	st frequency a	nd sm	allest	time	width				
PULS/SIG	GN Signal I	nput I/F	Permissible Input Freque		Sma t1	llest T	ime \ t		:h t4	t5	t6
Pulse	Long d	listance interface	500kpps		2	1	1	L	1	1	1
series interface	Open-o	collector output	200kpps		5	2.5	5 2.	.5	2.5	2.5	2.5

Pr0.00	Mode loop gain		Range	unit	defau lt	-	Related trol m	
			0 -2000	0.1Hz	0	Р	S	Т
Set up the	ban	dwidth of MFC, it is similar to the respons	e bandwidth	1				
Setup val	lue	Meaning						
0		Disable the function.						
1		Enable the function, set the bandwidth at	utomatically	,				
1		recommended for most application.						
2-10		Forbidden and reserved.	**					
11-2000)0	Set the bandwidth manually, 1.1Hz – 2000Hz						
MEC	:	and to anhance the nonformance of dynami	a two aim a fam	inmut aam	amaginal			

MFC is used to enhance the performance of dynamic tracing for input command, make positioning faster, cut down the tracking error, run more smooth and steady. It is very useful for multi-axis synchronous movement and interpolation, the performance will be better.

The main way to use this function :

- a. Choose the right control mode : Pr001 = 0
- b. Set up the inertia of ratio : Pr004
- c. Set up the rigidity : Pr003
- d. Set up the Pr000 :
 - 1) If no multi-axis synchronous movement, set Pr000 as 1 or more than 10;
 - 2) If multi-axis synchronous movement needed, set Pr000 as the same for all the axes.
 - 3) If Pr000 is more than 10, start with 100, or 150, 200, 250,

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Caution:

- 1. Set up the right control mode, the right inertia of ratio and rigidity firstly.
- 2. Don't change the value of Pr000 when the motor is running, otherwise vibration occurs
- 3. Set up a small value from the beginning if using it in manual mode, smaller value means running more smooth and steady, while bigger one means faster positioning

Pr0.02	Real-time Aut	ne Auto-gain Tuning		unit	default	F con	ode	
F10.02	Real-time Aut	o-gain runnig	0 -2	-	0	Р	S	т
Users can s	et up the action	node of the real-time auto-gain t	uning.					
Setup valu	ie mode	Varying degree of load inertia	in motion					
0	Manual	Real-time auto-gain tuning function is disabled.						
1	Standard	Basic mode. do not use unbala gain switching	Basic mode. do not use unbalanced load, friction compensation or					
2	Main application is positioning. it is recommended to use this							
Caution: It	F pr0.02=1 or 2,	users can't modify the values of	pr1.01 – p	r1.13, 1	the values	of th	em	

depend on the real-time auto-gain tuning ,all of them are set by the driver itself.

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

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

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

In **Position** 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.

Pr1.35*	positional command filter setup	Range	unit	default	Related control mo		
P11.55	positional command inter setup	0 -200	0.05us	0	Р		
	g for positional command pulse, eliminate the influence the input of high frequency positional			-		-lar	ge
time-delay	ved.						

5.4.3 Setup progress — Electronic Gear window

	Command pulse sounts per one motor	Range	unit	default		Related control mode		
Pr0.08	.08 Command pulse counts per one motor revolution		pulse	0	Р	S	Т	
		608						
Set the con	mmand pulse that causes single turn of the motor	shaft.						
	$8 \neq 0$, the actual turns = pulse number / Pr008							
2) If Pr008	8 = 0, Pr009 1 st numerator of electronic gear and	Pr0.10 D	enominat	tor of elect	ronic	;		
Gear beco	me valid.							
	onomission structure is screwu							

When the transmission structure is screw:

Pulses per round = Screw lead / Pulse equivalent

When the transmission structure is rack and pinion:

Pulses per round = (Modulus*Number of pinion*Helical angle*3.1415627) / (Gear ratio*Pulse equivalent)

				Range	unit	default		elated trol mod	de	
Pr0.09	1st numer	ator of electronic gea	ar	1-10737	-	1	Р			
				41824						
Set the nu	merator of di	vision/multiplication oper	ration mad	e according	to the	command	pulse	input	•	
				Range	unit	default		elated trol mod	de	
Pr0.10	denomina	tor of electronic gear		1-10737	-	1	Р			
				41824						
Set the der input.	nominator of	division/multiplication of	peration m	ade accordi	ng to th	e commai	nd pul	lse		
Pr0.09	Pr0.10	Command division/mul	/multiplication operation							
1-10737 41824	1-10737 41824	Command pulse input		set value]	position command					
(2)7 (3)7 (4)N 2、Ca (1)Y	The driver inp The pulse num The number of Number of tur Iculations: $X = X^* Pr0.09$	ut command pulse number aber of encoder after frequent f pulses per revolution of rns of motor is W / Pr0.10 : Z=2^17 = 131072	uency divi		1 2	doubling	is Y]	
		r: $Z=2^{2}=8388608$								

5.4.4 Setup progress — Encoder Output window

The output pulses counts per motor revolution = Pulses Per Round / 4

5.4.5 Setup progress — IO Setting window

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In setup progress—IO Setting(Input) window, users need select Pr4.00 SI1 as *Servo ON Input* to make motor enable.

Users can select SI2~SI9 input as other functions. Such as : Alarm clear, Positive limit, Negative limit . etc

In setup progress—IO Setting(Output) window, users can select SO1~SO6 output as other functions. Such as : *Alarm output*, *Servo ready output*. etc

5.4.6 Save the setting

After the all the configuration, users should save the parameters into NVM. (Non-Volatile Memory) Then users need to download and save the new settings to the driver, then restart the power supply or software reset to make new values of parameters valid.

5.4.7 Operation

When users have finished the above all of these parameters setting .

Users can give signal to drive by CN1 port. The motor will work in position mode, if users aren't satisfied with the performance of motor, users can continue adjusting related speed parameter.



5.5 Performance adjustment

5.5.1 Inertia ratio identification

Pre-conditions: 1, Servo disable. 2, Positive limit and negative limit invalid **Steps:**

 Set the Jog speed Pr6.04, and the setting should not be too large(600~1000rpm is recommend) Set the Acc Pr6.25(50~100 ms/1000rpm is recommend) Set the Default Inertia Ratio.

Download these settings, then Servo Enable.

2、Click "CCW" to make motor run to CCW direction, click "Position 1" to save the position limit 1 Click "CW" to make motor run to CW direction, click "Position 2" to save the position limit 2 Click "Run" to start Inertia ratio identification.

Inertia Ratio Identification					X
STEP-1					
Pr6.04 Jog Speed	400	rpm		Download	
Pr6.25 Acceleration of trial running	200	ms/100	0rpm		
Default Inertia Ratio	250]		Servo Enable	
				Invalid External Enable	
STEP-2					
			Current 6	2.9497 r	
			CCW	cw	
	6	2.9487	Position 1	Position 2 -0.0033	
Pr6.21 Waiting time of trial running	50	ms	Run		
Pr6.22 Cycling times of trial running	3				
STEP-3		_			
Inertia Ratio	0		Write		

3、After finishing, Click "Write" to save the Inertia ratio identification result



5.5.2 Gain adjustment

To tuning for better performance, users need turning position loop parameters. Users need to open *Run Testing* window.

Users can select different operation mode in real-time automatic adjustment mode, generally select **Position** mode. If users want to adjust gain parameters by yourself, users can select **Manual** mode, then users can adjust related parameter step by step until meet system requirement.

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

Position					
Setting	400			_	
Pr6.04 Jog Speed	400	rpm	Fold >>	>	
Pr6.25 Acceleration of trial running		Pr0.02 Real-time auto-gain tuning	2:Positi		
Pr0.04 Inertia ratio		Pr0.03 Real-time automatic rigidity adjustment	0:Manual 1:Standard		
Servo Enable		Pr0.06 Command pulse rotational direction setup	2:Positi 0	j	
Invalid External Enable		Pr3.03 Speed command reversal input	0]	
Current Position 0.0000 r		Pr1.00 1st position loop gain	320	0.1/s	
CCW CW		Pr1.01 1st velocity loop gain	180	0.1Hz	
Position 1 Position 2]	Pr1.02 1st time constant of velocity loop integration	310	0.1ms	
0.0000 0.0000	_	Pr1.04 1st time constant of torque filter	126	0.01ms	
		Pr1.05 2nd position loop gain	380	0.1/s	
Pr6.21 Waiting time of 100 ms trial running		Pr1.06 2nd velocity loop gain	180	0.1Hz	
Pr6.22 Cycling times of 5 trial running		Pr1.07 2nd time constant of velocity loop integration	10000	0.1ms	
		Pr1.09 2nd time constant of torque filter	126	0.01ms	
		Pr1.10 Velocity feed forward gain	300	0.1%	
		Pr1.12 Torque feed forward gain	0	0.01%	
		Pr1.15 Control mode switching	10]	

In **Manual** mode(Pr0.02=0), users can setup Kp, Ki and other related parameters. During tuning position loop, users can adjust KI to a very small value in advance and hold it constant, then users can enlarge the value of Kp parameter slowly until system oscillation occurs, at this moment users 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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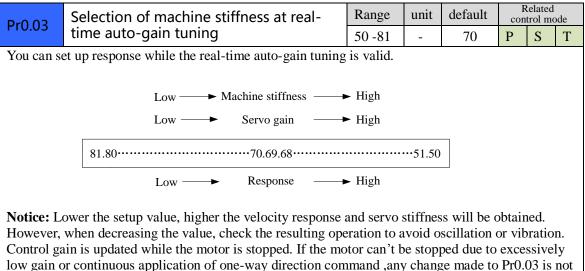
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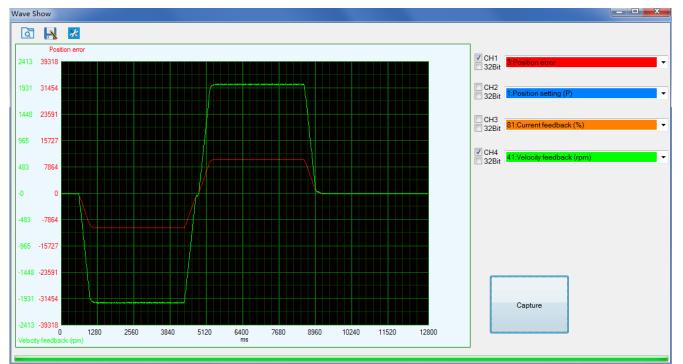
In **Standard** mode(Pr0.02=1), it is usually for interpolation movement. It is unavailable to modify the value of Pr1.00- 1.14, we just change the value of Pr0.03 real-time automatic adjustment rigid.

In **Position** mode(Pr0.02=2), it is usually for point to point movement. It is unavailable to modify the value of Pr1.00- 1.14, we just change the value of Pr0.03 real-time automatic adjustment rigid.

The definition of Pr0.03



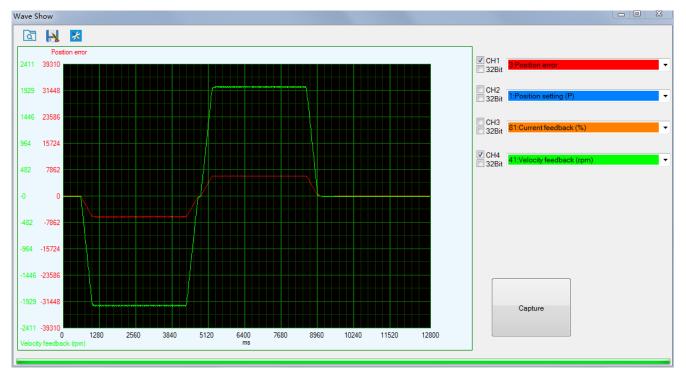
used for update. If the changed stiffness setting is made valid after the motor stopped, abnormal sound or oscillation will be generated. To prevent this problem, stop the motor after changing the stiffness setting and check that the changed setting is enabled.



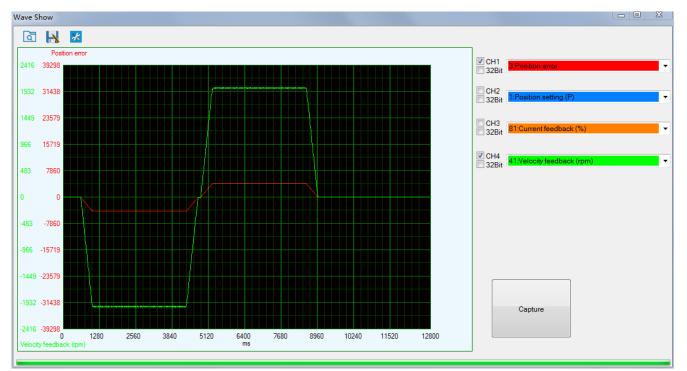
The following figure showing Pr0.02=2, Pr0.03=70, the position error (curve in red) is unacceptable!



Then we continue decreasing value of Pr0.03, then the position error become smaller and smaller. Pr0.03=68

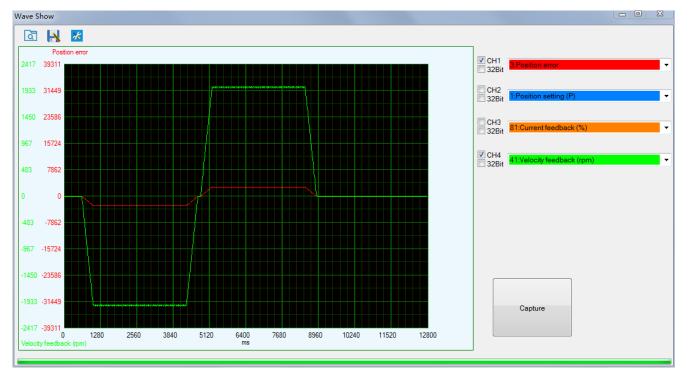


Pr0.03=66

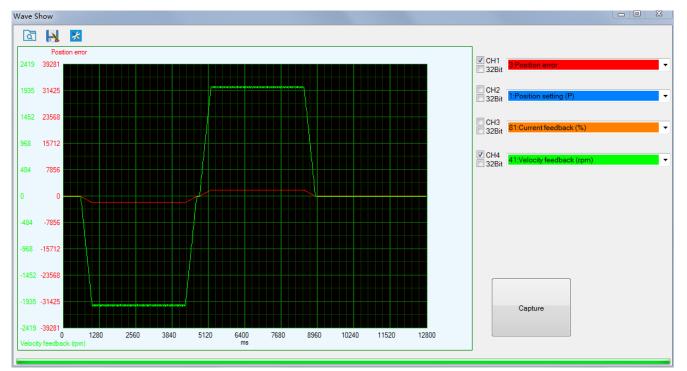




Pr0.03=64



Pr0.03=62

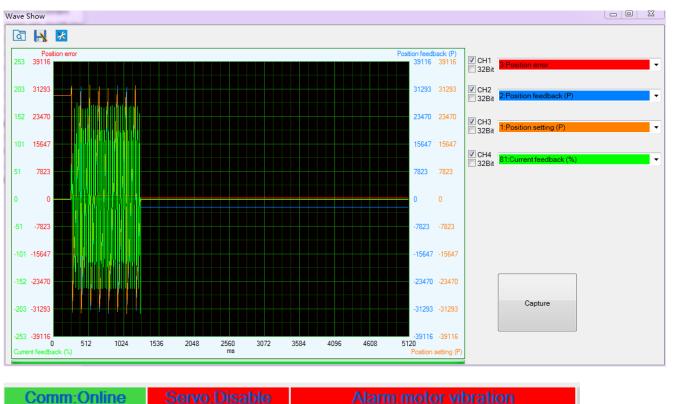


As we continue decreasing the value pf Pr0.03, then the position loop gain Kp become bigger and bigger, the integration time constant Vi become smaller and smaller, the position error become close to zero.

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Pr0.03=61



The noise of motor occurs and alarm occurs if the position loop gain becomes bigger, so just make sure there is no noise.

Finally, we set Pr0.03=62, the basic setting for position loop is finished in Position mode.



How to find the hidden parameter of ProTuner

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

Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr0.00	Model following control	1	0	2000	1	0.1Hz	None
Pr2.Vibration Restrain Function	Pr0.01	Control mode	0	0	10	0	-	valid after restart
Pr3.Speed, Torque Control	Pr0.02	Real-time auto-gain t	2	0	2	2	-	None
Pr4.I/F Monitor Setting	Pr0.03	Stiffness at real-time	70	50	80	70	-	None
Pr5.Extended Setup Pr6.Special Setup	Pr0.04	Inertia ratio	250	0	10000	250	%	None
r7.Factory setting	Pr0.06	Command pulse rotat	0	0	1	0	-	valid after restart
	Pr0.07	Command pulse input	3	0	3	3	-	valid after restart
	Pr0.08	Command pulse cou	10000	0	8388608	10000	Pulse	valid after restart
	Pr0.09	1st numerator of elect	1	1	10737418	1	-	None
	Pr0.10	Denominator of electr	1	1	10737418	1	-	None
	Pr0.11	Output pulse counts p	2500	1	2500	2500	P/rev	valid after restart
	Pr0.12	Reversal of pulse out	0	0	1	0	-	valid after restart
	Pr0.13	1st torque limit	300	0	500	300	-	None
	Pr0.14	Position deviation ex	200	0	500	200	0.1 rev	Encoder units
	Pr0.15	Absolute encoder set	0	0	15	0	-	None
	Pr0.16	External regenerative	100	40	500	100	Ω	valid after restart
	Pr0.17	Regenerative dischar	50	20	5000	50	W	valid after restart

- 2. Now here is the way to find all of them :
 - a. Click "Factory setting" :

^p arameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr7.15	Motor model input	26	0	7FFF	200	-	Hexadecimal, v
Pr2.Vibration Restrain Function	Pr7.16	Encoder selection	0	0	200	0	-	valid after restart
r3.Speed, Torque Control								
Pr4.I/F Monitor Setting Pr5.Extended Setup								
Pr6.Special Setup								
Pr7.Factory setting								



b. Click "here" 5 times:

Parameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr7.15	Motor model input	26	0	7FFF	200	-	Hexadecimal, v
Pr2.Vibration Restrain Function	Pr7.16	Encoder selection	0	0	200	0	-	valid after restart
Pr3.Speed, Torque Control								
Pr4.I/F Monitor Setting								
Pr5.Extended Setup Pr6.Special Setup								
Pr7.Factory setting								

c. Then click "Factory Setting", then we can find all parameters:

I 🖪 🔟 🔟 🖻		20						
arameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark
r0.Basic setting r1.Gain adjustment	Pr7.00	Current loop gain	1500	100	5000	1000	Hz	None
r2.Vibration Restrain Function	Pr7.01	Current loop integral ti	500	1	10000	500	0.1ms	None
3.Speed, Torque Control	Pr7.02	Motor rotor initial posit	177	0	360	0	-	valid after resta
4.I/F Monitor Setting	Pr7.03	Reserved parameters	0	0	32767	0	-	valid after resta
r5.Extended Setup r6.Special Setup r7.Factory setting	Pr7.04	Reserved parameters	0	0	32767	0	-	valid after resta
	Pr7.05	Motor pole pairs	4	1	20	4	-	valid after resta
	Pr7.06	Motor phase resistor	300	1	10000	100	0.01 <mark>Ω</mark>	valid after resta
	Pr7.07	Motor D/Q inductance	630	1	10000	700	0.01mH	valid after resta
	Pr7.08	Motor back EMF coef	420	100	10000	1000	0.1V/(valid after resta
	Pr7.09	Motor torque coefficient	35	1	1000	80	0.01N	valid after resta
	Pr7.10	Motor rated speed	3000	100	10000	2000	r/min	valid after resta
	Pr7.11	Motor maximum speed	5000	100	10000	2500	r/min	valid after resta
	Pr7.12	Motor rated current	400	1	3000	280	0.01A	valid after resta
	Pr7.13	Motor rotor interia	32	1	32767	250	0.01K	valid after resta
	Pr7.14	Motor power selection	400	10	32767	750	W	valid after resta
	Pr7.15	Motor model input	26	0	7FFF	200	-	Hexadecimal,
	Pr7.16	Encoder selection	0	0	200	0	-	valid after resta
	Pr7.17	Motor maximum current	300	1	500	300	%	valid after resta
	Pr7.18	Encoder index angle	177	0	360	0	-	None
	Pr7.19	Reserved parameters	1	0	500	1	-	None
	Pr7.20	Drive model input	0	-32767	32767	0	-	Hexadecimal,

If users restart the software ProTuner , just make the same steps above.

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. Users need to do the operation with the steps below:

- 1. Modify the value of parameter.
- 2. Click "download ":

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Parameter Manage								
🖾 🖪 🕇 🚹	∰ ∎	20						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr0.00	Model following control	1	0	2000	1	0.1Hz	None
Pr2.Vibration Restrain Function	Pr0.01	Control mode	0	0	10	0	-	valid after resta
Pr3.Speed, Torque Control	Pr0.02	Real-time auto-gain t	2	0	2	2	-	None
Pr4.I/F Monitor Setting	Pr0.03	Stiffness at real-time	70	50	80	70	-	None
Pr5.Extended Setup Pr6.Special Setup	Pr0.04	Inertia ratio	250	0	10000	250	%	None
Pr7.Factory setting	Pr0.05	Command pulse input	0	0	1	0	-	None

3. Click "save":

arameter Manage								
à 🖪 🕇 🕇	₿ .	20						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic setting Pr1.Gain adjustment	Pr0.00	Model following control	1	0	2000	1	0.1Hz	None
Pr2.Vibration Restrain Function	Pr0.01	Control mode	0	0	10	0	-	valid after resta
Pr3.Speed, Torque Control	Pr0.02	Real-time auto-gain t	2	0	2	2	-	None
Pr4.I/F Monitor Setting	Pr0.03	Stiffness at real-time	70	50	80	70	-	None
Pr5.Extended Setup Pr6.Special Setup	Pr0.04	Inertia ratio	250	0	10000	250	%	None
Pr7.Factory setting	Pr0.05	Command pulse input	0	0	1	0	-	None

4. Then users can power off the driver and restart it again, or users can *Software Reset* to make the new parameters setting valid.



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