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Chapter 1 Introduction

This software can run in Windows XP, Windows Vista, Win7. The computer make data exchanged and debug ELD2 series driver by series port communication. Please read the operation specification of driver when using. 1. System composition This software is matched with ELD2 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 ELD2 series is a software tool designed to configure and tune the Leadshine ELD2 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	www.leadshine	com 4

Leadshir	le		Operational Manual of ELD2 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	1	Check the explanation of parameters
Run Testing	Run Test	\odot	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



2.1 Connecting driver

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

🕢 Leadshine Motion Studio		_ _ X
System Funtions Language To	ols About	
V 🖸 🛛 🖸		雷夏智能 Leadshine
RS400 RS400 Configuration Performance adjustment Run Motion Monitor	Comm Connect Online Mode Communication Mode CommPort COM16 Refresh Series High Voltage Servo	
	Drive model RS400 Motor Model ACM6004L2H-60-D Ports IN-9,OUT:6 Soft Version 1.01	-88
Comm Offline Secure Direct	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.

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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

ſ	Parame	eter Man	age							23
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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 Manage								
🖾 🛃 🟗 👖 E	# •	20						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
PrU.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 p
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 p
····	Pr0.07	Command pulse input	3	0	3	3	-	valid after restart p
	Pr0.08	Command pulse cou	0	0	8388608	10000	Pulse	valid after restart p
	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 p
	Pr0.12	Reversal of pulse out	0	0	1	0	-	valid after restart p
	Pr0.13	1 st 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 p
	Pr0.17	Regenerative dischar	50	20	5000	50	W	valid after restart p
	4							•

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
Pru.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
Pr6.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 resta
	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

Parameter Manage								
a 🖪 1 🚹		2 0						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
PrU.Basic setting Pr1 Gain adjustment	Pr2.00	Adaptive filter mode s	0	0	4	0	-	None
Pr2.Vibration Restrain Function	Pr2.01	1 st notch frequency	2000	50	2000	2000	Hz	None
Pr3.Speed, Torque Control	Pr2.02	1st notch width selecti	2	0	20	2	-	None
Pr4.I/F Monitor Setting	Pr2.03	1st notch depth select	0	0	99	0	-	None
Pr6.Extended Setup Pr6.Special Setup	Pr2.04	2nd notch frequency	2000	50	2000	2000	Hz	None
Pr7.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
	•			III				•

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

Velocity torque control

	#* • e							
arameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
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
r4.I/F Monitor Setting	Pr3.03	Speed command rev	0	0	1	0	-	None
r6 Special Setup	Pr3.04	1st speed setup	0	-10000	10000	0	r/min	None
Pr7.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 ser
	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
	Dv2 20	Torque commend inn	0	0	1	0		None

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



Monitor setup

1 🖪 🚹 1	# •	2 0						
arameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
rU.Basic setting r1 Gain adjustment	Pr4.00	input selection SI1	3	0	FF	3	-	Hexadecimal,
r2.Vibration Restrain Function	Pr4.01	input selection SI2	0	0	FF	0	-	Hexadecimal,
r3.Speed, Torque Control	Pr4.02	input selection SI3	0	0	FF	0	-	Hexadecimal,
r4.I/F Monitor Setting	Pr4.03	input selection SI4	0	0	FF	0	-	Hexadecimal,
r5.Extended Setup r6.Spacial Satur	Pr4.04	input selection SI5	0	0	FF	0	-	Hexadecimal,
r7.Factory setting	Pr4.05	input selection SI6	0	0	FF	0	-	Hexadecimal,
	Pr4.06	input selection SI7	0	0	FF	0	-	Hexadecimal,
	Pr4.07	input selection SI8	0	0	FF	0	-	Hexadecimal,
	Pr4.08	input selection SI9	0	0	FF	0	-	Hexadecimal,
	Pr4.10	output selection SO1	1	0	FF	1	-	Hexadecimal,
	Pr4.11	output selection SO2	2	0	FF	2	-	Hexadecimal,
	Pr4.12	output selection SO3	4	0	FF	4	-	Hexadecimal,
	Pr4.13	output selection SO4	3	0	FF	3	-	Hexadecimal,
	Pr4.14	output selection SO5	1	0	FF	1	-	Hexadecimal,
	Pr4.15	output selection SO6	3	0	FF	3	-	Hexadecimal,
	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(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	0.1V	None
	D-4.01	Desition in a second sta	10	0	10000	10	Dulas	

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

Extension setting

arameter Manage								
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Parameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark
Pru.Basic setting Pr1 Gain adjustment	Pr5.00	2nd numerator of elec	10000	0	8388608	10000	-	None
Pr2.Vibration Restrain Function	Pr5.01	3rd numerator of elect	1	1	10737418	1	-	None
Pr3.Speed, Torque Control	Pr5.02	4th numerator of elect	1	1	10737418	1	-	None
Pr4.I/F Monitor Setting	Pr5.04	Inhabit input setup	0	0	2	0	-	None
Pr6 Special Setup	Pr5.06	Sequence at servo-off	0	0	1	0	-	None
Pr7.Factory setting Pr Pr7.Factory setting Pr	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
	D⊑ 00 ∢	DO 405	4	ŵ	10	4		h1

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



Special setting

Parameter Manage	arameter Manage								
🖾 🖪 1 🕫	# •	20							
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark	
PrU.Basic setting Pr1 Gain adjustment	Pr6.01	Encoder zero positio	0	0	360	0	-	valid after restart p	
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	
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	0.1 rev	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 p	
	•							•	

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

Factory setup

arameter Manage								
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Parameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark
PrU.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,
	D.7.01	O and an and all all should be	0	20202	20202	0		

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.



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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.

in Testing			23
Position			
Setting Pr6.04, log Speed	1000	1012	
	200	ms/1000rpm	<< Expand
Pro.25 Acceleration of trial running	250	marrootpm	Download
Servo Enable		al.	
Invalid External Enable			7.
Current Position 56.9990 r			
]		
Position 1 Position 2	J		
56.9989 56.9989			
Pr6.21 Waiting time of 100 ms			
triai running	Run		
trial running			



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.

larm						
Current History	Cause of non-rotation					
Alarm Code	Alarm Name	Alarm ID	Alarm Reason	Alarm Check	Alarm Handle	
Err150	encoder line brea					
Err240	CRC verification e					
Err150	encoder line brea					
Err150	encoder line brea					
Err000	no alarm					
Err000	no alarm					
Err000	no alarm					
Err000	no alarm					
Err000	no alarm					
Err000	no alarm					
		•		III		+
		Alarm ID	Name		Value	-
		0	Error Time(s)		213	
		1	Speed of Positio	n Command(rpm)	0	
		2	Relative Position	n Error(P)	0	
		3	Speed Comman	ıd(rpm)	0	
		4	Motor Speed(rpr	m)	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 Ter	nperature(°C)	1	
		10	Alarm Pulse Inst	ruction	21474	
		11	Alarm Pulse Fee	dbackAlarm Pulse In	terfere 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		
Port: COM1	▼ Baudrate 38400 ▼ Databit: 8 ▼ Stopbit: 1 ▼ Parity: None ▼ State:Close	Open
NO.: 01	@ Read: 01 Address 20 Return HEX: DEC: DIN:	Send
NO. : 01	@ Read: 01 @ Write: 00 Address 21 Return HEX: DEC: EIN:	Send
NO. : 01	@ Read: D1 @ Write: 00 Address 22 Return HEX: DEC: BIN:	Send
NO. : 01	@ Read: D1 @ Write: 00 Address 23 Return HEX: DBC: BIN:	Send
NO. : 01	@ Read: 01 Address 24 Return HEX: DEC: BIN: @ Write: 00	Send
NO. : 01	@ Read: 01 Address 25 Return HEX: DEC: BIN:	Send
NO. : 01	@ Read: 01 Address 26 Return HEX: DBC: BIN:	Send
NO.: 01	@ Read: 01 Address 27 Return HEX: DEC: BIN:	Send
NO. : 01	@ Read: 01 Address 20 Return HEX: DEC: BIN:	Send
NO. : 01	G Read: 01 Address 29 Return HEX: DEC: BIN: C Write: 00 Address 29 Return HEX: DEC: BIN:	Send
	Save Settings	



Chapter 5 Configuring the Driver

5.1 Setup progress

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The debug software for ELD2 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)



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 ELD2 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	

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.



a 🖪 💼 🔢	₿ R	20						
Parameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark
PrU.Basic setting Pr1 Gain adjuctment	Pr7.00	Current loop gain	1500	100	5000	1000	Hz	None
Pr2.Vibration Restrain Function	Pr7.01	Current loop integral time	500	1	10000	500	0.1ms	None
Pr3.Speed, Torque Control	Pr7.02	Motor rotor initial position a	177	0	360	0	-	valid after
Pr4.I/F Monitor Setting	Pr7.03	Reserved parameters	0	0	32767	0	-	valid after
Pr5.Extended Setup Pr6 Special Setup	Pr7.04	Reserved parameters	0	0	32767	0	-	valid after
Pr7.Factory setting	Pr7.05	Motor pole pairs	4	1	20	4	-	valid after
í de la companya de l	Pr7.06	Motor phase resistor	300	1	10000	100	0.01 <mark>Ω</mark>	valid after
	Pr7.07	Motor D/Q inductance	630	1	10000	700	0.01mH	valid after
	Pr7.08	Motor back EMF coefficient	420	100	10000	1000	0.1V/(valid after
	Pr7.09	Motor torque coefficient	35	1	1000	80	0.01N	valid after
	Pr7.10	Motor rated speed	3000	100	10000	2000	r/min	valid after
	Pr7.11	Motor maximum speed	5000	100	10000	2500	r/min	valid after
	Pr7.12	Motor rated current	400	1	3000	280	0.01A	valid after
	Pr7.13	Motor rotor interia	32	1	32767	250	0.01K	valid after
	Pr7.14	Motor power selection	400	10	32767	750	W	valid after
	Pr7.15	Motor model input	26	0	7FFF	200	-	Hexadeci
	Pr7.16	Encoder selection	0	0	200	0	-	valid after
	Pr7.17	Motor maximum current	300	1	500	300	%	valid after
	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	-	Hexadeci
	D.2.01	One of the state for the state	<u>م</u>	20707	20202	0		



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	
	CurrentVoltage V	
Command Source	Pr3.03 Speed command reversal input Acc Dec Config	
Electronic Gear	Pr3.12 Acceleration time setup 100 ms Dr3.13 Deceleration 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	



D=2.00	Speed setup, Internal /External			F	Range	unit	default	Related control mode		
Pr3.00	swi	tching	-		0 -3	-	0	S		
This drive	r is e	quipped with inter	nal speed setup function	on s	so that us	sers can cont	trol the sp	eed with		
contact inj	outs o	only.	1 1				1			
Setup va	lue	Speed setup met	hod							
0		Analog speed con	nmand(SPR)							
1		Internal speed co	mmand 1st to 4th spee	ed(H	PR3.04-I	PR3.07)				
2		Internal speed co	mmand 1st to 3rd spec	ed (PR3.04-	PR3.06),				
2		Analog speed con	mmand(SPR)							
3		Internal speed co	mmand 1st to 8th spee	ed (PR3.04-	PR3.11)				
<relations< td=""><td colspan="10"><relationship and="" between="" external="" internal="" internal<="" pr3.00="" setup="" speed="" switching="" td="" the=""></relationship></td></relations<>	<relationship and="" between="" external="" internal="" internal<="" pr3.00="" setup="" speed="" switching="" td="" the=""></relationship>									
command	spee	ed selection 1-3 an	d speed command to) De	e selecte	$d > \frac{1}{2}$	selec	tion of		
Setup	int	ernal command	command speed	11	interna	l command	Spee	d		
value	spe	eed(INTSPD1)	(INTSPD2)		speed (INTSPD3)	com	nand		
1	OF	FF	OFF		NO eff	ect	1st s	peed		
	10	N	OFF				2nd s	speed		
	OF	ŦF	ON				3rd s	peed		
	ON ON						4th s	peed		
2	OF	ff T	OFF				Ist s	beed		
	ON		OFF		NO eff	ect	2nd s	peed		
	Or	Tr	ON			Anal	og speed			
	IO	ON ON					com	nand		
3	Th	e same as [Pr3.00=	=1]		OFF		1st to	o 4th		
			OFF		ON		speed	1		
		rt M	OFF		ON ON		Sth s	peed		
		N	OFF		ON		oth s	peed		
	U	.1	ON	D -			/ul s	Related		
Pr3.02	Inp	ut gain of speed	d command	Ra	ange	unit	default	control mode		
		5 1		10 -	-2000	(r/min)/v	500	ST		
Based on t	the vo	oltage applied to th	e analog speed comm	and	l (SPR),	set up the co	onversion	gain to		
motor con	ıman	d speed.	1 ()	1	. ,	1, 1		1 .1		
Users can $D_{r2} O_{2} D_{3}$	set u	p "slope" of relation $relation = \frac{1}{2}$	on between the comma $OO(r/min)/V$ hence int	ind	input vo	ltage and m	otor speed	l, with		
Notice:	laun	18 Set to P15.02=5	00(1/mm)/v, nence mp	Jui	of ov be	comes 5000	1/111111.			
1. Do not a	apply	more than +10V t	o the speed command	inr	out(SPR)	l.				
2. When u	sers (compose a position	loop outside of the d	rive	er while	users use the	driver in	velocity		
control mo	ode, t	he setup of Pr3.02	gives larger variance	to t	he overa	ll servo syst	em.	2		
3. Pay an e	extra	attention to oscilla	tion caused by larger	setu	up of Pr3	.02.				
			Positive direction							
			Speed (r/min)							
			3000							
				/	1					
			10 6							
			2	4	6 8 10					
		Slong at an fasta		Cor	mmand inp	ut voltage (V)				
	Slope at ex-factory									
				300	0					

Negative direction



Pr3.03 Re		eversal of speed command input			unit	default	Relate control m	ed 10de		
P15.05	Nev	versar or speed of	0 -1	-	0	S				
Specify the polarity of the voltage applied to the analog speed command (SPR).										
Setup value Motor rotating direction										
0		Non-reversal	[+ voltage] ->[+ direction]	[- voltage] → [-direction]]			
1	1 reversal $[+ voltage] \rightarrow [- direction] [- voltage] \rightarrow [+ direction]$				[+ voltage] \rightarrow [- direction] [- voltage] \rightarrow [+direction]					
Caution:	When	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
		0 -10000	Ms(1000r/min)	100	S
Dr2 12	time setue deceleration	Range	unit default		Related control mode
PI3.13	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.





Dr2 15	Speed zero clamp function selection	Range	unit	default	Related control mode			
P15.15	Speed zero-clamp function selection	0 -3	-	0	S			
1. If Pr3	3.15=0, the function of zero clamp is forbidden.	It means the	e motor ro	otates with	actual			
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 condi	tion no m	natter what	the			
veloc	ity of motor is and motor stop rotating no matter	er what the y	value of P	r3 16 is				
3 If Pr3	3.15-2 the function of zero clamp belongs to the	e value of F	$r_3 16$ If i	the actual	velocity is			
J. IIII.	han the value of Dr3 16 the motor will stop rota	ting in serve	13.10.11	lition	velocity is			
1688 1	nan the value of 113.10, the motor will stop fota	ung m serve	J-011 C0110		Deleted			
Dr2 16	Speed zero, clamp lovel	Range	unit	default	control mode			
P15.10	speed zero-clamp level	0 -20000	r/min	30	S			
33.71	1 1 1 1 1 1 1	1 /1	1	1 1	1 (

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	Pr3.00	Pr3.00 Velocity setup 8 Internal Speed						
Motor Selection	Internal Speed							
	Pr3.04 1st speed	100	rpm	Pr3	8.08 5th spe	ed	500	rpm
Control Mode	Pr3.05 2nd speed	200	rpm	Pr3	3.09 6th spe	ed	600	rpm
	Pr3.06 3rd speed	300	rpm	Pr3	3.10 7th spe	ed	700	rpm
Command Source	Pr3.07 4th speed	400	rpm	Pr3	3.11 8th spe	ed	800	rpm
Encoder Output	Acc and Dec Setting	ation time s	satup		100	me/1	1000rom	
	Pr3.12 Acceler	ation time s	setup		100	ms/	UUUrpm	
IO Setting	Pr3.13 Decele	ration time	setup		100	ms/1	000rpm	
	Pr3.14 Sigmoi time setup	d accelerati	ion/decelera	ition	30	ms		
Save								

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, 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.



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 com PULS PULS SIBNH" SIBNL"	mand
Command Source	© cw+ccw	PULS PULS (ow) (ow) (ow) (ow) (ow) (ow) (ow) (ow)	_
Electronic Gear	© A Phase + B Phase	-+ +- 90" -+ +- 90" PULS SIGN SIGN SIGN	
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:Positio	on 🔻
	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		unit	default	R con	Related control mode				
	Setup	0 -1	-	0	Ρ					
Set command pulse input rotate direction, command pulse input type										

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Dr0 07*	07* Command Pulse Input Mode Setu				Rang	ge	unit	defa	ault	Ilt Related control mod	
PT0.07	Comme	and Fulse input iv	ioue setup		0-3	3	-	3		Р	
Pr0.06	Pr0.07	Command Puls	e Format	Sigr	nal	Direction Command			Negative Direction Command		1
0	0 or 2	90 phase differenc 2-phase pulse(A ph phase)	Pulse sign		A相 B相 tit B相比A相超前90°		 	t1 t1 t1 t1 B相比A相滞后90°			
	1	Positive direction p negative direction	Pulse sign					_			
	3	Pulse + sign	Pulse sign								
1	0 or 2	90 phase differenc 2 phase pulse(A ph phase)	Pulse sign		A相			t1 t1 t1 t1 B相比A相超前90°			
	1	Positive direction p negative direction	oulse + pulse	Pulse sign		t2	t2	t3	+ + t2 t2		_
	3 Pulse + sign			Pulse sign							
Command	l pulse inp	ut signal allow large	st frequency a	and sm	allest	time	width				
PULS/SIG	GN Signal I	nput I/F	Permissible	Max.	Sma	llest T	ime V	Vidth	ר +4	+5	+6
Pulse	Long d	istance interface	500kpps		2	1	1		1	1	1
series interface	Open-c	Doing distance methadeSookppsOpen-collector output200kpps			5	2.5	2.	5	2.5	2.5	2.5

			Range	unit	defau	cor	Related control mode		
Pr0.00	Mo	ode loop gain			lt				
			0 -2000	0.1Hz	0	Р	S	Т	
Set up the bandwidth of MFC, it is similar to the response bandwidth									
Setup va	lue	Meaning							
0		Disable the function.							
1		Enable the function, set the bandwidth au	utomatically	,					
1		recommended for most application.							
2-10		Forbidden and reserved.							
11-200	00	Set the bandwidth manually, $1.1Hz - 200$							
				1					

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

DrO	02	Pool_time Aut	o-azin Tunina	Range	unit	default	R con	elated trol m	ode
FIU	.02	Real-time Auto	o-gain runnig	0 -2	-	0	Р	S	Т
Use	Users can set up the action mode of the real-time auto-gain tuning.								
Se	tup valu	e mode	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 unbalanced load, friction compensation or gain switching						
	2	Position	Main application is positioning. it is recommended to use this mode on equipment without unbalanced horizontal axis, ball screw driving equipment with low friction, etc.						
Cau	ition: If	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 mod		ed ode			
		0 -200	0.05us	0	Р					
Do filtering for positional command pulse, eliminate the interference of the narrow pulse, over-large										
setup will influence the input of high frequency positional command pulse, and make more										
time-delay	yed.									

5.4.3 Setup progress — Electronic Gear window

Pr0.08	Command pulse counts per one motor revolution	Range	unit	default	Related control mode							
		0-8388	pulse	0	Р	S	Т					
		608										
Set the co	Set the command pulse that causes single turn of the motor shaft.											
1) If Pr008	$8 \neq 0$, the actual turns = pulse number / Pr008											
2) If Pr008	2) If $Pr008 = 0$, $Pr009 1^{st}$ numerator of electronic gear and $Pr0.10$ Denominator of electronic											
Gear become valid.												

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	R con	elated trol mo	ode		
Pr0.09	1st numer	ator of electronic gea	ar	1-10737	-	1	Р				
				41824							
Set the numerator of division/multiplication operation made according to the command pulse input.											
	Range unit default Related control mode										
Pr0.10	denomina	tor of electronic gear		1-10737	-	1	Р				
				41824							
Set the denominator of division/multiplication operation made according to the command pulse input.											
Pr0.09	Pr0.10	Command division/multiplication operation									
1-10737	1-10737	Command pulse input	[Pr0.09	set value	posit	ion comman	ıd				
41824	41824		C Pr0.10	set value							
1, Set	ttings:										
(1)T	The driver inp	ut command pulse numbe	er is X								
(2)T	The pulse num	iber of encoder after frequ	uency divi	sion and fre	quency	doubling	is Y				
(3)T	The number of	f pulses per revolution of	the motor	encoder is 2	Z						
(4)N	Number of tur	ns of motor is W									
2、Ca	lculations:										
(1)Y=X* Pr0.09 / Pr0.10											
(2)1	7Bit encoder	: Z=2^17 = 131072									
	23Bit encode	r: Z=2^23 = 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	10rpm		
Default Inertia Ratio	250	1		Servo Enable	
				Invalid External Enable	
STEP-2					
			Current 6	i2.9497 r	
			ccw	cw	
		2.0407	Decision 1		
	0	2.9487	Position	Position 2 -0.0033	
Pr6.21 Waiting time of trial running	50	ms			
Pr6.22 Cycling times of trial running	3		Run		
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

rosition				
Setting				_
Pr6.04 Jog Speed	400	rpm	Fold >>	
Pr6.25 Acceleration of trial running		Pr0.02 Real-time auto-gain	2:Positi	on 🔻
Pr0.04 Inertia ratio		Pr0.03 Real-time automatic rigidity adjustment	0:Manu 1:Stand	al ard
Servo Enable		Pr0.06 Command pulse rotational direction setup	0	
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
D. 0.01 W. W. M. 100		Pr1.05 2nd position loop gain	380	0.1/s
trial running time of 100 ms		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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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.



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 Manage								
🖸 🖪 1 🕫	# •	20						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
PrU.Basic setting Pr1.Cain 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 p
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	Pr0.06	Command pulse rotat	0	0	1	0	-	valid after restart p
	Pr0.07	Command pulse input	3	0	3	3	-	valid after restart p
	Pr0.08	Command pulse cou	10000	0	8388608	10000	Pulse	valid after restart p
	Pr0.09	1 st 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 p
	Pr0.12	Reversal of pulse out	0	0	1	0	-	valid after restart p
	Pr0.13	1 st 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 p
	Pr0.17	Regenerative dischar	50	20	5000	50	W	valid after restart p
	•			m				•

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

Parameter Manage	rameter Manage										
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Parameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark			
PrU.Basic setting Pr1 Gain adjustment	Pr7.15	Motor model input	26	0	7FFF	200	-	Hexadecimal, val			
Pr2.Vibration Restrain Function	Pr7.16	Encoder selection	0	0	200	0	-	valid after restart p			
Pr3.Speed, Torque Control											
Pr5.Extended Setup											
Pr6.Special Setup											
Pr7.Factory setting											
								,			



b. Click "here" 5 times:

Parameter Manage	rameter Manage											
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Parameter 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, val				
Pr2.Vibration Restrain Function	Pr7.16	Encoder selection	0	0	200	0	-	valid after restart p				
Pr3.Speed, Torque Control												
Pr4.I/F Monitor Setting Pr5 Extended Setup												
Pr6.Special Setup												
Pr7.Factory setting												
	•							- F				

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

Parameter Manage								
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Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark 📩
PrU.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 🍍
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,
	D.7.01	O and a second at the second	0	20707 III	20202	0		··

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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Parame	Parameter Manage										
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Parar	meter Number	Number	Name	Value	Min	Max	Default	Unit	Remark 🔶		
Pri G	asic setting ain adjustment	Pr0.00	Model following control	1	0	2000	1	0.1Hz	None		
Pr2.V	ibration Restrain Function	Pr0.01	Control mode	0	0	10	0	-	valid after resta		
Pr3.S	peed, Torque Control	Pr0.02	Real-time auto-gain t	2	0	2	2	-	None		
Pr4.I/I	F Monitor Setting	Pr0.03	Stiffness at real-time	70	50	80	70	-	None		
Pr6.S	necial Setup	Pr0.04	Inertia ratio	250	0	10000	250	%	None		
Pr7.F	actory setting	Pr0.05	Command pulse input	0	0	1	0	-	None		

3. Click "save":

Parameter Manage								
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Parameter Number	Number	Name	Value	Min	Мах	Default	Unit	Remark 🔄
PruBasic 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
Pro.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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