Operational Manual Of EL5 Software

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Chapter 1 Introduction

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

1. System composition

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

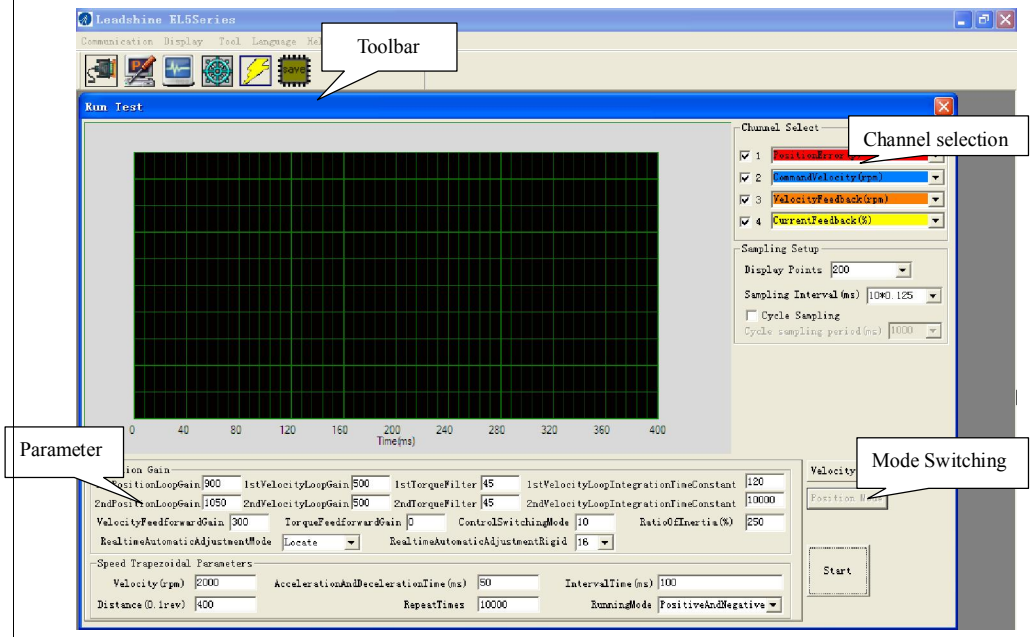
2. Running condition

CPU: above 1.5GHz
RAM: above 256M
Hard disk capacity: above 10G
Displayer: resolution 1024*768, color 24 bit
Communication interface: normal series or USB series adapter

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

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

1.1 Workspace



1.2 Menus and Toolbar

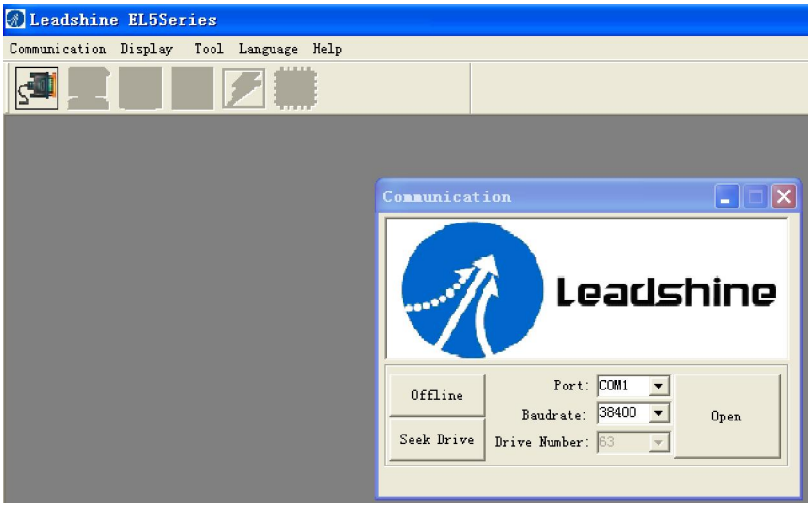
Menus and toolbars are at the top of the workspace. You can click menu bar to view the pull-down menu. The toolbar below the menu offers the common commands.

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

Chapter 2 Using the software

2.1 Connecting driver

Click “  ” to connect driver and PC computer.



If the driver is powered off, click “offline”.
In general, if the driver is powered on, set communication Port , baud rate ,equipment like the picture above, then click “open” to enter the interface.

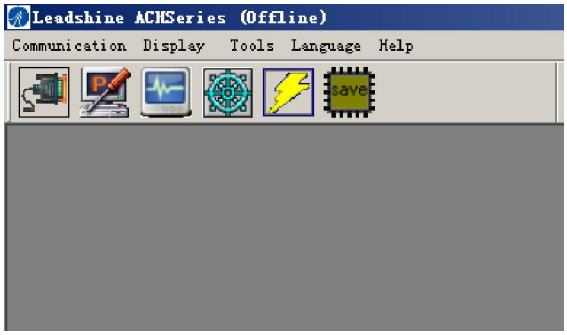
Note:

Notice

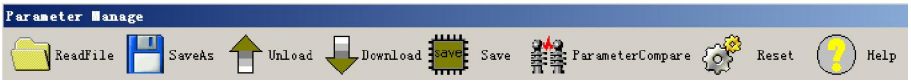
Before clicking the Open button, please make sure:
1) The RS232 cable has been connected between the drive and the PC’s serial port.
2) The drive has been powered on and the green LED is on.
The motor is unnecessary connecting to the drive if you just want to change the parameters but not tuning.

2.2 Off-line using

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



2.3 Parameter Management



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

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

Unload:
Upload the values of driver to the computer.

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

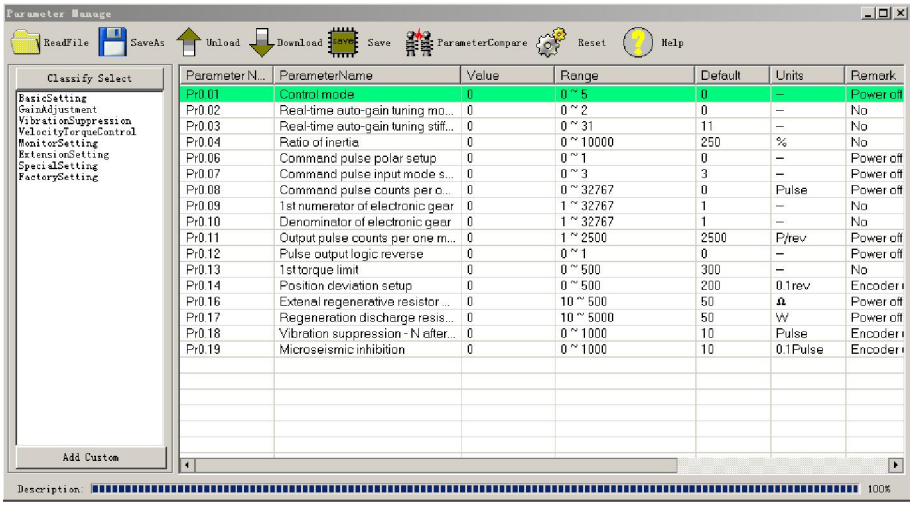
Save:
Save current values of parameter(no download to eeprom of driver)

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

Reset:
Reset all values of parameter to defaults

Help
Check the explanation of parameters.

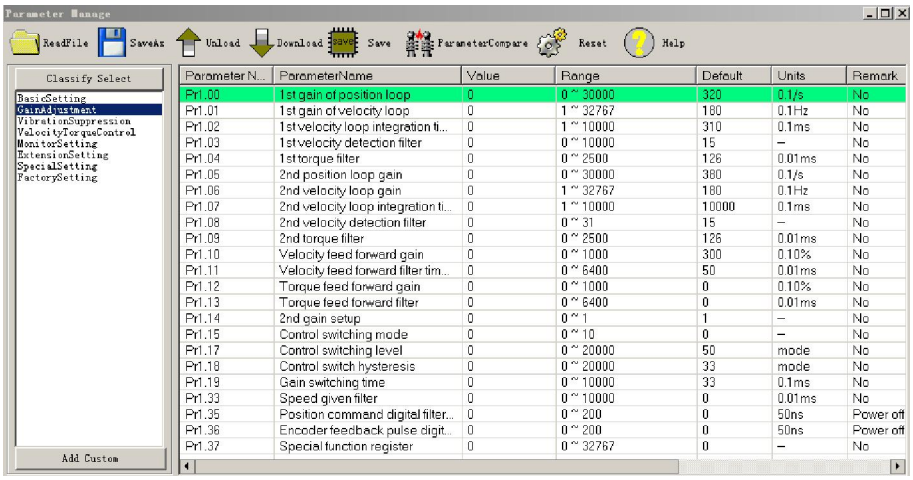
Basic setting



Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr0.01	Control mode	0	0 ~ 5	0	–	Power off
Pr0.02	Real-time auto-gain tuning mo...	0	0 ~ 2	0	–	No
Pr0.03	Real-time auto-gain tuning stiff...	0	0 ~ 31	11	–	No
Pr0.04	Ratio of inertia	0	0 ~ 10000	250	%	No
Pr0.06	Command pulse polar setup	0	0 ~ 1	0	–	Power off
Pr0.07	Command pulse input mode s...	0	0 ~ 3	3	–	Power off
Pr0.08	Command pulse counts per o...	0	0 ~ 32767	0	Pulse	Power off
Pr0.09	1st numerator of electronic gear	0	1 ~ 32767	1	–	No
Pr0.10	Denominator of electronic gear	0	1 ~ 32767	1	–	No
Pr0.11	Output pulse counts per one m...	0	1 ~ 2500	2500	P/rev	Power off
Pr0.12	Pulse output logic reverse	0	0 ~ 1	0	–	Power off
Pr0.13	1st torque limit	0	0 ~ 500	300	–	No
Pr0.14	Position deviation setup	0	0 ~ 500	200	0.1rev	Encoder
Pr0.16	External regenerative resistor ...	0	10 ~ 500	50	Ω	Power off
Pr0.17	Regeneration discharge resis...	0	10 ~ 5000	50	W	Power off
Pr0.18	Vibration suppression - N after...	0	0 ~ 1000	10	Pulse	Encoder
Pr0.19	Microseismic inhibition	0	0 ~ 1000	10	0.1Pulse	Encoder

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

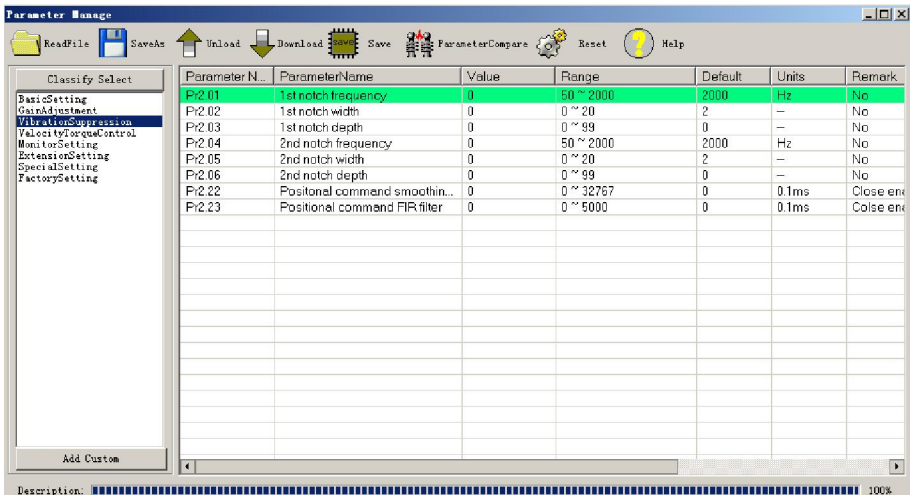
Gain adjustment



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

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

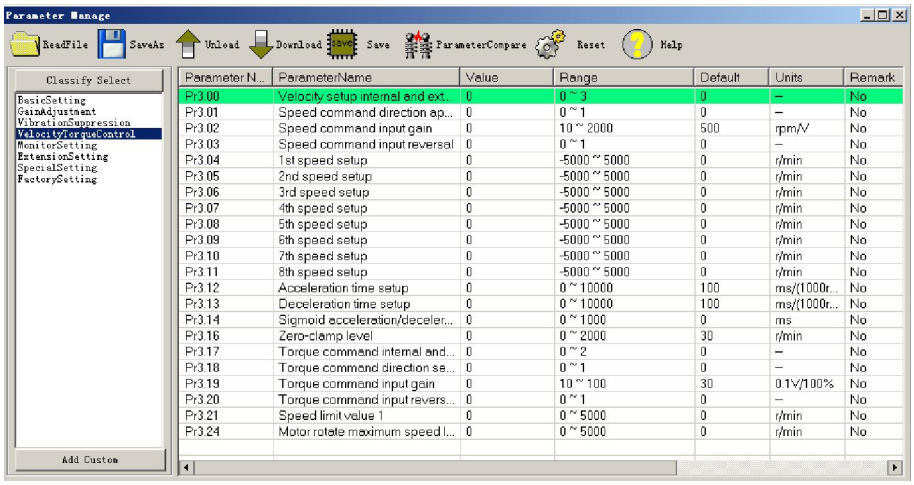
Vibration suppression



Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr2.01	1st notch frequency	0	50 ~ 2000	2000	Hz	No
Pr2.02	1st notch width	0	0 ~ 20	2	–	No
Pr2.03	1st notch depth	0	0 ~ 99	0	–	No
Pr2.04	2nd notch frequency	0	50 ~ 2000	2000	Hz	No
Pr2.05	2nd notch width	0	0 ~ 20	2	–	No
Pr2.06	2nd notch depth	0	0 ~ 99	0	–	No
Pr2.22	Positonal command smoothin...	0	0 ~ 32767	0	0.1ms	Close en
Pr2.23	Positional command FIR filter	0	0 ~ 5000	0	0.1ms	Colse en

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

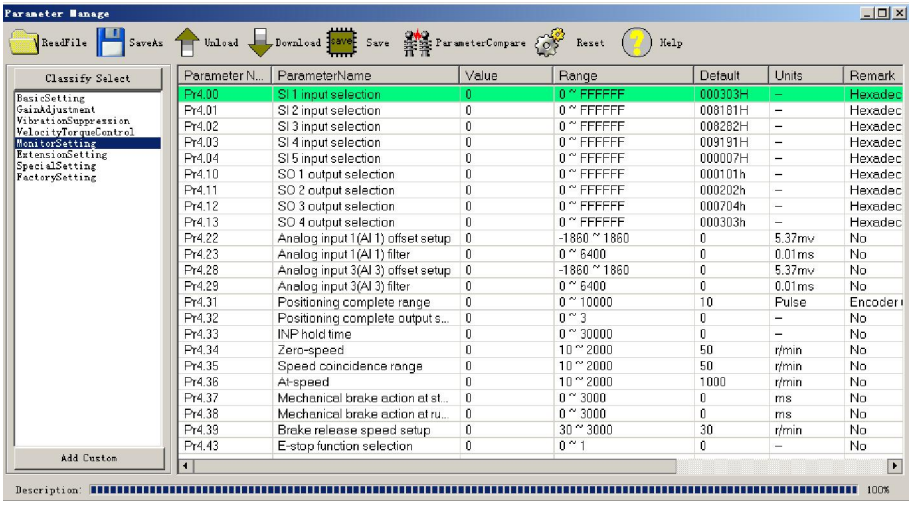
Velocity torque control



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

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

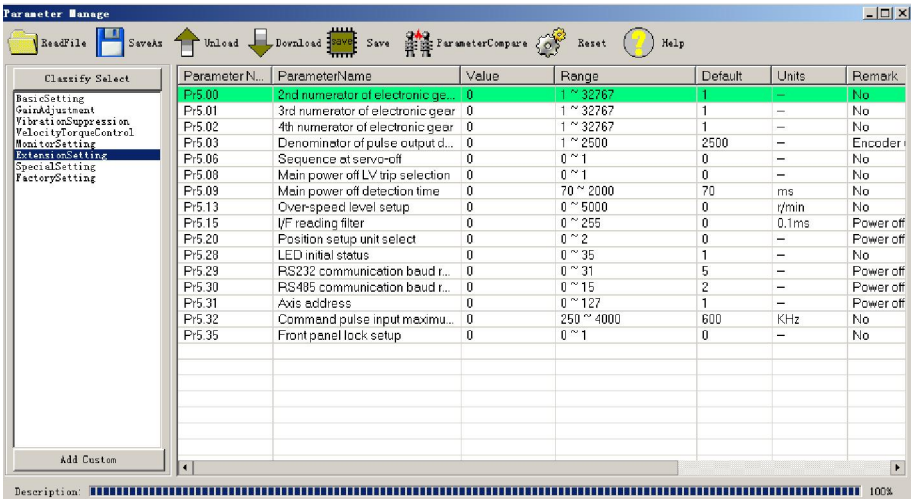
Monitor setup



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

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

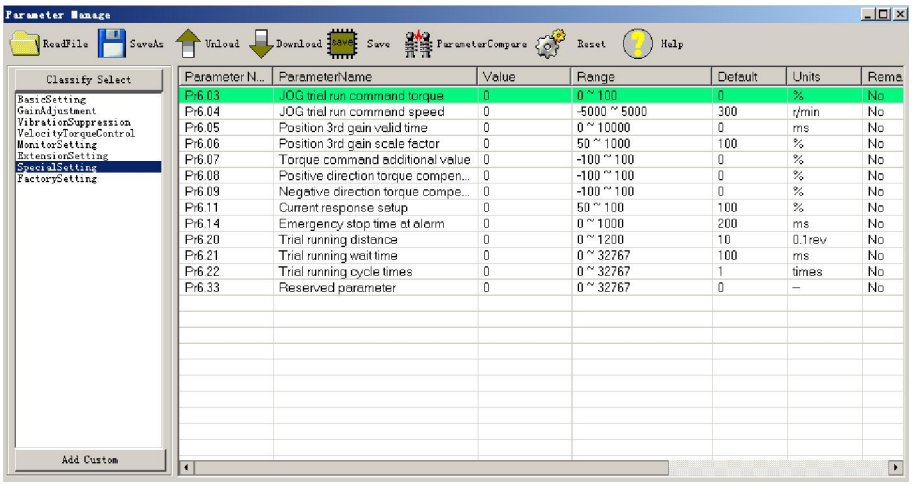
Extension setting



Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr5.00	2nd numerator of electronic ge...	0	1 ~ 32767	1	–	No
Pr5.01	3rd numerator of electronic gear	0	1 ~ 32767	1	–	No
Pr5.02	4th numerator of electronic gear	0	1 ~ 32767	1	–	No
Pr5.03	Denominator of pulse output d...	0	1 ~ 2500	2500	–	Encoder
Pr5.06	Sequence at servo-off	0	0 ~ 1	0	–	No
Pr5.08	Main power off LV trip selection	0	0 ~ 1	0	–	No
Pr5.09	Main power off detection time	0	70 ~ 2000	70	ms	No
Pr5.13	Over-speed level setup	0	0 ~ 5000	0	r/min	No
Pr5.15	I/F reading filter	0	0 ~ 255	0	0.1ms	Power off
Pr5.20	Position setup unit select	0	0 ~ 2	0	–	Power off
Pr5.28	LED initial status	0	0 ~ 35	1	–	No
Pr5.29	RS232 communication baud r...	0	0 ~ 31	5	–	Power off
Pr5.30	RS485 communication baud r...	0	0 ~ 15	2	–	Power off
Pr5.31	Axis address	0	0 ~ 127	1	–	Power off
Pr5.32	Command pulse input maximu...	0	250 ~ 4000	600	KHz	No
Pr5.35	Front panel lock setup	0	0 ~ 1	0	–	No

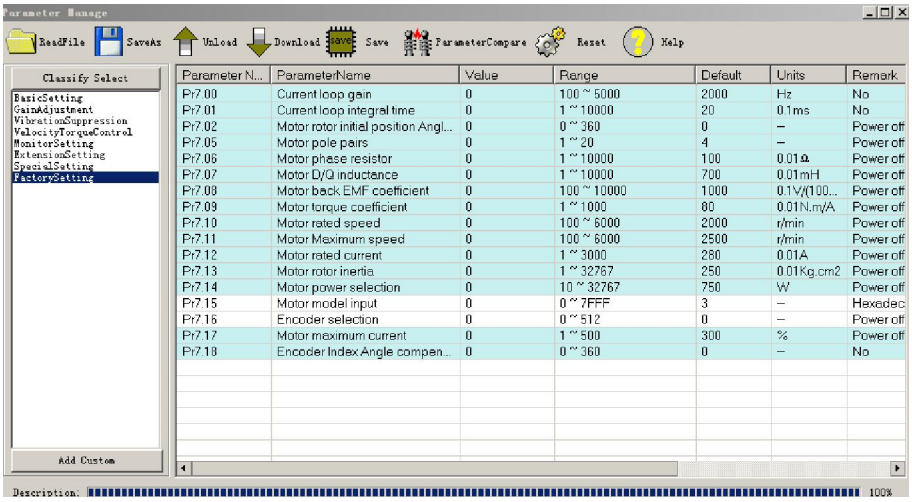
In this window, you can set the values of parameter about extended function.

Special setting



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

Factory setup



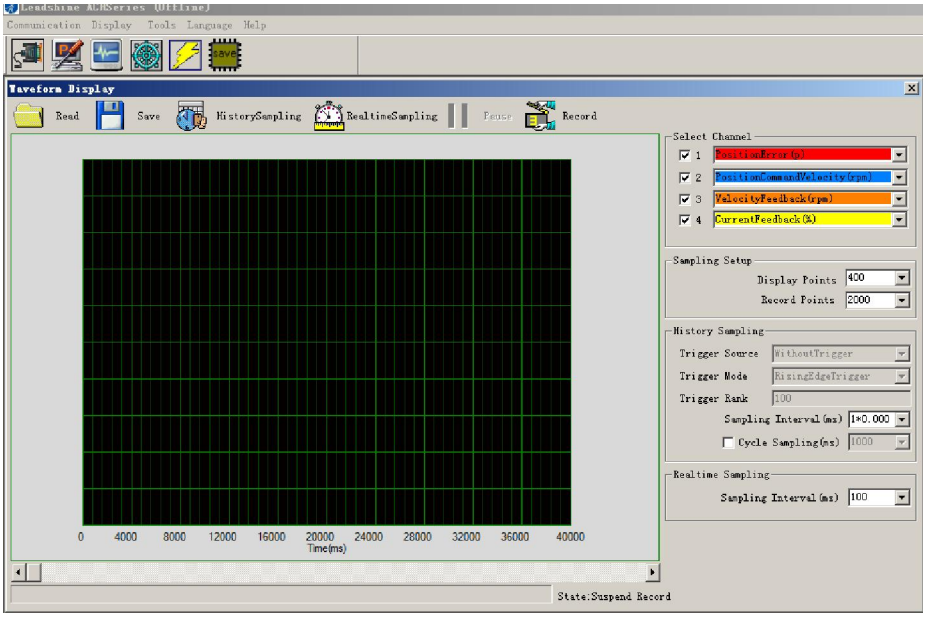
In this window, you can set the values of parameter about motor setting.
If the motor isn't included in motor library, then you can match this motor through modifying the parameter of Pr7.00 – Pr7.16. First, set Pr7.15=0, then set other parameters according to the specification of motor.
In general,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

Notice:

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

2.4 Waveform Curve

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



Upload the saved ".wave" file from the computer

Save current record wave as waveform file.

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

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

Start sampling;

Suspend/Continue:

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

Sampling interval:

The time value of sampling interval.

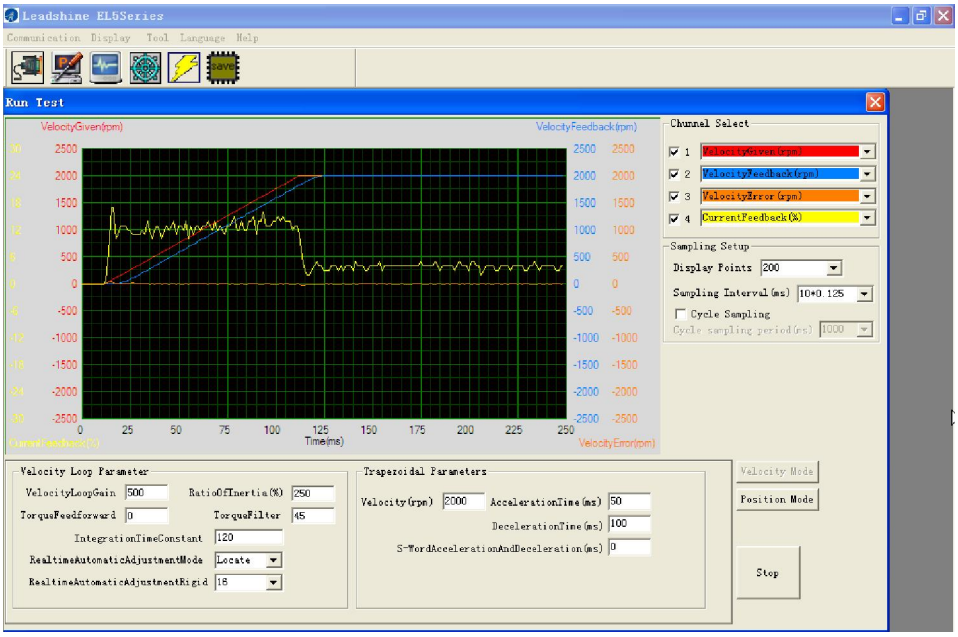
Sampling setup:

Continue reading segment sampling data.

Chapter 3 Run Test

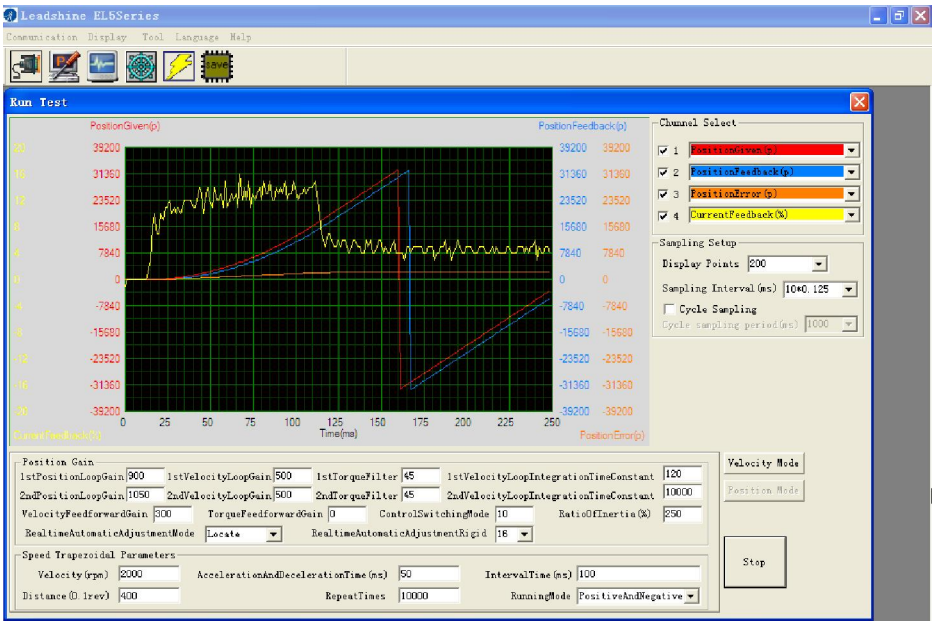
There are two modes in run test, one is velocity mode while other is position mode. Switching the mode need to power off and restart after switching.

Velocity Mode Tuning Window



In velocity mode, the parameter what you need to adjust have velocity loop gain, integration time constant, velocity, acceleration, acceleration and deceleration time, etc. You can make the motor running by giving the command velocity.

Position Mode Tuning Window

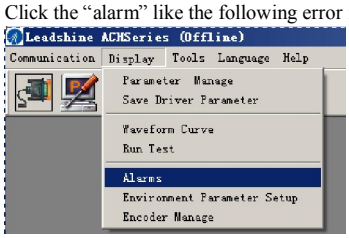


In position mode, the parameter what you need to adjust is 1st position loop gain, velocity, ratio of inertia, acceleration and deceleration time, etc. you can setup real-time auto adjust mode, then adjust real-time auto adjust rigid. You need to decrease the rigid if the noise exists while it means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

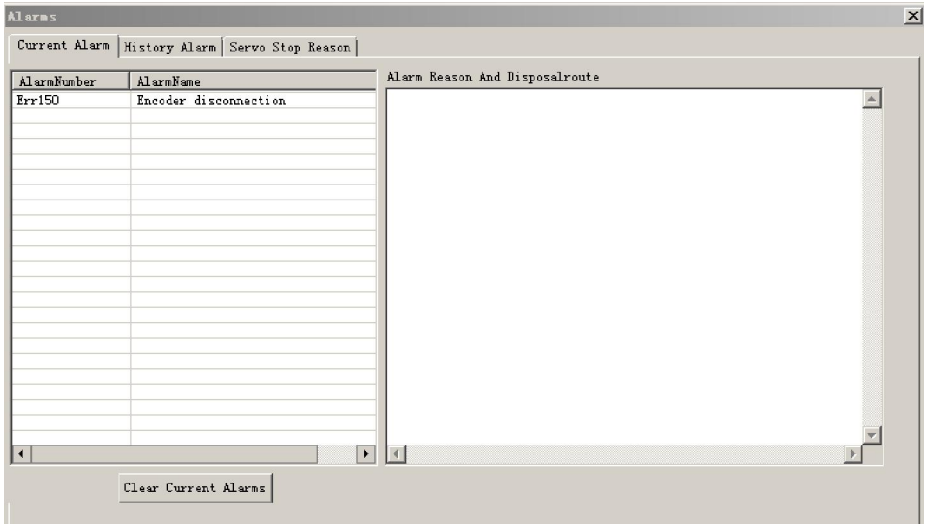
Chapter 4 Alarm and encoder management

4.1 Current alarm

Click the “alarm” like the following error :



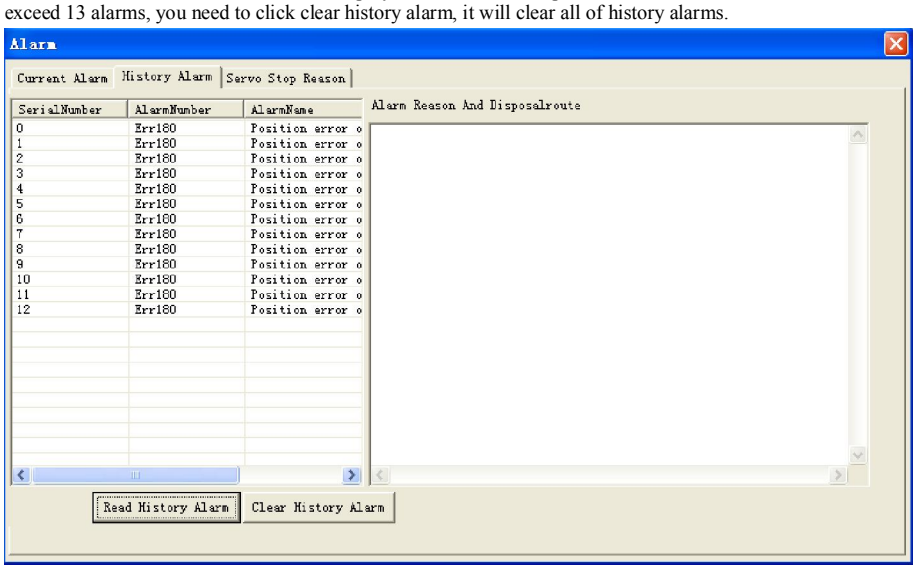
Then you can see the window like this ：



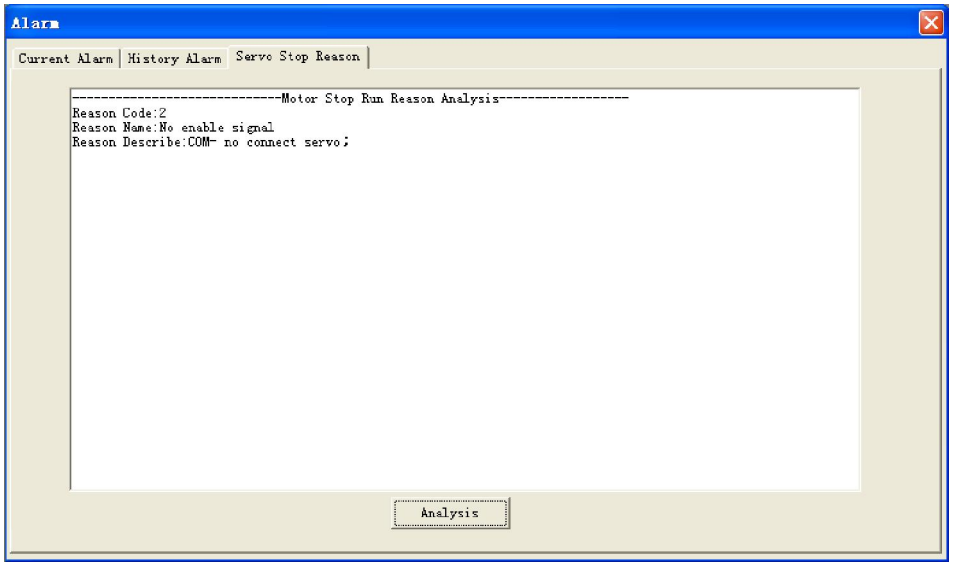
You can see the alarms after power on this time, the alarm will be eliminated after power off .

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

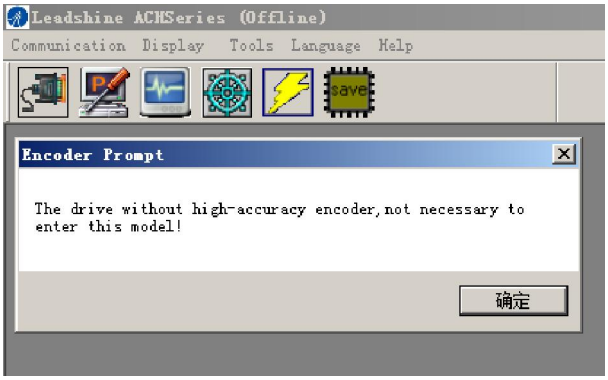


The reasons of servo stop running



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

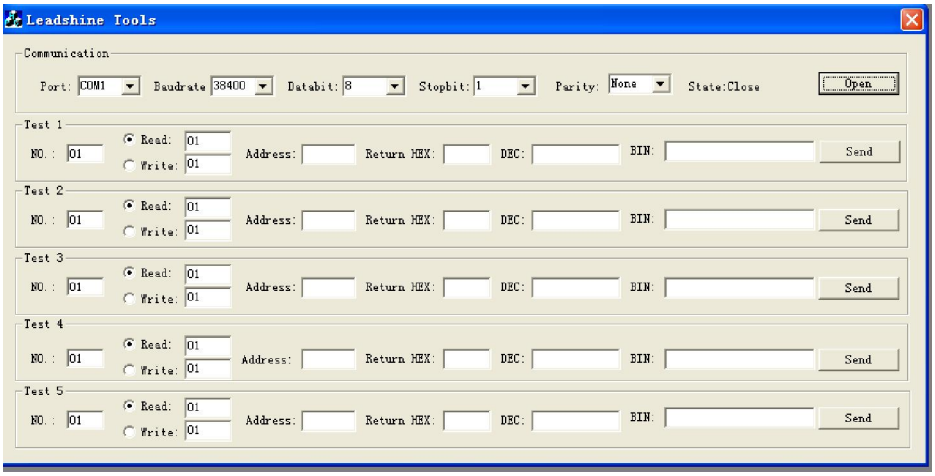
4.3 Encoder Management



In this window, you can set the values of parameter about encoder information. If the motor isn't high accuracy encoder, you won't see the encode parameter setup window.

4.4 Tool

Universal tuning software

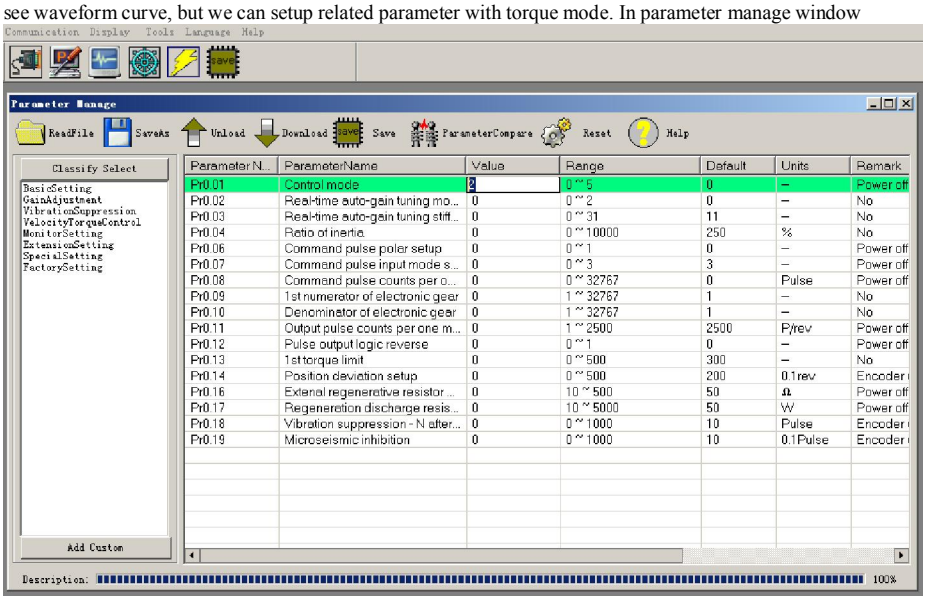


Chapter 5 Configuring the Driver

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

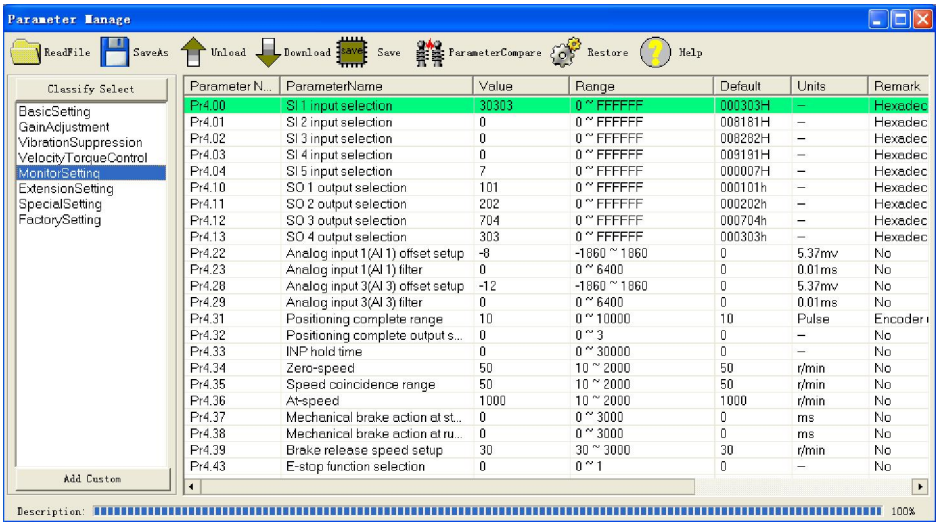
5.1 Torque mode

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



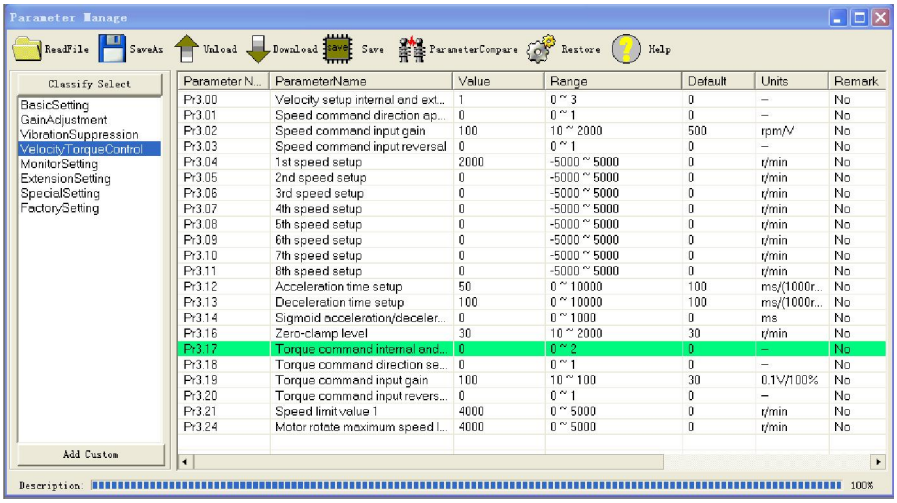
ParameterN...	ParameterName	Value	Range	Default	Units	Remark
Pr0.01	Control mode	2	0 ~ 5	0	–	Power off
Pr0.02	Real-time auto-gain tuning mo...	0	0 ~ 2	0	–	No
Pr0.03	Real-time auto-gain tuning stiff...	0	0 ~ 31	11	–	No
Pr0.04	Ratio of inertia	0	0 ~ 10000	250	%	No
Pr0.06	Command pulse polar setup	0	0 ~ 1	0	–	Power off
Pr0.07	Command pulse input mode s...	0	0 ~ 3	3	–	Power off
Pr0.08	Command pulse counts per o...	0	0 ~ 32767	0	Pulse	Power off
Pr0.09	1st numerator of electronic gear	0	1 ~ 32767	1	–	No
Pr0.10	Denominator of electronic gear	0	1 ~ 32767	1	–	No
Pr0.11	Output pulse counts per one m...	0	1 ~ 2500	2500	P/rev	Power off
Pr0.12	Pulse output logic reverse	0	0 ~ 1	0	–	Power off
Pr0.13	1st torque limit	0	0 ~ 500	300	–	No
Pr0.14	Position deviation setup	0	0 ~ 500	200	0.1rev	Encoder
Pr0.16	External regenerative resistor ...	0	10 ~ 500	50	Ω	Power off
Pr0.17	Regeneration discharge resis...	0	10 ~ 5000	50	W	Power off
Pr0.18	Vibration suppression - N after...	0	0 ~ 1000	10	Pulse	Encoder
Pr0.19	Microseismic inhibition	0	0 ~ 1000	10	0.1Pulse	Encoder

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



Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr4.00	SI 1 input selection	30303	0 ~ FFFFFF	000303H	–	Hexadec
Pr4.01	SI 2 input selection	0	0 ~ FFFFFF	008181H	–	Hexadec
Pr4.02	SI 3 input selection	0	0 ~ FFFFFF	008282H	–	Hexadec
Pr4.03	SI 4 input selection	0	0 ~ FFFFFF	008181H	–	Hexadec
Pr4.04	SI 5 input selection	7	0 ~ FFFFFF	000007H	–	Hexadec
Pr4.10	SO 1 output selection	101	0 ~ FFFFFF	000101h	–	Hexadec
Pr4.11	SO 2 output selection	202	0 ~ FFFFFF	000202h	–	Hexadec
Pr4.12	SO 3 output selection	704	0 ~ FFFFFF	000704h	–	Hexadec
Pr4.13	SO 4 output selection	303	0 ~ FFFFFF	000303h	–	Hexadec
Pr4.22	Analog input 1(AI 1) offset setup	-8	-1860 ~ 1860	0	5.37mv	No
Pr4.23	Analog input 1(AI 1) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.28	Analog input 3(AI 3) offset setup	-12	-1860 ~ 1860	0	5.37mv	No
Pr4.29	Analog input 3(AI 3) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.31	Positioning complete range	10	0 ~ 10000	10	Pulse	Encoder u
Pr4.32	Positioning complete output s...	0	0 ~ 3	0	–	No
Pr4.33	INP hold time	0	0 ~ 30000	0	–	No
Pr4.34	Zero-speed	50	10 ~ 2000	50	r/min	No
Pr4.35	Speed coincidence range	50	10 ~ 2000	50	r/min	No
Pr4.36	At-speed	1000	10 ~ 2000	1000	r/min	No
Pr4.37	Mechanical brake action at st...	0	0 ~ 3000	0	ms	No
Pr4.38	Mechanical brake action at ru...	0	0 ~ 3000	0	ms	No
Pr4.39	Brake release speed setup	30	30 ~ 3000	30	r/min	No
Pr4.43	E-stop function selection	0	0 ~ 1	0	–	No

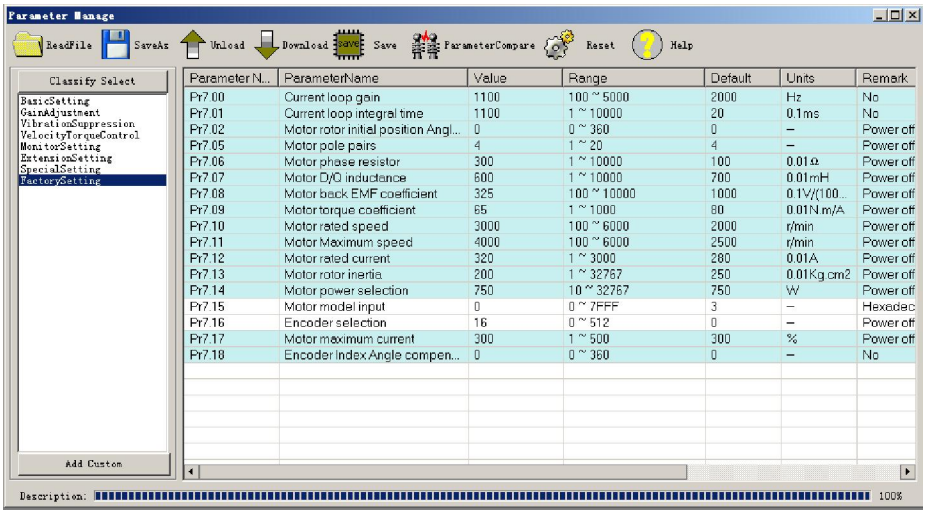
Then , you need to in torque control parameter setup Pr3.17=0.



Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr3.00	Velocity setup internal and ext...	1	0 ~ 3	0	–	No
Pr3.01	Speed command direction ap...	0	0 ~ 1	0	–	No
Pr3.02	Speed command input gain	100	10 ~ 2000	500	rpm/V	No
Pr3.03	Speed command input reversal	0	0 ~ 1	0	–	No
Pr3.04	1st speed setup	2000	-5000 ~ 5000	0	r/min	No
Pr3.05	2nd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.06	3rd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.07	4th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.08	5th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.09	6th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.10	7th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.11	8th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.12	Acceleration time setup	50	0 ~ 10000	100	ms/(1000r...	No
Pr3.13	Deceleration time setup	100	0 ~ 10000	100	ms/(1000r...	No
Pr3.14	Sigmoid acceleration/deceler...	0	0 ~ 1000	0	ms	No
Pr3.16	Zero-clamp level	30	10 ~ 2000	30	r/min	No
Pr3.17	Torque command internal and...	0	0 ~ 2	0	–	No
Pr3.18	Torque command direction se...	0	0 ~ 1	0	–	No
Pr3.19	Torque command input gain	100	10 ~ 100	30	0.1V/100%	No
Pr3.20	Torque command input revers...	0	0 ~ 1	0	–	No
Pr3.21	Speed limit value 1	4000	0 ~ 5000	0	r/min	No
Pr3.24	Motor rotate maximum speed l...	4000	0 ~ 5000	0	r/min	No

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

About the tuning of current loop gain

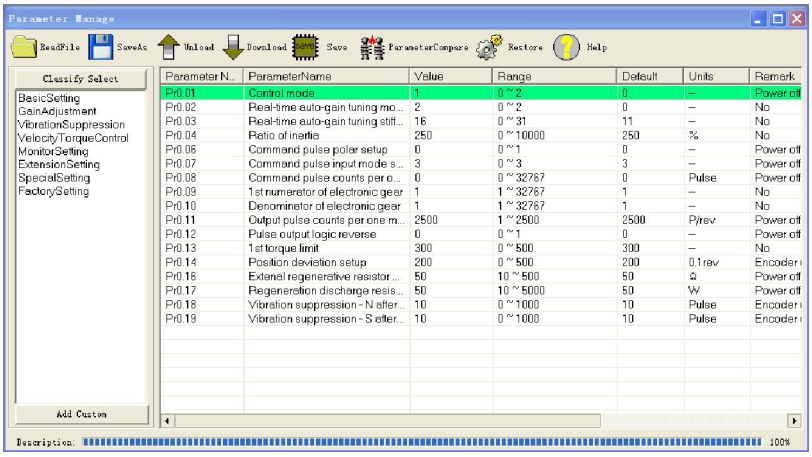


Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr7.00	Current loop gain	1100	100 ~ 5000	2000	Hz	No
Pr7.01	Current loop integral time	1100	1 ~ 10000	20	0.1ms	No
Pr7.02	Motor rotor initial position Angl...	0	0 ~ 360	0	–	Power off
Pr7.05	Motor pole pairs	4	1 ~ 20	4	–	Power off
Pr7.06	Motor phase resistor	300	1 ~ 10000	100	0.01Ω	Power off
Pr7.07	Motor D/Q inductance	600	1 ~ 10000	700	0.01mH	Power off
Pr7.08	Motor back EMF coefficient	325	100 ~ 10000	1000	0.1V/(100...	Power off
Pr7.09	Motor torque coefficient	65	1 ~ 1000	80	0.01N.m/A	Power off
Pr7.10	Motor rated speed	3000	100 ~ 6000	2000	r/min	Power off
Pr7.11	Motor Maximum speed	4000	100 ~ 6000	2500	r/min	Power off
Pr7.12	Motor rated current	320	1 ~ 3000	280	0.01A	Power off
Pr7.13	Motor rotor inertia	200	1 ~ 32767	250	0.01Kg.cm2	Power off
Pr7.14	Motor power selection	750	10 ~ 32767	750	W	Power off
Pr7.15	Motor model input	0	0 ~ 7FFF	3	–	Hexadec
Pr7.16	Encoder selection	16	0 ~ 512	0	–	Power off
Pr7.17	Motor maximum current	300	1 ~ 500	300	%	Power off
Pr7.18	Encoder Index Angle compen...	0	0 ~ 360	0	–	No

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

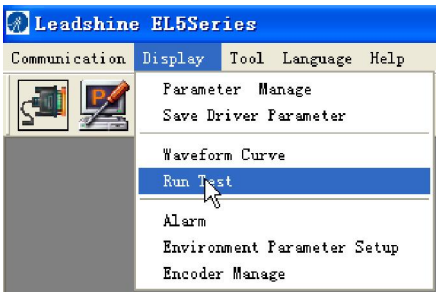
5.2 Velocity mode

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

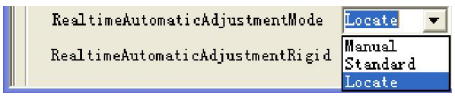


Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr0.01	Control mode	1	0 ~ 2	0	–	Power off
Pr0.02	Real-time auto-gain tuning mo...	2	0 ~ 2	0	–	No
Pr0.03	Real-time auto-gain tuning stiff...	16	0 ~ 31	11	–	No
Pr0.04	Ratio of inertia	250	0 ~ 10000	250	%	No
Pr0.06	Command pulse polar setup	0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

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

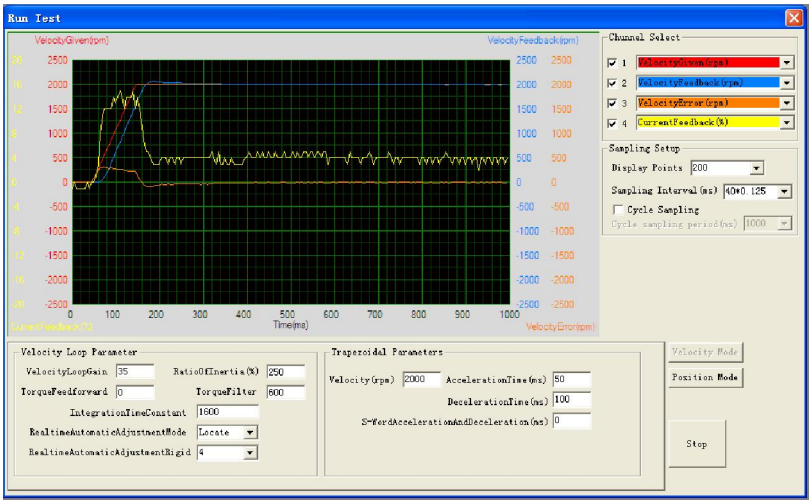


You can select different operation mode in real-time automatic adjustment mode, generally select **Locate** mode, if you want to adjust gain parameter by yourself, you can select **Manual** mode, then you can adjust related parameter step by step until to system requirement.
You can adjust velocity loop gain and integration time constant for tunning velocity loop and it is also very important to set ratio of inertia.

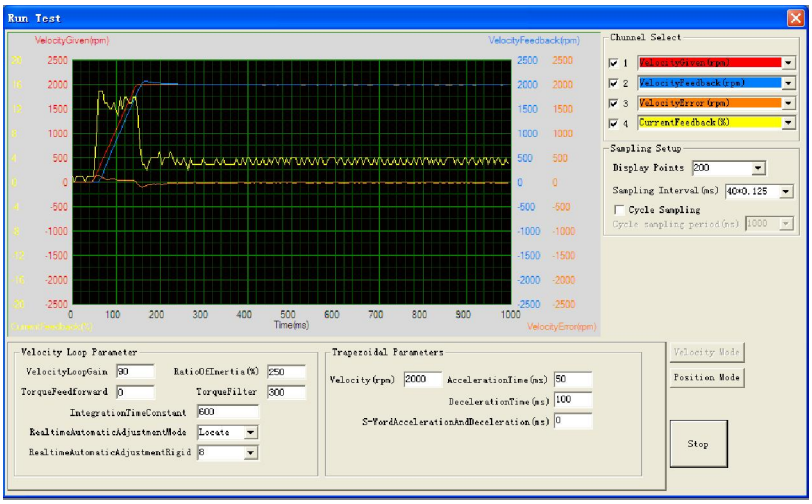


In **Manual** mode, you can setup VP, VI, and other related parameter. During tuning velocity loop, you can adjust Vi to a very small value in advance and hold it constant, then you can enlarge the value of Vp until system oscillation occurs, at this moment you can enlarge the value of Vi slowly until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

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



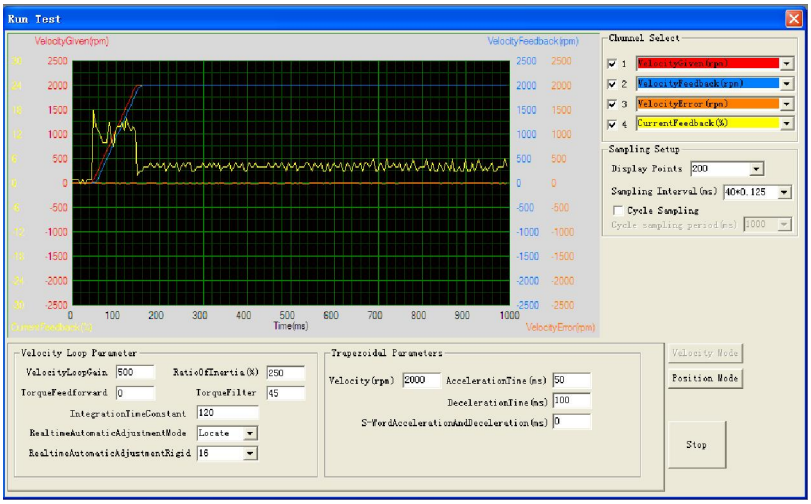
Then we continue increasing system rigid, then the velocity error become smaller and smaller.



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

But the noise of motor occurs if the rigid becomes bigger, so just make sure there is no noise.

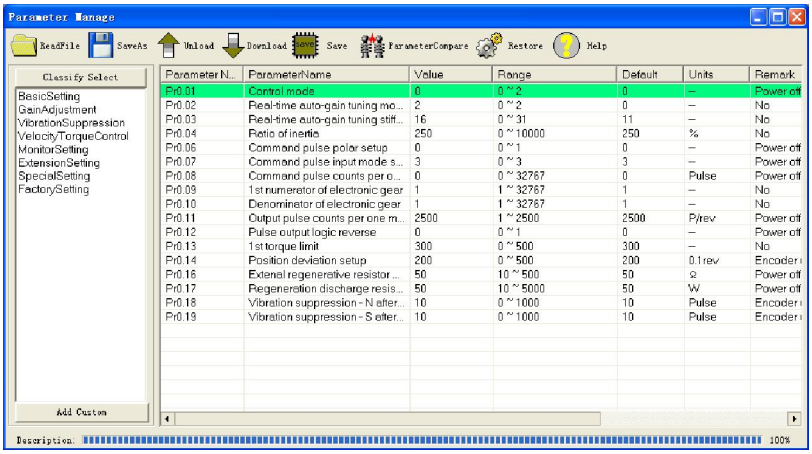
Finally, the basic setting for velocity loop is finished **in Locate mode.**



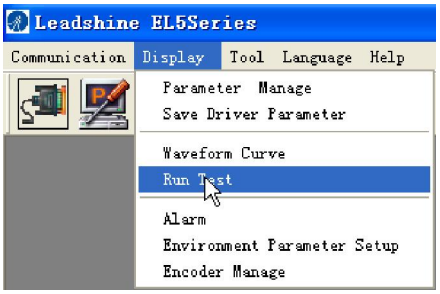
5.3 Position mode

Position Loop Tuning

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



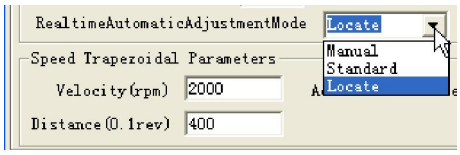
Click->Display will display the menu of pull down, select Run test, click the left key Run test will display position mode window, you can also directly click Toolbar button to display position mode window, if you doesn't modify the parameter value of control mode, you can also click Position Mode to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



Tuning Position Loop Parameters

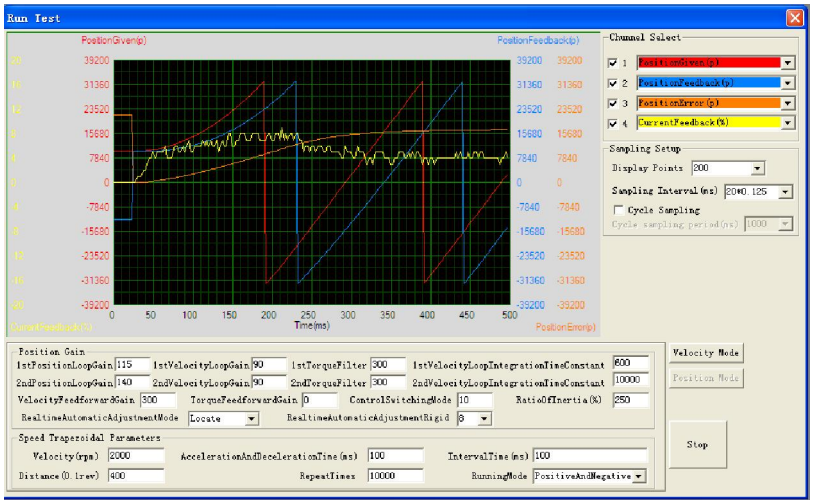
You can select different operation mode in real-time automatic adjustment mode, generally select **Locate** mode. If you want to adjust gain parameter by yourself, you can select **Manual** mode, then you can adjust related parameter step by step until system requirement.

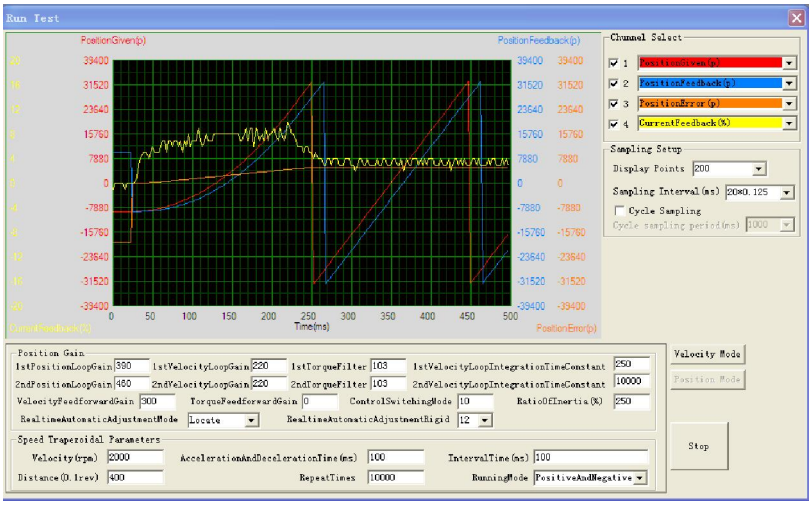
You can adjust position loop gain, velocity integration time constant and ratio of inertia for tunning position loop tuning. If you need stronger rigid, you only need adjust ratio of inertia, then adjust gain and integration



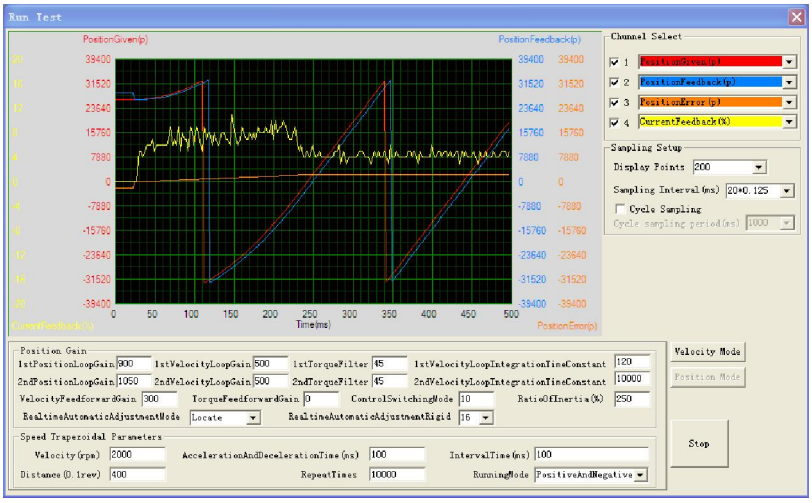
In **Manual** mode, you can setup Kp, Ki and other related parameters. During tuning position loop, you can adjust KI to a very small value in advance and hold it constant, then you can enlarge the value of Kp parameter slowly until system oscillation occurs, at this moment you can enlarge the value of Vi parameter slowly until system oscillation occurs, at this moment the basic adjustment of system finished.
In **Locate** mode. It is unavailable to modify the value of pr1.00- 1.14, we just change the value of real-time automatic adjustment rigid, firstly we select a smaller value.

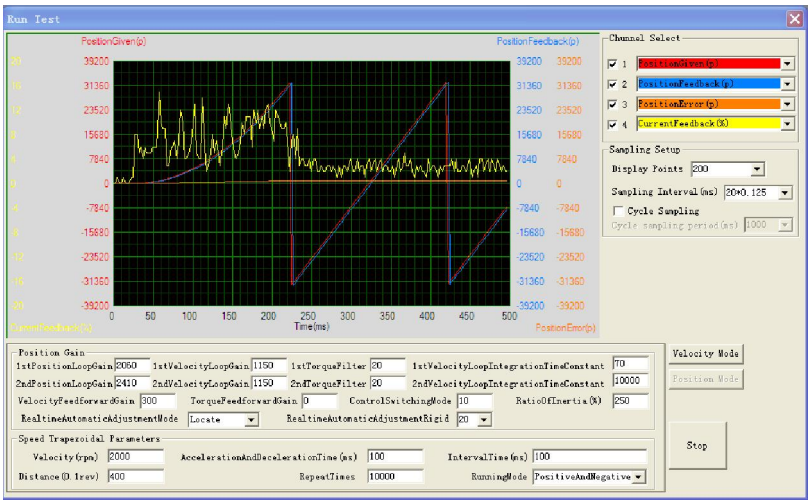
Then we continue increasing system rigid, then the position error become smaller and smaller.





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



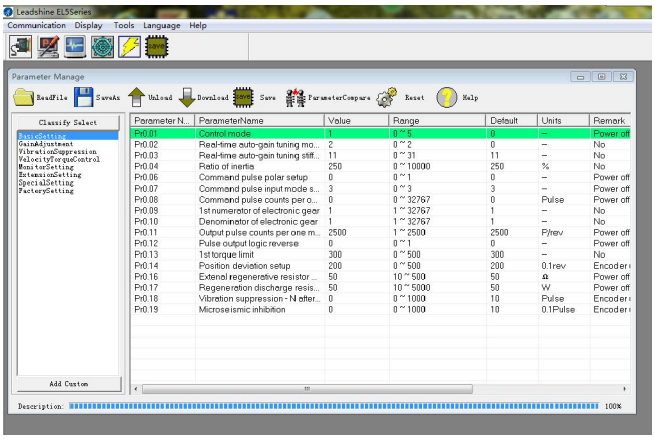


But the noise of motor occurs if the rigid becomes bigger, so just make sure there is no noise. Finally, the basic setting for position loop is finished **in Locate mode.**

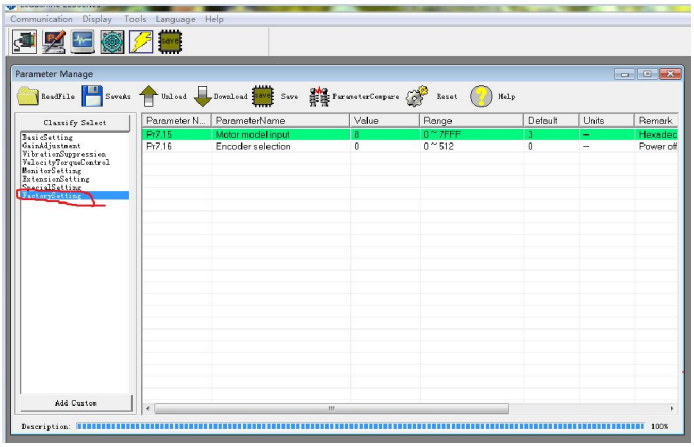
Appendix

How to find the hidden parameter of ProTuner

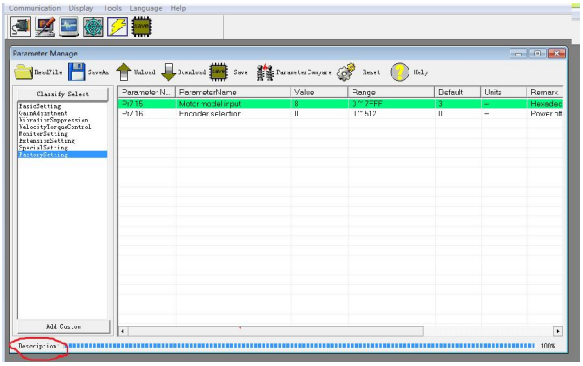
1. Run the software of ProTuner , we just find part of the parameter :



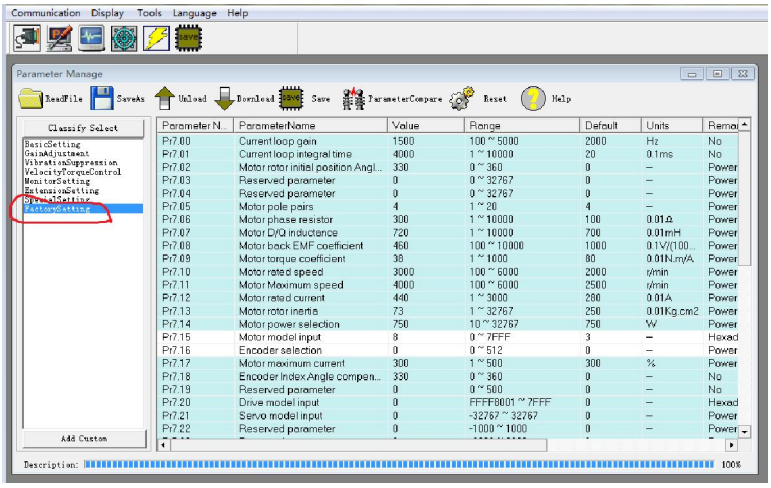
2. Now here is the way to find all of them :
   a. Click “factorysetting” :



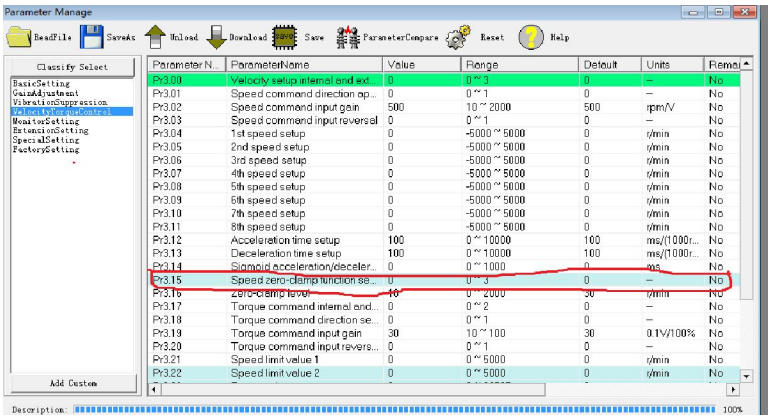
   b. Click “ description” :



c. Then double click “ factorysetting” ,then we can find all parameter:



d. For example, we can find the parameter: Pr3.15 :



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

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

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

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

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

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

Here is the step to modify the values of parameters for matching this white motor with driver:

1. **Modify the value of pr7.15 to f .**

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

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

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

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

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

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

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

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

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

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

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

3. **Download the new value of parameters**

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

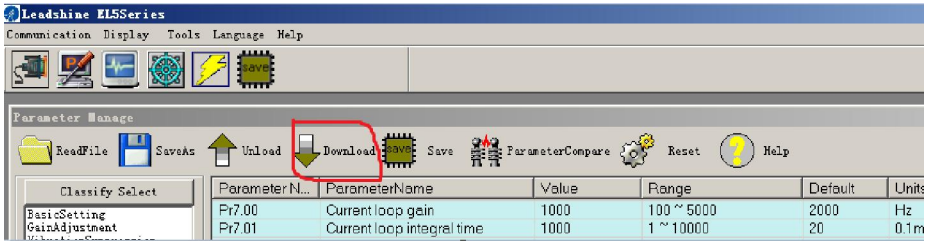
NOTICE: Contact the provider of motor for specification of motor.

How to modify the new values of parameter to the driver

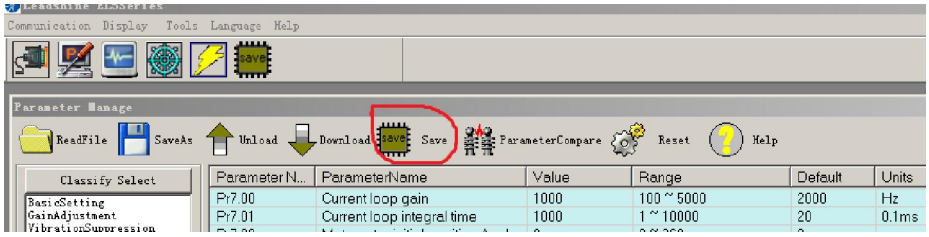
Sometimes, we need to restart the driver to make it available after modifying the values of parameter, so it is very important to follow the right step. You need to do the operation with the steps below:

1. Modify the value of parameter.

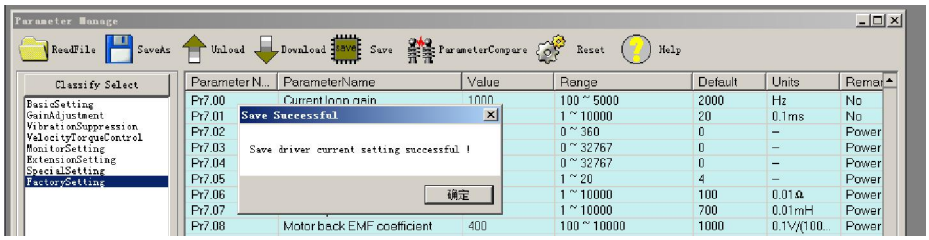
2. Click “download “:



3. Click “save”:



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



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

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