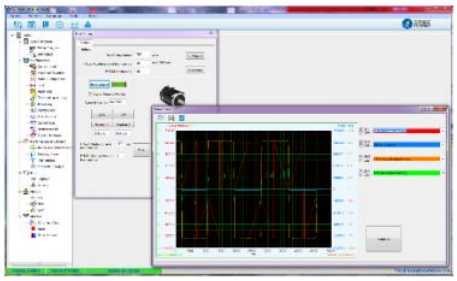
# *Motion Studio Software*

# *Quick Start*

***Version 0.1***



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# 1 Preparation List

- Leadshine servo drive
- Motor
- Cables
  - Motor power cable
  - Encoder feedback cable
  - Software configuration cable
- Software (Motion Studio)

# 2 Introduction

Motion Studio is a free software for easy commissioning of the Leadshine servo drives. This software allows the user to modify the parameters of the servo drive, performance adjustment, trial run, monitor the status and so on.

Motion Studio currently only supports the interface: **Modbus RTU over RS232**

## 2.1 Installing Motion Studio

| Caution |
| --- |
| We do not recommend using C:\Program or C:\Program Files as destination folder, because these paths require admin privileges. Since the installer automatically starts the application after it has been extracted, it would start in elevated mode, making the files created by Motion Studio only accessible to the admin-user. |

**Running condition:**

CPU: above 1.5GHz

RAM: above 256M

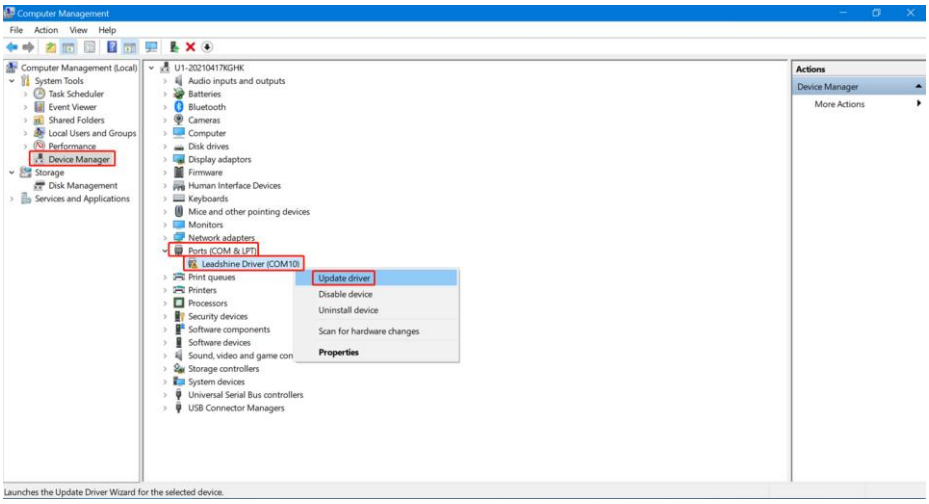
Hard disk capacity: above 10G

Displayer: resolution 1024*768, color 24 bit

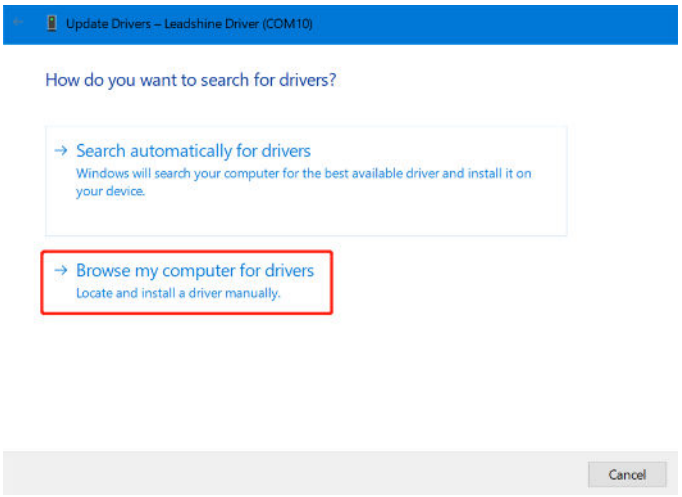
Communication interface: normal series or USB series adapter

**Steps:**

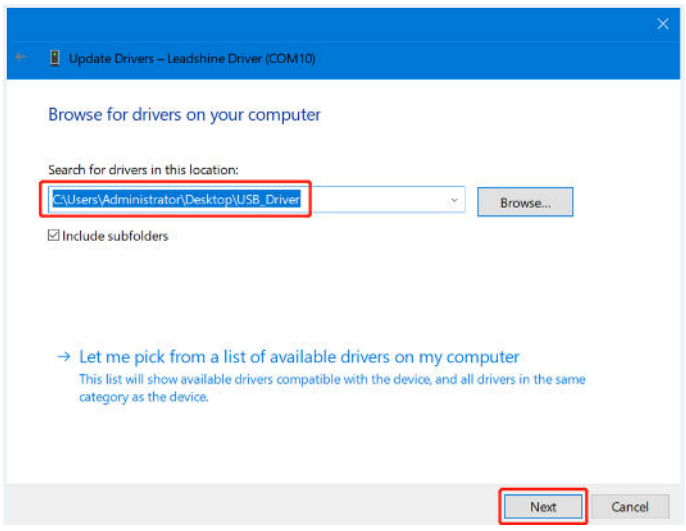
1. Download the Motion Studio zip file: “MotionStudio_OverseasEdition” and the USB driver zip file: “USB_Driver for LeadshineMotionStudio”.
2. Select the destination folder and decompress the zip files.
3. Install the USB driver according to your computer system, if it is necessary to install driver.
   Click in turn “Device Manager”, “Ports (COM&LPT)”, “Leadshine Driver”, “Update driver”




Click “Browse my computer for drivers”




Search for drivers in the location from “USB_Driver” folder in which you placed the application that Leadshine provide, and then accomplish updating driver.



## 2.2 Uninstalling

To delete an installation that you don't need anymore, just delete the corresponding folder.

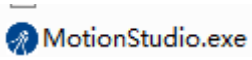
## 2.3 Upgrading

To upgrade Motion Studio, just install the new version in a new folder.

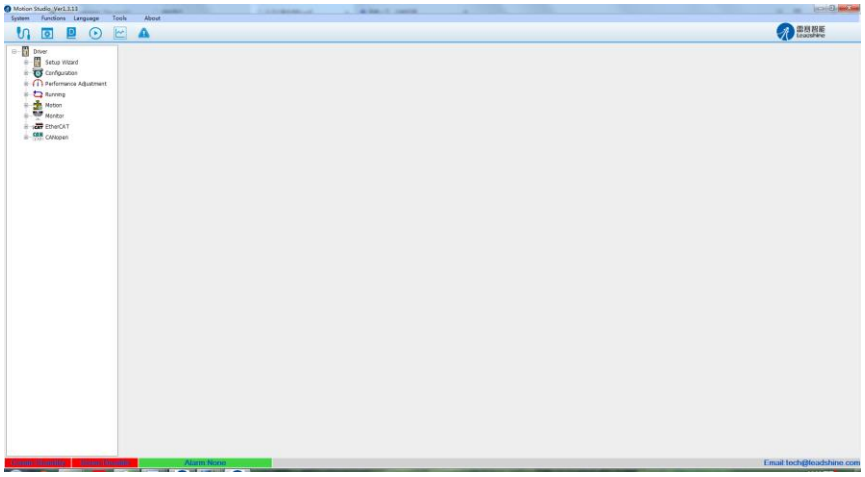
# 3 JOG Trail

## 3.1 Connecting the servo drive and Motion Studio

| Caution |
| --- |
| Before clicking the Connect button, please make sure<br>1. The RS232 cable has been connected between the drive and the PC's USB port.<br>2. The drive has been powered on.<br>The motor is unnecessary connecting to the drive if users just want to change the parameters but not tuning. |

1. Click on "Motion Studio.exe" 

and it will start, you will see the main window as shown below.

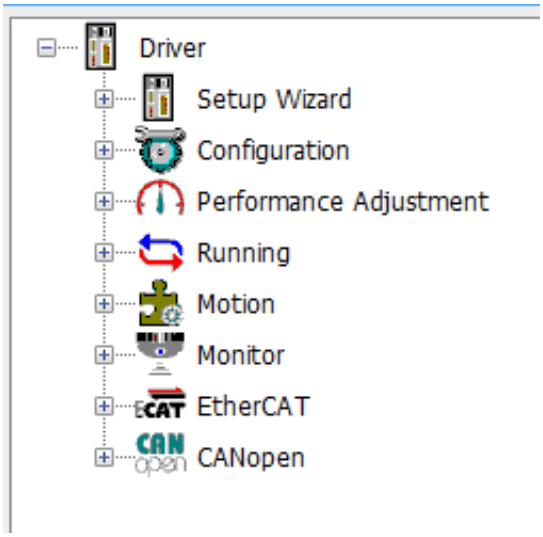


**At the top of the main window, you can access the main functions:**

| Button | Description | Function |
| --- | --- | --- |
| | Comm connection | Connect and disconnect a drive |
| | Parameter Manage | Display all parameters with their value, and modify them. |
| | Object Dictionary | Display all objects in object dictionary with their value, and modify them. |

| | | |
|---|---|---|
| | Run Testing | Trial run the servo motor. |
| | Wave Show | Display the values of the objects in the object dictionary over time. |
| | Alarm Info | Display the alarm information. |

**On the left side of the main window, you can see the function tree.**




**At the bottom of the main window, you can monitor the main status of the drive via Motion Studio. "Green" is for normal and "red" is for abnormal status.**

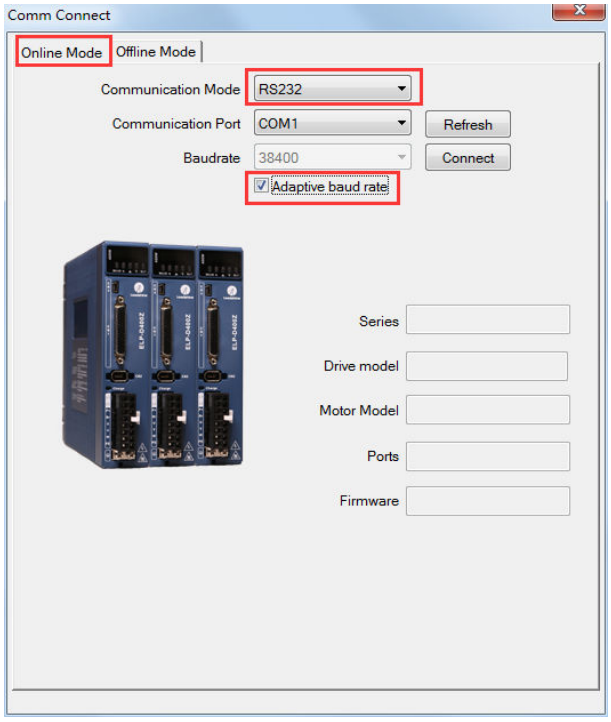
**Comm**: Standby (red) or Online (green).

**Servo**: Disable (red) or Enable (green).

**Alarm**: Other alarm information (red) or None (green).

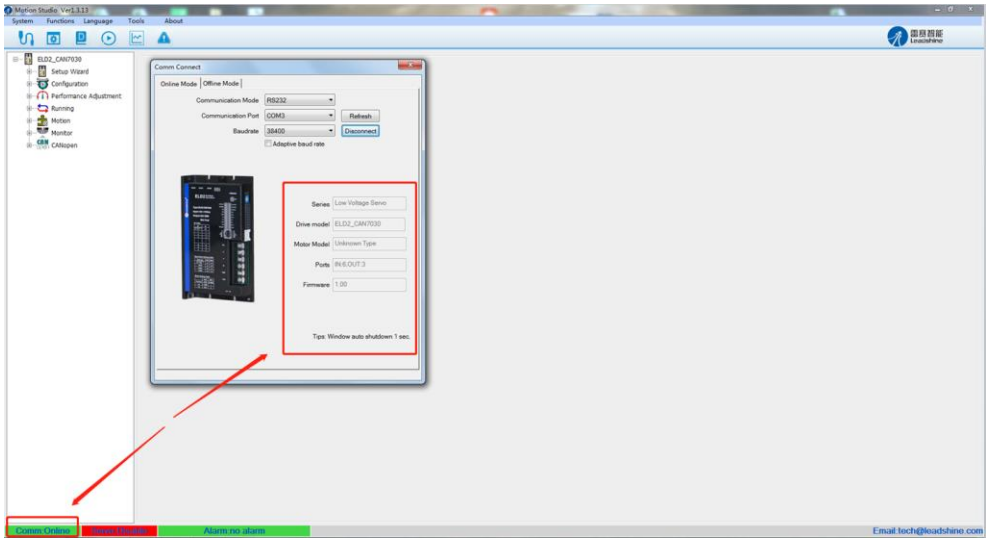
3. Click on , you will see the "Comm Connect " window as shown below. Select appropriate communication port and baud rate to start connecting.

Note: Recommend communication port under COM10. Baud rate is "Adaptive".




4. Click on the "Connect" button to complete the connection.

If the connection is successful, you will see the window as shown below.

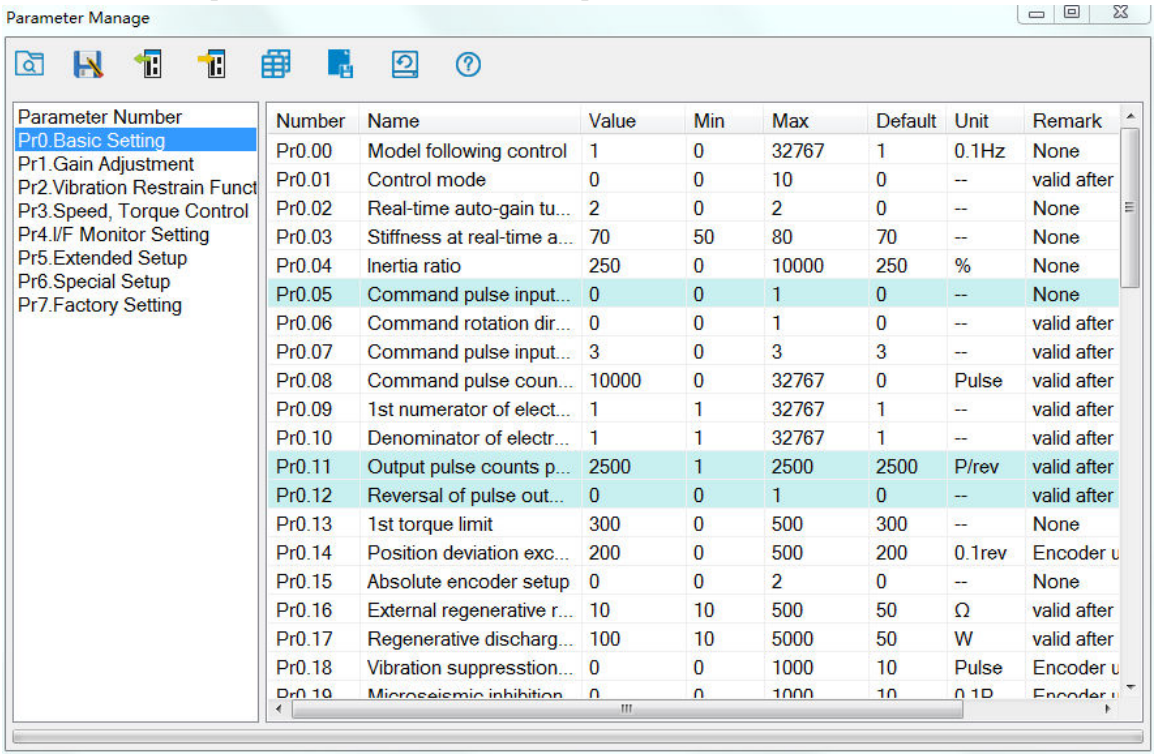


If the connection fails, make sure all cables are properly connected, the device is powered on and that you have selected the correct device and set the appropriate communication parameters.

# 3.2 Parameter manage

Click on , and you will see the “Parameter Manage” window as shown below.

Please refer to the product user manual for detailed parameters.




| Button | Description | Function |
|---|---|---|
| | Read parameters file | Read 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. |
| | Read from drive | Read parameters from the drive. |
| | Write to drive | Write parameters to the drive. |
| | Parameter compare | Compare the difference of parameters value of two projects and display it out. |
| | Save to driver | Save parameters into Non-Volatile Memory. |
| | Factory reset | Reset all values of parameters to defaults. |
| | Help | Check the explanation of parameters. |

## *3.2.1 Setting the Leadshine motor parameters*

Note: Please set the motor parameters according to the encoder type.

Setting the motor parameters take effect after the drive (power supply) restart.

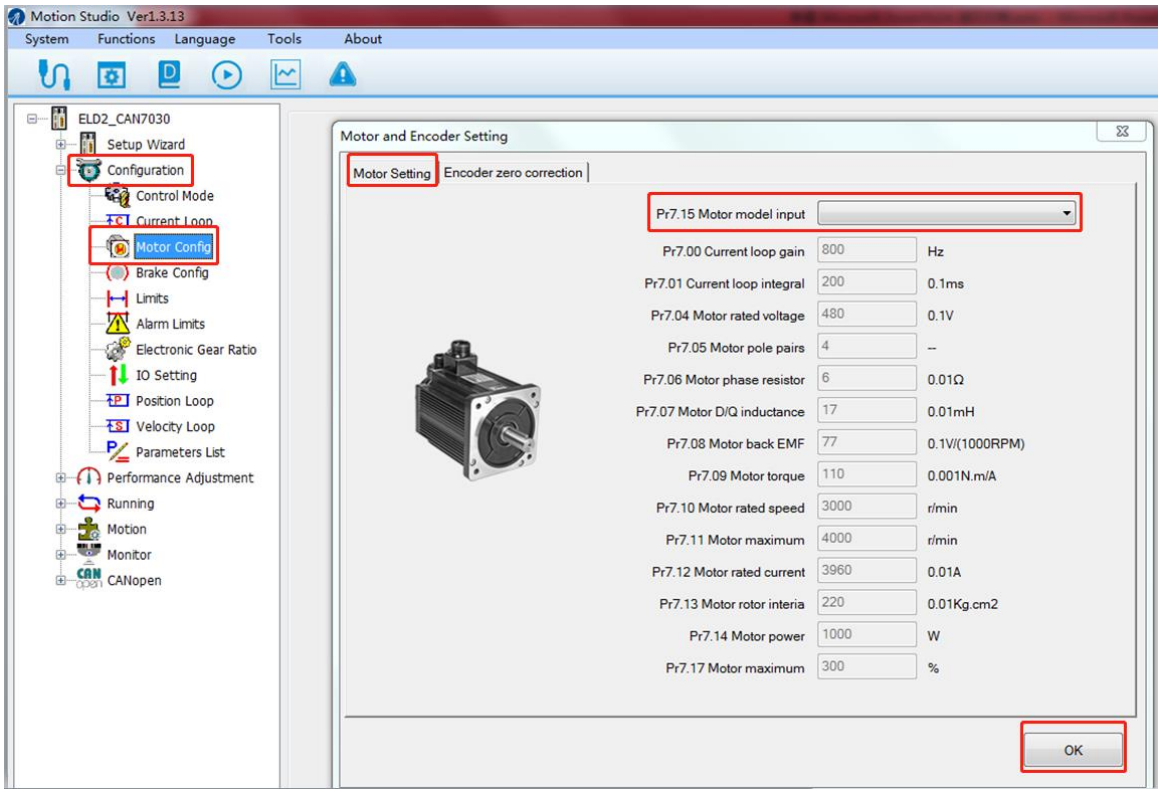
**Auto-setting**

If the drive is matched with Leadshine servo motor with serial signal encoder, including 17bit and 23 bit serial signal encoder. The drive can automatically identify the motor parameters by "read from drive".

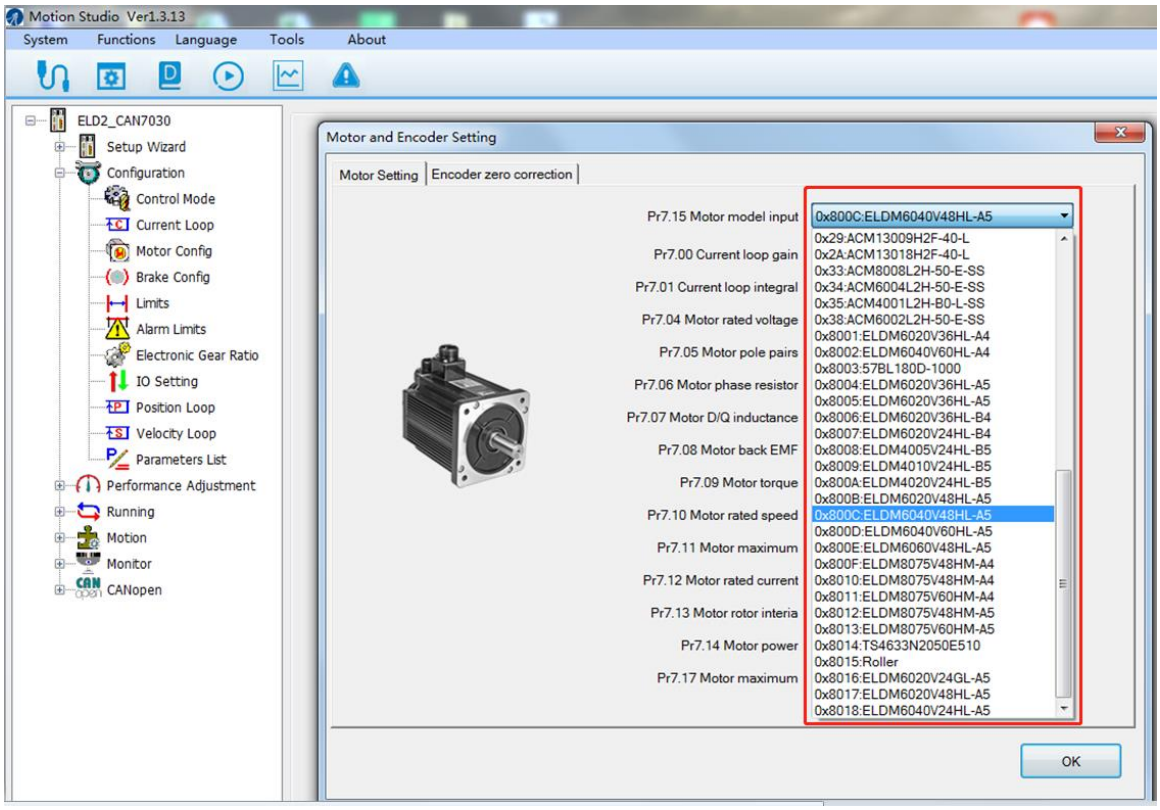
**Manual-setting**

If the drive is matched with Leadshine servo motor with incremental ABZ+Hall uvw encoder, for example 1000 lines encoder, the drive needs to manually set motor parameters after "read from driver".

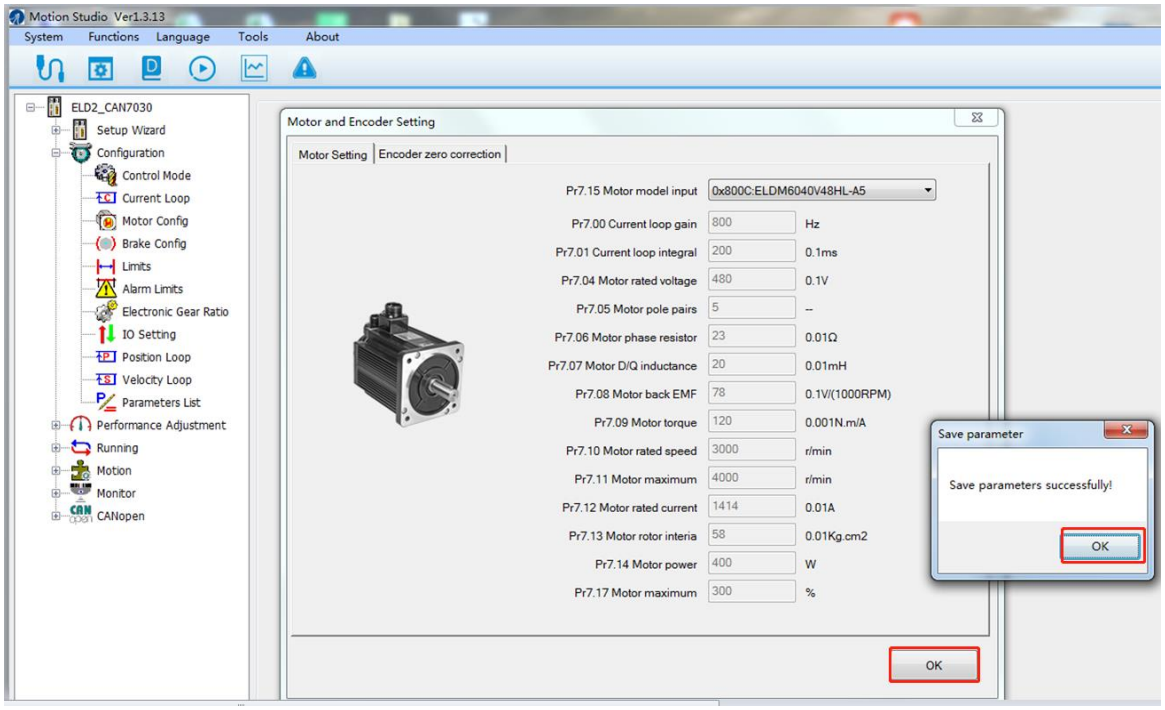
1. Close Parameter Manage, open "Configuration"—"Motor Config", you will see the window "Motor and Encoder Setting".



2. You can click the bar “Pr7.15 Motor model input” to view the pull-down menu.



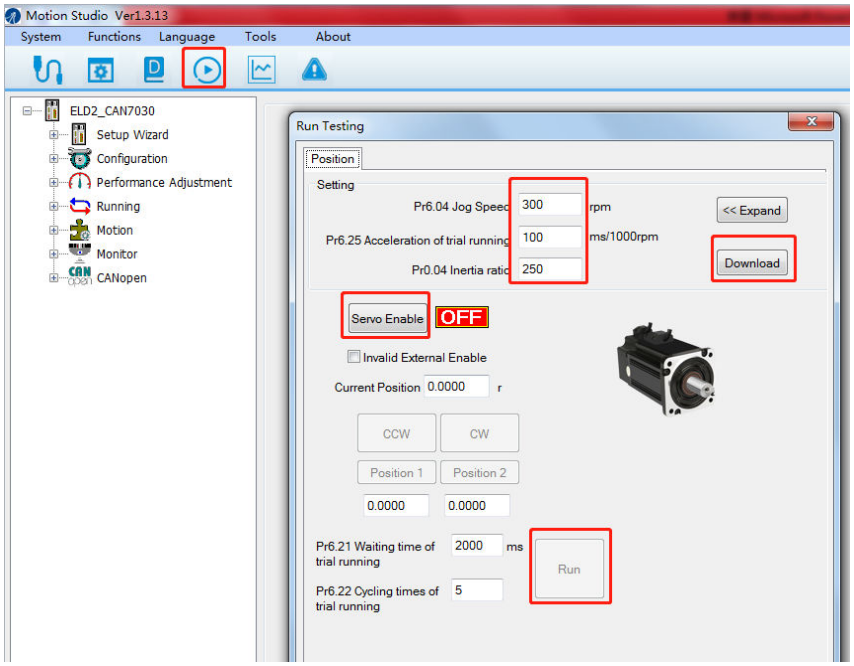

3. Select a matching motor model, press the button “OK”, Complete the motor parameters setting.



# *3.3 Run testing*

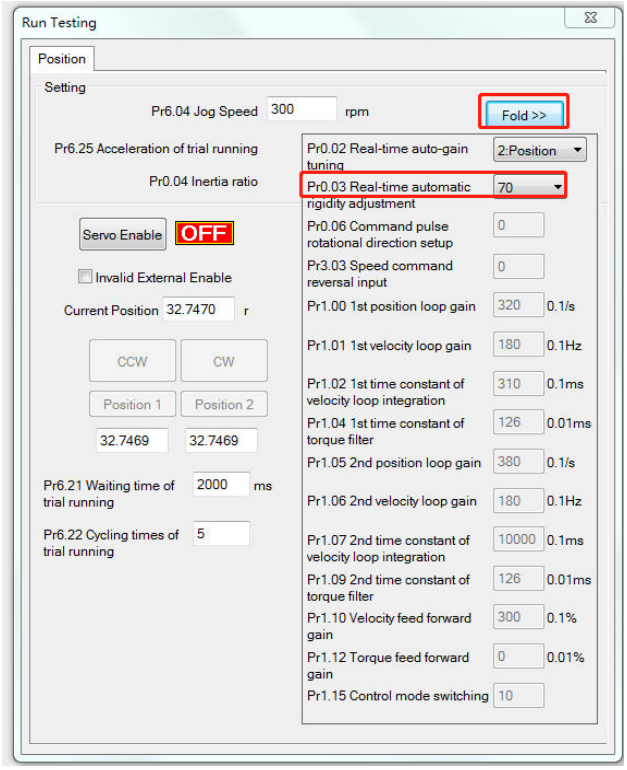
| Caution |
| --- |
| Before Run testing, please make sure:<br>1. The motor is not loaded.<br>2. The motor parameters have been set and are in effect. |

Open the window “Run Testing”.

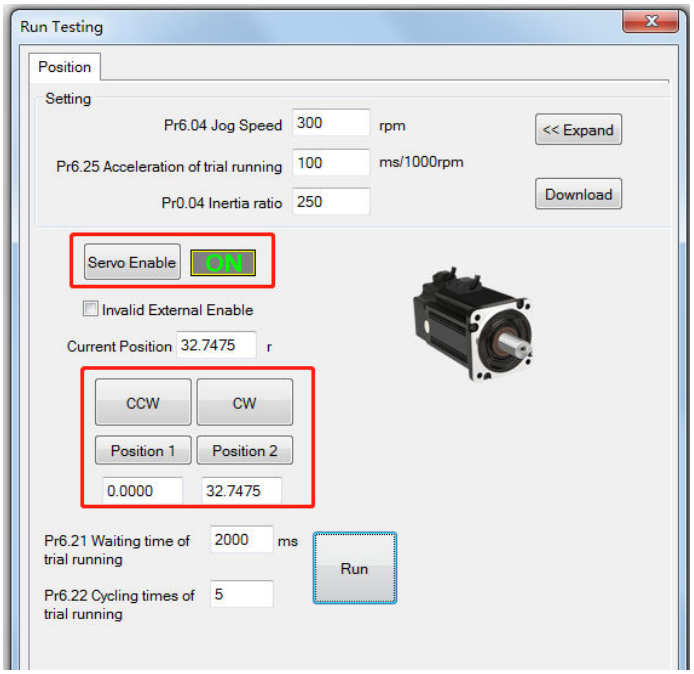



1. Before starting the “Run”, you need to set the relevant objects for the movement itself like “jog Speed”, “acceleration of trial running”, “inertia ratio” and “Expand”.

Note: “inertia ratio” and “Expand” recommend the default data, “inertia ratio” is not more than 300. “Pr0.03” is between 68 and 72. Click button “Download” to make sure the modified parameters take effect.

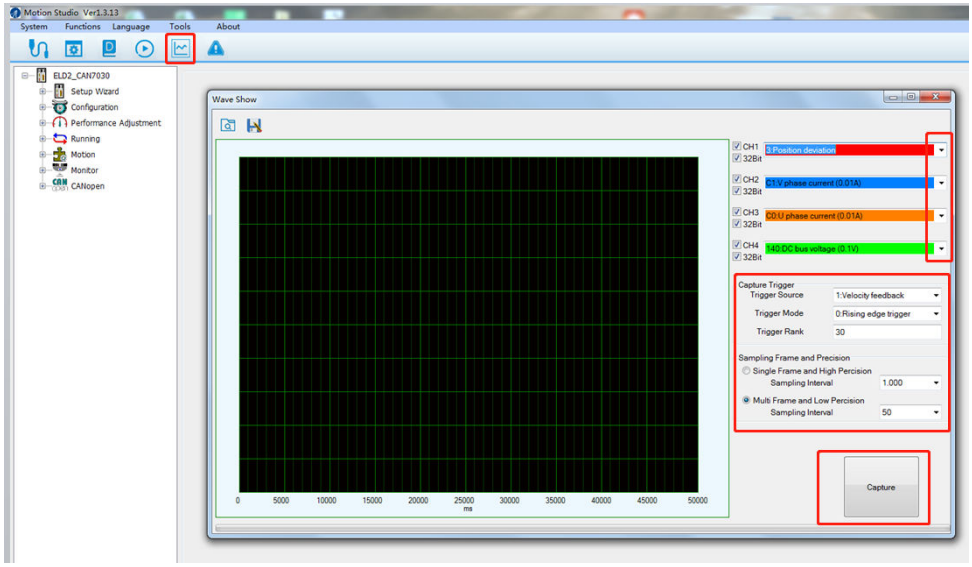



2. Click button “Servo Enable”, then you can run the motor.
   Click “CCW” to make motor run to CCW direction，click “Position 1” to save the testing position as limit 1.
   Click “CW” to make motor run to CW direction， click “Position 2” to save the testing position as limit 2.
   Click “Run” to start testing progress.



# *3.4 Wave show*

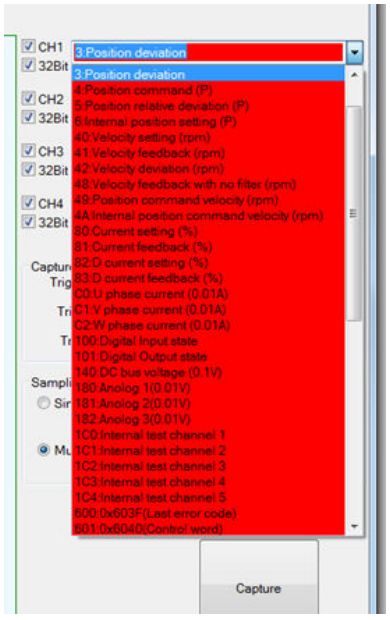
Open the window “Wave Show”.

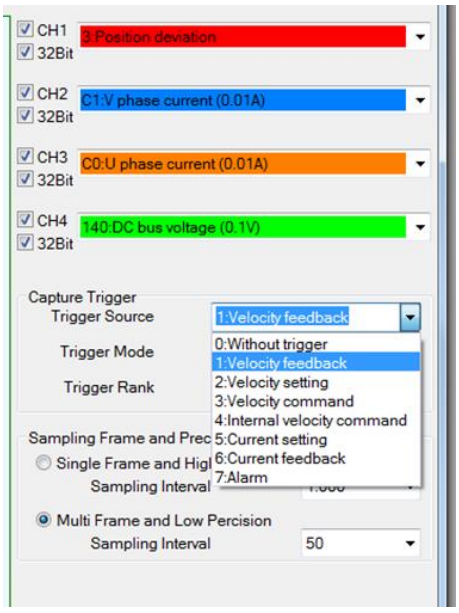



: Load wave file from the computer.

: Save current wave record as wave file.

1. You can click the option bar on the right to choose the pull-down menu. Identify the data you want to monitor and the trigger conditions.

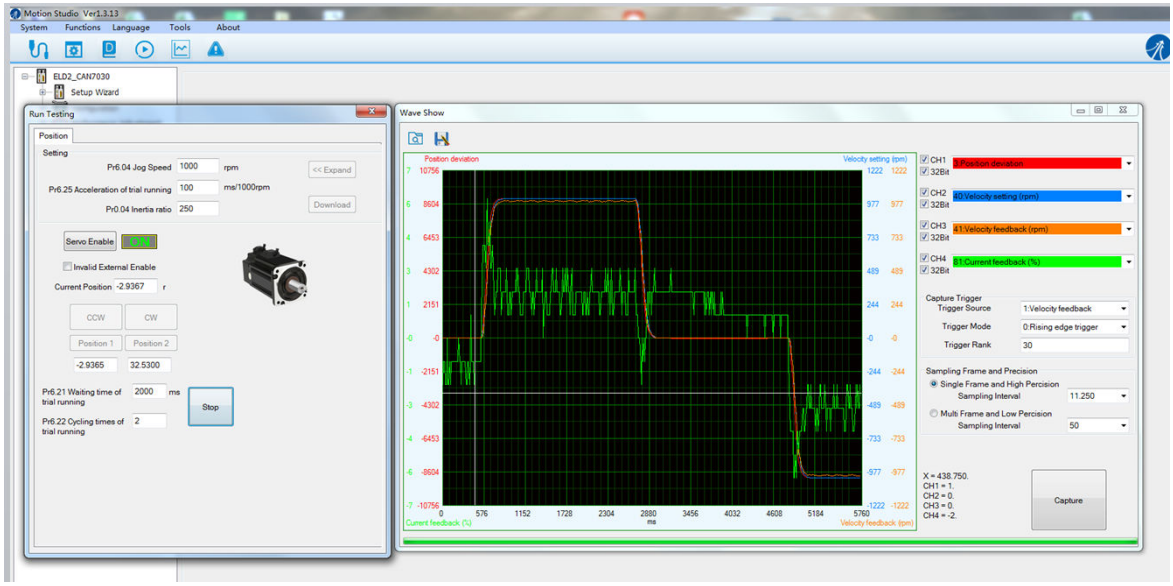


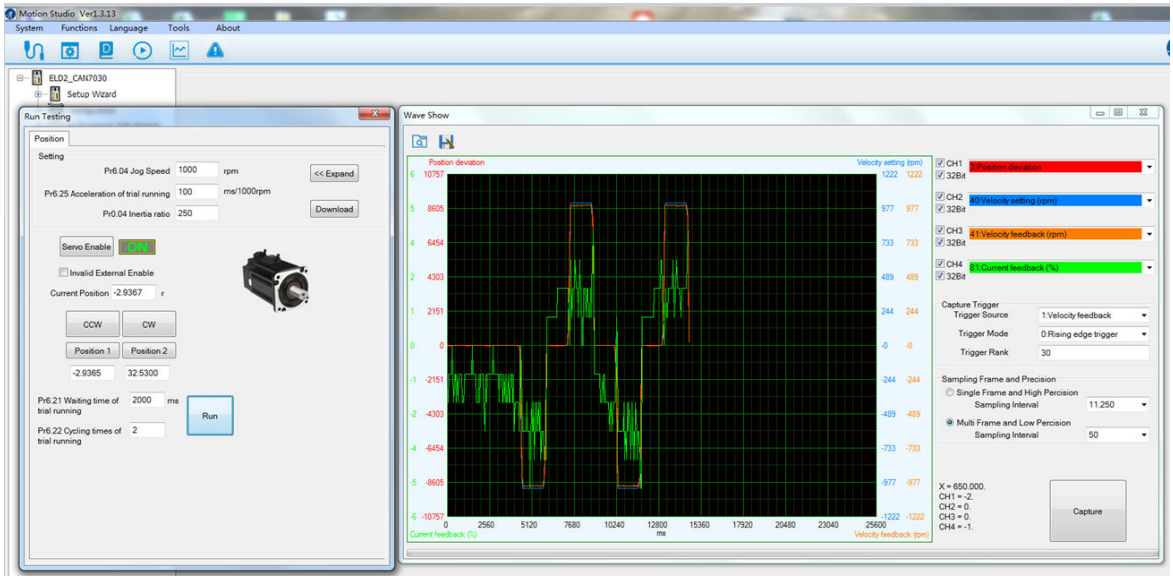

2. Click the button “Capture”, you can monitor the status of performance when the motor is running. For example, the driver and motor are running position feedback、position error、velocity feedback and current feedback.

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

**Single Frame:**



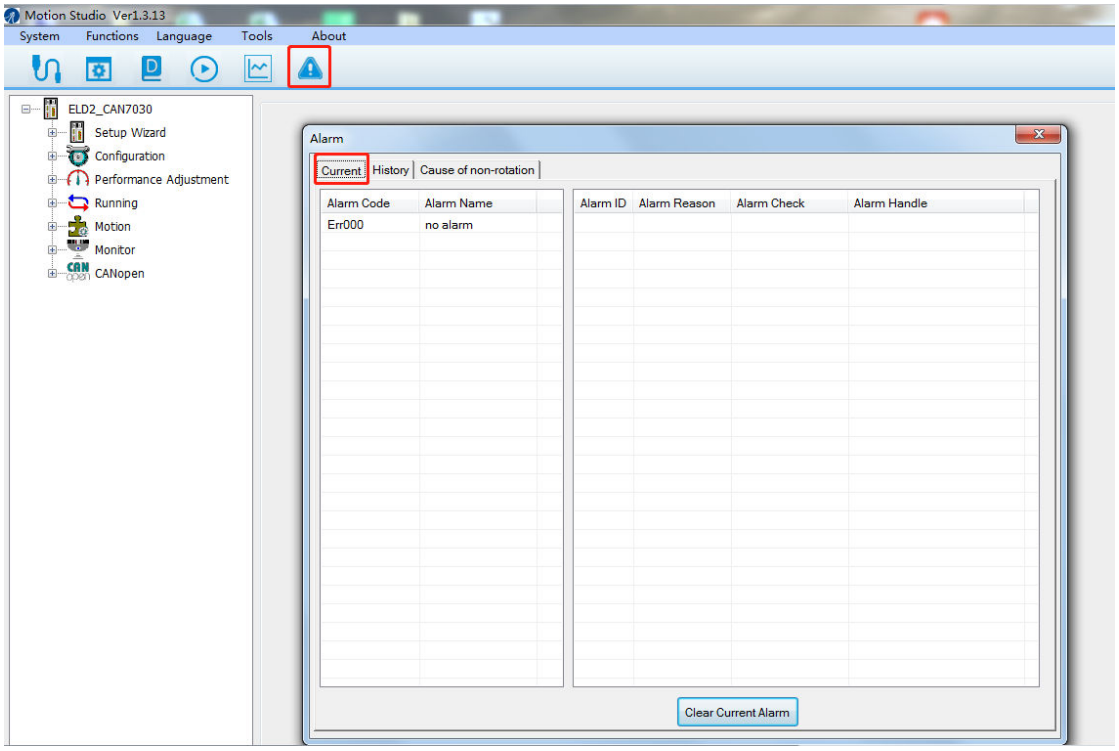

**Multi Frame:**



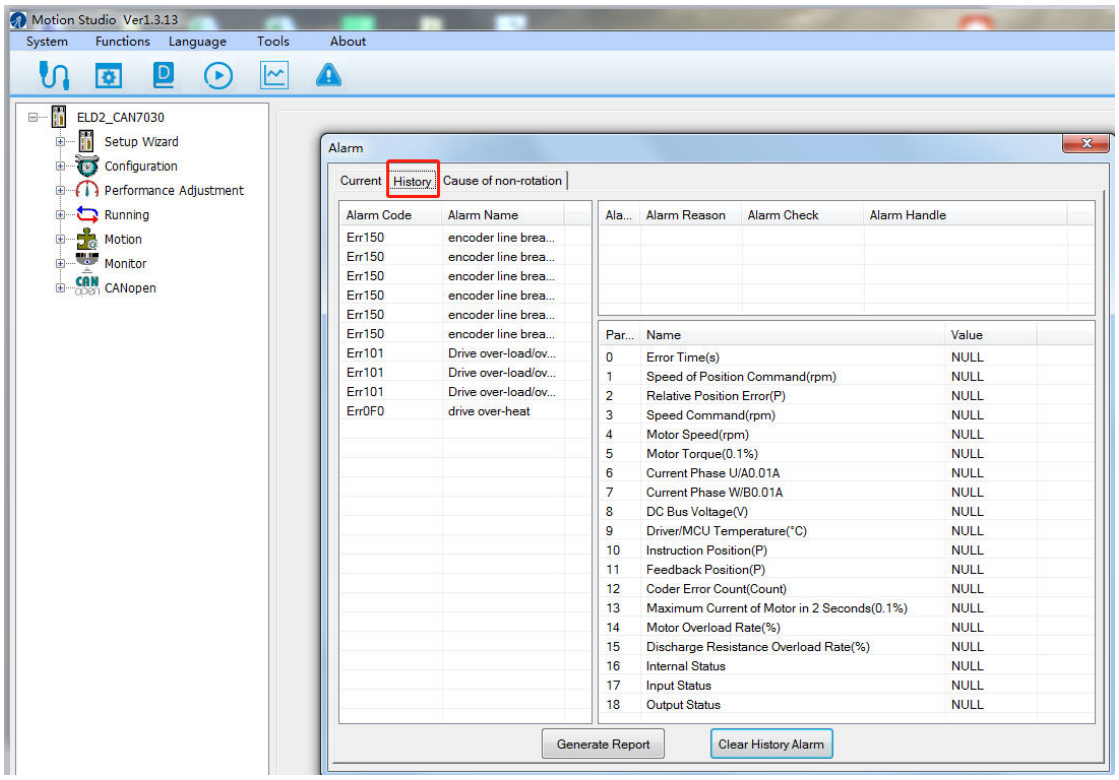
# *3.5 Alarm info*

Open the window “Alarm Info”, you can choose to see the alarm information for “Current” or “History”.

**Current alarm:**




**History alarm:**



# 4 Performance Tuning

## 4.1 Real-time auto-gain tuning (Pr0.02)

**Manual mode (Pr0.02=0)**

Kp, Ki and other parameters can be set manually. Pr003 is unavailable now.

About how to tune position loop, Ki can be adjusted to a very small value in advance and hold it constant, then enlarge the value of Kp parameter slowly until system oscillation occurs, at this moment enlarge the value of Vi parameter slowly until system oscillation occurs, at this moment the basic adjustment of system is finished.

**Standard mode (Pr0.02=1)**

It is usually for interpolation movement. It is unavailable to modify the value of Pr1.00- 1.14, just change the value of Pr0.03, and all values of Pr1.00-1.14 will be changed at the same time.

**Positioning mode (Pr0.02=2)**

It is usually for point to point movement. It is unavailable to modify the value of Pr1.00- 1.14, just change the value of Pr0.03, and all values of Pr1.00-1.14 will be changed at the same time.

## 4.2 Inertia ratio (Pr0.04)

| Caution |
| --- |
| Before Run testing, please make sure:<br>If the motor is loaded or mounted on the equipment, move it within safe limits. |

It is very important to find the ratio of inertia for one axis, in order to make best performance before setting other parameter (for example, setting PID of position loop or velocity loop).

Connect motor with load if you need to test one axis.

Inertia ratio identification pre-conditions:

1. Servo disable.
2. Positive limit and negative limit invalid.

**Steps:**

1. Set the Jog speed Pr6.04, and the setting should not be too large (300~1000rpm is recommended)

Set the Acc Pr6.25 (100~200 ms/1000rpm is recommended). 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 as limit 1.

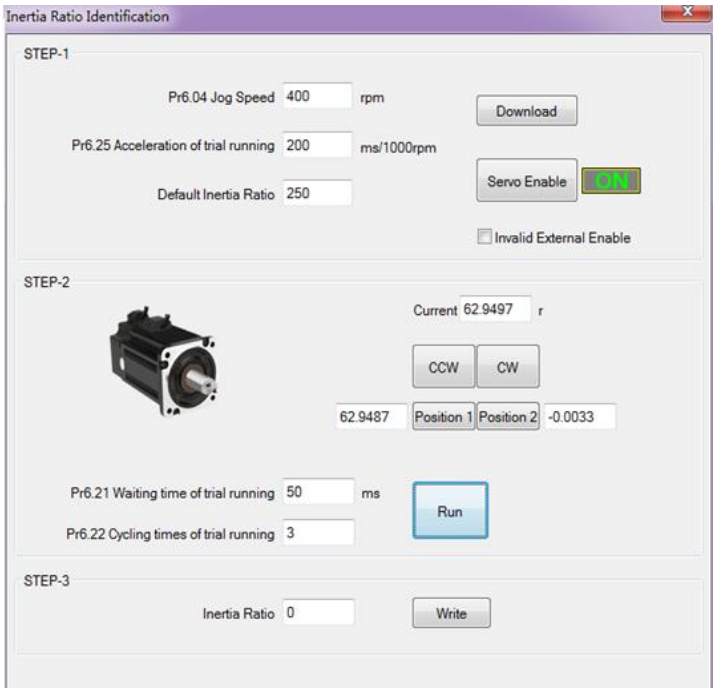
Click “CW” to make motor run to CW direction，click “Position 2” to save the position as limit 2.

Set the waiting time Pr6.21 (1000~2000ms is recommended).

Set the cycling times Pr6.22 (3~5 is recommended).

Click “Run” to start inertia ratio dentification.

3. After the motor finished its trial running, click “Write” to save the inertia ratio identification result into the servo drive.



# *4.3 Gain adjustment (Pr0.03)*

Definition of Pr0.03:

| Pr0.03 | Selection of machine stiffness at real-time auto-gain tuning | Range | unit | default | Related control mode | | |
|---|---|---|---|---|---|---|---|
| | | 50 -81 | - | 70 | P | V | T |

You can set up response while the real-time auto-gain tuning is valid.

Low ⟶ Machine stiffness ⟶ High

Low ⟶ Servo gain ⟶ High

81.80·····70.69.68·····51.50

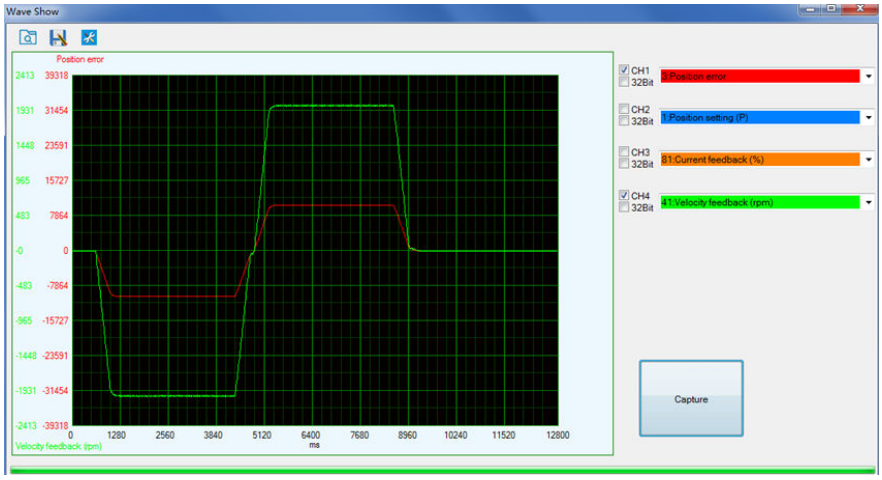
Low ⟶ Response ⟶ High

**Notice:** Lower the setup value, higher the velocity response and servo stiffness will be obtained. However, when decreasing the value, check the resulting operation to avoid oscillation or vibration. Control gain is updated while the motor is stopped. If the motor can't be stopped due to excessively low gain or continuous application of one-way direction command ,any change made to Pr0.03 is not 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.

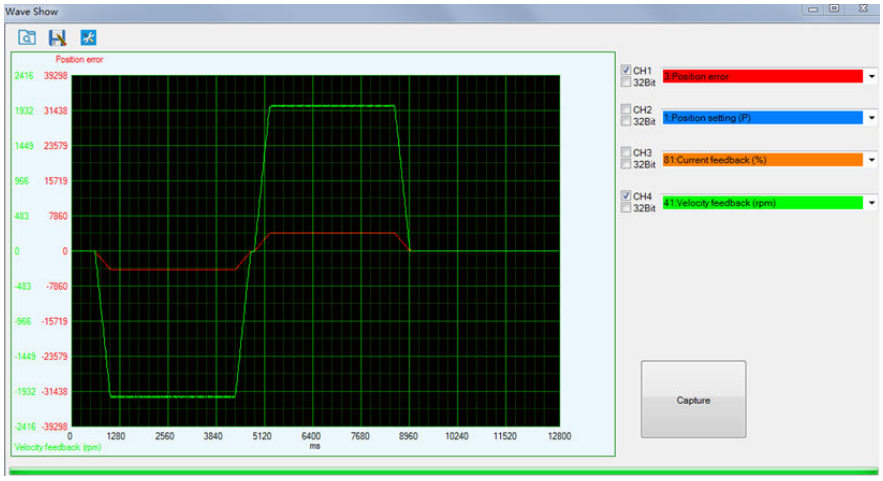
You can determine the suitable Pr0.03 by monitoring "3: Position error", "41: Velocity feedback" and "81: Current feedback".

**Refer to an example:**

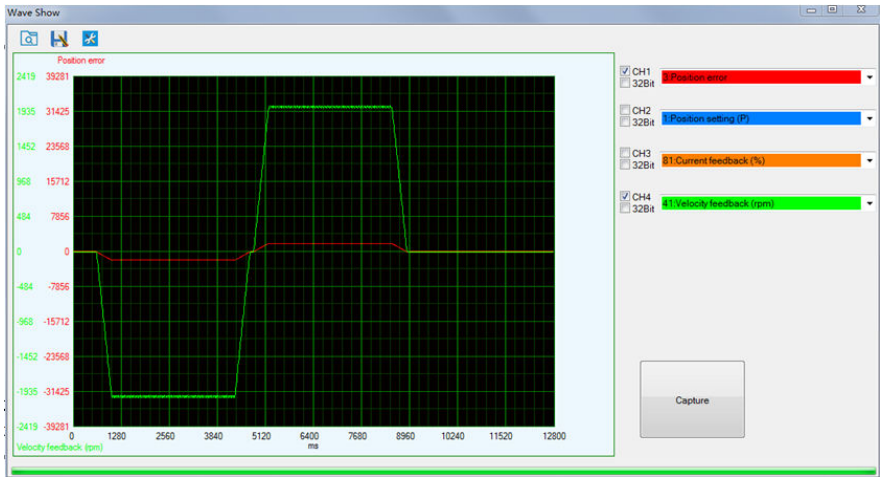
1. The following figure showing Pr0.02=2, Pr0.03=70, the position error value (curve in red) is approximately 10,000.



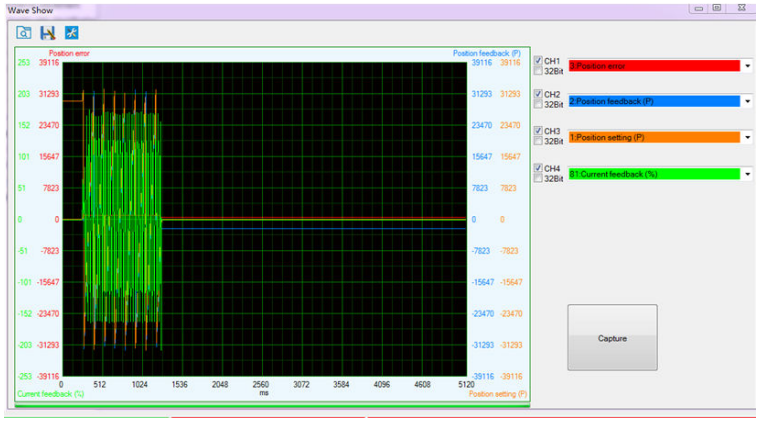
2. Keep decreasing value of Pr0.03, then the position error become smaller and smaller.
When Pr0.03=66, the position error value (curve in red) is approximately 4000.




3. When keep decreasing the value pf Pr0.03, the position loop gain Kp become bigger and bigger, the integration time constant Vi become smaller and smaller, the position error becomes close to zero. When Pr0.03=62, the position error value (curve in red) is approximately 2000.




4. If Pr0.03 is set too small, it can cause the servo system to oscillate or become unstable, and the noise of the motor occurs, also alarm may appear. When Pr0.03=61, the operation of the motor becomes oscillatory.




5. In summary, the most suitable value of Pr0.03 is 62.