

Quick Start of Motion Studio

# Motion Studio Software

# Quick Start

Version 0.1







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## **1** Preparation List

- Leadshine servo drive
- Motor
- Cables
  - $\triangleright$ Motor power cable
  - Encoder feedback cable  $\triangleright$
  - $\triangleright$ 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"

Update Drivers – Leadshine Driver (COM10)	
How do you want to search for drivers?	
→ Search automatically for drivers Windows will search your computer for the best available driver and install it on your device.	
→ Browse my computer for drivers Locate and install a driver manually.	
	Cancel

Search for drivers in the location from "USB\_Driver" folder in which you placed the application that Leadshine provide, and then accomplish updating driver.

<ul> <li>Update Drivers – Leadshine Driver (COM10)</li> </ul>	
Browse for drivers on your computer	
Search for drivers in this location:           C\Users\Administrator\Desktop\USB_Driver	
☑ Include subfolders	
→ Let me pick from a list of available drivers on my computer This list will show available drivers compatible with the device, and all drivers in the same category as the device.	
Next Can	cel



### 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 1. The RS232 cable has been connected between the drive and the PC's USB port. 2. The drive has been powered on. 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" MotionStudio.exe and it will start, you will see the main window as shown below.

Motion 1	Nado VerL111				 · Aller I					0
System	Functions Large									
5	o D	ک 🕑	A						の 部門 開催	
e-10 1	Setus Witard Configuration									
-	Setup Wittand									
	Performance Adjust	trent								
- 1	Rarring									
	Mation Maritor									
8-2	EtherCAT									
18-1	CANopen									
-										
Comm	Stanting lite	an Court	1	tarm Noon	 	 _	_	 _	Email toch@toad	shine com

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

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





$\odot$	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	Servo:Disable	Alarm:None					

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

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

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

3. Click on **1**, 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".





Online Mode Offline Mode Communication Mode RS232  Communication Port COM1  Refresh Baudrate 38400  Connect Refresh	
Communication Port COM1   Refresh Baudrate 38400  Connect	
Baudrate 38400 Connect	
Adaptive baud rate	
Larra Larra Larra	
Series	1
	1
Drive model	
Motor Model	
Ports	
Firmware	]

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

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

System Functions Language Tools				<b>第月習業</b> Leaderte
				 Locarene
ELD2_CAN7030	Comm Connect			
8- 😈 Configuration	Online Mode Offine Mode			
iii 🕜 Performance Adjustment	Communication Mode	R5232 •		
H- 🔄 Running	Communication Port	COM3 • Relvesh		
Hoton Hontor Hontor	Baudrate			
(0 CANopen		Adaptive baud rate		
	ALC: NO. OF CO.			
	1 mm 2 1	Series Low Voltage Servo		
		The spectrum state of the second		
	瘤混。	Drive model ELD2_CAN7030		
		Motor Model Unknown Type		
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Ports PLEOUT3		
		Fermiere 1.00		
	The state of the s			
		Tips: Window auto shutdown		
		Lips. Window auto shutdown	n Tsec	
	/			
	1			
/				
Comm.Online	Alarm:no alarm			Email.tech@leadshine.com

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 [1], and you will see the "Parameter Manage" window as shown below.

Please refer to the product user manual for detailed parameters.

		2 0						
Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark
Pr0.Basic Setting Pr1.Gain Adjustment	Pr0.00	Model following control	1	0	32767	1	0.1Hz	None
Pr2.Vibration Restrain Funct	Pr0.01	Control mode	0	0	10	0		valid after
Pr3.Speed, Torque Control	Pr0.02	Real-time auto-gain tu	2	0	2	0		None
Pr4.I/F Monitor Setting	Pr0.03	Stiffness at real-time a	70	50	80	70		None
Pr5.Extended Setup	Pr0.04	Inertia ratio	250	0	10000	250	%	None
Pr6.Special Setup Pr7.Factory Setting	Pr0.05	Command pulse input	0	0	1	0		None
FIT actory Setting	Pr0.06	Command rotation dir	0	0	1	0		valid after
	Pr0.07	Command pulse input	3	0	3	3		valid after
	Pr0.08	Command pulse coun	10000	0	32767	0	Pulse	valid after
	Pr0.09	1st numerator of elect	1	1	32767	1		valid after
	Pr0.10	Denominator of electr	1	1	32767	1		valid after
	Pr0.11	Output pulse counts p	2500	1	2500	2500	P/rev	valid after
	Pr0.12	Reversal of pulse out	0	0	1	0		valid after
	Pr0.13	1st torque limit	300	0	500	300		None
	Pr0.14	Position deviation exc	200	0	500	200	0.1rev	Encoder u
	Pr0.15	Absolute encoder setup	0	0	2	0		None
	Pr0.16	External regenerative r	10	10	500	50	Ω	valid after
	Pr0.17	Regenerative discharg	100	10	5000	50	W	valid after
	Pr0.18	Vibration suppresstion	0	0	1000	10	Pulse	Encoder u
	Drft 10	Microeeiemic inhibition	0	Λ	1000	10	0 1D	Encoder

Button	Description	Function
ব্রী	Read parameters file	Read parameter setup from the folder (the project file from PC computer).
R	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.
1	Read from drive	Read parameters from the drive.
	Write to drive	Write parameters to the drive.
曲	Parameter compare	Compare the difference of parameters value of two projects and display it out.
	Save to driver	Save parameters into Non-Volatile Memory.
0	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.

Motion Studio Ver1.3.13		
System Functions Language Tools	About	
Vi 🖸 🖻 🕑 🖂	<b>A</b>	
	Motor and Encoder Setting           Motor Setting         Encoder zero correction           Pr7.15 Motor model input           Pr7.00 Current loop gain           Pr7.01 Current loop integral           Pr7.05 Motor rated voltage           Pr7.06 Motor phase resistor           Pr7.07 Motor D/Q inductance           Pr7.08 Motor back EMF           Pr7.09 Motor torque           Pr7.11 Motor rated speed           Pr7.12 Motor rotor interia           Pr7.14 Motor power           Pr7.17 Motor maximum	0x8000:ELDM6040V48HL-A5           0x29:ACM13009H2F-40-L           0x24:ACM13018H2F-40-L           0x3:AACM60004L2H-50-E-SS           0x3:AACM6004L2H-50-E-SS           0x3:AACM6004L2H-50-E-SS           0x3:ACM6004L2H-50-E-SS           0x3:ACM6004L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002L2H-50-E-SS           0x3:ACM6002V38HL-A5           0x8007:ELDM6020V38HL-A5           0x8007:ELDM6020V48HL-A5           0x8007:ELDM6020V48HL-A5           0x8007:ELDM6020V48HL-A5           0x8007:ELDM6020V48HL-A5           0x8007:ELDM6020V48HL-A5           0x8007:ELDM8075V48HM-A4           0x8010:ELDM8075V48HM-A5           0x8010:ELDM8075V48HM-A4           0x8011:ELDM8075V48HM-A5           0x8012:ELDM8075V48HM-A5           0x8013:ELDM6020V24GL-A5           0x8013:ELDM6020V24GL-A5           0x8013:ELDM6020V24GL-A5           0x8013:ELDM6020V24GL-A5           0x8013:ELDM6020V24GL-A5

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

Motion Studio Ver1.3.13 System Functions Language Tools	About			-		
ELD2_CAN7030	Motor and Encoder Setting				8	)
Configuration	Motor Setting Encoder zero correction					
Control Mode		Pr7.15 Motor model input	0x800C:ELD	M6040V48HL-A5	•	
Motor Config		Pr7.00 Current loop gain	800	Hz		
( ) Brake Config		Pr7.01 Current loop integral	200	0.1ms		
→ Limits → Alarm Limits		Pr7.04 Motor rated voltage	480	0.1V		
Electronic Gear Ratio		Pr7.05 Motor pole pairs	5	] -		
		Pr7.06 Motor phase resistor	23	0.01Ω		
Position Loop		Pr7.07 Motor D/Q inductance	20	0.01mH		
Velocity Loop		Pr7.08 Motor back EMF	78	0.1V/(1000RPM)		
Performance Adjustment		Pr7.09 Motor torque	120	0.001N.m/A	Save param	eter X
🕮 🕁 Running		Pr7.10 Motor rated speed	3000	r/min	Save param	leter
Motion		Pr7.11 Motor maximum	4000	r/min	Save para	ameters successfully!
Monitor		Pr7.12 Motor rated current	1414	0.01A		
a cost entropen		Pr7.13 Motor rotor interia	58	0.01Kg.cm2		ок
		Pr7.14 Motor power	400	w		- OK
		Pr7.17 Motor maximum	300	%		
					ок	



### 3.3 Run testing



Before Run testing, please make sure:

1. The motor is not loaded.

2. The motor parameters have been set and are in effect.

#### Open the window "Run Testing".

Motion	Studio Ver1.	3.13					And in case of the second values of
System	Functions	Language	Tools	About			
ហ	¢.		~	Δ			
	ELD2_CAN703 Setup W Configura Performa Running Motion Motion CANoper	izard ation nce Adjustment		Pr6.25 Acceleration of tris Pr0.04 In Servo Enable	ertia ratio 250	rpm ms/1000rpm	<< Expand Download

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.

Run Testing			×
Position			
Setting			
Pr6.04 Jog Speed	300	rpm	<< Expand
Pr6.25 Acceleration of trial running	100	ms/1000rpm	
Pr0.04 Inertia ratio	250		Download
Servo Enable Serve Enable Invalid External Enable Current Position 32.7475 r CCW CW Position 1 Position 2 0.0000 32.7475 Pr6.21 Waiting time of 2000 m			6. N
trial running Pr6.22 Cycling times of 5 trial running	Run		

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### 3.4 Wave show

Open the window "Wave Show".

Motion Studio Ver1.3.13		and the second s
System Function Language Tools	Were Show	2       041       1 Policion disordination         2       242       042         2       242       043         2       242       043         2       242       043         2       242       043         2       242       043         2       242       043         2       242       044         2       242       044         2       242       044         2       242       044         2       242       045         2       244       044         2       245       045         2       244       044         2       245       044         2       244       044         2       245       045         2       246       045         2       246       045         2       246       044         2       246       045         2       246       045         2       246       045         2       246       045         2       246       045
	0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000	Capture
	ms	
	C	
Can: Load wave	re 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.



 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:

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### 3.5 Alarm info

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

#### **Current alarm:**

Motion Studio Ver1.3.13			and the second		0	
ystem Functions Language Tools	About					
V) 🖸 🛛 🕑 🗠						
ELD2_CAN7030						
🖲 🚺 Setup Wizard	Alarm					<b>x</b>
Configuration		1	1			
Performance Adjustment	Current History	Cause of non-rotation				
Running	Alarm Code	Alarm Name	Alarm ID Alarm Reason	Alarm Check	Alarm Handle	
	Err000	no alarm				
Monitor						
Motion     Monitor     Constant						
			Clear C	urrent Alarm		

#### History alarm:

Motion Studio Ver1.3.13						-
System Functions Language Tools	About					
V 🖸 🖻 💽 🗠	<b>A</b>					
ELD2_CAN7030						
Setup Wizard	Alarm					×
Configuration		1 I				
Performance Adjustment	Current History	Cause of non-rotation				
🕮 📩 Running	Alarm Code	Alarm Name	Ala	Alarm Reason	Alarm Check	Alarm Handle
Here Motion	Err150	encoder line brea				
	Err150	encoder line brea				
T	Err150	encoder line brea				
CANopen	Err150	encoder line brea				
	Err150	encoder line brea				
	Err150	encoder line brea	Par	Name		Value
	Err101	Drive over-load/ov	0	Error Time(s)		NULL
	Err101	Drive over-load/ov	1	Speed of Positio	on Command(rpm)	NULL
	Err101	Drive over-load/ov	2	Relative Position	n Error(P)	NULL
	Err0F0	drive over-heat	3	Speed Commar	nd(rpm)	NULL
			4	Motor Speed(rp	m)	NULL
			5	Motor Torque(0.	.1%)	NULL
			6	Current Phase U		NULL
			7	Current Phase V		NULL
			8	DC Bus Voltage		NULL
			9	Driver/MCU Terr		NULL
			10	Instruction Posit		NULL
			11	Feedback Positi		NULL
			12	Coder Error Cou		NULL
			13		ent of Motor in 2 Second	
			14	Motor Overload		) NULL
			16	Internal Status	stance Overload Rate(%	NULL NULL
			17	Internal Status		NULL
			18	Output Status		NULL
			10	o aiput o taids		NOLL
		Ger	nerate Rep	ort	ar History Alarm	
			ionato Nepi			
d						

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## **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:	
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.

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

STEP-1				
Pr6.04 Jog Speed	400	rpm		Download
Pr6.25 Acceleration of trial running	200	ms/10	00rpm	
Default Inertia Ratio	250			Servo Enable
				Invalid External Enable
			Current	62.9497 r
		62.9487	ccw	62.9497 r CW 1 Position 2 -0.0033
Pr6.21 Waiting time of trial running	50	62.9487 ms	CCW Position	cw
			ccw	cw
Pr6.21 Waiting time of trial running			CCW Position	cw



### 4.3 Gain adjustment (Pr0.03)

Definition of Pr0.03:



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.



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2. Keep decreasing value of Pr0.03, then the position error become smaller and smaller.



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.