

LeadshineMotionStudio Software User Manual CS1-D Series

Closed Loop Stepper Drives

Leadshine Motion Studio Ver1.0.7		
System Funtions Language	Tools About	
		_
Driver	Comm Connect 23	
🖶 🚺 Setup Progress	Online Mode	
Configuration		
Performance adjustment		
🕀 😋 Run	Communication Mode RS232 *	
🕀 🍰 Motion	CommBot COM2 Bafrash	
B-Monitor		
	Series	
	Motor Model	
	Porte	
	Soft Version	
	Connect Offline Mode	
Comm:Standby Servo:Dis	able Alarm:None	

Revision 1.0 ©2019 Leadshine Technology Co., Ltd.

Leadshine Technology Co., Ltd (Headquarters)

Address: Floor 11, Block A3, iPark 1001 Xueyuan Avenue, Shenzhen, Guangdong 518055, China

Tel: 86-400-885-5521

Fax: 86-755-2640-2718

Web: <u>www.leadshine.com</u>

Sales: sales@leadshine.com

Support: tech@leadshine.com



Notice

Read this manual carefully before any assembling and using. Incorrect handling of Products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements.

This manual is not for use or disclosure outside of Leadshine except under permission. All rights are reserved. No part of this manual shall be reProduced, stored in retrieval form, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise without apProval from Leadshine. While every Precaution has been taken in the Preparation of the book, Leadshine assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

This document is ProPrietary information of Leadshine that is furnished for customer use ONLY. Information in this document is subject to change without notice and does not rePresent a commitment on the part of Leadshine. Therefore, information contained in this manual may be updated from time-to-time due to Product imProvements, etc., and may not conform in every respect to former issues.

Record of Revisions

Revision	Date	Author	Description of Release
1.0	Oct, 2019	MF	Initial Release



Table of Content

1. Introduction	1
2. Prerequisites	1
2.1 Operation System	1
2.2 Motor Connection	1
2.3 Accessories	1
3. Software Overview	2
3.2 Work Space	2
3.3 Menu and Toolbar	3
4. Connect the Drive	4
5. Manage Drive Parameters	7
5.1 Read Parameters	7
5.2 Edit Parameters	8
5.3 Key Parameter Description	9
5.3.1 Pulse/Rev (Instruction number per rev) (Pr 0.00)	9
5.3.2 Peak Current (Pr 5.00)	9
5.3.3 Closed Loop Holding Current Percentage (Pr 5.01)	9
5.3.4 Encoder Resolution (Pr 7.01)	9
5.3.5 Allowed Max Position Following Error Pulses (Pr 0.05)	9
5.3.6 Control Mode (read only) (Pr 0.01)	9
5.3.7 Open Loop Output Current Percentage (Pr 5.02)	
5.3.8 Control Type (read only) (Pr 0.06)	10
5.3.9 Pulse Effective Edge (Pr 5.19)	
5.3.10 Delay of Loosening Brake (Pr 4.19)	
5.3.11 Delay of Closing Brake (Pr 4.20)	10
5.3.12 "ENA" Input Signal Level Setting (Pr 4.30)	
5.3.13 "ALM" Output Signal Impedance State (Pr 4.31)	
5.3.14 "PEND" Output Signal Impedance State (Pr 4.00)	



6.

7.

8.

9.

5.3.15 Distance to Send "In Position" Output Signal (Pr 4.24)	
5.3.16 Fault clearing input signal level (Pr 4.33)	11
5.3.17 Current Loop Kp (Pr 7.03)	11
5.3.18 Current Loop Ki (Pr 7.04)	11
5.3.19 Position Loop Kp (Pr 1.00)	11
5.3.20 Velocity Loop Kp (Pr 1.02)	11
5.3.21 Velocity Loop Ki (Pr 1.01)	11
5.3.22 Instruction Filtering Time (Pr 2.00)	11
5.3.23 Locking shaft current time (Pr 26)	11
5.3.24 Motor Inductance (Pr 0.04)	12
5.3.25 Auto-Tuning at Power-on (Pr 5.13)	12
5.3.26 Velocity Switching Point: Open Loop to Closed Loop (Pr 2.01)	12
5.3.27 Velocity Switching Point: Closed Loop to Open Loop (Pr 2.02)	12
5.4 Run Test	12
5.5 Monitor Window	
Write to Drive (Download to Drive)	15
Resetting Drive	16
Manage Configuration File	16
7.1 Open a Configuration File	16
7.2 Save a Configuration File	17
Manage Drive Error History	



1. Introduction

Thank you for choosing Leadshine Products. The CS1-D series closed loop stepper drives include 4 models, CS1-D403, CS1-D507, CS1-D808, and CS1-D1008. When those drives are implemented with compatible stepper motors with encoders, your motion control system performance will get significant imProvement over traditional open loop stepper systems such as no loss of step, higher torque, lower noise & heating, and smoother motion. Leadshine closed loop Products are also ideal alternatives to replace similar frame size brushless servo systems in low-to-middle speed applications because of their features of much lower cost, much higher torque, and much easier system setup and configuration.

For most applications Leadshine closed loop stepper systems are easy to configure & setup and can be implemented without any tuning efforts, same as classic open loop stepper systems. But in some cases this free LeadshineMotionStudio software tool can still be used for performance tuning, and configuring custom settings like output current, micro-step resolution, control type, etc.

2. Prerequisites

Leadshine LeadshineMotionStudio for CS1-D closed loop stepper drives is a free Windows based software. To successfully run this software, the following Prerequisites must be satisfied.

2.1 Operation System

This LeadshineMotionStudio software must be installed and run on a computer with Windows 7 or Window 10 operating system for either 32 or 64 bit.

2.2 Motor Connection

From LeadshineMotionStudio software settings of a CS1-D drive can be changed with or without a stepper motor connected.

- Without a stepper motor connected, a user can only use the LeadshineMotionStudio software to change the CS1-D drive parameter values.
- With a stepper motor connected Properly to the CS1-D drive, a user can not only configure settings of the connected drive but also run the motor to test and tune motion performance. Refer to the CS1-D drive user manual for how to connect a stepper motor.

2.3 Accessories

To connect a CS1-D Closed loop stepper drive to the computer, Leadshine offers a special RS232 cable (Figure 1). It can be used to connect to the RS232 connector on the computer. If such a RS232 connector does not exist



on that computer, a user can use a USB to RS232 adaptor (Figure 2) or conversion cable to get the drive connected. Please note that not all USB to RS232 adapters will work. Contact your CS1-D drive seller or Leadshine technical support for getting such a USB to RS232 adaptor, which have been confirmed to work fine with the CS1-D series closed loop stepper drives.



Figure 1: RS232 Tuning cable



Figure 2: USB to RS232 converter

3. Software Overview

Refer the following sections for a quick overview for this LeadshineMotionStudio software.

1	Leadshine Motion Studio Ver1.0.7	Ivicinu bal 1	Tool	har				. D X			
	System Funtions Language	Tools About				A	雷夏智能 Leadshing				
nu har 7	Configuration	Parameter Manage	a	2 0							x
.nu vai 2	Parameters list	Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark	1
	Object dictionary	Pro.basic settirig Pr1 Gain adjustment	Pr0.00	Instruction number pe	1600	200	51200	1600	P/R	-	
	🗐 🚍 Run	Pr2.Vibration Restrain Function	Pr0.01	Open / closed loop c	2	0	255	2	<u> </u>	-	
	I=- Trial Run	Pr3.Speed, Torque Control	Pr0.03	Motor running direction	1	0	1	0	-	-	
	Motion	Pr4.Monitor Setting	Pr0.04	Motor inductance	1444	0	10000	1499	0.001	-	
		Pr6 Special Setting	Pr0.05	Max position followin	4000	0	65535	4000	-	-	
	Monitor	Pr7.Factory setting	Pr0.06	Pulse mode	1	0	1	0	5 <u></u> 2	-	
	Waveform Curve		Pr1.00	Position loop Kp	25	0	3000	25	-	-	
	🖊 Alarm		Pr1.01	Velocity loop Ki	0	0	3000	0	8 <u>22</u> 0	-	
	State Monitor		Pr1.02	Velocity loop Kp	25	0	3000	25	-	-	
	1.000		Pr1.03	Torque feedforward	50	0	10000	50	5 <u>22</u> 7	-	
			Pr1.07	Position loop filter fre	3000	0	3000	3000	-	-	
			Pr1.08	Velocity loop filter fre	300	0	3000	300	5 <u>00</u> 7	-	
			Pr2.00	Instruction filtering time	15	0	2048	15	ms	-	
			Pr2.01	Velocity point for ope	18	0	200	18	0.1r/s	-	
			Pr2.02	Velocity point for clos	12	0	200	12	-	-	
			Pr2.03	Delay of open loop s	5	0	32767	5	3 <u>00</u> 0	-	
			Pr2.04	Delay of closed loop	250	0	32767	250	-	-	
	Comm Online Service		Pr2.05	Feedback speed thre	50	0	200	50	3 <u>00</u> 0	-	
	Servin Servi		Pr2.06	Reserved	500	0	65535	500	-	-	
			Pr2.07	Reserved	2000	0	65535	2000	5 <u>00</u> 7	-	
	11		Pr2.08	Reserved	320	0	3000	320	-	-	
			0.000	B I			OFF OF				

3.2 Work Space

Figure 3: Software space



3.3 Menu and Toolbar

There are two menu bars, menu bar 1 is used to set up the Leadshine Studio software, menu bar 2 is used to set up the drive, Menu items and respective toolbar items are described in the following table:

Menu bar 1	Sub-menu Item	Toolbar Icon	Function
System	Connect	S	Connect/disconnect the drive to/from the computer
	Exit	-	Close Leadshine Motion Studio software
	Save Parameter		Save modified parameter values to drive, it will be invalid after powering off
Functions	Software Reset	-	The modified parameters take effect, and no power supply restart is required.
Language	Chinese	-	-
	English	-	-
	Series Port Tool	-	
Tools	USB Tool	-	No need to use
	Object Dict Tool	-	
	Register Tool	-	
About	Platform info	-	-
isout	Parameter Doc	-	-



Menu bar 2	Submenu Item	Toolbar Icon	Function
	IO setting	-	Connect/disconnect the drive to/from the computer
Configuration	Parameter list	¢	Close Leadshine Motion Studio software
	Object dictionary	D	No need to use
Run	Trial Run	\odot	Refer to Chapter 5.4
Motion	РТР	-	No need to use
	Waveform Curve		Refer to Chapter 5.5
Monitor	Alarm		Monitor drive alarm
	State Monitor	-	No need to use

4. Connect the Drive

Follow the following steps to connect a CS1-D closed loop step drive to the LeadshineMotionStudio software on your computer.

- Read section 2.3 first, then connect the drive to your computer through a RS232 connection.
- Power on the CS1-D closed loop stepper drive.
- Launch Leadshine Motion Studio software, Step 1 to click the icon as Figure 4. Please do not click offline mode and any other icon
- Step 2 to select the correct COM port from "CommPort" dropdown list control (Figure 4). When a USB to RS232 adaptor is used, you can go to Device Manager of your computer to find the correct port.



Leadshine Motion Studio Ver1.0.7		_ = X
System Funtions Language Tools	About	
V 🖸 🛛 🖸 🖂		i智能 shino
Driver Driver Setup Progress Configuration Performance adjustment Run Motion Motion Monitor	Comm Connect	
	Series Drive model Motor Model Ports Soft Version	
Comm Standby Server Disable	3 Connect Offline Mode	adshine.com

Figure 4: Communication screen

• Click "Connect" button and wait a few seconds. If the drive has been successfully connected, the screen will be automatically displayed with the Series and Drive Model as shown in Figure 5. Otherwise, the following error message will be displayed (Figure 5).



Comm Connect		X
Online Mode		
Communication Mode	R\$232	Ŧ
CommPort	СОМЗ	▼ Refresh
	Series	Closed Loop Stepper Ser
	Drive model	Unknown Type
	Ports	IN:0,OUT:0
	Soft Version	1.00
Disconnect	Offline Mod	e

Figure 5: Communication error message

• If the wrong COM port is selected or the drive is not powered on, the following window will pop up



Figure 6: Communication error message



5. Manage Drive Parameters

Settings and configurations of the connected CS1-D closed loop stepper drive are all stored in parameters. They can be read, changed, and saved through the LeadshineMotionStudio CS1-D software.

5.1 Read Parameters

After the drive is connected successfully connected to computer, after clicking icon on the tool bar, current settings of the CS1 D drive will be automatically unloaded and displayed (Figure 7). Or the

current settings of the CS1-D drive will be automatically uploaded and displayed (Figure 7). Or the Parameters window can also be opened any time by clicking the "Configuration->Parameters list" on the menu bar 2.

Leadshine Motion Studio Ve	r1.0.7							×		
System Funtions Lang	uage Tools About									
N 🖸 🛛	• 🗠 🔺						更智能 dshine			
CS1-D5075	· · · · · · · · · · · · · · · · · · ·									
	Parameter Manage									×
								_		
🗄 🖓 Run										
🗄 📆 Motion	[]			Lines ou	To be and		Tablens (
🗄 🏆 Monitor	Parameter Number	Number	Name	Value	Min	Max	Default	Unit	Remark	
	Pri.Gain adjustment	Pr0.00	Instruction number pe	1600	200	51200	1600	P/R	a. 78	
	Pr2.Vibration Restrain Function	Pr0.01	Open / closed loop c	2	0	255	2	-		
	Pr3.Speed, Torque Control	Pr0.03	Motor running direction	1	0	1	0	177	1	III
	Pr4.Monitor Setting	Pr0.04	Motor inductance	1506	0	10000	1499	0.001		
	Pr6 Special Setting	Pr0.05	Max position followin	4000	0	65535	4000	-	100	
	Pr7.Factory setting	Pr0.06	Pulse mode	1	0	1	0	-	-	
		Pr1.00	Position loop Kp	25	0	3000	25	-	120	
		Pr1.01	Velocity loop Ki	0	0	3000	0	-		
		Pr1.02	Velocity loop Kp	25	0	3000	25	-		
		Pr1.03	Torque feedforward	50	0	10000	50	(1 <u></u>		
		Pr1.07	Position loop filter fre	3000	0	3000	3000	-	-	
		Pr1.08	Velocity loop filter fre	300	0	3000	300	-		
		Pr2.00	Instruction filtering time	15	0	2048	15	ms		
		Pr2.01	Velocity point for ope	18	0	200	18	0.1r/s		
		Pr2.02	Velocity point for clos	12	0	200	12	-	1 	
		Pr2.03	Delay of open loop s	5	0	32767	5	-	()	
0.05		Pr2.04	Delay of closed loop	250	0	32767	250	-		
Comm:Onine 3		Pr2.05	Feedback speed thre	50	0	200	50	-		
		Pr2.06	Reserved	500	0	65535	500	_		
		Pr2.07	Reserved	2000	0	65535	2000	-		
		Pr2.08	Reserved	320	0	3000	320	-	-	
		<u>P-0.00</u> ∢	Deserved	4		OFFOF				+ -
		L								

Figure 7: Parameters

Filter Displayed Parameters

On the left of parameters manage window, you can use filter the displayed parameters (Figure 8).







Figure 8: parameter type

5.2 Edit Parameters

To edit a parameter value, double click the "Value" field for that parameter. You can then change its value.

Make sure the input value is an integer in the range defined in the "Range" field. See Figure 9.

Parameter Number Pr0.Basic setting Pr1.Gain adjustment Pr2.Vibration Restrain Function Pr3.Speed, Torque Control Pr4.Monitor Setting Pr6.Extended Setting Pr7.Factory settingNumber NameNameValueMinMaxDefaultUnitPr0.00Instruction number per rotation1600200512001600P/RPr0.01Open / closed loop control202552-Pr0.02Motor running direction1010-Pr0.03Motor running direction1010-Pr0.04Motor inductance150601000014990.001Pr0.05Max position following error4000655354000-Pr0.06Pulse mode10Pr1.00Position loop Kp25Double click the cell in Value column to charge the valuePr1.01Velocity loop Kp25Double click the cell in Value column to charge the valuePr1.02Velocity loop Kp25Double click the cell in Value column to charge the valuePr1.03Torque feedforward5001000050-Pr1.03Torque feedforward50030003000-Pr1.04Velocity loop filter frequency300003000-Pr1.03Torque feedforward500204815msPr2.04Velocity point for open loop to cl180200 <t< th=""><th></th><th>38°</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>		38°							
P10.Basic setting P1.Gain adjustment P2.Vibration Restrain Function P3.Speed, Torque Control P4.Monitor Setting P5.Extended Setting P5.Extended Setting P7.Factory setting P7.Factory setting Pr0.00 Instruction number per rotation 1 0 1 0 - P7.0.01 Open / closed loop control 2 0 255 2 - P7.0.03 Motor running direction 1 0 1 0 - P6.Special Setting P7.Factory setting Pr0.04 Motor inductance 1506 10000 1499 0.001 Pr0.05 Max position following error 4000 65535 4000 - Pr0.06 Pulse mode 1 0 - - Pr1.00 Position loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.07 Position loop filter frequency 3000 0 3000 3000 - Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01	arameter Number	Number	Name	Value	Min	Max	Default	Unit	Rer
Pr0.01 Open / closed loop control 2 0 255 2 - Pr0.03 Motor running direction 1 0 1 0 - Pr0.03 Motor running direction 1 0 1 0 - Pr0.04 Motor running direction 1 0 1 0 - Pr0.05 Max position following error 4000 65535 4000 - Pr0.06 Pulse mode 1 0 - - Pr1.01 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.03 Torque feedforward 50 0 3000 3000 -	rU.Basic setting 1 Gain adjustment	Pr0.00	Instruction number per rotation	1600	200	51200	1600	P/R	
r3.Speed, Torque Control r4.Monitor Setting r5.Extended Setting r5.Extended Setting r6.Special Setting r7.Factory setting Pr0.03 Motor running direction 1 0 1 0 - Pr0.04 Motor inductance 1506 10000 1499 0.001 r5.Extended Setting r6.Special Setting r7.Factory setting Pr0.05 Max position following error 4000 65535 4000 - Pr0.06 Pulse mode 1 0 - - - Pr1.00 Position loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.03 Torque feedforward 50 0 3000 3000 - Pr1.04 Velocity loop filter frequency 3000 0 3000 3000 - Pr2.00 Instruction filtering time 15 0 2048 <td>2.Vibration Restrain Function</td> <td>Pr0.01</td> <td>Open / closed loop control</td> <td>2</td> <td>0</td> <td>255</td> <td>2</td> <td>-</td> <td></td>	2.Vibration Restrain Function	Pr0.01	Open / closed loop control	2	0	255	2	-	
44.Monitor Setting Pr0.04 Motor inductance 1506 10000 1499 0.001 5.Special Setting Pr0.05 Max position following error 4000 65535 4000 - Pr0.06 Pulse mode 1 0 - - - Pr1.00 Position loop Kp 25 Double click the cell in Value column to change the value. - Pr1.01 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.03 Torque feedforward 50 0 3000 3000 - Pr1.04 Velocity loop filter frequency 3000 0 3000 - - Pr1.03 Torque feedforward 15 0 2048 15 ms Pr1.04 Velocity loop filter frequency 3000 0 3000 200 12 - Pr2.00 Instruction filtering time	3.Speed, Torque Control	Pr0.03	Motor running direction	1	0	1	0	-)
Pr0.05 Max position following error 4000 65535 4000 - P6.Special Setting Pr0.06 Pulse mode 1 0 - Pr1.00 Position loop Kp 25 Double click the cell in Value column to change the value. - Pr1.01 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.03 Torque feedforward 50 0 3000 3000 - Pr1.04 Velocity loop filter frequency 3000 0 3000 - - Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 12 - Pr2.02 Velocity point for closed loop s 12 0	4.Monitor Setting	Pr0.04	Motor inductance	1506	A	10000	1499	0.001	<u>50</u> 95
Pr0.06 Pulse mode 1 0 - Pr1.00 Position loop Kp 25 Double click the cell in Value column to change the value. - Pr1.01 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. - Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.03 Torque feedforward 50 0 3000 3000 - Pr1.04 Velocity loop filter frequency 3000 0 3000 - - Pr1.05 Velocity loop filter frequency 300 0 3000 - - Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 12 - Pr2.02 Velocity point for closed loop s 12 0 32767 5 - Pr2.03 Delay of closed loop switch to cl 50 0 32767	6 Special Setting	Pr0.05	Max position following error	4000		65535	4000	-)
Pr1.00 Position loop Kp 25 Double click the cell in Value column to change the value. Pr1.01 Velocity loop Kp 25 Double click the cell in Value column to change the value. Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. Pr1.02 Velocity loop Kp 25 Double click the cell in Value column to change the value. Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.07 Position loop filter frequency 3000 0 3000 3000 - Pr1.08 Velocity loop filter frequency 300 0 3000 300 - Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 12 - Pr2.02 Velocity point for closed loop s 12 0 32767 5 - Pr2.03 Delay of closed loop switch to cl 50 0 32767 250 -	7.Factory setting	Pr0.06	Pulse mode	1	\backslash	V	0	-	<u>00</u> 95
Pr1.01Velocity loop Ki0Double Circk the Cert in Value column to change the value.Pr1.02Velocity loop Kp25Pr1.03Torque feedforward5001000050-Pr1.07Position loop filter frequency3000030003000-Pr1.08Velocity loop filter frequency300030003000-Pr2.00Instruction filtering time150204815msPr2.01Velocity point for open loop to cl18020012-Pr2.02Velocity point for closed loop s120327675-Pr2.03Delay of open loop switch to clo250032767250-Pr2.04Delay of closed loop switch to250020050-Pr2.05Feedback speed threshold of cl50020050-Pr2.06Reserved500065535500-Pr2.06Reserved20000655552000-		Pr1.00	Position loop Kp	25 Do		alt the coli	in Volue		
Pr1.02 Velocity loop Kp 25 Column to change the value. Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.07 Position loop filter frequency 3000 0 3000 3000 - Pr1.08 Velocity loop filter frequency 300 0 3000 3000 - Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 12 - Pr2.02 Velocity point for open loop switch to clo 5 0 32767 5 - Pr2.03 Delay of closed loop switch to clo 250 0 32767 5 - Pr2.04 Delay of closed loop switch to clo 250 0 32767 5 - Pr2.05 Feedback speed threshold of cl 50 0 200 50 - Pr2.06 Reserved 500 0 65535 500 -		Pr1.01	Velocity loop Ki	0 0				2	<u>62</u> 85
Pr1.03 Torque feedforward 50 0 10000 50 - Pr1.07 Position loop filter frequency 3000 0 3000 3000 - Pr1.08 Velocity loop filter frequency 300 0 3000 3000 - Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 12 - Pr2.02 Velocity point for open loop switch to clo 5 0 32767 5 - Pr2.03 Delay of closed loop switch to clo 250 0 32767 50 - Pr2.04 Delay of closed loop switch to clo 250 0 200 50 - Pr2.05 Feedback speed threshold of cl 500 0 200 500 - Pr2.06 Reserved 500 0 65535 500 -		Pr1.02	Velocity loop Kp	25 CO	lumn to	change th	e value.		+++>
Pr1.07 Position loop filter frequency 3000 0 3000 3000 - Pr1.08 Velocity loop filter frequency 300 0 3000 3000 - Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 12 - Pr2.02 Velocity point for open loop switch to clo 5 0 32767 5 - Pr2.03 Delay of open loop switch to clo 250 0 32767 5 - Pr2.04 Delay of closed loop switch to o 250 0 200 50 - Pr2.05 Feedback speed threshold of cl 500 0 200 500 - Pr2.06 Reserved 500 0 65535 500 -		Pr1.03	Torque feedforward	50	0	10000	50	19 <u>14</u> 1	<u>62</u> 35
Pr1.08 Velocity loop filter frequency 300 0 3000 300 Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 18 0.1r/s Pr2.02 Velocity point for open loop switch to clo 12 0 200 12 - Pr2.03 Delay of open loop switch to clo 5 0 32767 5 - Pr2.04 Delay of closed loop switch to o 250 0 200 50 - Pr2.05 Feedback speed threshold of cl 500 0 200 500 - Pr2.06 Reserved 500 0 65535 500 -		Pr1.07	Position loop filter frequency	3000	0	3000	3000	-	++0
Pr2.00 Instruction filtering time 15 0 2048 15 ms Pr2.01 Velocity point for open loop to cl 18 0 200 18 0.1r/s Pr2.02 Velocity point for open loop sould for closed loop s 12 0 200 12 - Pr2.03 Delay of open loop switch to clo 5 0 32767 5 - Pr2.04 Delay of closed loop switch to o 250 0 32767 250 - Pr2.05 Feedback speed threshold of cl 50 0 200 50 - Pr2.06 Reserved 500 0 65535 500 - Pr2.07 Deserved 2000 0 65555 2000 -		Pr1.08	Velocity loop filter frequency	300	0	3000	300	39 <u>58</u> 3	<u>62</u> 85
Pr2.01 Velocity point for open loop to cl 18 0 200 18 0.1r/s Pr2.02 Velocity point for closed loop s 12 0 200 12 - Pr2.03 Delay of open loop switch to clo 5 0 32767 5 - Pr2.04 Delay of closed loop switch to clo 250 0 32767 250 - Pr2.05 Feedback speed threshold of cl 50 0 200 50 - Pr2.06 Reserved 500 0 65535 500 -		Pr2.00	Instruction filtering time	15	0	2048	15	ms)
Pr2.02 Velocity point for closed loop s 12 0 200 12 - Pr2.03 Delay of open loop switch to clo 5 0 32767 5 - Pr2.04 Delay of closed loop switch to clo 250 0 32767 250 - Pr2.05 Feedback speed threshold of cl 50 0 200 50 - Pr2.06 Reserved 500 0 65535 500 -		Pr2.01	Velocity point for open loop to cl	18	0	200	18	0.1r/s	<u>62</u> 85
Pr2.03 Delay of open loop switch to clo 5 0 32767 5 - Pr2.04 Delay of closed loop switch to o 250 0 32767 250 - Pr2.04 Delay of closed loop switch to o 250 0 32767 250 - Pr2.05 Feedback speed threshold of cl 50 0 200 50 - Pr2.06 Reserved 500 0 65535 500 -		Pr2.02	Velocity point for closed loop s	12	0	200	12	-	++++)
Pr2.04 Delay of closed loop switch to o 250 0 32767 250 - Pr2.05 Feedback speed threshold of cl 50 0 200 50 - Pr2.06 Reserved 500 0 65535 500 - Pr2.07 Description 2000 0 65535 500 -		Pr2.03	Delay of open loop switch to clo	5	0	32767	5	34 <u>14</u> 3	<u>82</u> 85
Pr2.05 Feedback speed threshold of cl 50 0 200 50 - Pr2.06 Reserved 500 0 65535 500 - Pr2.07 Description 2000 0 65535 2000 -		Pr2.04	Delay of closed loop switch to o	250	0	32767	250	())
Pr2.06 Reserved 500 0 65535 500 -		Pr2.05	Feedback speed threshold of cl	50	0	200	50	39 <u>29</u> 3	<u>62</u> 35
Dr2.07 December 2000 0 05525 2000		Pr2.06	Reserved	500	0	65535	500	()	++++>
F12.07 Reserved 2000 0 05555 2000 -		Pr2.07	Reserved	2000	0	65535	2000	3 <u>90</u> 3	<u>52</u> 35
Pr2.08 Reserved 320 0 3000 320 -		Pr2.08	Reserved	320	0	3000	320	())





When trying to make parameter value changes, please note:

- Some parameters are read-only, and take no effect whatever you type in.
- Some parameters are only effective after the related DIP switches on the CS1-D closed loop stepper drive are set to "default", such as parameters "Pulse/Rev", "Filter time", and "Encoder Resolution".
- Some parameters only can be set by DIP switch, such as parameters "Pulse Mode", "Control Mode"and "No Auto Tuning"
- Some parameters are "Reserved" means invalid parameter.

5.3 Key Parameter Description

All parameters for the CS1-D series closed loop stepper drives are described in this section.

5.3.1 <u>Pulse/Rev (Instruction number per rev)</u> (Pr 0.00)

This parameter is used to set micro step resolution. To make this parameter effective,

- DIP switches 1-4 (DP1-4) of the CS1-D drive must be all set to "ON" positions.
- It can be any value in the range of 200 51,200.

5.3.2 <u>Peak Current</u> (Pr 5.00)

This parameter is used to set the peak current that the CS1-D drive can output.

5.3.3 <u>Closed Loop Holding Current Percentage</u> (Pr 5.01)

This parameter is a percentage value of the peak current in Pr 5.00. It is used for both holding and idle current in closed loop control mode (Pr 0.01 value "2"). Increase this parameter value can improve response time and better torque, but may result in higher heating. For Leadshine motors, it is suggested keep the default value unless you really make your own configurations.

5.3.4 <u>Encoder Resolution</u> (Pr 7.01)

This parameter value must be set to 4 times of the encoder lines. For example, for a 1000-line encoder this parameter value must be set to 4000.

5.3.5 <u>Allowed Max Position Following Error Pulses</u> (Pr 0.05)

This parameter is used to set the allowed maximum pulse number of position errors.

5.3.6 Control Mode (read only) (Pr 0.01)

This parameter is set by SW8, used to select open loop control or closed loop control. When its value is "0" for open loop control; "2" is for closed loop control (default).





5.3.7 Open Loop Output Current Percentage (Pr 5.02)

This parameter is used to set the output and idle current in a percentage value of the peak current value (Pr 0.01), when the CS1-D drive operates in open loop control mode. It is only effective when parameter Pr 0.01 is set to "0" for open loop control.

5.3.8 <u>Control Type (read only)</u> (Pr 0.06)

This parameter is read only, because it's set by SW7. Value "0" is for pulse & direction (also called step & direction) control; value "1" for CW/CCW control.

5.3.9 Pulse Effective Edge (Pr 5.19)

This parameter is used to determine when a pulse will be recognized. Set its value to "0" for rising edge (default); set its value to "1" for falling edge.

5.3.10 Delay of Loosening Brake (Pr 4.19)

This parameter is used to set the delay time before brake releasing. Usually keep the default value of this parameter unless you really want.

5.3.11 Delay of Closing Brake (Pr 4.20)

This parameter is used to set the delay time before starting to close the brake. Usually keep the default value of this parameter unless you really want.

5.3.12 <u>"ENA" Input Signal Level Setting</u> (Pr 4.30)

This parameter is used to set the "ENA" signal voltage level of the CS1-D drive. Set its value to "0" for high level; set its value to "1" for low level(default).

5.3.13 "ALM" Output Signal Impedance State(Pr 4.31)

This parameter is used to set the "ALM" signal impedance level of the CS1-D drive. Set its value to "1" for high level (default); set its value to "0" for low level.

5.3.14 <u>"PEND" Output Signal Impedance State</u> (Pr 4.00)

This parameter is used to set the "PEND" signal impedance level of the CS1-D drive. Set its value to "1" for high level; set its value to "0" for low level (default).

5.3.15 Distance to Send "In Position" Output Signal (Pr 4.24)

This parameter is used to set the distance (in number of pulses) to send out the In-Position signal.Usually keep the default value of this parameter unless you really want.



5.3.16 Fault clearing input signal level (Pr 4.33)

This parameter is used to set the "RST" signal voltage level of the CS1-D drive. Set its value to "0" for high level(default); set its value to "1" for low level.

5.3.17 <u>Current Loop Kp</u> (Pr 7.03)

This parameter is used to set the current loop bandwidth of the CS1-D drive. It is for advanced users only. Usually keep the default value for powering Leadshine motors.

5.3.18 <u>Current Loop Ki</u> (Pr 7.04)

This parameter is used for tuning current loop integral gain. Usually keep the default value for Leadshine motors and 3rd party motors with normal inductance.

5.3.19 Position Loop Kp (Pr 1.00)

This parameter is used for tuning position loop Proportional gain. Usually keep the default value for Leadshine stepper motors, unless really needed to do so.

- Increase this value will reduce position following error, but could result in motor vibration.
- Decrease the value if the motor vibrates.

5.3.20 <u>Velocity Loop Kp</u> (Pr 1.02)

This parameter is used for tuning velocity loop integral gain. Usually keep the default value for Leadshine stepper motors, unless really needed to do so.

- Increase the value can increase velocity stiffness.
- Reduce this value when the motor vibrates at low speed.

5.3.21 <u>Velocity Loop Ki</u> (Pr 1.01)

This parameter is used for tuning Velocity loop Proportional gain. Usually keep the default value for Leadshine stepper motors unless really needed to do so. Set it to 0 if the motor shakes during settling.

5.3.22 Instruction Filtering Time (Pr 2.00)

This parameter is used to configure the time for internal command filtering. In some applications, change this value could improve overall system performance.

Note: for multi-axis systems with interpolation, this value must be set to the same for all axes.

5.3.23 Locking shaft current time (Pr 5.04)

This parameter is used to configure the internal smoothing time for the CS1-D drive initial current ramp-up



when the drive is turned on. Increase this value if there is a motor overshooting like "JUMP" at powered-on.

5.3.24 Motor Inductance (Pr 0.04)

This parameter is read-only, when the Auto-Tuning on the drive is turned on. It is for reference only.

5.3.25 Auto-Tuning at Power-on (Pr 5.13)

This parameter is used to set if the drive auto-tuning is turned on at power-on. It is read-only parameter for informational only. Its value is actually determined by dip switch SW6 of the CS1-D drive.

5.3.26 Velocity Switching Point: Open Loop to Closed Loop (Pr 2.01)

This parameter is used to set the velocity switching point from open loop to closed loop. Usually keep the default value. Only change it when it causes motor vibration at this mode switching velocity point.

5.3.27 <u>Velocity Switching Point: Closed Loop to Open Loop</u> (Pr 2.02)

This parameter is used to set the velocity switching point from closed loop control to open loop control. Usually keep the default value. Only change it when it causes motor vibration at this mode switching velocity point.

5.3.28 VBS function (Pr 2.13)

This parameter is used to vibration compressing, mainly solves the problem of motor vibration in 0.5 rps to 2 rps at low speed. Little effect on the performance of the speed segment above 3rps.

5.4 Run Test

Step 3 to click

or double click Run->Trial Run menu item for running test. This Run Testing window Click the icon of LeadshineMotionStudio software can be used to make motor run, but can not monitor the motion wave. The steps are as follows:

• Step 1 to set Jog Speed (running test speed) and Acceleration, then click "Download" to take effective;

CW

• Step 2 to click "Servo Enable" to make the icon change from **OFF** to





to make motor run in JOG Speed. Or set first

"current position" value to position 1, then make motor runs to achieve second "current position" as



position 2. At last to click to make motor runs back and forth.

5.5 Monitor Window

The Monitor Window includes 3 sub-menu: "Waveform Curve", "Alarm", and "State Monitor" in Figure 10,



Figure 10: Monitor window

The most useful sub-menu "Waveform Curve" as Figure 11, is a scope used to display colored curves based on what have been chosen on Channel 1 and Channel 2 dropdown lists during the test. It can be used to:

- Perform motion performance test for current drive parameter setting.
- Monitor motion performance when the CS1-D drive takes control signals from a connected motion controller/PLC/pulse generator...



Figure 11: Scope portion of Motion Test window

Available options for Channel 1 add 2 dropdown list controls include "Position Error", "Velocity



Feedback", "Position Feedback", "Velocity Targeted", "Position Targeted", "Resultant Current", "Bus Voltage", "Phase A Current", and "Phase B Current". See Figure 12.



Figure 12 curve type options

Way	ve Sł	now		
	à		*	

When click the icon

, it will have a setup window as shown in

Figure 13. The "Capture Trigger" on the left is used for monitoring motion performance when the CS1-D drive controlled by exterior controller or PLC. The "Sampling Frame and Precision" on the right is used to perform motion performance test for current drive parameter setting .

Capture Trigger			Sampling Frame and Precision		
Trigger Source	1:Velocity feedback	•	C Single Frame and High Pe	ercision	
			Sampling Interval	0.500	•
Trigger Mode	0:Rising edge trigger	-	Multi Frame and Low Percent	cision	
	20	-	Sampling Interval	50	•
Trigger Rank	30				
			Consel		
	UN		Cancer		

Capture

to monitor motion wave When you have completed the above settings, please click the icon



•

6. Write to Drive (Download to Drive)

After parameters tuned & optimized and motion performance tested, you must download their changes to the drive. Otherwise, those changes will be lost next time when the drive is re-powered.

Following the following steps to write parameters to the drive.

	Parameter Manage								
	ه	Ы	1	T	₿		0	0	
lick the icon	Para	meter N	umber	D	ownLoad	4]			

manage. A confirmation will be popped up to confirm the modified parameters and download them to the drive as shown in Figure 14.

arameter	Modify Review		×
Classify	Name	Value	
Pr5.01	Closed loop holding cur	50	

Figure 14: Write to drive confirmation message

• Click "OK" to continue downloading parameter values to the CS1-D drive.



7. Resetting Drive

•

To reset the current drive configurations back to factory settings, follow the following steps.



parameter manage window. The confirmation message will be popped up (Figure 15). Select "Driver Parameter" item, then click the "OK" button to continue resetting Process.

Factory reset	X
Manufacturer parameters <u>(</u> Driver Parameter Motor Parameter	ок

Figure 15: resetting confirmation message

8. Manage Configuration File

After the drive performance is tuned and parameter values optimized, its settings can be saved to a configuration file in .lsr format. You can also open an existing .lsr configuration file and load the settings to the LeadshineMotionStudio CS1-D software.

7.1 Open a Configuration File

Follow the following steps to load settings from an .lsr configuration file



Open parameter window, then click icon Príl Basic setting

, then it will show as



Figure 16.

Organize 🔻 N	ew folder			(iii •	
🔆 Favorites	A N	lame	^	Date modified	Туре
📃 Desktop	I.	test.lsr		2018/9/19 11:46	LSR Fil
Libraries Documents Music Pictures Videos					

Figure 16: open an .lsr configuration file window

• Find and select the .lsr configuration fil click "OK" button. After the configuration file is open, then



After a configuration file is opened, to get back to its original settings you will need to repower the CS1-D closed loop stepper drive.

7.2 Save a Configuration File

Follow the following steps to save the current parameters into an .lsr configuration file



• Open the parameter manage window, click the icon show as Figure 17

Page | 17



Organize 👻 New	folder			8==	-
🔶 Favorites	Name			Date modified	Тур
Desktop	2	No ite	ems match yo	our search.	
Recent Places	-				
词 Libraries					
Documents Music					
E Pictures					
Videos			12	2	
File name: t	est				
Save as type: 1	sr Files(*.lsr)				

Figure 17: save configuration file

• Choose the location and file name and click the Save button.

9. Manage Drive Error History

You can use the LeadshineMotionStudio for CS1-D software to track error history Previously happened to the connected CS1-D closed loop stepper drives. Follow the following steps for that:





larm Code rr000	Alarm Name no alarm	Alarm ID	Alarm Reason Alarm Ch Alarm	eck Alarm Handle				-
			Current History	Cause of non-rotation				
			Alarm Code	Alarm Name	Ala	Alarm Reason	Alarm Check	Alarm Handle
			Err152	initialized position				
			Err180	position error over				
			Err152	initialized position				
			Err180	position error over				
			Err152	initialized position				
			Err240	CRC verification e	Ala	Name		Va
			ErrFFF	Communication e	0	Error Time(s)		0
			ErrFFF	Communication e	1	Speed of Positio	on Command(rpm)	0
			ErrFFF	Communication e	2	Relative Position	n Error(P)	0
			ErrFFF	Communication e	3	Speed Comman	nd(rpm)	0
					4	Motor Speed(rp	m)	0
					5	Motor Torque(0.	001A)	0
					6	Current Phase U	J/A(0.001A)	0

Figure 18: Show the drive's alarm