

CS1-D503S

Closed Loop Stepper Drive

User Manual



Revision 1.0

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Notice

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Record of Revisions

| Revision | Date | Description of Release |
|-----------------|------------------|--|
| <i>1.0</i> | <i>Aug, 2019</i> | <i>Initial Release</i> |
| <i>1.1</i> | <i>Mar, 2020</i> | <i>Modified the configuration of S1 rotating switch;</i> |

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Leadshine



1. Introduction

Leadshine CS1-D503S are closed loop stepper drives designed to solve the loss of step problem in open loop stepper control systems, thus increase system reliability at minimal cost increase. It implements advanced control algorithm of Leadshine based on its tens of years' experience in stepper and servo controls. The CS1-D503S are highly reliable and affordable and performs excellent in many industrial applications such as CNC, medical, electronics, packaging...

The CS1-D503S can power 2-phase NEMA 8, 11 and 17 stepper motors with incremental encoders. Compared with traditional open loop stepper systems, the CS1-D503S adopted closed loop step system can eliminate potential loss of step, make real-time position error correction, and do not need torque reservation (100% torque implementation). Also it can power the driven stepper motor with reduced heating, lower noise, low vibration...

1.1 Features

- No loss of step
- No torque reservation
- No hunting or overshooting
- No tuning for easy setup
- Enhance performance at low speed application(30-120 RPM)
- 20-50VDC supply voltage, max 3A output current
- Max 500 KHz input frequency
- Brake output does not need to connect a relay

Inputs and Outputs

- Step & DIR (CW & CCW) inputs
- Enable input and Error Reset input
- Alarm output and In Position output
- Brake outputs
- Encoder A/B/Z outputs

Protections

- Over current
- Over voltage
- Motor connection error
- Encoder connection error
- Position following error
- ROM error
- Auto-tuning error

Switch Setting

- Microstep resolution
- Rotation direction
- Pulse Mode
- Positional command filter
- Closed / Open Loop Mode
- Encoder resolution
- Gain adjustment and output current
- 5V or 24V control signal voltage selector

Software Tuning

- Output current
- Input/Output signals level
- Motion parameters
- Brake parameters

1.2 Applications

When a CS1-D503S closed loop stepper drive is implemented with a compatible stepper motor with encoder, the closed stepper system can be adopted in many small to median speed applications such as CNC routers, CNC mills, CNC laser cutters, CNC plasma, lab automation instruments, plotters, medical equipment, electronic equipment, small packaging machines, etc.

2. Specifications

2.1 Electrical Specifications

| Parameters | Min | Typical | Max | Unit |
|-----------------------------|-----|---------|------------|------|
| CS1-D503S Current | 0.5 | 2.5 | 3.0 (Peak) | A |
| Operating Voltage | 20 | 24 | 50 | VDC |
| Logic input signal current | 7 | 10 | 16 | mA |
| Pulse input frequency | 0 | - | 500 | kHz |
| Brake output signal current | - | - | 500 | mA |
| Alarm output voltage | - | - | 24 | VDC |
| Minimal pulse width | 1.0 | - | - | μS |
| Minimal direction setup | 2.0 | - | - | μS |
| Isolation resistance | 500 | | | MΩ |

2.2 Environment

| Cooling | Natural Cooling or Forced Cooling | |
|-----------------------|-----------------------------------|---|
| Operating Environment | Environment | Avoid dust, oil fog and corrosive gases |
| | Humidity | 40%RH—90%RH |
| | Operating Temperature | 0°C — 50°C (32°F - 122°F) |
| | Vibration | 10-50Hz / 0.15mm |
| Storage Temperature | -20°C — 65°C (-4°F - 149°F) | |
| Weight | Approx. 280 g (9.9 Oz) | |

2.3 Mechanical Specifications

(unit: mm [1inch=25.4mm])

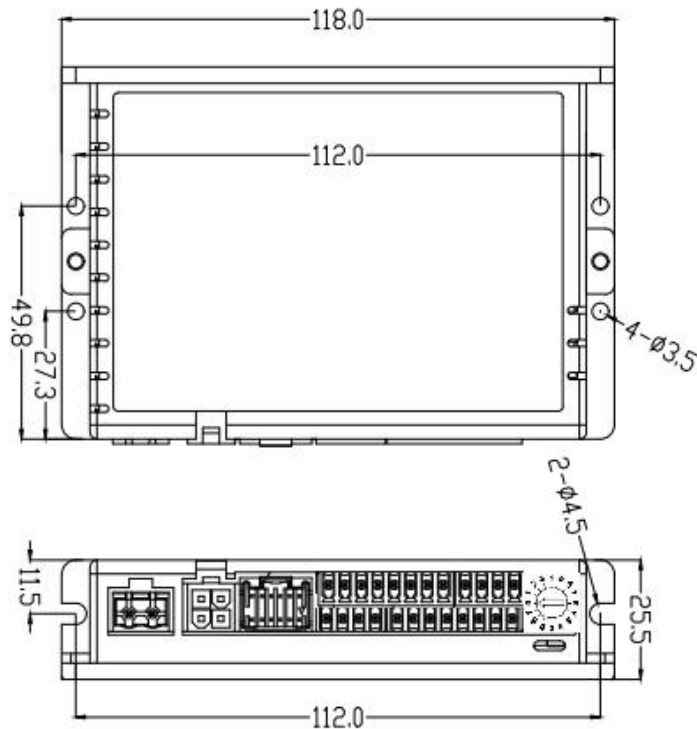


Figure 1: Mechanical specifications

2.4 Heat Dissipation

- CS1-D503S reliable working temperature should be no more than 60°C (140°F)
- It is recommended to mount the drive vertically to maximize heat dissipation. Mount a cooling fan nearby if necessary.
- If multiple CS1-D503S drives are installed, it is suggested to keep a minimal 30mm (1.2 inches) between two of them.

3. Connections and LED Indication

A CS1-D503S closed loop stepper drive has 5 connection blocks from P1 to P5 (see figure 2).

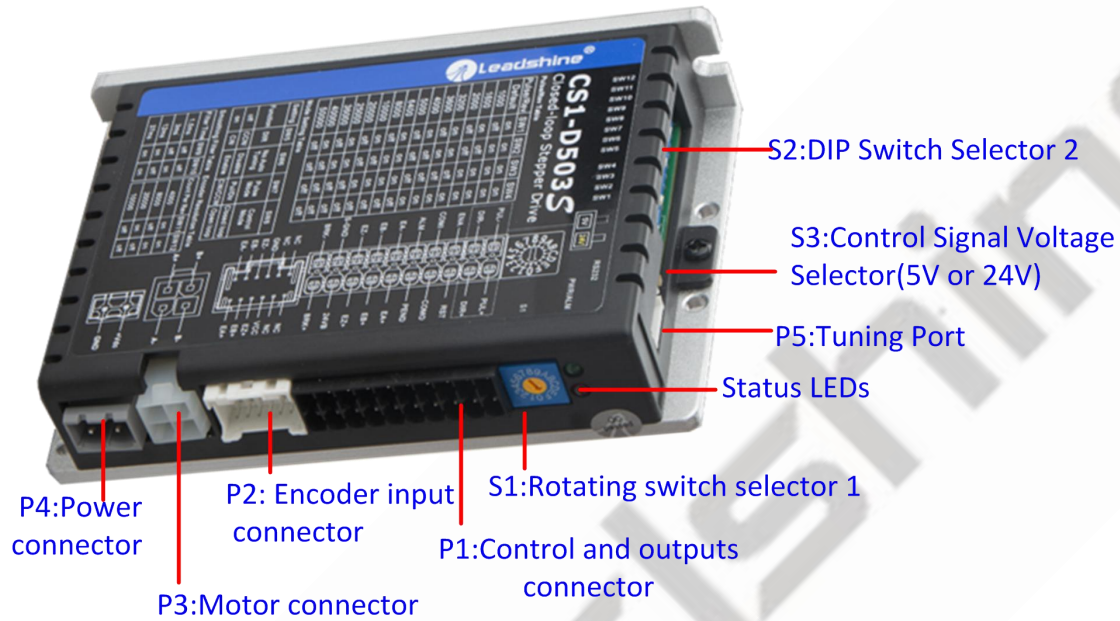


Figure 2: CS1-D503S connectors

3.1 P1 – Control and Digital Output Connections

The P1 connector in Figure 2 contains connections for control signals and a configurable digital output.

See the following table for details.

| PIN | I/O | Details |
|-------------|-----|--|
| PUL+ (CW+) | I | <u>Pulse and Direction Connection:</u> (1) Optically isolated, high level 3.5-5V or 24V, low voltage 0-0.5V (2) Maximum 500 KHz input frequency (3) The width of PUL signal is at least 1.0 μ s, duty cycle is recommended 50% (4) Single pulse (step & direction) or double pulse (CW/CCW) is set by DIP Switch SW7 (5) DIR signal requires advance PUL signal minimum 2 μ s in single pulse mode (6) The factory setting of control signal voltage is 24V, must need to set S3 (figure 2) if it is 5V |
| PUL- (CW-) | I | |
| DIR+ (CCW+) | I | |
| DIR- (CCW-) | I | |

| | | |
|--------------|----------|--|
| RST | I | <p><u>Alarm Reset and Enable Signals: Optional.</u></p> <p>(1) RST means alarm reset, ENA means Enable. Optically isolated, single-ended.</p> |
| ENA | I | <p>(2) RST and ENA: Effective high level is 3.5-24V; Effective low level is 0-0.5V connection</p> <p>(3) RST signal can clear the alarm of “Position following error” and “Fail to lock motor shaft”, other alarms require the power supply to be restarted</p> <p>(4) ENA signal requires advance DIR signal minimum 2μs in single pulse mode, (default no connection)</p> |
| COMI | I | Common connection of single-end input signals (common-cathode and common-anode) |
| COMO | O | Common connection of single-end output signals (common-cathode) |
| PEND | O | <p><u>In Position and Alarm :</u> They takes a sinking or sourcing 100mA current at 5-24V. Max 30V</p> |
| ALM | O | |
| EA+ | O | Encoder A+ output |
| EA- | O | Encoder A- output |
| EB+ | O | Encoder B+ output |
| EB- | O | Encoder B- output |
| EZ+ | O | <p>Encoder Z +/- output, optional. Only if the closed-loop motor has Z signal input to CS1-D503S, the CS1-D503S will have Z signal output to controller or PLC</p> |
| EZ- | O | |
| 24VB | I | Used for brake signal, connect with +24 DC of external power supply, refer to chapter 7.2.3 |
| BRK+ | O | Brake+ signal, Max. 24/500mA, connect with brake coil. |
| BRK- | O | Brake- signal, Max. 24/500mA, connect with brake coil. It's shown as SO7 in Leadshine ProTuner and level cannot be modified |
| S-GND | O | Signal GND |

Notes: (1) Shielding control signal wires is suggested; (2) To avoid/reduce interference, don't tie control signal cables and power wires together; (3) Brake output does not need to connect a relay

3.2 P2 - Encoder Signal Input Connector

The P2 connector in Figure 2 is for encoder signal connection. Refer to the following table for details.

| Drive Pin Name | Description |
|----------------|-----------------------------|
| NC | No connection |
| VCC | +5V voltage for encoder |
| GND | Power ground connection |
| EZ+ | Encoder Z+ input connection |
| EZ- | Encoder Z- input connection |
| EB+ | Encoder B+ input connection |
| EB- | Encoder B- input connection |
| EA+ | Encoder A+ input connection |
| EA- | Encoder A- input connection |

3.3 P3 - Motor Connector

| PIN | Details |
|-----|--------------------------|
| A+ | Connect to motor A+ wire |
| A- | Connect to motor A- wire |
| B+ | Connect to motor B+ wire |
| B- | Connect to motor B- wire |

3.4 P4 - Power Connector

| Pin | Details |
|------|--|
| GND | Connect to power supply ground connection. |
| +VDC | Connect to power supply positive connection. Suggest 24-48VDC power supply voltage |



Warning: Don't plug/unplug P3 or P4 connector to avoid drive damage or injury while powered on.

3.5 P5 - Tuning Port

CS1 series has a tuning port with RS232 to modify the drive parameters, it's only for tuning, not for equipment control because neither precision nor stability is sufficient. If you need a field bus drive, use a Leadshine RS485 or EtherCAT type drives:

<http://www.leadshine.com/ProductSubType.aspx?type=products&category=stepper-products&producttype=stepper-drives&subtype=network-stepper-drives>

The interface definition is as follows:

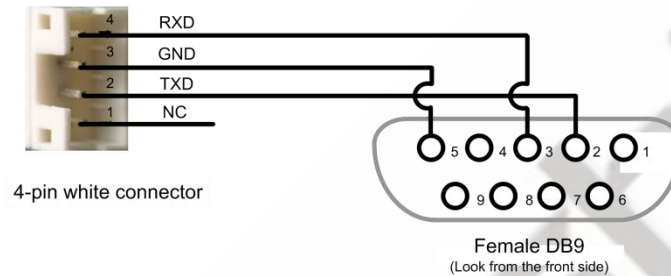


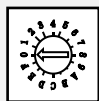


Figure 3: CABLE-PC-1 connectors

3.6 Status LED Lights

There are two LED lights for CS1 Series. The GREEN one is the power indicator which should be always on in normal circumstance. The RED one is a drive status indication light, which will be OFF while working normally but ON and flash 1 or 2 times in a 3-second period in the case of enabled over-current or over-voltage protection.

3.7 Switches

The CS1-D503S has one rotating switch, one 12-bit DIP switch and one 1-bit selector switch.

| Switch | Pic | Details |
|--------------------|---|---|
| Rotating switch S1 |  | Drive Peak Current and Gain adjustment |
| DIP switch S2 |  | Microstep resolution Rotation direction Pulse Mode Positional command filter Closed / Open Loop Mode Encoder resolution |
| Selector switch S3 |  | 5V or 24V control signal voltage selector. The factory setting is 24V, must need to set S3 to 5V if the control signal voltage is 5V |

4. Motor Selection

The CS1-D503S are designed to power 2-phase NEMA 8/11/17 stepper motors under 10000-line incremental encoders. Leadshine offers many high performance closed loop stepper motors.

Notes: Default closed-loop stepper motors is equipped with a 1000-line incremental encoder without Z signal, contact Leadshine for stepper motor with 2500-line, 5000-line encoders and with Z (Index) signal.

5. Power Supply Selection

The CS1-D503S can power small and medium size closed loop stepper motors (frame size from NEMA 8 to 11) from Leadshine. To get good system performance, it is important to select proper supply voltage and output current. Generally speaking, supply voltage determines the high speed performance of the motor, while output current determines the output torque of the driven motor (particularly at lower speed). Higher supply voltage will allow higher motor speed to be achieved, at the price of more noise and heating. If the motion speed requirement is low, it's better to use lower supply voltage to decrease noise, heating and improve reliability.

5.1 Regulated or Unregulated Power Supply

Both regulated and unregulated power supplies can be used to supply the drive. However, unregulated power supplies are preferred due to their ability to withstand current surge and fast response for current change. If you prefer to a regulated power supply, it is suggested to choose such a power supply specially designed for stepper/servo controls such as Leadshine RPS series (<http://www.leadshine.com/producttypes.aspx?producttype=regulated-switching>). Or, in the case when only normal switching power supplies are available, it is important to use "OVERSIZE" high current output rating power supplies (for example, using a 4A power supply for 3A stepper motor) to avoid problems such as current clamp. On the other hand, if unregulated supply is used, one may use a power supply of lower current rating than that of motor (typically 50%-70% of motor current). The reason is that the drive draws current from the power supply capacitor of the unregulated supply only during the ON duration of the PWM cycle, but not during the OFF duration. Therefore, the average current withdrawn from power supply is considerably less than motor current. For example, two 3A motors can be well supplied by one power supply of 4A rating.

5.2 Power Supply Sharing

Multiple CS1-D503S drives can share one power supply to save space and reduce cost, if that power supply has enough power capacity. To avoid cross interference, connect each stepper drive directly to the shared power supply separately. To avoid cross interference, DO NOT daisy-chain connect the power supply input pins of the Drivers. Instead connect them to power supply separately.

5.3 Selecting Supply Voltage

The CS1-D503S are designed to operate within 20-50VDC voltage input. When selecting a power supply, besides voltage from the power supply power line voltage fluctuation and back EMF voltage generated during motor deceleration needs also to be taken into account. Ideally it is suggested to use a power supply with the output of 20-48VDC, leaving room for power line voltage fluctuation and back-EMF.

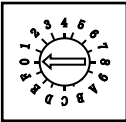
Higher supply voltage can increase motor torque at higher speeds, thus helpful for avoiding losing steps. However, higher voltage may cause bigger motor vibration at lower speed, and it may also cause over-voltage protection or even drive damage. Therefore, it is suggested to choose only sufficiently high supply voltage for intended applications.

6. Switch Configurations

The CS1 series has one rotating switch, one 12-bit DIP switch and one 1-bit selector switch. “Default” means that parameters can be modified by Leadshine PC software, “Factory” means that factory setting, suitable for most customer applications

6.1 S1 - Rotating Switch Configurations

This rotating switch is used to set the peak current of the drive and motion gain, from the motor phase current and application requirements. When the rotating switch code is set to 0 (default), the user can modify the drive peak current value and Kp & Ki value through Leadshine PC software.

| | Peak Current | Code | Velocity loop Ki | Position loop Kp | Velocity loop Kp | Remark |
|---|--------------|----------------------|------------------|------------------|----------------------------------|---|
|  | 1.2A | 0(default & factory) | 0 | 25 | 25 | 1) Recommended motors are CS-M211013, CS-M21702 and CS-M21704 |
| | | 1 | 0 | 50 | 15 | 2) Velocity loop Ki Indicates the stop time and position accuracy , “0” indicates the stop time is long, but the position error is smaller. “16” means the stop time is short, but the position error is slightly larger. |
| | | 2 | 0 | 75 | 10 | |
| | | 3 | 0 | 100 | 5 | 3) Position loop Kp and velocity loop Kp is a pair of composite parameters that represent rigidity. “25” and “25” composite parameters indicate the rigidity is weak, “100” and “5” composite parameters indicate the rigidity is strong. |
| | | 4 | 16 | 25 | 25 | |
| | | 5 | 16 | 50 | 15 | |
| | | 6 | 16 | 75 | 10 | 4) Usually keep factory settings |
| | 7 | 16 | 100 | 5 | | |
| | 2.5A | 8 | 0 | 25 | 25 | 1) Recommended motors are CS-M21706, CS-M21708. |
| | | 9 | 0 | 50 | 15 | 2) Velocity loop Ki Indicates the stop time and position accuracy , “0” indicates the stop time is long, but the position error is smaller. “16” means the stop time is short, but the position error is slightly larger. |
| | | A | 0 | 75 | 10 | |
| | | B | 0 | 100 | 5 | 3) Position loop Kp and velocity loop Kp is a pair of composite parameters that represent rigidity. “25” and “25” composite parameters indicate the rigidity is weak, “100” and “5” composite parameters indicate the rigidity is strong. |
| | | C | 16 | 25 | 25 | |
| | | D | 16 | 50 | 15 | |
| E | | 16 | 75 | 10 | 4) Usually keep factory settings | |
| F | 16 | 100 | 5 | | | |

6.2 S2 - DIP Switch Configurations

The 12-bit is located on the side (DIP switch S2 in Figure 2) and used to configure settings of micro step resolution, output current, and motor standstill current as shown below, the factory setting of SW1-SW12 is **ON, OFF, OFF, ON, OFF, OFF, ON, OFF, OFF, OFF, OFF, OFF**.

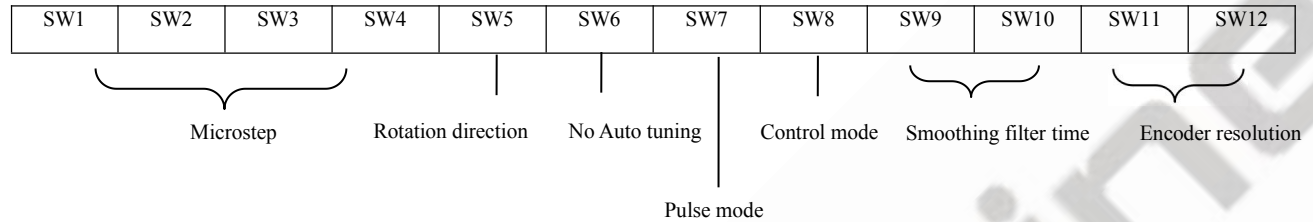


Figure 4: DIP switches

6.2.1 Micro Step (SW1-SW4)

Each CS1-D503S has 8 micro step settings which can be configured through DIP switch SW5, SW6, SW7 and SW8. See the following table for detail. When they are set to **ON, ON, ON, ON**, the microstep can be set via Leadshine PC software.

| Micro step | Pulses/Rev. (for 1.8° motor) | SW5 | SW6 | SW7 | SW8 |
|------------|------------------------------|-----|-----|-----|-----|
| 2 | 400 (default) | ON | ON | ON | ON |
| 5 | 1000 | OFF | ON | ON | ON |
| 8 | 1600 | ON | OFF | ON | ON |
| 10 | 2000 | OFF | OFF | ON | ON |
| 16 | 3200 | ON | ON | OFF | ON |
| 18 | 3600 | OFF | ON | OFF | ON |
| 20 | 4000 (factory) | ON | OFF | OFF | ON |
| 25 | 5000 | OFF | OFF | OFF | ON |
| 32 | 6400 | ON | ON | ON | OFF |
| 40 | 8000 | OFF | ON | ON | OFF |
| 50 | 10000 | ON | OFF | ON | OFF |
| 100 | 20000 | OFF | OFF | ON | OFF |
| 125 | 25000 | ON | ON | OFF | OFF |
| 180 | 36000 | OFF | ON | OFF | OFF |
| 200 | 40000 | ON | OFF | OFF | OFF |
| 250 | 50000 | OFF | OFF | OFF | OFF |

6.2.2 Mode Setting (SW5 - SW8)

| | Function | ON | OFF |
|-----|--------------------|-----------------------|------------------------|
| SW5 | Rotation Direction | CW (clockwise) | CCW (counterclockwise) |
| SW6 | No Auto Tuning | Enable | Disable |
| SW7 | Pulse Mode | CW/CCW (double pulse) | PUL/DIR (single pulse) |
| SW8 | Control Mode | Open loop control | Closed loop control |

6.2.3 Smoothing Filter Time Configuration (SW9-SW10)

CS1-D503S has an advanced feature called control command smoothing to make the input pulse from pulse generator (controller, PLC, etc.) S-curve acceleration, to improve motion smoothness and high-speed start frequency in many circumstances.

This is achieved through adding filtering time which is configured SW9-SW10. See the following table for how to configure. When SW9-SW10 setting is OFF, OFF, the filtering time can be set by Leadshine PC software.

| Filter Time | SW9 | SW10 |
|------------------------------|-----|------|
| 1.5 ms (default and factory) | OFF | OFF |
| 3 ms | OFF | ON |
| 12 ms | ON | OFF |
| 37 ms | ON | ON |



The Filter Time value must be set to the same for each CS1-D503S in multi-axis applications

6.2.4 Encoder Resolution Configuration (SW11-SW12)

CS1-D503S can power closed loop stepper motors with incremental encoders (include and under 5000 ppr resolution), it has 2-bit DIP switch to set motor encoder resolution as below, When SW11-SW12 setting is ON, ON, the encoder resolution can be set by Leadshine PC software.

| Encoder Resolution (ppr) | Count per Rev. (cpr) | SW11 | SW12 |
|--------------------------|----------------------|------|------|
| 1000 | 4000 (default) | ON | ON |
| 2000 | 8000 | OFF | ON |
| 5000 | 20000 | ON | OFF |
| 2500 | 10000 (factory) | OFF | OFF |

6.3 S3 - Selector Switch Configurations

The 1-bit selector is located on the top (S3 in figure 2), used to configure the voltage of control signals. For the safety of optically coupled, the factory setting is 24V, which no need to connect 2K resistors, making it easier to use. When the voltage of the control signal is 5V, the S3 must be set to 5V, otherwise, the motor won't work.

7. Typical Connection

A complete closed loop stepper system should include a stepper motor with encoder, CS1-D503S drive, power supply and controller (pulse generator). A typical connection is as below.

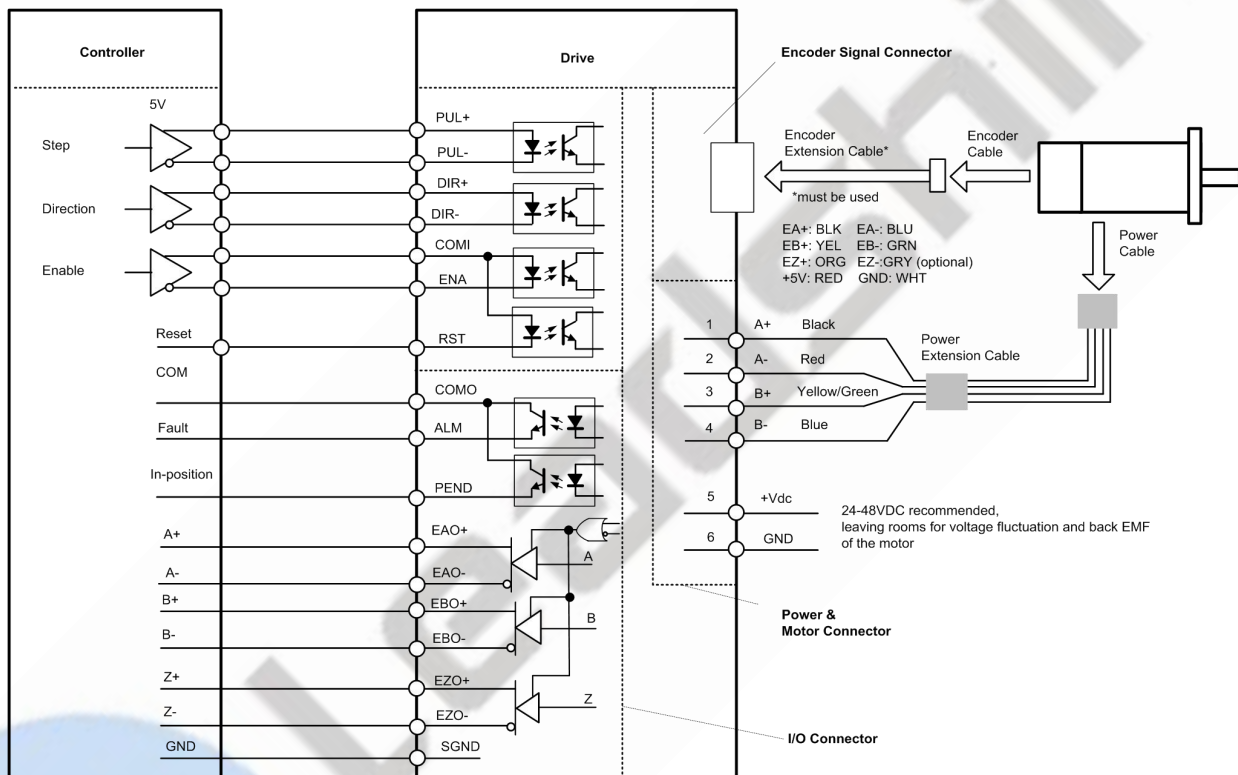
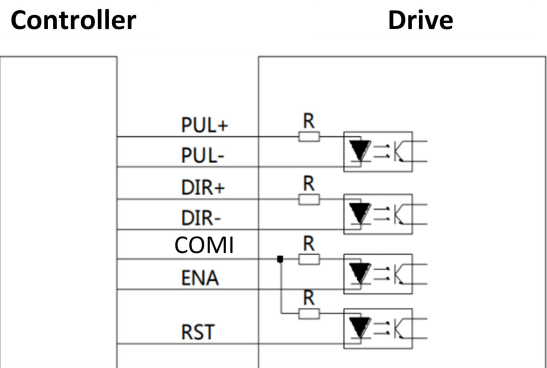


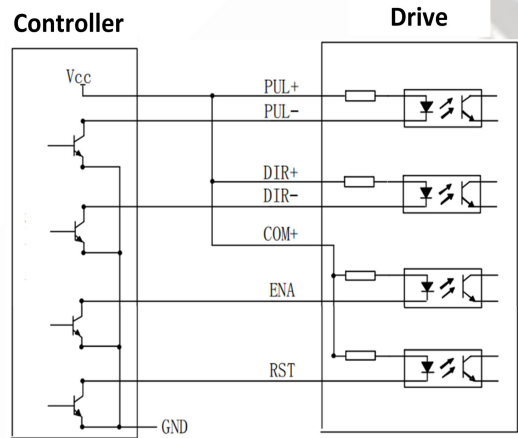
Figure 5: Typical connection

- Notes:**
- (1) If need Z signal output, please contact Leadshine for the motor and encoder extension cable with Z signal.
 - (2) Pulse and direction inputs level 5V or 24V selected by selector switch S3. When it is 24 V, the S3 selection of 5V will damage the input photo-coupling.
 - (3) Enable (ENA) and alarm reset (RST) signal is 5V~24V compatible.

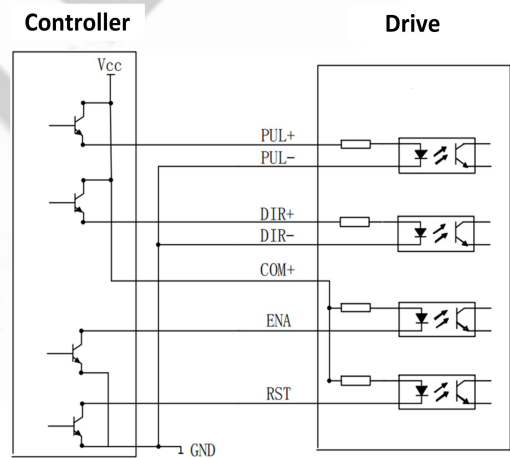
7.1 Digital Input Connection



Differential connection



Connections to PNP signals
(Common-cathode)



Connections to open-collector signals
(Common-anode)

Figure 6: Digital input connections

7.2 Digital Output Connection

7.2.1 In position and Fault Output Connection

The PEND (In-position) and ALM (Alarm) can be connected either in sinking or sourcing as below:

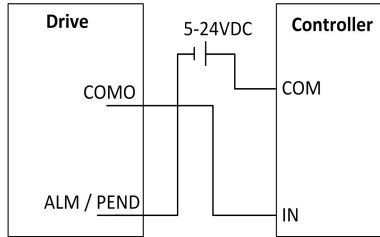


Figure 7 Sinking output

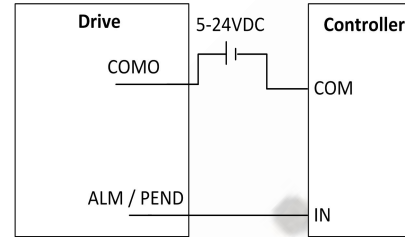


Figure 8 Sourcing output

7.2.2 Encoder Output Connection

The CS1-D503S has a differential encoder output signal (EA+/-, EB+/-, EZ+/-), can be connected to the upper controller to feedback the position information of the motor.

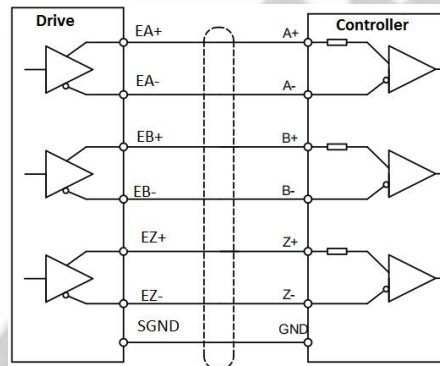


Figure 9 Encoder signals output

7.2.3 Brake Output Connection

This drive has a special brake output, built-in a fly-wheel diode, driving current up to 500 mA, can directly drive the motor brake without relays. The connection is below:

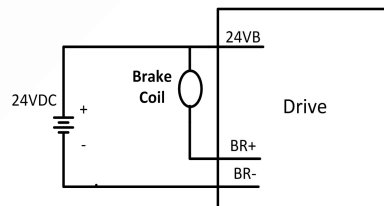


Figure 10 Brake output connection

8. Sequence Chart of Control Signals

In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as

following diagram:

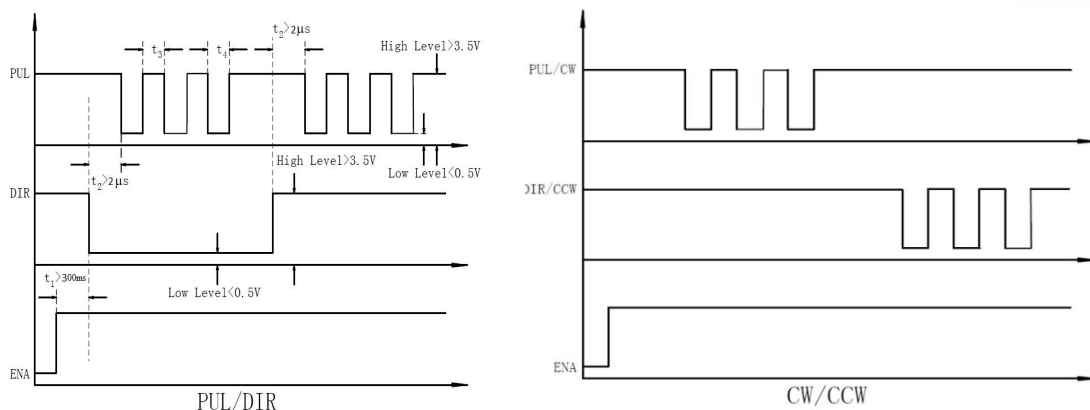


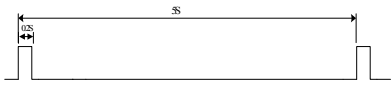
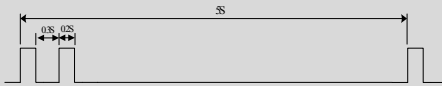
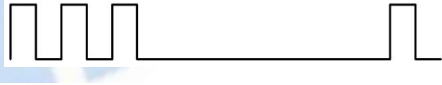

Figure 11: Sequence chart of control signals



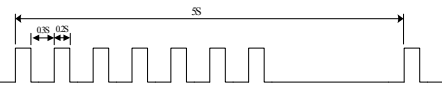
Remark:

- a) t_1 : ENA must be ahead of DIR by at least 300ms. Usually, ENA+ and ENA- are NC (not connected). See “Connector P1 Configurations” for more information.
- b) t_2 : DIR must be ahead of PUL effective edge by 2 μ s to ensure correct direction;
- c) t_3 : Pulse width not less than 1 μ s;
- d) t_4 : Low level width not less than 1 μ s;
- e) Duty cycle of PUL signal is recommended 50%.

9. Fault Protections

To improve reliability, the drive incorporates some built-in protection features.

| Blink time(s) | Sequence wave of red LED | Description | Trouble shooting |
|---------------|---|--------------------------|--|
| 1 |  | Over-current | Turn off the power immediately. a) Check wiring is short-circuited or not; b) Check motor is short-circuited or not. |
| 2 |  | Over-voltage | Turn off the power immediately. a) Check if the power voltage is higher than 90VDC |
| 3 |  | Chip error | Restart the power supply, if the drive is still alarm, please contact after-sale |
| 4 |  | Fail to lock motor shaft | a) The drive is not connected to a motor; b) If alarm is occurred when connect a |

| | | | |
|--------|---|--------------------------|--|
| | | | motor , set DIP switch SW6 to 'on' and restart power supply; If it still alarm, please check the motor power cable. |
| 5 |  | EEPROM error | Restart the power supply, if the drive is still alarm, please contact after-sale |
| 6 |  | Fail to auto tuning | Set DIP switch SW6 to 'on' |
| 7 |  | Position following error | a) The value of position following error is set too small; b) Motor torque is not enough or motor speed is too high; c) Motor wiring error, check wiring |
| Always | - | PCB board is burned out | Contact after-sale a) Power supply connection is wrong |

When above protections are active, the motor shaft will be free or the red LED blinks. Reset the drive by repowering it to make it function properly after removing above problems.

10. Software Configuration

The CS1-D503S is designed for simple setup and implementation. For most applications no software configuration or tuning is needed especially when driving Leadshine stepper motors with encoders. If you want to do fine tuning or custom configurations such as micro-step, current percentage change..., you can use Leadshine's free ProTuner software to make the changes.

11. Accessories

If you plan to use the ProTuner software, contact your supplier or Leadshine to purchase the RS232 cable with part number [CABLE-PC-1](#) for connecting the CS1-D503S to a computer with Windows 7/8/10 installed. In the case of using USB to RS232 conversion, contact your supplier or Leadshine for such a cable with part number [USB2.0-232](#) which has been verified working fine.



[CABLE-PC-1](#)

(RS232 tuning cable)



[USB2.0-232](#)

(USB to RS232 Conversion Cable)

12. Troubleshooting

In the event that your drive doesn't operate properly, the first step is to identify whether the problem is electrical or mechanical in nature. The next step is to isolate the system component that is causing the problem. As part of this process you may have to disconnect the individual components that make up your system and verify that they operate independently. It is important to document each step in the troubleshooting process. You may need this documentation to refer back to at a later date, and these details will greatly assist our Technical Support staff in determining the problem should you need assistance.

Many of the problems that affect motion control systems can be traced to electrical noise, controller software errors, or mistake in wiring.

| Symptoms | Possible Problems | Solutions |
|---------------------------------------|--|--|
| Motor is not rotating | No power | Connect power supply correctly |
| | Microstep resolution setting is wrong | Setting appropriate microstep |
| | Fault condition exists | Check wiring and restart power |
| | The drive is disabled | Drive restore factory setting, and keep ENA+, ENA- input signals unconnected. |
| Wrong motor rotation direction | The Direction signal level is reverse | Toggle the SW5 DIP switch |
| The drive in fault | Red light flashes once in a 5-second period | The motor coil may short circuit or exiting the wrong wiring |
| | Red light flashes twice in a 5-second period | The power supply exceeds Max. operation voltage |
| | Red light flashes 7-times in a 5-second period | If using Leadshine's motor, refer to motor wiring in datasheet; If using 3 rd motor, need to swap the wiring of motor phase A+ and phase A- |
| | Red light is always on after power on | The drive is burned |
| Erratic motor motion | Control signal is too weak | Ensure the current of control signal is within 7-16mA |
| | Control signal is interfered | Don't tie the control signal cable with power cable together |
| | Wrong motor connection | Refer to user manual of drive and motor |

| | | |
|--|---|--|
| | | datasheet |
| | Something wrong with motor coil | Check the motor is normal |
| Motor stalls during acceleration | Current setting is too small | Choose another power supply with lager power or increase the output current of drive |
| | Motor is undersized for the application | Choose another motor with higher torque |
| | Acceleration is set too high | Reduce the acceleration |
| | Power supply voltage too low | Choose another power supply with large voltage output |
| Excessive motor & drive heating | Inadequate heat sinking / cooling | Refer to chapter 2.4 |
| | Motor peak current setting is too high | Reduce the current value refer to motor datasheet |
| Motor vibration when power on | Speed loop Kp is too high | Reduce the speed loop Kp value |

13. Warranty

Twelve Month Warranty

Leadshine Technology Co., Ltd. warrants its products against defects in materials and workmanship for a period of 12 months from shipment out of factory. During the warranty period, Leadshine will either, at its option, repair or replace products which proved to be defective.

Exclusions

The above warranty does not extend to any product damaged by reasons of improper or inadequate handlings by customer, improper or inadequate customer wirings, unauthorized modification or misuse, or operation beyond the electrical specifications of the product and/or operation beyond environmental specifications for the product.

Obtaining Warranty Service

To obtain warranty service, please contact your seller to obtain a returned material authorization number (RMA) before returning product for service.

Shipping Failed Products

If your product fail during the warranty period, please contact your seller for how and where to ship the failed product for warranty or repair services first, you can also e-mail customer service at tech@leadshine.com to obtain a returned material authorization number (RMA) before returning product for service. Please include a written description of the problem along with contact name and address.