# MSST

## Step Motor Drive
## User Manual

- ▪ MSST5-Q   ▪ MSST10-Q
- ▪ MSST5-I   ▪ MSST10-I
- ▪ MSST5-C   ▪ MSST10-C

**SHANGHAI AMP&MOONS' AUTOMATION CO.,LTD.**

# Contents

# 1 Introduction

Thank you for selecting a MOONS' motor drive. We hope our dedication to performance, quality and economy will make your motion control project successful.

If there's anything we can do to improve our products or help you use them better, please call (86)21-52634688 or fax (86)21-52634098. You can also email info@moons.com.cn.

## 1.1 Features

- Programmable, microstepping digital step motor driver in compact package
- MSST5 operates from a 24 to 48 volt DC power supply
- MSST10 operates from a 24 to 70 volt DC power supply
- Operates in velocity or position mode
- Accepts analog signals, digital signals and RS-232 serial commands
- Optional RS-422/485 communication
- Optional encoder feedback
- MSST5 provides motor current up to 5 amps/phase (peak of sine)
- MSST10 provides motor current up to 10 amps/phase (peak of sine)
- Eight optically isolated digital inputs
- Four optically isolated digital outputs
- Two ±10 volt analog inputs for speed and position control. Can also be configured for 0 to 10V, ±5V or 0 to 5V signal ranges.

## 1.2  Block diagram

The block diagram of MSST5/10-Q/I/C is as below
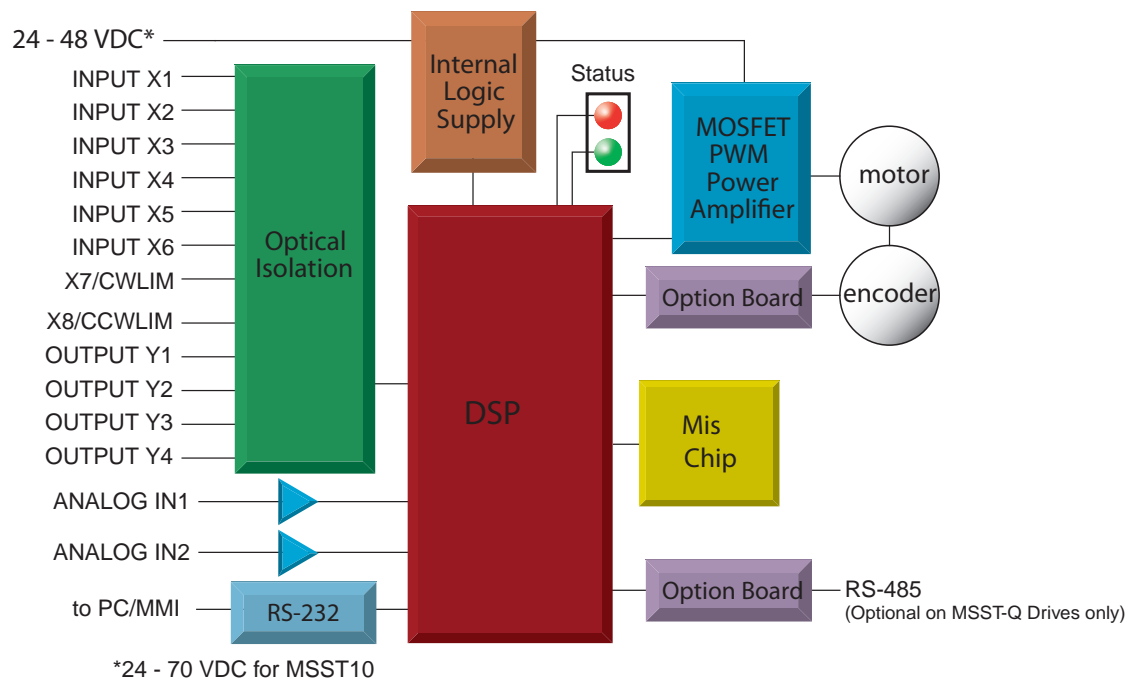


MSST5-I and MSST10-I
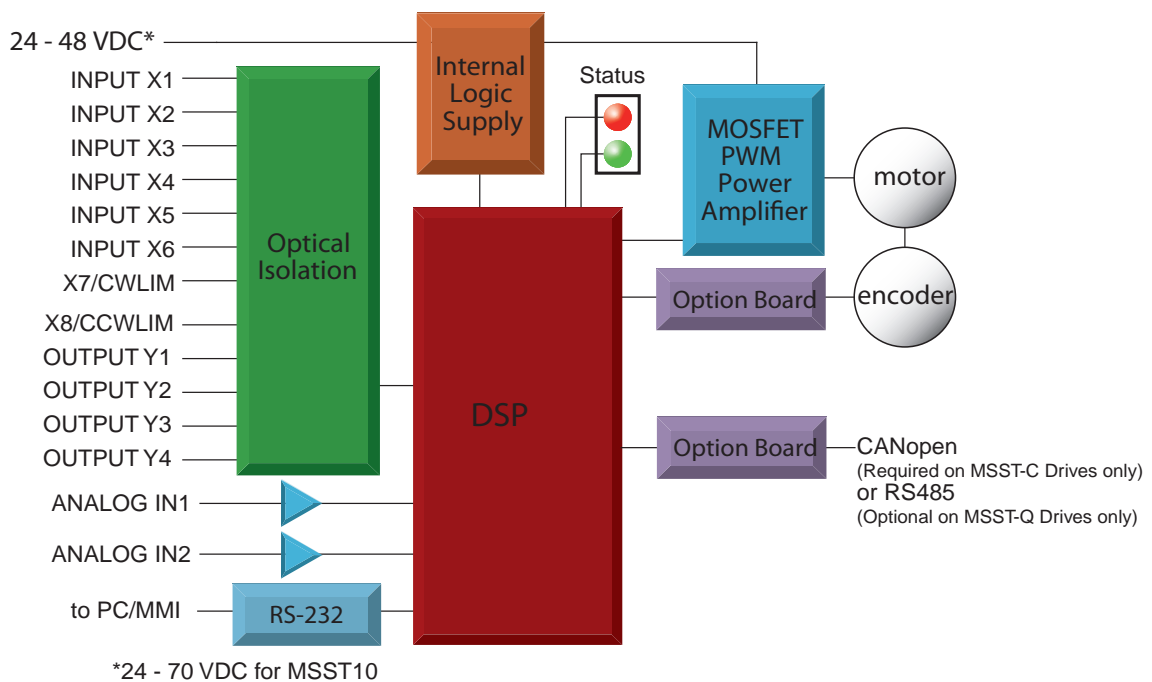


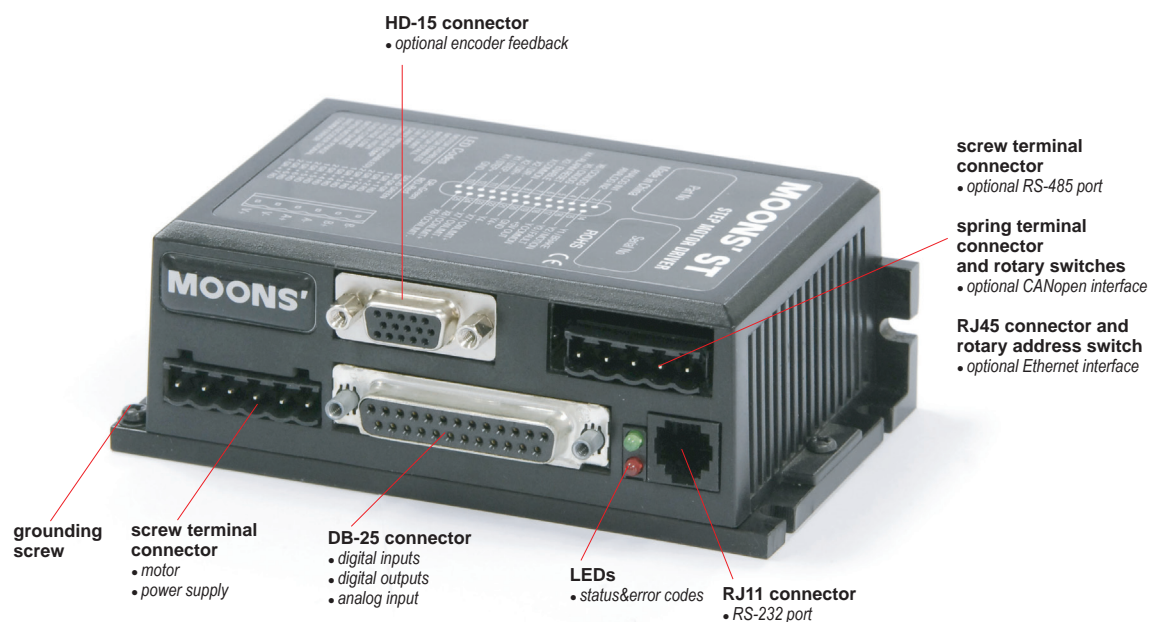MSST5-Q, MSST5-C, MSST10-Q and MSST10-C

# 2 Getting Started

This manual describes the use of six different drive models. What you need to know and what you must have depends on the drive model. For all models, you'll need the following:

- A 24-48 volt DC power supply. (24 - 70VDC for MSST10 models). Please read the section entitled Choosing a Power Supply for help in choosing the right power supply.
- A compatible step motor. See section on Recommended Motors.
- A small flat blade screwdriver for tightening the connectors (included).
- A PC running Microsoft Windows XP, Windows 7, Windows 8/10 (32-bit or 64-bit) operating system
- A MOONS'programming cable (included)

**If you've never used an MSST drive before** you'll need to get familiar with the drive and the set up software before you try to deploy the system in your application. We strongly recommend the following:

1. For -Q drives, install the MSST Configurator and Q Programmer software applications from the CD. For -I models, use the Mis Programmer software for configuration and programming. For -C drives, install the ST Configurator and the CANopen Example Program softeware applications

2. Launch the software by clicking Start...Programs...MOONS...

3. Connect the drive to your PC using the programming cable.

4. Connect the drive to the power supply.

5. Connect the drive to the motor.

6. Apply power to the drive.

7. The software will recognize your drive, display the model and firmware version and be ready for action.

The connectors and other points of interest are illustrated below. Depending on your drive model and application, you'll need to make connections to various parts of the drive. These are detailed later in the manual.

**HD-15 connector**
• *optional encoder feedback*

**screw terminal connector**
• *optional RS-485 port*

**spring terminal connector and rotary switches**
• *optional CANopen interface*

**RJ45 connector and rotary address switch**
• *optional Ethernet interface*

**grounding screw**

**screw terminal connector**
• *motor*
• *power supply*

**DB-25 connector**
• *digital inputs*
• *digital outputs*
• *analog input*

**LEDs**
• *status&error codes*

**RJ11 connector**
• *RS-232 port*

## 2.1  Mounting the Drive

You can mount your drive on the wide or the narrow side of the chassis using #6 screws. If possible, the drive should be securely fastened to a smooth, flat metal surface that will help conduct heat away from the chassis. If this is not possible, then forced airflow from a fan may be required to prevent the drive from overheating.

> ▪ **Never use your drive in a space where there is no air flow or where other devices cause the surrounding air to be more than 40°C.**
>
> ▪ **Never put the drive where it can get wet or where metal or other electrically conductive particles can get on the circuitry.**
>
> ▪ **Always provide air flow around the drive. When mouting multiple ST drives near each other, maintain at least one half inch of space between drives.**

## 2.2  Choosing a Power Supply

When choosing a power supply, there are many things to consider. If you are manufacturing equipment that will be sold to others, you probably want a supply with all the safety agency approvals. If size and weight are an issue use a switching supply.

You must also decide what size of power supply (in terms of voltage and current) is needed for your application.

### 2.2.1  Voltage

PWM drives work by switching the voltage to the motor terminals on and off while monitoring current to achieve a precise level of phase current. To do this efficiently and silently, you'll want to have a power supply with a voltage rating at least five times that of the motor. Depending on how fast you want to run the motor, you may need even more voltage than that.

**If you choose an unregulated power supply supply , make sure the no load voltage of the supply does not exceed the drive's maximum input voltage specification.**

### 2.2.2  Current

The maximum supply current you could ever need is the sum of the two phase currents. However, you will generally need a lot less than that, depending on the motor type, voltage, speed and load conditions. That's because the MSST drives use switching amplifiers, converting a high voltage and low current into lower voltage and higher current. The more the power supply voltage exceeds the motor voltage, the less current you'll need from the power supply. A motor running from a 48 volt supply can be expected to draw only half the supply current that it would with a 24 volt supply.

We recommend the following selection procedure:

1. If you plan to use only a few drives, get a power supply with at least twice the rated phase current of the motor.

2. If you are designing for mass production and must minimize cost, get one power supply with more than twice the rated current of the motor. Install the motor in the application and monitor the current coming out of the power supply and into the drive at various motor loads. This will tell you how much current you really need so you can design in a lower cost power supply.

# 3 Connections

## 3.1 Connecting the Power Supply

If you need information about choosing a power supply, please read Choosing a Power Supply located elsewhere in this manual.

Connect the motor power supply "+" terminal to the driver terminal labeled "VDC". Connect power supply "-" to the drive terminal labeled "GND". Use 18 or 20 gauge wire. The MSST drives contain an internal fuse that connect to the power supply + terminal. This fuse is not user replaceable. If you want to install a user servicable fuse in your system install a fast acting fuse in line with the + power supply lead. Use a 4 amp fuse for the MSST5 drives and 7 amps for the MSST10.

The green ground screw on the corner of the chassis should be connected to earth ground.

**Be careful not to reverse the wires. Reverse connection will destroy your driver, void your warranty and generally wreck your day.**

If you plan to use a regulated power supply you may encounter a problem with regeneration. If you rapidly decelerate a load from a high speed, much of the kinetic energy of that load is transferred back to the power supply. This can trip the overvoltage protection of a switching power supply, causing it to shut down. We offer the RC880 "regeneration clamp" to solve this problem. If in doubt, buy an RC880 for your first installation. If the "regen" LED on the RC880 never flashes, you don't need the clamp.
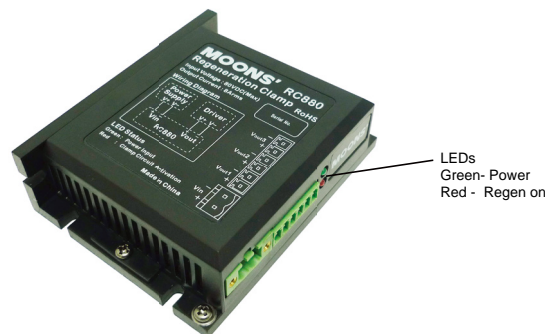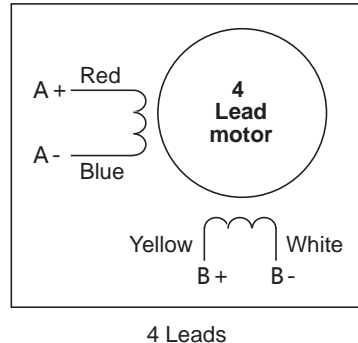


RC880 Regen Clamp

## 3.2  Connecting the Motor

**Never connect or disconnect the motor while the power is on.**

**Four lead motors** can only be connected one way. Please follow the sketch below.



4 Leads

**Six lead motors** can be connected in series or center tap. In series mode, motors produce more torque at low speeds, but cannot run as fast as in the center tap configuration. In series operation, the motor should be operated at 30% less than the rated current to prevent overheating. Winding diagrams for both connection methods are shown below. NC means not connected.
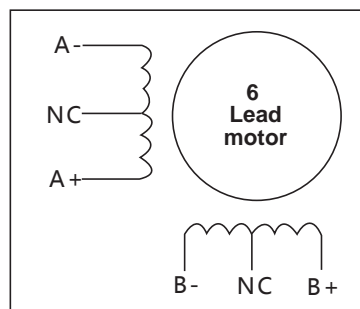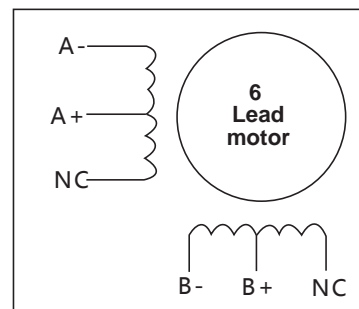


6 Leads Series Connected                    6 Leads Center Tap Connected

**Eight lead motors** can also be connected in two ways: series and parallel. As with six lead motors, series operation gives you less torque at high speeds, but may result in lower motor losses and less heating. In series operation, the motor should be operated at 30% less than the unipolar rated current. The motors recommended in this manual should be connected in parallel. The wiring diagrams for eight lead motors are shown below.
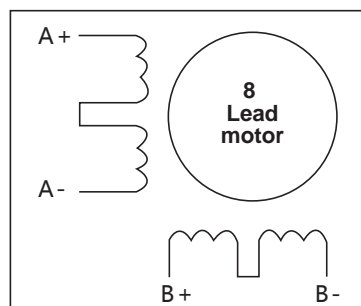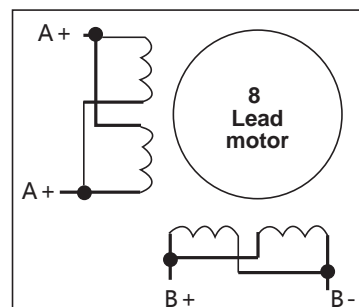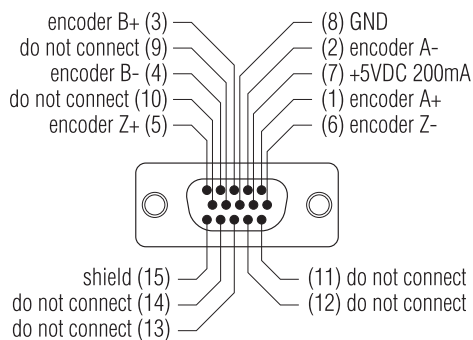


8 Leads Series Connected                    8 Leads Parallel Connected

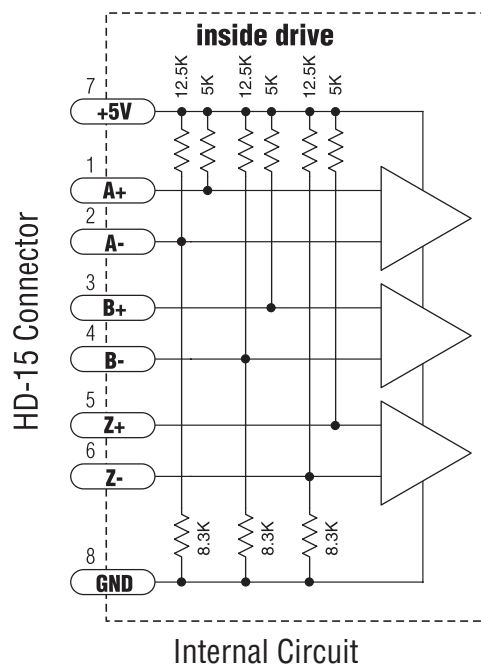## 3.3  Connecting an Encoder (Requires the optional Encoder Feedback Card)

The encoder connections use a HD-15 connector, which you must connect to your encoder as shown below. See back page for mating connector information.

If your encoder is single ended, connect the encoder outputs to the A+, B+ and Z+ inputs. Leave A-, B- and Z- unconnected. (Z is the encoder index signal and is optional.)

encoder B+ (3)
do not connect (9)
encoder B- (4)
do not connect (10)
encoder Z+ (5)

(8) GND
(2) encoder A-
(7) +5VDC 200mA
(1) encoder A+
(6) encoder Z-

shield (15)
do not connect (14)
do not connect (13)

(11) do not connect
(12) do not connect

**Front View**

**Pin Assignments (facing drive)**

**HD-15 Connector**

**inside drive**

7  +5V
1  A+
2  A-
3  B+
4  B-
5  Z+
6  Z-
8  GND

12.5K  5K  12.5K  5K  12.5K  5K

8.3K  8.3K  8.3K

**Internal Circuit**
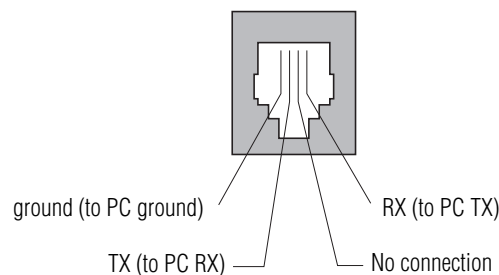
## 3.4  Communications

### 3.4.1  Connecting to the PC using RS-232

- Locate your computer within 8 feet of the drive.

- If you have a CANopen drive, you still need to connect to the RS232 port on your PC to configure the drive, and download Q Programs, if necessary. Once configuration is complete, refer to the CANopen Manual for information on using your CANopen drive.

- Your drive was shipped with a communication cable. Plug the large end into the serial port of your PC and the small end into the PC/MMI jack on your drive. Secure the cable to the PC with the screws on the sides.

**Never connect a drive to a telephone circuit. It uses the same connectors and cords as telephones and modems, but the voltages are not compatible.**

If your PC does not have a serial port, you should purchase a "USB Serial Converter". We have had good results with the Port Authority "USB Serial DB9" Adapter from CablesToGo.com and with the SW1301 from SewellDirect.com.For 64 bit XP and Vista systems, the recommended USB serial adapter is USB-COM-CBL from byterunner.com. This adapter also works for 32 bit Windows systems.

For laptops, a PCMCIA converter card is a good choice. Our applications engineers use the SSP-100 from Sewell Direct.



ground (to PC ground)   RX (to PC TX)

TX (to PC RX)   No connection

Pin Assignments of the PC/MMI Port
(RJ11 connector)

### 3.4.2 Connecting to a host using RS-485 option card

RS-485 allows you to connect more than one drive to a single host PC, PLC, HMI or other computer. It also allows the communication cable to be long (more than 1000 feet). But the device to which you connect must have an RS-485 port.

**RS-485/422**

RX+ RX− TX+ TX− GND

Pin diagram is shown to the right. Wiring diagrams can be found on the next page. We recommend the use of Category 5 cable. It is widely used for computer networks, it is inexpensive, easy to get and certified for quality and data integrity.
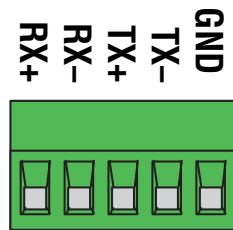
The ST drives can be used with either two wire or four wire RS-485 implementations. The connection can be point to point (i.e. one drive and one host) or a multi-drop network (one host and up to 32 drives).

Four Wire Systems utilize separate transmit and receive wires. One pair of wires must connect the host computer's transmit signals to each drive's RX+ and RX- terminals. Another pair connects the TX+ and TX- drive terminals to the host computer's receive signals. A logic ground terminal is provided on each drive and can be used to keep all drives at the same ground potential. This terminal connects internally to the DC power supply return (V-), so if all the drives on the RS-485 network are powered from the same supply it is not necessary to connect the logic grounds. **You should still connect one drive's GND terminal to the host computer ground.**

**Four wire** systems are better than two wire types because the host can send and receive data at the same time, increasing system throughput. Furthermore, the host never needs to disable its transmitter, which simplifies your software.

to PC GND
to PC RX-
to PC RX+
to PC TX-
to PC TX+

RX+ RX- TX+ TX - GND        RX+ RX- TX+ TX - GND        RX+ RX- TX+ TX - GND
Drive #1                    Drive #2                    Drive #3
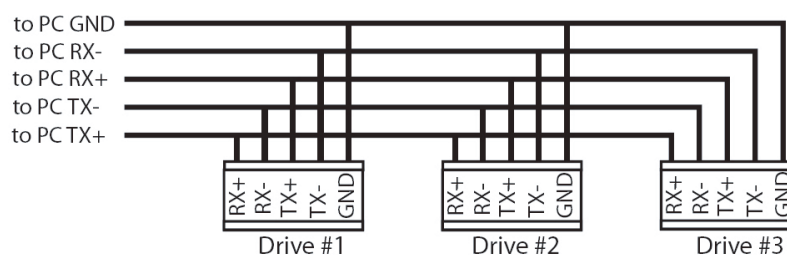
**RS-485 Four Wire System**

### RS-232 to RS-485 4-wire Converter

22-25AL (25-pin) from Integrity Instruments (http://www.rs-485.com).

Connect as follows:

| adaptor | drive |
|---------|-------|
| T+ | RX+ |
| T- | RX- |
| R+ | TX+ |
| R- | TX- |
| SHLD | GND |

**Requires a 7.5 to 24 Volt power supply**

### USB to RS-422/485 4-wire Converter

IR-1401B from Beijing itRob Intelligent Telecommunication Co. (http://www.itrob.cn/2_Products/2_Products_IR-1401B.htm).

| adaptor | drive |
|---------|-------|
| T+ | RX+ |
| T- | RX- |
| R+ | TX+ |
| R- | TX- |
| SHLD | GND |

**The +5V of the converter is not used**

### Two-Wire Configuration

**Two Wire** Systems transmit and receive on the same pair of wires, which can lead to trouble. The host must not only disable its transmitter before it can receive data, it must do so quickly, before a drive begins to answer a query. The MSST drives include a "transmit delay" parameter that can be adjusted to compensate for a host that is slow to disable its transmitter. This adjustment can be made over the network using the TD command, or it can be set using the ST Configurator software. It is not necessary to set the transmit delay in a four wire system.
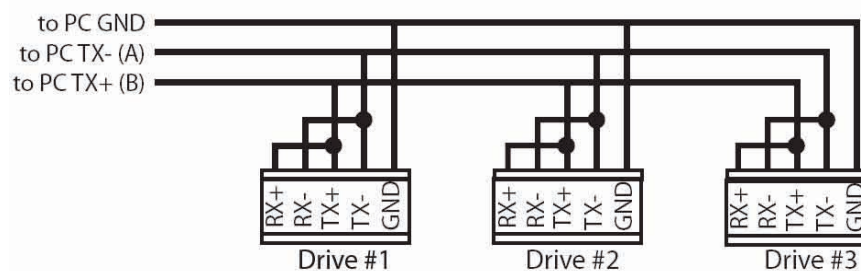


**RS-485 Two Wire System**

### RS-232 to RS-422/485 2-wire Converter:

485-25EL (25-pin) or 485-9E (9-pin) from Integrity Instruments (http://www.rs-485.com).Connect the adaptor's "B" pin to the STM17S's TX+ and RX+ terminals. Connect the "A" pin to the drive's TX- and RX- terminals.

Connect as follows:

| adaptor | drive |
|---------|-------|
| B | RX+ |
| A | RX- |
| B | TX+ |
| A | TX- |
| SHLD | GND |

**Requires a 7.5 to 24 Volt power supply**

### USB to RS-422/485 2-wire Converters

USB-COMi-M from byterunner technologies (http://www.byterunner.com). Set SW1 to ON and SW2-4 to OFF. Connect pin 1 of the converter to RX- and TX-. Connect pin 2 to RX+ and TX+. Pin 6 is ground. The DB-9 is not used.

Connect as follows:

| adaptor | drive |
|---------|-------|
| PIN2 | RX+ |
| PIN1 | RX- |
| PIN2 | TX+ |
| PIN1 | TX- |
| PIN6 | GND |

IR-1401B from Beijing itRob Intelligent Telecommunication Co. (http://www.itrob.cn/2_Products/2_Products_IR-1401B.htm). Connect D+ of the converter to RX+ and TX+ of the drive. Connect D- of the converter to RX- and TX- of the drive. Connect GND of the converter to GND of the drive. The +5V, R+ and R- connections of the converter are not used. The converter will automatically operate in 2-wire mode.

Connect as follows:

| adaptor | drive |
|---------|-------|
| D+ | RX+ |
| D- | RX- |
| D+ | TX+ |
| D- | TX- |
| GND | GND |

**The +5V of the converter is not used**

### 3.4.3  Assigning Multi-Drop Addresses

Before wiring the entire system, you'll need to connect each drive individually to the host computer so that a unique address can be assigned to each drive. Use the programming cable and the ST Configurator software that came with your drive for this purpose.

Connect the drive to your PC, then launch the ST Configurator software. Finally, apply power to your drive. If you have already configured your drive, then you should click the Upload button so that the ST Configurator settings match those of your drive. Click on the Motion button, then select the "SCL" operating mode. If you have a Q drive, you may want to select "Q Programming". Either way, you'll see the RS-485 Address panel appear. Just click on the address character of your choice. You can use the numerals 0..9 or the special characters ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ . Just make sure that each drive on your network has a unique address. If you are using a 2 wire network, you may need to set the Transmit Delay, too. 10 milliseconds works on the adapters we've tried. Once you've made your choices, click Download to save the settings to your drive.

### 3.4.4  Assigning CANopen Addresses

Each node on a CANopen system must have a unique Node ID. Valid ranges for the Node ID are 0x01 through 0x7F. Node ID 0x00 is reserved in accordance with DS301. The Node ID is selected using two rotary switches; one sixteen position switch and one eight position switch. The sixteen position switch is located just to the left of the CANopen connector. The eight position switch is located inside the drive, and may only be accessed by removing the cover of the drive. It is recommended that the internal switch be left at the factory default setting "0" However, if additional Node IDs are required, it is possible to access them using the internal switch.

The Node ID is a concatenation of the two switch values. To set the Node ID to 0x3B, for example, turn the internal eight position switch to the value "3", and the sixteen position switch to the value "B".

Please refer to the CANopen manual for more information.

## 3.5 Inputs and Outputs

The ST drives have three types of inputs:

- high speed digital inputs for step & direction commands

- digital inputs for other signals, 12 - 24 volt logic

- analog inputs for analog speed and positioning modes

All drives include eight digital inputs and two analog inputs.

- CW & CCW Limit: can be used to inhibit motion in a given direction, forcing the motor and load to travel within mechanical limits. Can be configured for active closed, active open or not used.

- IN1/STEP & IN2/DIR: digital signals for commanding position. Quadrature signals from encoders can also be used. These inputs can also be connected to sensors, switches and other devices for use with Q and I commands such as Wait Input, Seek Home, Feed to Sensor, If Input and others.

- IN3,4,5,6: software programmable inputs can be used for motor enable, alarm reset or jogging. These inputs can also be connected to sensors, switches and other devices for use with Q and I Wait Input, Seek Home, Feed to Sensor, If Input and other commands.

- Analog In: analog velocity or position command signal. Can be configured for 0-10V, 0-5V, ±10V or ±5V, with or without offset.

### 3.5.1 Connector Pin Diagram
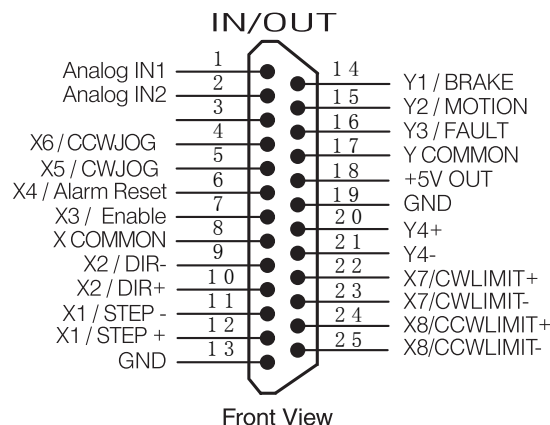


IN/OUT1 (DB-25) Connector

### 3.5.2 High Speed Digital Inputs

The ST drives include two high speed inputs called STEP and DIR. They accept 5 volt single-ended or differential signals, up to 2 MHz. Normally these inputs connect to an external controller that provides step & direction command signals. You can also connect a master encoder to the high speed inputs for following applications. Or you can use these inputs with Wait Input, If Input, Feed to Sensor, Seek Home and other such commands.

Connection diagrams follow.
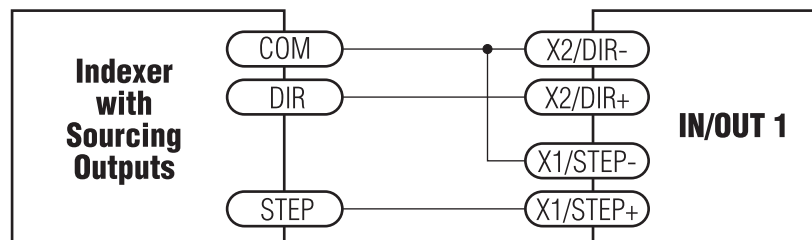
Connecting to indexer with Sourcing Outputs
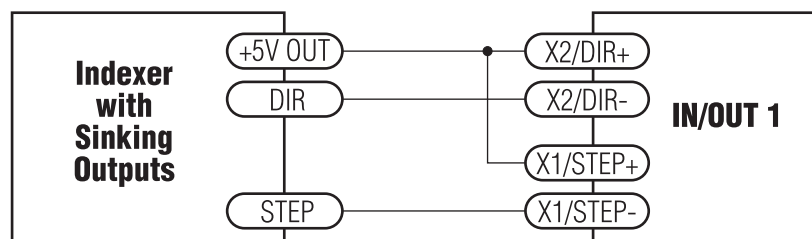
Connecting to Indexer with Sinking Outputs
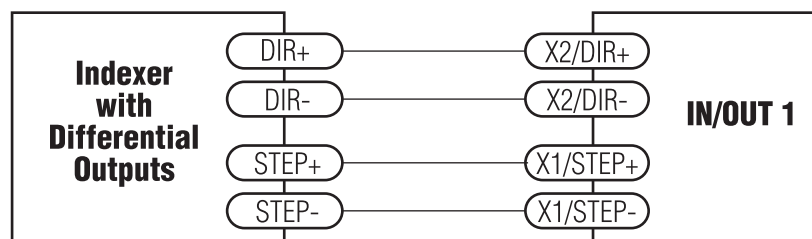
Connecting to Indexer with Differential Outputs
*(Many High Speed Indexers have Differential Outputs)*
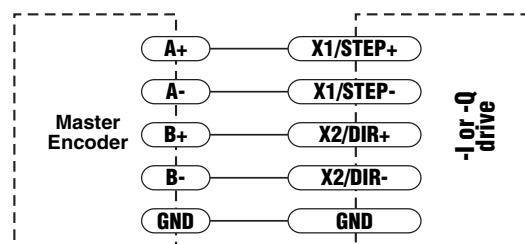
Wiring for Encoder Following

**MOONS'**

**Using High Speed Inputs with 12-24 Volt Signals**

Most PLCs don't use 5 volt logic. You can connect signal levels as high and DIR inputs if you add external dropping resistors, as shown below.

- For 12 volt logic, add 820 ohm, 1/4 watt resistors

- For 24 volt logic, use 2200 ohm, 1/4 watt resistors

**The maximum voltage that can be applied to an input terminal is 24 volts DC. Never apply AC voltage to an input terminal.**
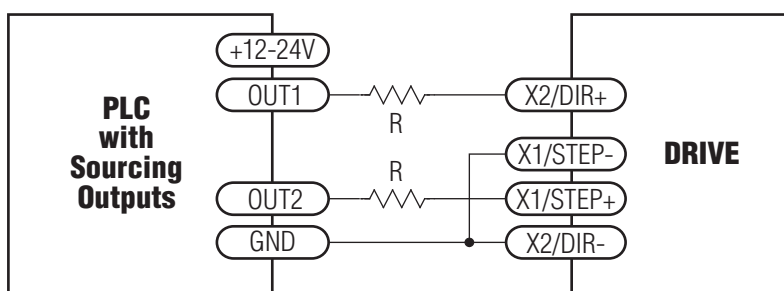


Connecting to PLC with Sourcing (PNP) Outputs
*(Most PLC's use 24 volt logic)*
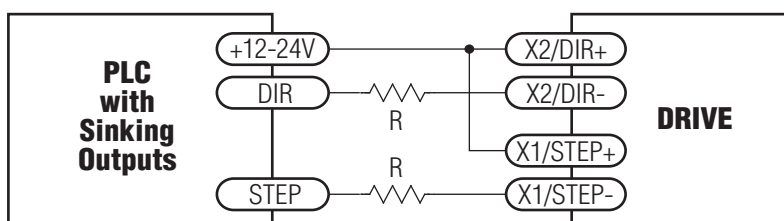


Connecting to PLC with Sinking (NPN) Outputs
*(Most PLC's use 24 volt logic)*
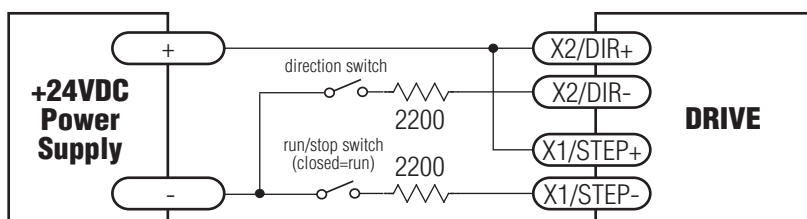


Using Mechanical Switches at 24 Volts

### 3.5.3  Other Digital Inputs

As we mentioned in the previous section, the high speed STEP and DIR inputs are configured for five volt logic. All other digital inputs are designed for operation between 12 and 24 volts DC.

**Single Ended Inputs**

The MSST drives include four single ended, optically isolated input circuits that can be used with sourcing or sinking signals, 12 to 24 volts. This allows connection to PLCs, sensors, relays and mechanical switches. Because the input circuits are isolated, they require a source of power. If you are connecting to a PLC, you should be able to get power from the PLC power supply. If you are using relays or mechanical switches, you will need a 12-24 V power supply. This also applies if you are connecting the inputs to the programmable outputs of an I product from MOONS'.
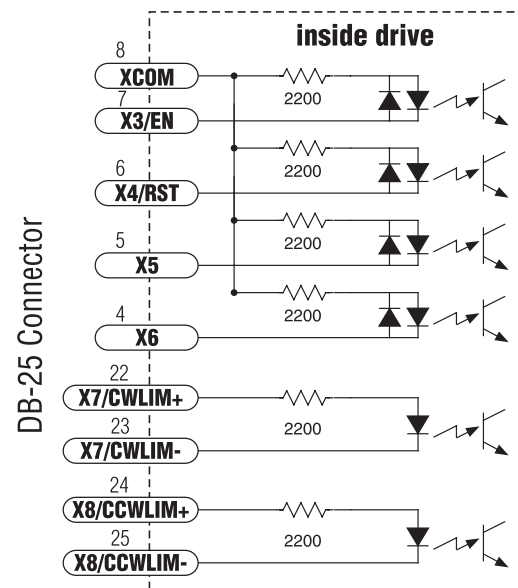
**What is COM?**

"Common" is an electronics term for an electrical connection to a common voltage. Sometimes "common" means the same thing as "ground", but not always. In the case of the ST drives, if you are using sourcing (PNP) input signals, then you will want to connect COM to ground (power supply -). If you are using sinking (NPN) signals, then COM must connect to power supply +.

**Note: If current is flowing into or out of an input, the logic state of that input is low or closed. If no current is flowing, or the input is not connected, the logic state is high or open.**

The diagrams on the following pages show how to connect the inputs to various commonly used devices.

**MOONS'**
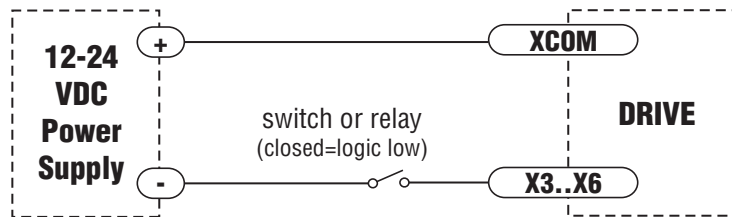


Connecting an Input to a Switch or Relay
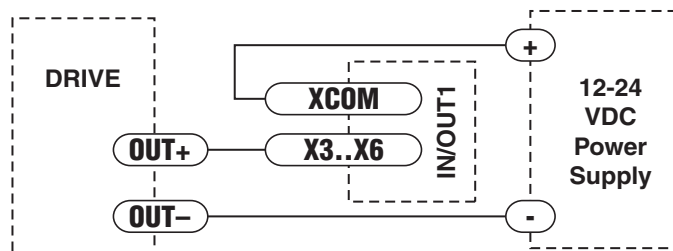


Connecting another I drive to the MSST
(When output closes, input goes low).
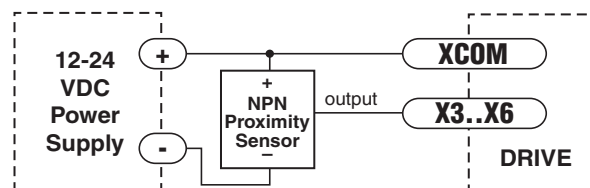


Connecting an NPN Type Proximity Sensor to an input
(When prox sensor activates, input goes low).
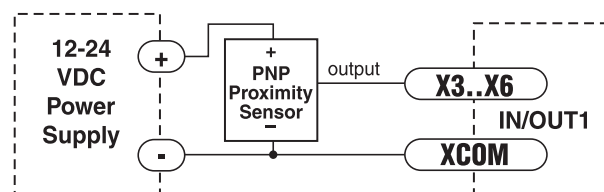


Connecting a PNP Type Proximity Sensor to a an input
(When prox sensor activates, input goes low).

### 3.5.4  Connecting Limit Switches

The CWLIMIT and CCWLIMIT inputs are used for connecting end of travel sensors. These inputs are differential, which allows you to use signals that are sinking (NPN), sourcing (PNP) or differential (line driver). By connecting switches or sensors that are triggered by the motion of the motor or load, you can force the motor to operate within certain limits. This is useful if a program or operator error could cause damage to your system by traveling too far.

The limit inputs are optically isolated. This allows you to choose a voltage for your limit circuits of 12 to 24 volts DC. This also allows you to have long wires on limit sensors that may be far from the drive with less risk of introducing noise to the drive electronics. The schematic diagram of the limit switch input circuit is shown below.
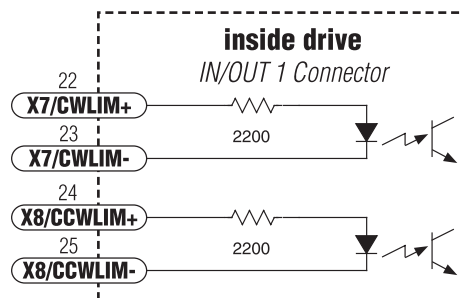
**Wiring a Mechanical Limit Switch**

You can use normally open or normally closed limit switches. Either way, wire them as shown here. Be sure to set the polarity using the Mis Programmer for I drives or the ST Configurator software for the MSST5-Q and MSST10-Q,MSST5-C and MSST10-C.
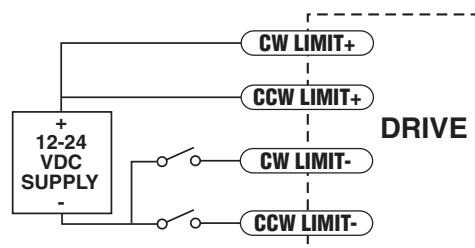
**Wiring a Limit Sensor**

Some systems use active limit sensors that produce a voltage output rather than a switch or relay closure. These devices must be wired differently than switches.

If your sensor has an open collector output or a sinking output, wire it like this:
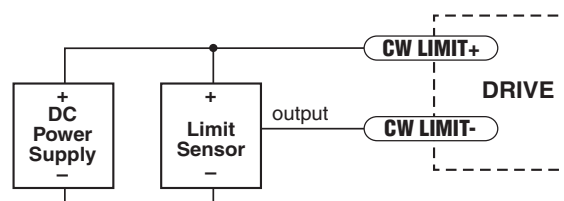
If the sensor output goes low at the limit, select the option "closed" (in the software). If the output is open, or high voltage, choose "open".

Other sensors have sourcing outputs. That means that current can flow out of the sensor output, but not into it. In that case, wire the sensor this way:
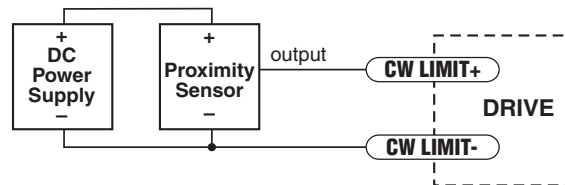
### 3.5.5  Analog Inputs

The MSST drives feature two analog inputs. Each input can accept a signal range of 0 to 5 VDC, ±5 VDC, 0 to 10 VDC or ±10 VDC. The drive can be configured to operate at a speed or position that is proportional to the analog signal.

Use the ST Configurator software to set the signal range, offset, deadband and filter frequency.
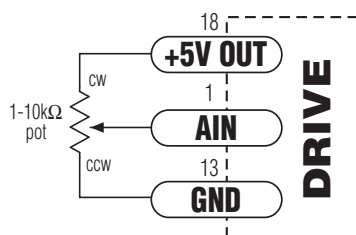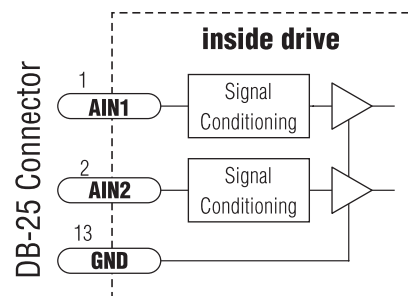
Connecting a Potentiometer to Analog Input 1

### 3.5.6  Programmable Outputs

The MSST drives feature four digital outputs. These outputs can be set to automically control a motor brake, to signal a fault condition, to indicate when the motor is moving or to provide an output frequency proportional to motor speed (tach signal). Or the outputs can be turned on and off by program instructions like Set Output.

The outputs can be used to drive LEDs, relays and the inputs of other electronic devices like PLCs and counters. For OUT4, the "+" (collector) and "-" (emitter) terminals of each transistor are available at the connector. This allows you to configure each output for current sourcing or sinking. The OUT1-3 outputs can only sink current. The COM terminal must be tied to power supply (-).
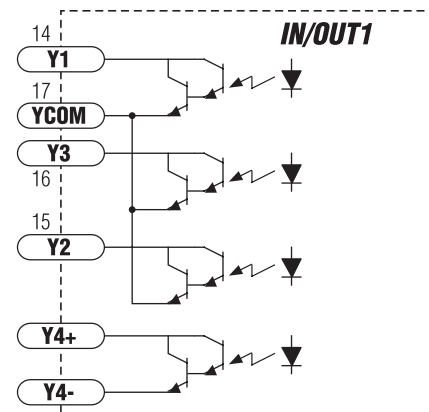
Diagrams of each type of connection follow.

**Do not connect the outputs to more than 30VDC.**

**The current through each output terminal must not exceed 100 mA.**
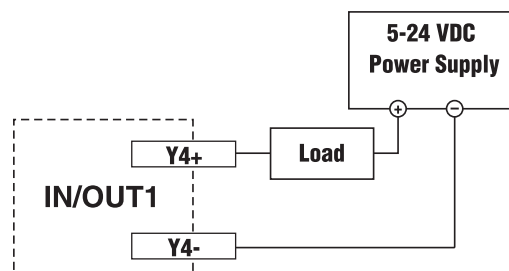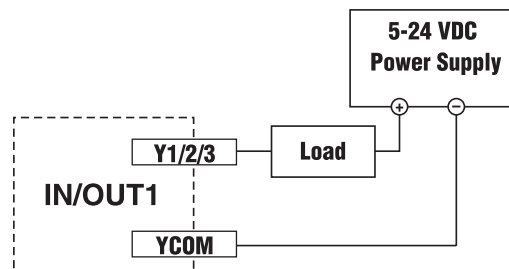
Sinking Output
Using Y4
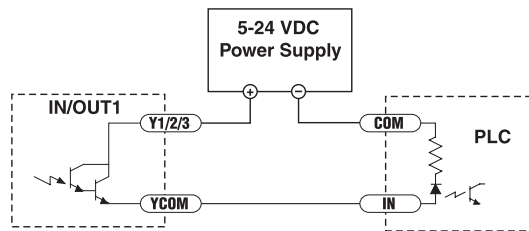
Sourcing Output
Y1, Y2 or Y3
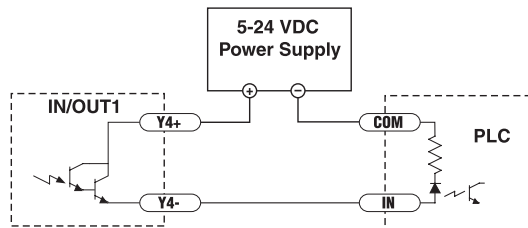


Sourcing Output
Using Y4
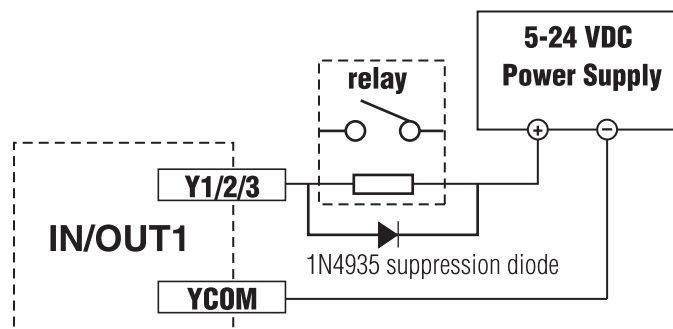


Driving a Relay
Y1, Y2 or Y3
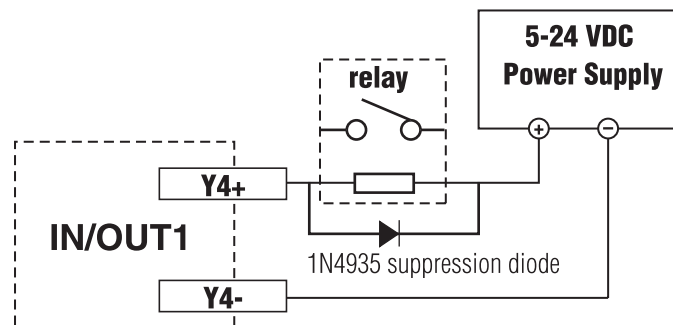


Driving a Relay
Using Y4

# 4  Troubleshooting

**Alarm Codes**

In the event of an error, the green LED on the main board will flash one or two times, followed by a series of red flashes. The pattern repeats until the alarm is cleared.

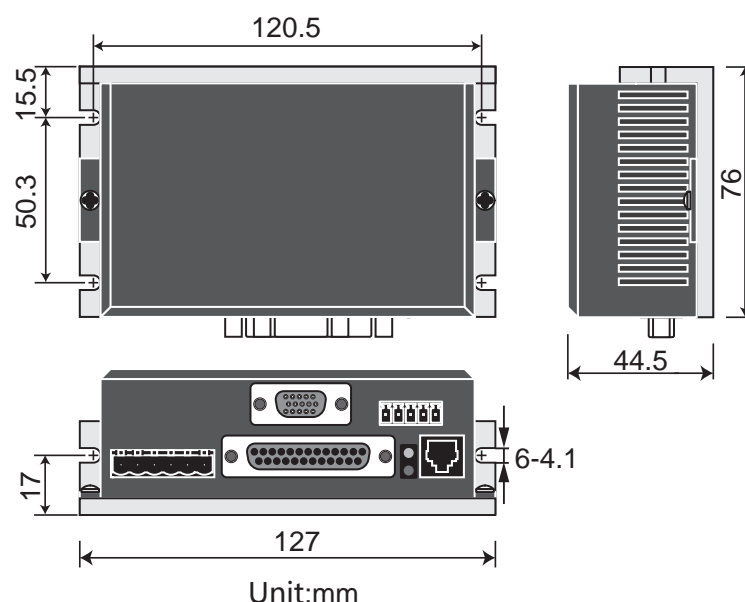| | Code | Error |
|---|---|---|
| 🟢 | solid green | no alarm, motor disabled |
| 🟢🟢 | flashing green | no alarm, motor enabled |
| 🔴🟢 | 1 red, 1 green | motor stall (optional encoder only) |
| 🔴🟢🟢 | 1 red, 2 green | move attempted while drive disabled |
| 🔴🔴🟢 | 2 red, 1 green | ccw limit |
| 🔴🔴🟢🟢 | 2 red, 2 green | cw limit |
| 🔴🔴🔴🟢 | 3 red, 1 green | drive overheating |
| 🔴🔴🔴🟢🟢 | 3 red, 2 green | internal voltage out of range |
| 🔴🔴🔴🔴🟢 | 4 red, 1 green | power supply overvoltage |
| 🔴🔴🔴🔴🟢🟢 | 4 red, 2 green | power supply undervoltage |
| 🔴🔴🔴🔴🔴🟢 | 5 red, 1 green | over current / short circuit |
| 🔴🔴🔴🔴🔴🟢🟢 | 5 red, 2 green | motor resistance out of range |
| 🔴🔴🔴🔴🔴🔴🟢 | 6 red, 1 green | open motor winding |
| 🔴🔴🔴🔴🔴🔴🟢🟢 | 6 red, 2 green | bad encoder signal (optional encoder only) |
| 🔴🔴🔴🔴🔴🔴🔴🟢 | 7 red, 1 green | serial communication error |

# 5  Reference Materials

## 5.1  Mechanical Outlines



Unit:mm

## 5.2  Technical Specifications

| | |
|---|---|
| Amplifier | Digital MOSFET. 20 kHz PWM.<br>MSST5: 18 - 53 VDC, motor current: 0.1 to 5.0 amps/phase peak of sine<br>MSST10: 18 - 75 VDC, motor current: 0.1 to 10 amps/phase peak of sine |
| Digital Inputs | Step & Direction: differential, optically isolated, 5V logic. 330 ohms internal resistance.<br>0.5 µsec minimum pulse width. 2 µsec minimum set up time for direction<br>All other digital inputs: optically isolated, 12 - 24V logic. 2200 ohms.<br>Maximum current: 10 mA. |
| Analog Inputs | ±10VDC, 12 bit ADC, 100k ohms internal impedance. |
| Outputs | Photodarlington, 100 mA, 30 VDC max. Voltage drop: 1.2V max at 100 mA. |
| Physical | 1.775 x 3 x 5 inches (45.1x76.2x127mm)overall. 10 oz (280 g)<br>Ambient temperature range: 0°C to 40°C. |

## 5.3  Torque Speed Curves

**14HYB401-03**
Drive: MSST5
Microstep: 20000 steps/rev
Current: 1.4A(Peak)

Legend: 24V — 36V



Torque(mN·m) vs Speed(rps)

**17HD4435-02N**
Drive: MSST5
Microstep: 20000 steps/rev
Current: 1.8A(Peak)

Legend: 24V — 36V



Torque(mN·m) vs Speed(rps)

**17HD6404-05N**
Drive: MSST5
Microstep: 20000 steps/rev
Current: 1.8A(Peak)

Legend: 24V — 36V



Torque(mN·m) vs Speed(rps)

**23HS2442-05**
Drive: MSST5
Microstep: 20000 steps/rev
Current: 4A(Peak)

Legend: 24V — 36V — 48V



Torque(N·m) vs Speed(rps)

**23HS3442-06**
Drive: MSST5
Microstep: 20000 steps/rev
Current: 4.2A(Peak)

Legend: 24V — 36V — 48V



Torque(N·m) vs Speed(rps)

**24HS5401-10N**
Drive: MSST10
Microstep: 20000 steps/rev
Current: 4A(Peak)

Legend: 24V — 48V



Torque(N·m) vs Speed(rps)

**34HD0801-2**
Drive: MSST10
Microstep: 20000 steps/rev
Current: 6.3A(Peak)

Legend: 24V — 60V



Torque(N·m) vs Speed(rps)

**34HD1801-02**
Drive: MSST10
Microstep: 20000 steps/rev
Current: 6.3A(Peak)

Legend: 24V — 48V



Torque(N·m) vs Speed(rps)

## 5.4  Mating Connectors and Accessories

**Mating Connectors**

Motor/power supply: PCD P/N ELV06100, included with drive. IN/OUT1: DB-25 male. AMP P/N 747912-2. Shell Kit AMP P/N748678-3. Included. Optional encoder feedback: HD-15 male. Norcomp P/N 180-015-102-001. Shell Kit AMP P/N 748678-1. Not included.

**Accessories**

Breakout Box for DB-25 Connector
    BOB-1, includes cable


Screw Terminal Connectors that mate directly to the DB-25 connector on the front panel of the drive:

    Phoenix Contact P/N 2761622
    This connector is not available from MOONS'. You must purchase it from a
    Phoenix distributor.


Mating Cable for IN/OUT connector with "flying leads"
    Black Box P/N: BC00702
    This cable is not available from MOONS'. You must purchase it from Black Box.
    Useful for custom wired applications. This shielded cable has a DB-25 connector on each
    end. You can cut off the female end to create a 6 foot "DB-25 to flying lead cable".
    It'll be easier to wire if you get the cable color chart from Black Box's web site.
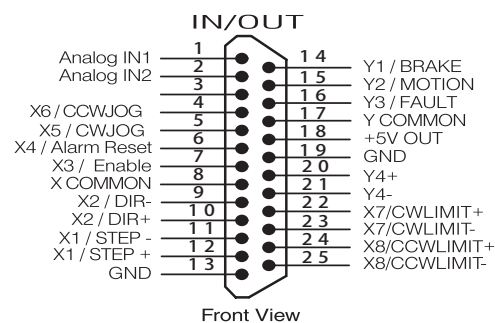

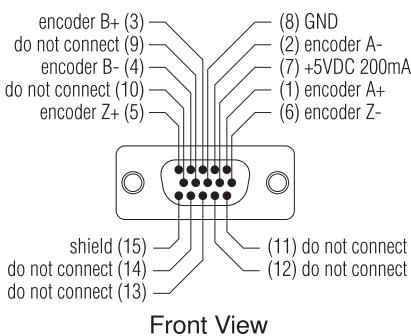Regeneration Clamp:
    MOONS' Products RC880.


Recommended CANopen USB Adapter (-C drives only)
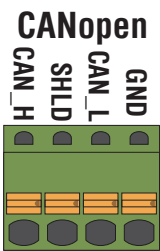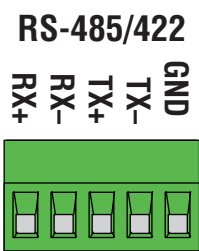    Kvaser LeafLight HS This adapter is not available from MOONS'.

## 5.5  Connector Diagrams



**DB-25 I/O Connector**



**HD-15 Encoder Connector**

# 6 Contacting MOONS'

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