Hardware Installation Manual

Of the Multi-axis Stepper Drive MX3660

Version 0.0.0

http://www.Leadshine.com

Safety Items

Read this manual carefully before trying to install the stepper drive into your system. Uses who setup the stepper drive should have a better understanding on electronics and mechanics. Contact Leadshine technical guys when you have questions on this document.

Make sure the power supply voltage dose not exceed the drive's input range. Double check the connections and make sure the power lead polarity is correct.

Do not set high current for small stepper motor. It is possible that the motor will be damaged.

Disconnect the motor from the load if you are not sure the move direction. Adjust the axis in the center before trying to run the motor.

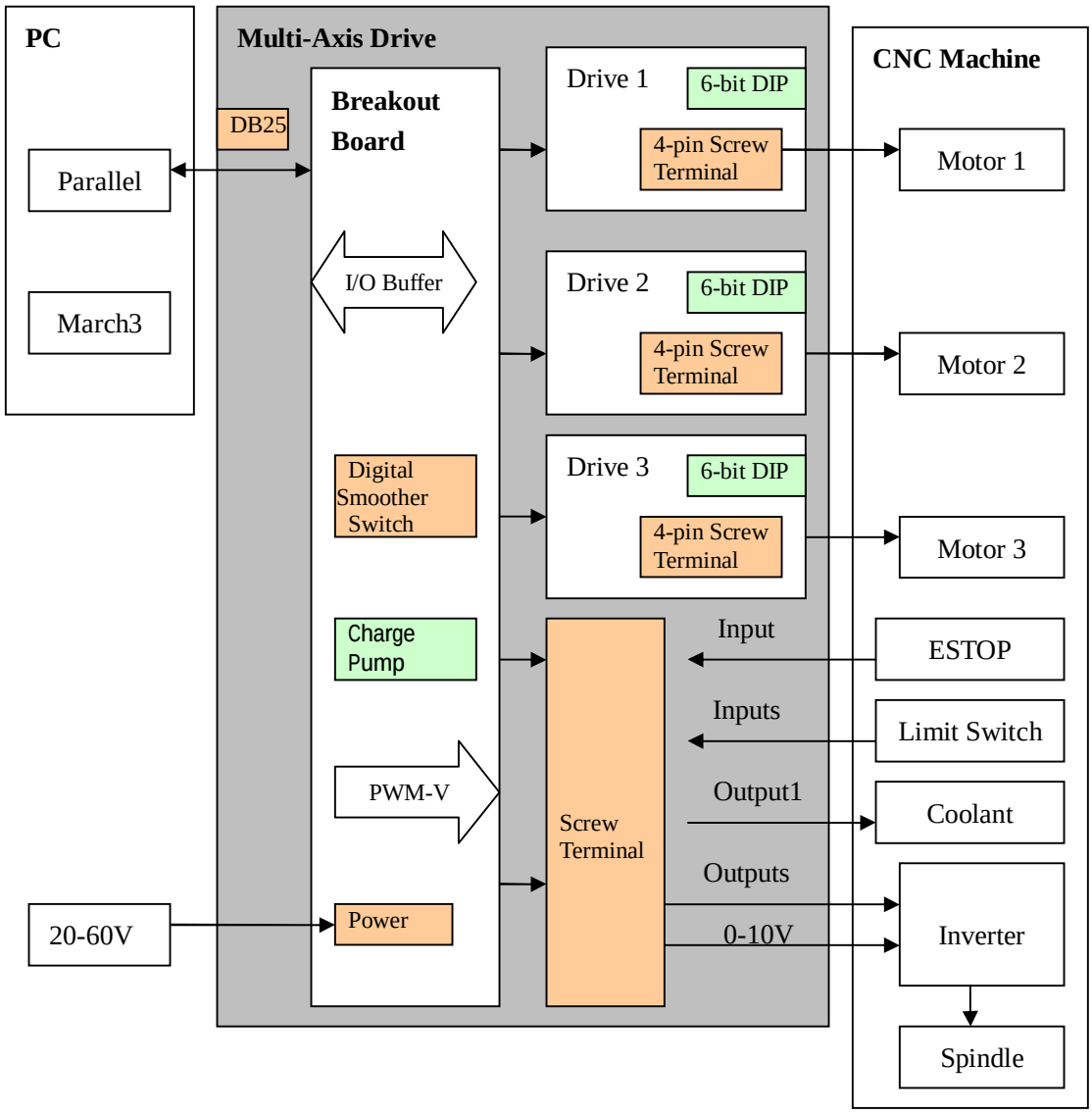
Never disconnect the motor lead when the power source is energized.

Table of Contents

Introduction to the MX3660 1
Getting Start 2
    Connection Diagrams 2
    Connecting Power Supply 3
    Connecting Motor 3
    Connecting the Emergency Stop Switch 4
    Connecting the Home / Limit Switch 4
    Connecting the Inverter 5
    Using External Step & Direction Signal 6
Typical Connections 7
Configuration 7
Power Supply Selection 8
    Regulated or Unregulated Power Supply 8
    Selecting Supply Voltage 9
    Recommended Supply Voltage 9
Control Signal Setup Timing 10
Protection Functions 10
    Over-current Protection 10
    Over-voltage Protection 11
Frequently Asked Questions 12
    Problem Symptoms and Possible Causes 12
Warranty 13
    Exclusions 13
    Obtaining Warranty Service 13
    Warranty Limitations 13
    Shipping Failed Product 13
Contact Us 14

Introduction to the MX3660

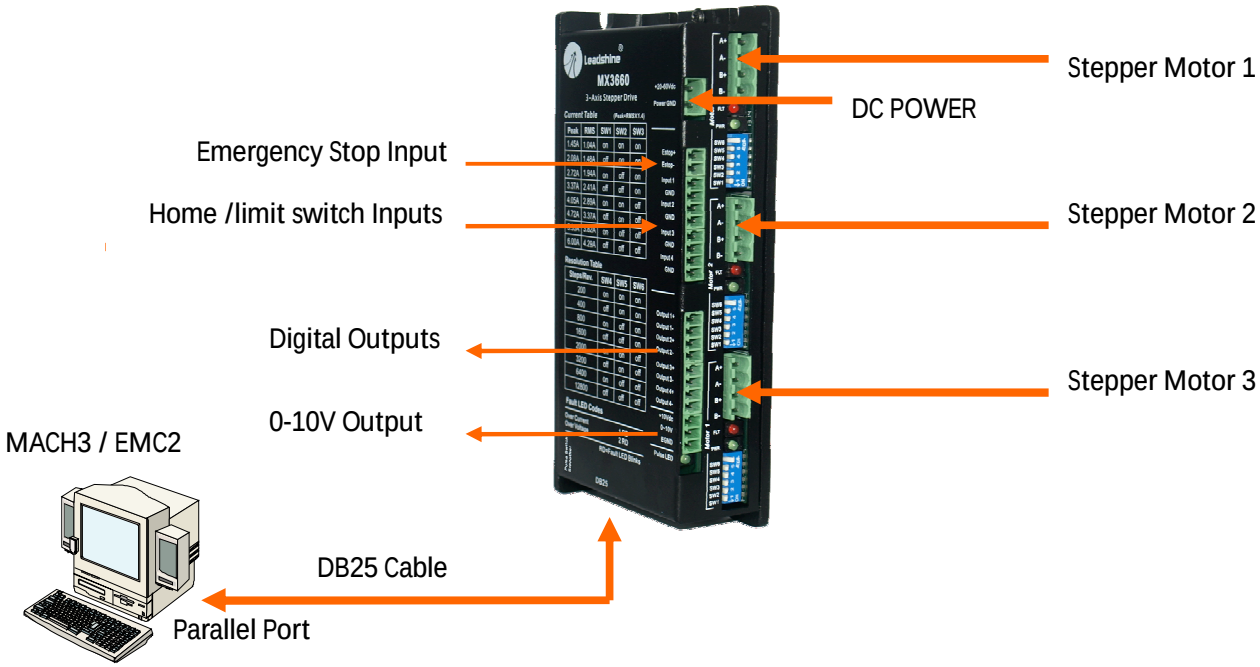
Based on the latest DSP technology and adopting Leadshines' advanced control algorithms, Leadshine MX series was specially designed to allow easy and rapid implementation of multiple axis stepper solutions. With up to 60VDC working voltage and output current to 6.0A, Leadshine multi-axis stepper drives are capable of driving multiple 2 phase stepper motors in frame size 17, 23, 24, and 34. Leadshine multiple axis stepper strives can drive stepper systems at excellent low-to-high speed performance with high precision, extra low motor heating, smooth movement, and low motor noise. They are featured with anti resonance, multi stepping, digital smoothing, options of different configuration for each axis, automatic idle current reduction, and easy configurations of micro stepping and output currents via DIP switches. Their integrated breakout board and built-in IO's offer easy implementation for many applications at very effect costs.



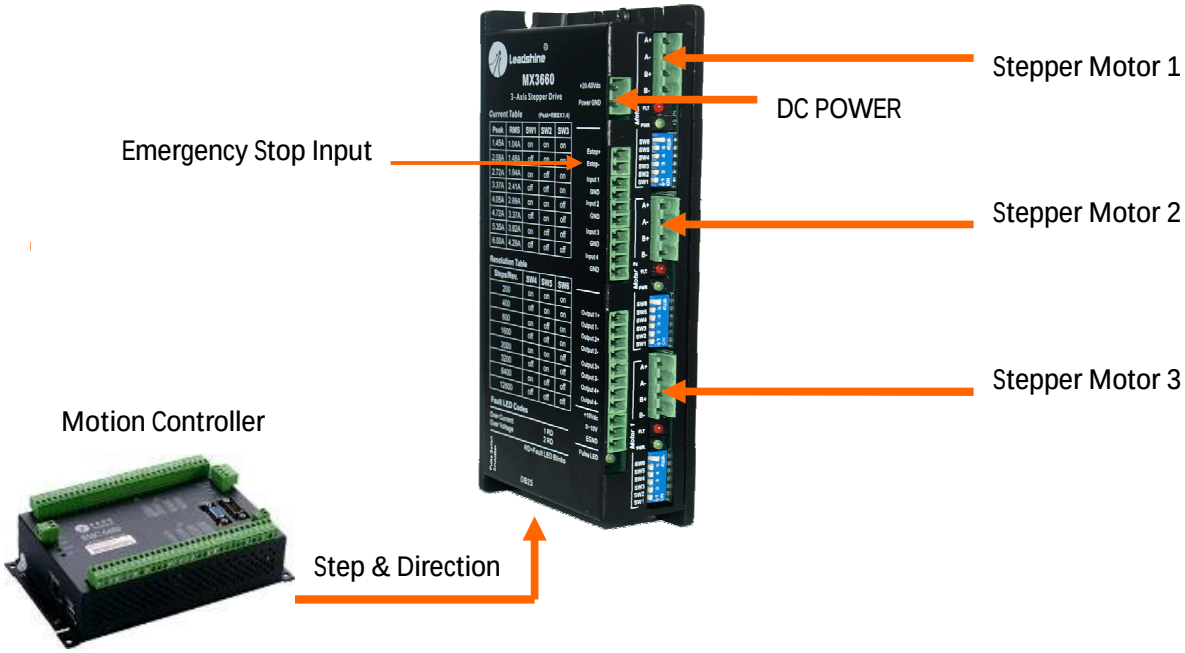
Getting Start

To get start you need one PC with parallel port (DB25), three stepper motors (one is also ok) and a DC power supply for the first time evaluation. The MX3660 is designed for those applications using Mach3 as the motion controller. However it is also possible to control it a traditional motion controller which generates the Steps & Direction command.

Connection Diagrams



Connection diagram of the MX3660 with parallel port



Connection diagram of the MX3660 with External Step & Direction Inputs

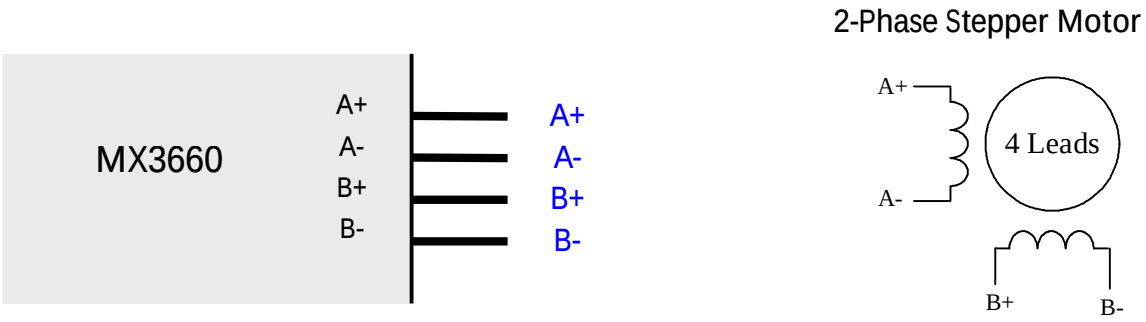
Connecting Power Supply

The power of the MX3660 can be connected as follows.

Power Connections of the MX3660

Connecting Motor

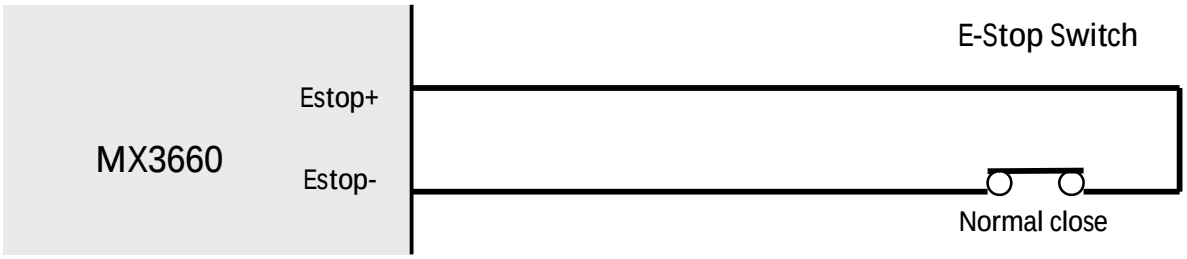
The drive module of the MX3660 is designed for 2-phase stepper motor. It can work with Leadshine 42HS series (NEMA 17), 57HS series (NEMA 23), 86HS series (NEMA 34) stepper motor which has the A+, A-, B+ and B- lead. Just connect these leads to the corresponding terminals of the MX3660 as follows. Please refer to the motor's datasheet for the wire color definition.



Connect 2-phase stepper motor to the MX3660

Connecting the Emergency Stop Switch

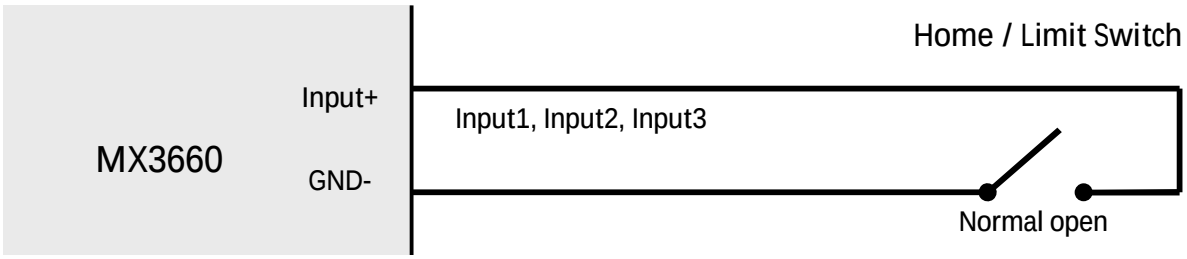
The emergency stop input of the MX3660 is used to disable the power stage of the motor output. By default this input is active high, meaning that you need connect a normal close switch between the Estop+ and Estop- terminal. If it is not required for your system, just connect a wire between them.
Note1: The E-Stop is only active when a PC with Mach3 / EMC is adopted as the control system.
Note2: It is possible to change the active level of the E-stop input in MACH3 or EMC2.



E-stop switch connection of the MX3660

Connecting the Home / Limit Switch

The home / limit input of the MX3660 can be connected as follows. By default these digital inputs are active at low level, meaning that you need to connect them to the normal open switches. If these inputs are not required for your application, just leave them unconnected.
Note1: These inputs are only active when a PC with Mach3 / EMC is adopted as the control system.
Note2: It is possible to change the active level of these inputs in MACH3 or EMC2.

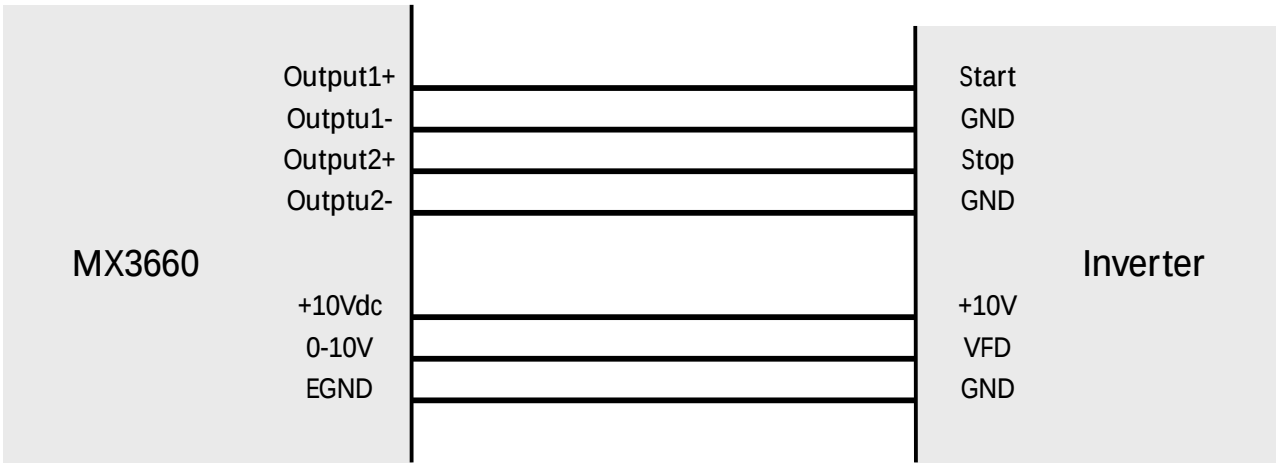


Home / limit switch connection of the MX3660

Connecting the Inverter

Most of the Inverter in the market can be controlled by several digital inputs and one analog input. The MX3660 has four general purpose digital outputs of OC (open collector) type. The actual connection between the MX3660 and the inverter depends on the control mode of the inverter. The following connection diagram use one output to start the spindle, one output to stop the spindle and the 0-10V output to control the spindle speed.

Note1: These outputs and the 0-10V output are only active when a PC with Mach3 / EMC is adopted as the control system.
Note2: It is possible to change the active level of these outputs in MACH3 or EMC2.

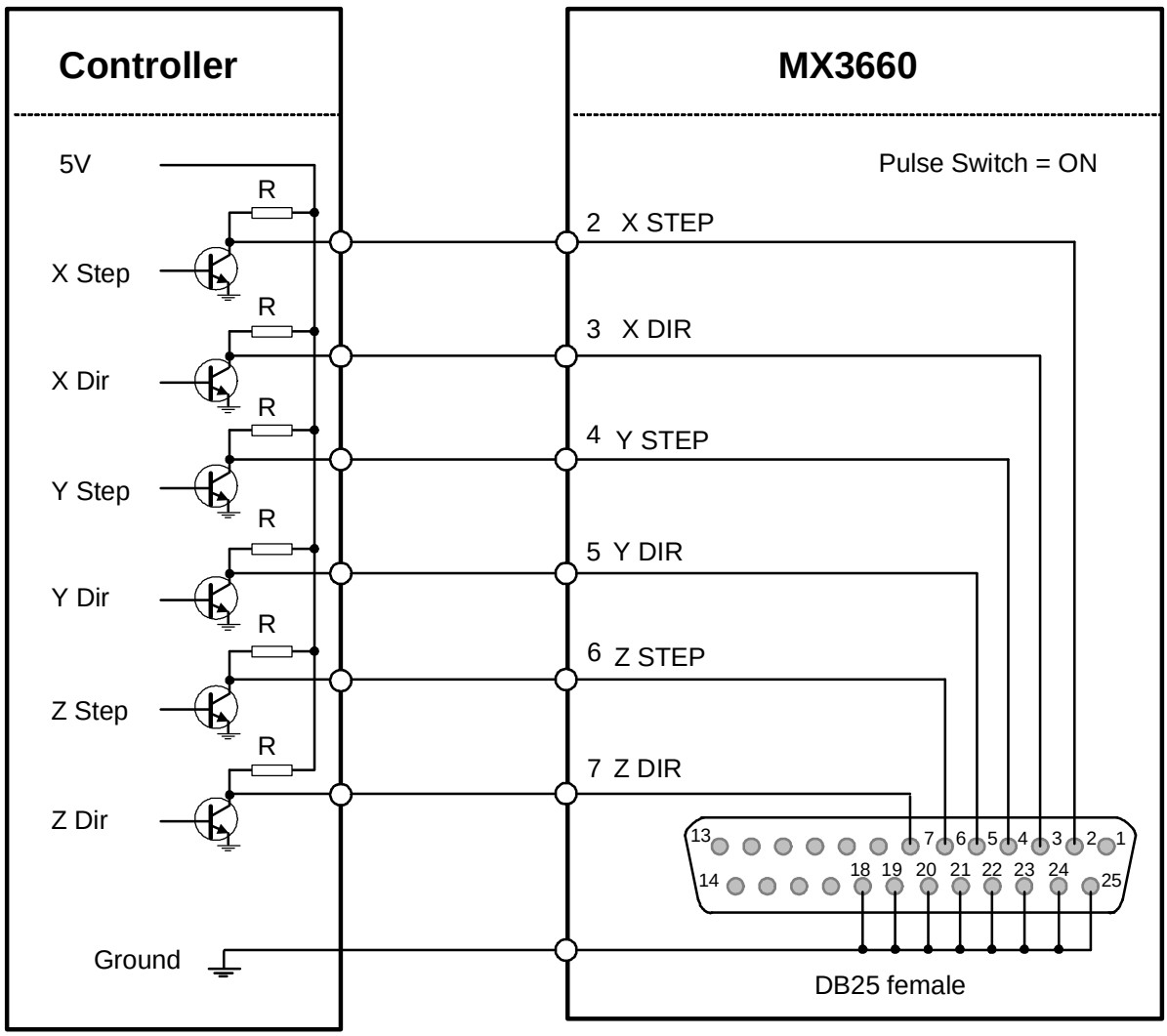


Connect the MX3660 to the inverter

Using External Step & Direction Signal

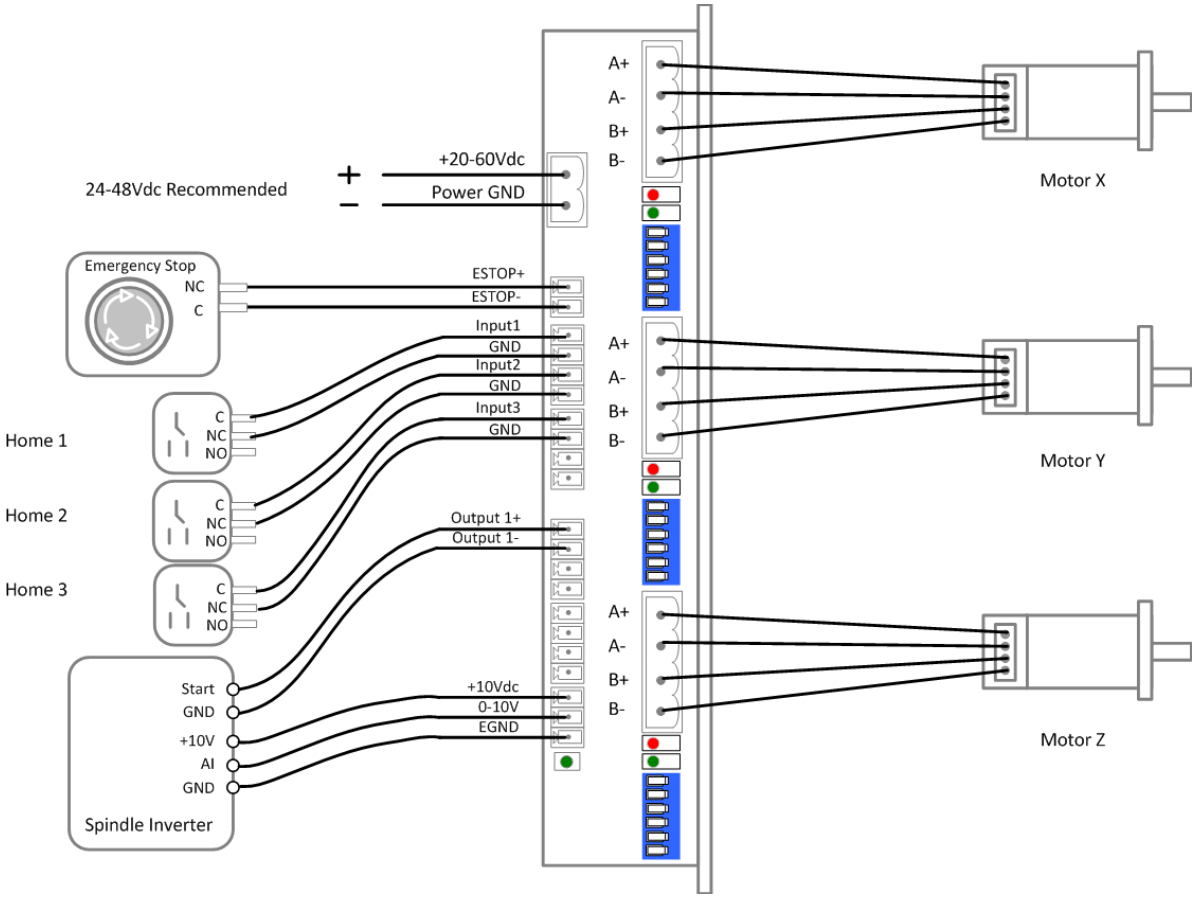
Though the MX3660 has been special designed for those software that use the PC and parallel port as the motion controller, you can also use external step and direction signal to control it.

Note1: The pulse switch should be on when using external step & direction as command source.
Note2: OC (open collector) output is recommended.



External step & direction signal connection of the MX3660

Typical Connections



Typical Connections of the MX3660 with CNC machine

Configuration

For the motor drive module, you only need to configure the peak current and micro step resolution for the stepper motor. A 6-bit DIP switch is used for this purpose. Usually, the RMS current of the drive should be equal to the motor's phase current (or rated current). In practice, the setting current (RMS value) can be less than the motor's phase current if the actual torque is capable of moving the load at required motion velocity and acceleration. The micro step resolution setting is depending on the application. Higher resolution that is greater than 1600 PPR only introduces more smooth motion.

Micro Step Resolution Setting (SW4-SW6)

Steps/Rev	SW4	SW5	SW6
200	On	On	On
400	Off	On	On
800	On	Off	On
1600	Off	Off	On
2000	On	On	Off
3200	Off	On	Off
6400	On	Off	Off
12800	Off	Off	Off

Current Setting (SW1-SW3)

Peak	RMS	SW1	SW2	SW3
1.45A	1.04A	on	on	on
2.08A	1.48A	off	on	on
2.72A	1.94A	on	off	on
3.37A	2.41A	off	off	on
4.05A	2.89A	on	on	off
4.72A	3.37A	off	on	off
5.35A	3.82A	on	off	off
6.00A	4.29A	off	off	off

Current and micros step resolution setting of the MX3660

Power Supply Selection

To achieve good driving performances, it is important to choose a suitable supply voltage and use a matching current value. 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.

Regulated or Unregulated Power Supply

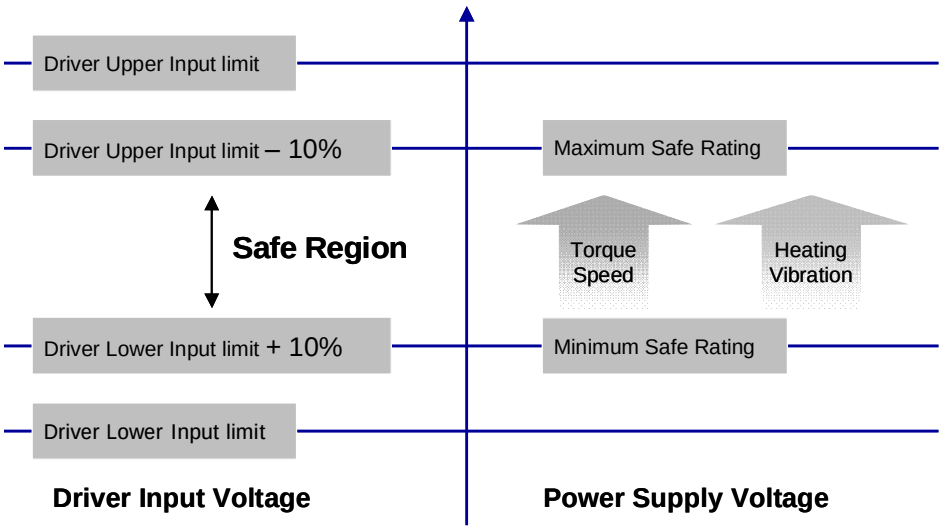
Both regulated and unregulated power supplies can be used to supply the drive. If regulated power supplies (such as most switching supplies.) are indeed used, it is important to have large current output rating to avoid problems like current clamp, for example using 4A supply for 3A motor-drive operation. 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.

Selecting Supply Voltage

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, and it is suggested to use power supplies with theoretical output voltage of drive's minimum + 10% to drive's maximum – 10%, leaving room for power fluctuation and back-EMF.

Select Power Supply Voltage



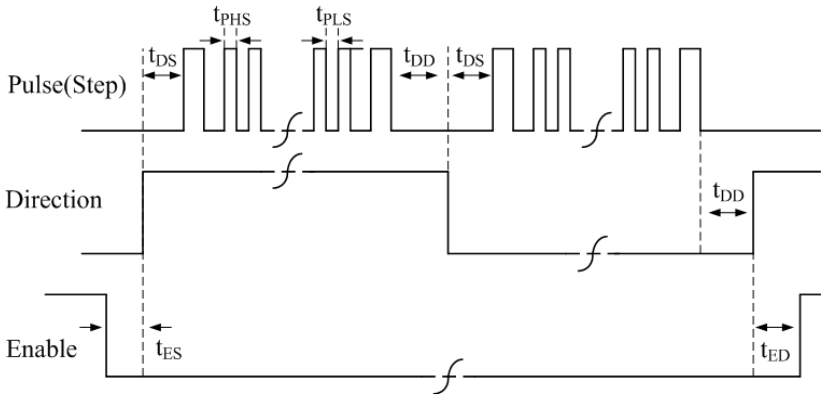
Recommended Supply Voltage

Both Leadshine's regulated and unregulated power supply has been designed specially for motion control.

Power Supply	Output Voltage	Continuous Current	Matching Motor
RPS2410	DC 24V	10A	42HS Series, 57HS Series
RPS369	DC 36V	9A	57HS Series, 86HSeries
RPS488	DC 48V	8A	86HSeries

Control Signal Setup Timing

To make a reliable operation, the MX3660 requires the control signals to meet the setup time requirements as follows. Otherwise losing of steps may happen.



Symbol	Description
t_{DS}	Direction Setup Time
t_{PHS}	Pulse High Level Setup Time
t_{PLS}	Pulse Low Level Setup Time
t_{DD}	Direction DelayTime
t_{ES}	Enable Setup Time
t_{ED}	Enable Delay Time

Control Signal Setup Time						
Drive	Frequency	T_{DS}	T_{PHS} / T_{PLS}	T_{DD}	T_{ES}	T_{ED}
MX3660	200K	>5uS	>2.5us	>5uS	>5ms	>5ms

Protection Functions

To improve reliability, the drive module incorporates some built-in protection functions. It uses one red LED to indicate the protection type. The periodic time of red is 4 s (seconds), and the blinking times of red LED indicates what protection has been activated. Because only one protection can be displayed by red LED, so the drive will decide what error to display according to their priorities. See the following protection Indications table for displaying priorities.

Priority	Time(s) of Blink	Sequence wave of red LED	Description
1st	1		Over-current protection activated
2nd	2		Over-voltage protection activated
3rd	3		Emergency stop activated

Over-current Protection

Over-current protection will be activated when continuous current exceeds the limit or in case of short circuit between motor coils or between motor coil and ground, and RED LED will blink once

within each periodic time.

Over-voltage Protection

When power supply voltage exceeds the limits, protection will be activated and red LED will blink twice within each periodic time.

When above protections are active, the motor shaft will be free or the LED will blink. Reset the drive by repowering it to make it function properly after removing above problems. Since there is no protection against power leads (+ , –) reversal, it is critical to make sure that power supply leads correctly connected to drive. Otherwise, the drive will be damaged instantly.

Frequently Asked Questions

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.

Problem Symptoms and Possible Causes

Symptoms	Possible Problems
Motor is not rotating	No power
	Fault condition exists
	Control signal is too weak
	The motor output setting of Mach3 is not correct
Motor rotates in the wrong direction	The Direction signal level is reverse
The Drive In Fault	Power supply voltage beyond drive's input range
	Something wrong with motor coil
	Wrong connection
	Control signal is interfered
	Something wrong with motor coil
	Motor is undersized for the application
	Acceleration is set too high
	Power supply voltage too low
Excessive motor and drive heating	Inadequate heat sinking / cooling
	Load is too high

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, a returned material authorization number (RMA) must be obtained from customer service at e-mail: before returning product for service. Customer shall prepay shipping charges for products returned to Leadshine for warranty service, and Leadshine shall pay for return of products to customer.

Warranty Limitations

Leadshine makes no other warranty, either expressed or implied, with respect to the product. Leadshine specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Some jurisdictions do not allow limitations on how long and implied warranty lasts, so the above limitation or exclusion may not apply to you. However, any implied warranty of merchantability or fitness is limited to the 12-month duration of this written warranty.

Shipping Failed Product

If your product fail during the warranty period, e-mail customer service at 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. Send failed product to distributor in your area or: ULeadshine Technology Co., Ltd. 3/F, Block 2, Nanyou Tianan Industrial Park, Nanshan Dist, Shenzhen, China.U Also enclose information regarding the circumstances prior to product failure.

Contact Us

China Headquarters
Address: 3/F, Block 2, Nanyou Tianan Industrial Park, Nanshan District Shenzhen, China
Web: http://www.leadshine.com

Sales Hot Line:
Tel: 86-755-2641-7674 (for Asia, Australia, Africa areas)
86-755-2640-9254 (for Europe areas)
86-755-2641-7617 (for America areas)
Fax: 86-755-2640-2718
Email: sales@leadshine.com.

Technical Support:
Tel: 86-755-2641-8447, 86-755-2641-8774, 86-755-2641-0546
Fax: 86-755-2640-2718
Email: tech@leadshine.com(for All)

Leadshine U.S.A
Address: 25 Mauchly, Suite 318 Irvine, California 92618
Tel: 1-949-608-7270
Fax: 1-949-608-7298
Web: http://www.leadshineUSA.com
Email: sales@leadshineUSA.com and support@leadshineUSA.com.