

DMX DC Motor Driver Board

Version 1.1 -2010
WD1550

Overview

The DMX- (Servo) Motor controller allows DC motors to be controlled over a standard DMX system. The board may be configured to drive the DC motor simply as a variable speed, reversible motor or with the addition of a position feedback potentiometer, to create a powerful servo motor controller for accurate positioning purposes.



The DMX- (Servo) Motor controller will drive DC motors rate at up to 24V at 5Amp continuous current. The DMX module requires 2-DMX consecutive channels that may be set using on-board address switches. The module also incorporates a 'local' control option for setting up control and the ability to include end travel limit switches.

Connections and Controls

DMX IN-OUT

Connection to a standard DMX network via 5-pin XLR connector. A termination resistor is provided on the board if this is the last device on the network. ("Ter" jumper). Insert a jumper over this 2-pin connector if this module is the last device on the DMX network.

Motor Connection (+/-)

Connection to the DC motor. Positive(+) and Negative (-)

Motor Power Supply

Maximum rating is **24V DC at 5A continuous** (shipped as standard with a 10A fuse)

Electronics- Board Power Supply

A power supply must be separate from the motor power supply used. Requires 9-12V DC at 250mA to operate the on-board control electronics.

Limit Switches. (Emergency Stop / E-Button)

If require, connect limit switches to this terminal. The terminal is active with switch closure and will disable the motor drive amplifier output until the switch short is removed. Connect multiple limit switches in parallel. (Switch **Common** and **Normal Open** contact connections)

Feed Back Potentiometer

For servo use, connect a **10K linear potentiometer** to these contacts- center contact to the potentiometer wiper. The 'Local Set' potentiometer allows the module to be controlled without a DMX signal being present.

M-S switch

Set the S/M DIP switch-(3) to the **S** position for **servo action** or to the **M** position for **variable speed, reversing motor** control operation.

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L-R switch

Set the L/R DIP switch-(2) to **L position** for control using the **on-board potentiometer** and to the **R position** for control via the **DMX network**.

DMX Signals

The controller expects to receive 2 consecutive bytes. In **Motor mode**, the **first byte** represents the **motor speed and direction: 0 would be full speed reverse, 255 full speed forwards and 127 (or thereabouts) no motion. Byte 2 enables or disables the motor drive amplifier. Channel 2 must be > 127 to enable the amplifier.**

In **Servo mode**, **byte 1** represents the **set position for the servo: 0 fully anticlockwise, 255 fully clockwise. Byte 2 enables or disables the motor drive amplifier. Channel 2 must be > 127 to enable the amplifier**

Motor Operation

Set the DMX Board base address (1-511), the M-S switch to M and the L-R switch to R. Connect to the DMX network and set channel 1 to midway (Example: value 127) an channel 2 to a value less than 127. Switch on the power supplies to the controller- the motor should not move. Increase Channel 2 to 200. The motor should start to hum and maybe rotate very slowly. The speed and direction of rotation of the motor may now be controlled by the values on channel 1. If the motor does not respond, make sure you have nothing connected across the Limit Terminals, there is a valid DMX control signal and the board base address is set correctly.

For Local board operation, any incoming DMX signal is disregarded and the motor speed / direction is controlled only by the on-board Local potentiometer and remote Limit switches.

Status LED's

+5V: Power supply present.

DMX / Limit: No suitable DMX signal present or Limit switch contacts close.

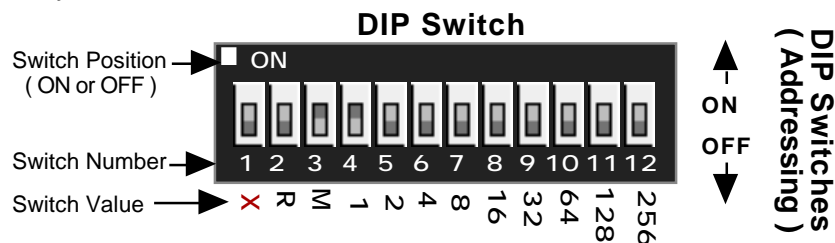
PWM - A and B: Visual indication of the PWM drives levels. (Speed control ON)

Trip: Current has exceeded board power (about 20Amps)- board will remain inactive until reset.

Address-Settings Block

DMX Module Address-

The **DMX DC Motor base address** for the module is set within the **range of 1 to 511** using the on board DIP switches. Set the appropriate DIP switch to the ON position and add the values to determine the base address. The DMX Motor module expects the two control channels to be at The base address and base address+1 positions in the DMX packet. The motor board base address is read continuously.



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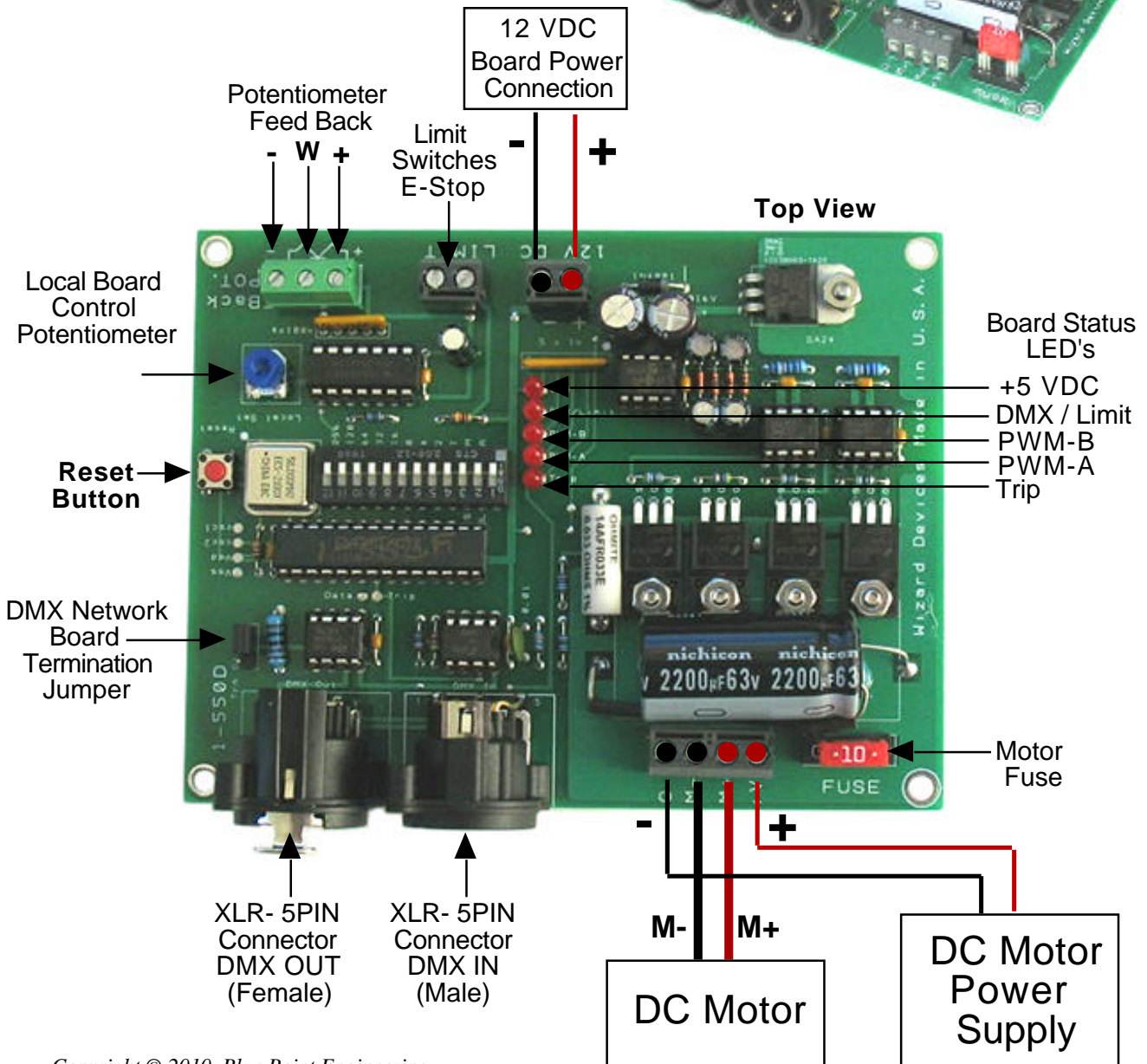
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Connections Overview



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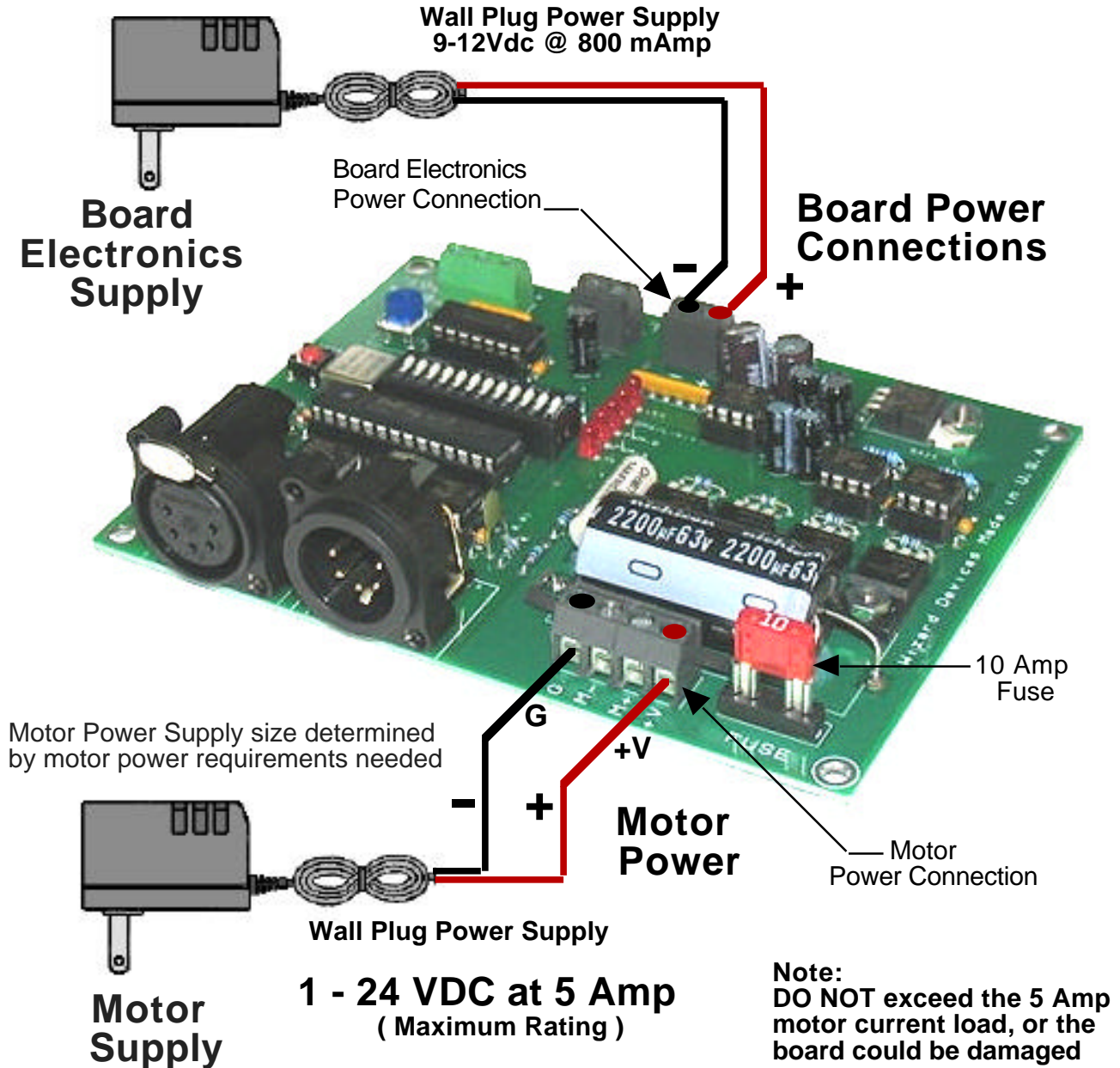
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Power Connection

Two (2) Power supplies are required. The board electronics power supply must be separate from the motor power supply used.



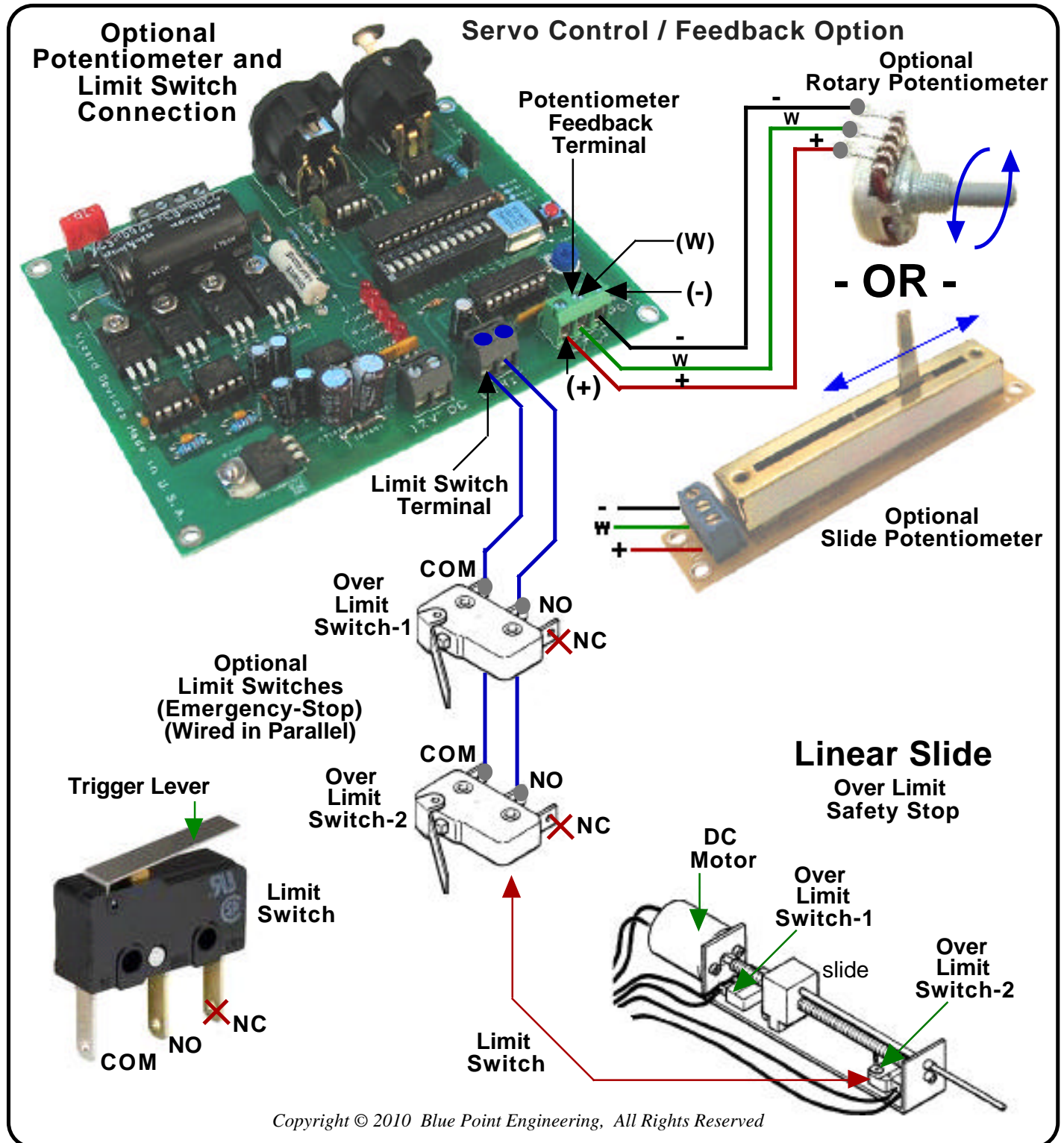
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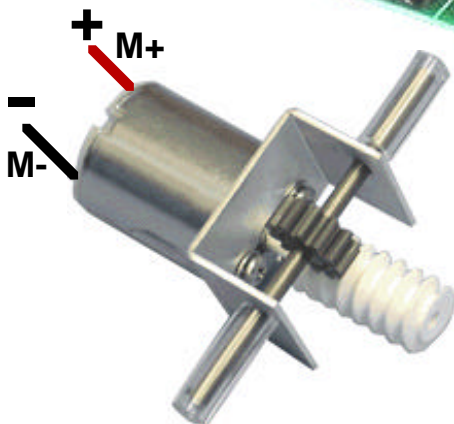
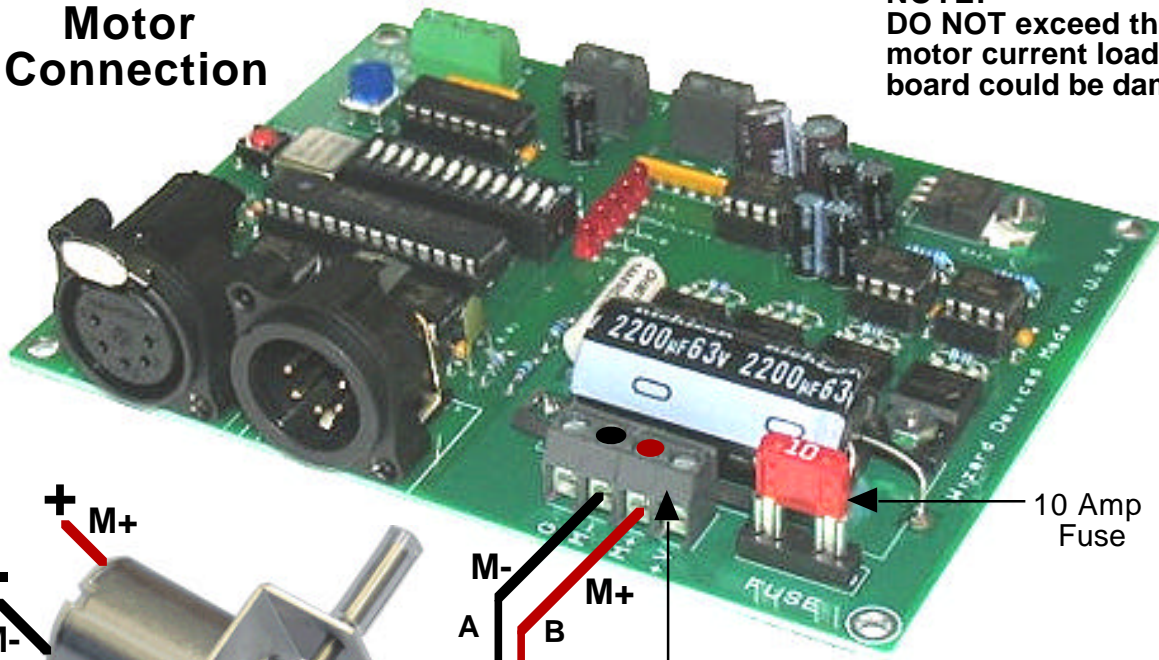
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Motor Connection

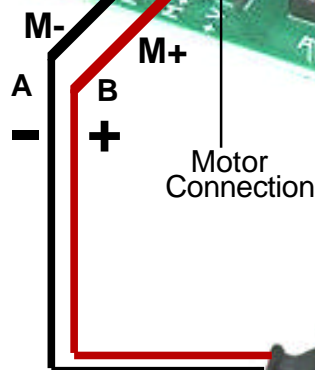
NOTE:
DO NOT exceed the 5 Amp motor current load, or the board could be damaged



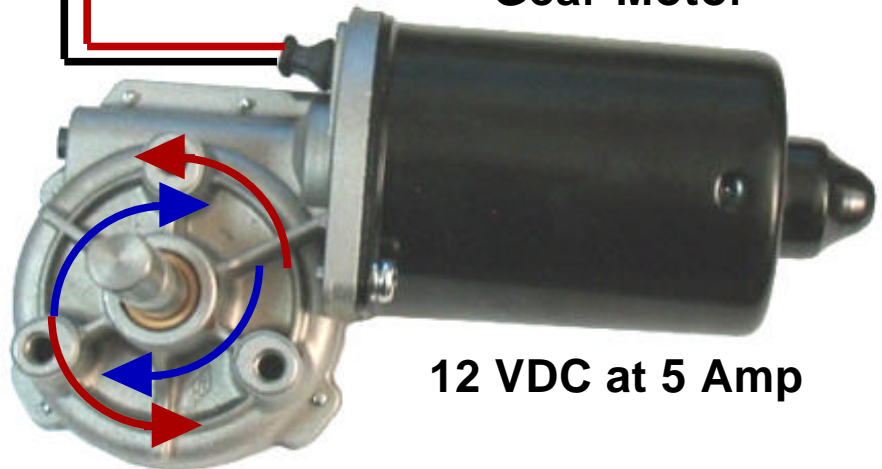
DC Motor
6 VDC at 2 Amp

- Clockwise Rotation (CW)
- CounterClockwise Rotation (CCW)

Speed Control
0-100%



Right Angle Gear Motor



12 VDC at 5 Amp

NOTE:

Some motor types may be reversed when connected to the controller, CW=CCW, CCW=CW Rotation, reversing the motor wire leads A to B and B to A (M+ / M-) may correct rotation reversal.

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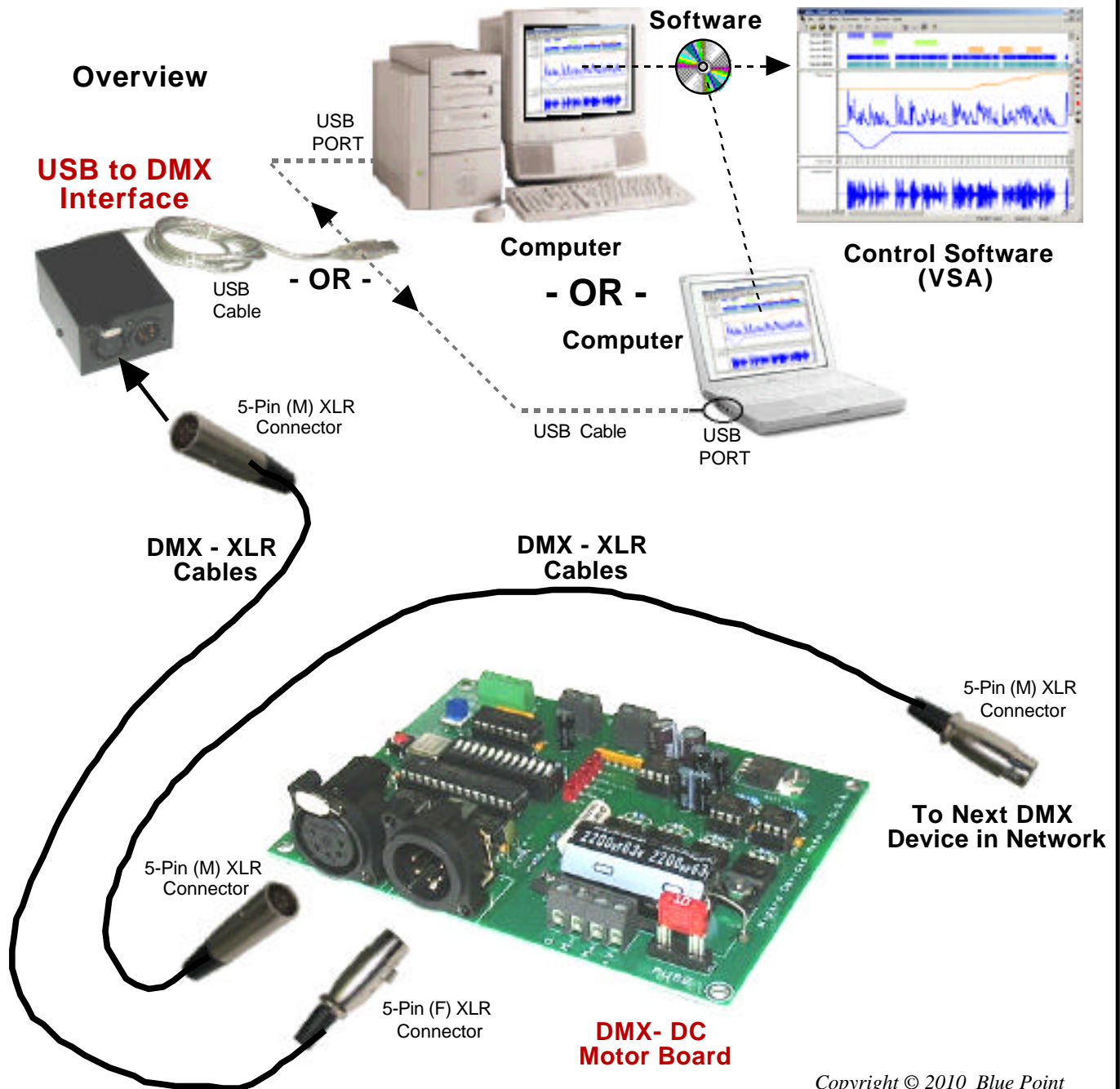
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DMX Network Setup - 5 Pin

Overview



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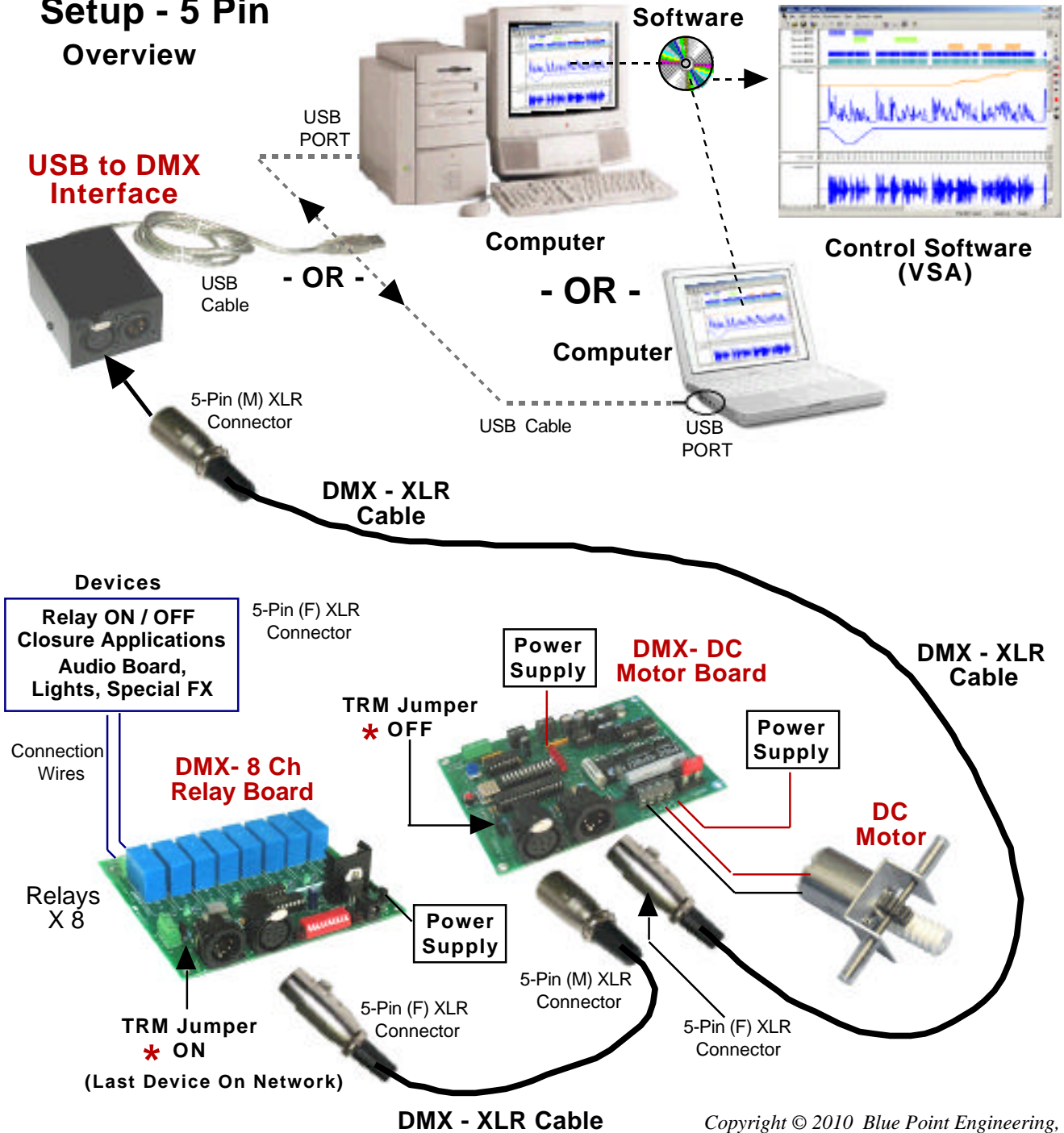
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DMX DC Motor Driver Board

DMX Network Setup - 5 Pin Overview



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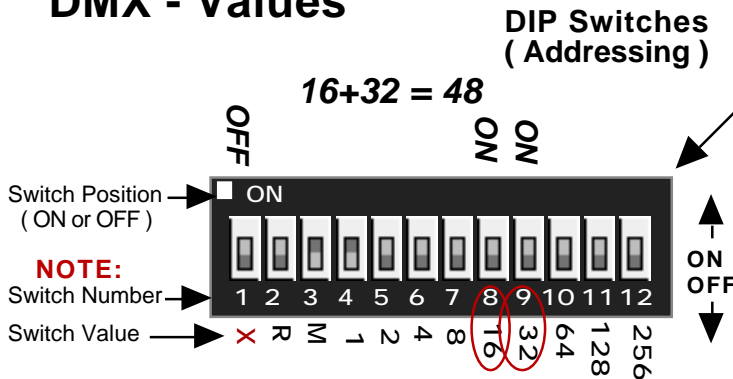
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Board Address DMX - Values



The **DMX base address** for the Motor Controller Board is set within the **range of 1 to 511** using the on board DIP switches. Set the appropriate DIP switch to the **ON** position and add the values to determine the base address. The module expects the two control channels to be at the base address and base address+1 positions in the DMX packet, the base address is read continuously on the Motor Controller Board.

Setting the base address of DMX DC Motor Channel Outputs

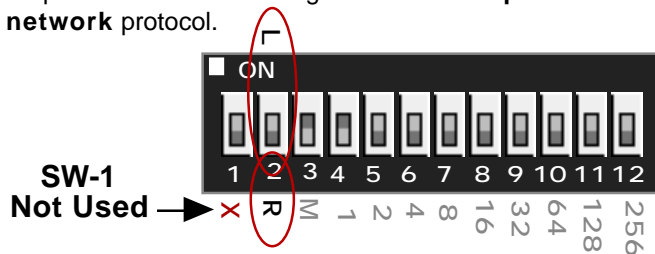
Add the value of the address DIP switches set to the **ON** position to calculate the base address.

Example: DIP switches 8 (value 16) and 9 (value 32) set to **ON** position, the base address is now 48, (16+32) this setting is used to determine the starting address output of Channel-1, the next Channel needed would be address 49 for Channel-2 (Base address = 48, (16+32) + next channel (+1) = 49, Channel 2 = 49)

NOTE: The Motor Board uses a 12 Position DIP switch block. Use caution when setting the addressing as the Switch Numbers do not relate to the standard DMX 512 value chart. Use actual Switch Value to calculate addressing.

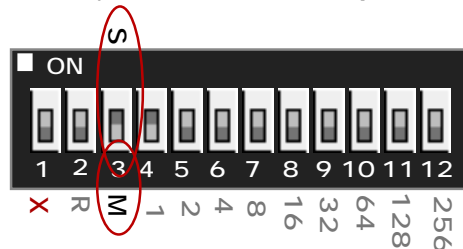
L-R switch

DIP switch set to **L** position for control using the **on-board potentiometer** and to the **R** position for control via the standard **DMX network** protocol.



M-S switch

DIP switch set to the **S** position for **servo action** or to the **M** position for **variable speed, reversing motor** control.



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DMX Signal Overview Motor Mode

In Motor Mode: (DMX)

Byte-1 represents the motor speed and direction:

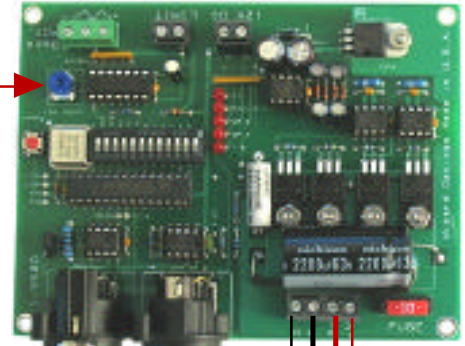
Value 0 would be motor full speed reverse (CCW)

Value 255 motor full speed forwards (CW)

Value 127 (+ or - depending on motor type) NO motor motion.

Byte- 2 enables or disables the motor drive amplifier. (DMX Mode)
Channel 2= greater than 127 to enable the amplifier (Motor ON).

On-Board
Motor Control
Potentiometer



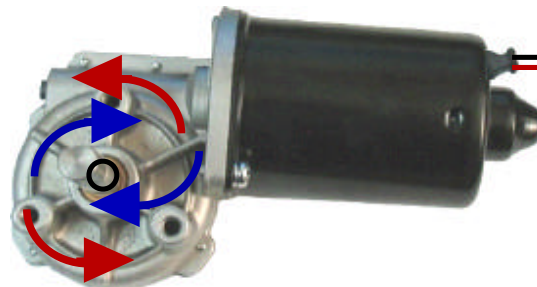
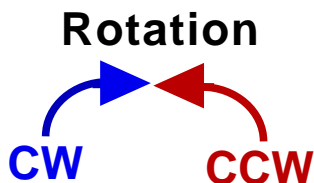
Motor Mode: DMX Control Mode = DIP Switch - 2 Set to R Position

DMX Control		Mode= MOTOR		
Byte-1 Channel-1	Motor Speed	100% + Full ← Faster Slow	Neutral	Slow + Faster → Full
	Value	0 to 127 (+ /-)	127 (+/-)	127 (+/-) to 255
	Motor Rotation	CCW	STOP	CW
Byte-2 Channel-2	0 to 127 Motor Power OFF - 128 to 255 Motor Power ON			

Motor Mode: Manual Control Mode = DIP Switch - 2 Set to L Position
Motor Controlled by On-Board Potentiometer Rotation

Manual Control		Mode= MOTOR		
Motor Speed	Full ← Faster Slow	Neutral	Slow → Faster Full	
Potentiometer	POT- Left Rotation	Center	POT- Right Rotation	
Motor Rotation	CCW	STOP	CW	

NOTE: Some motor types may rotate / drift at Stop value 127, add + or - value to stop motor.
Some motor types may be reversed, CW=CCW, CCW=CW Rotation, reversing the motor wire leads A to B and B to A (M+ / M-) may correct rotation reversal.



Right Angle
Gear Motor
12 VDC at 5 Amp

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EXAMPLE: Motor Control - DMX

Motor Operation

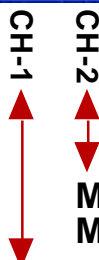
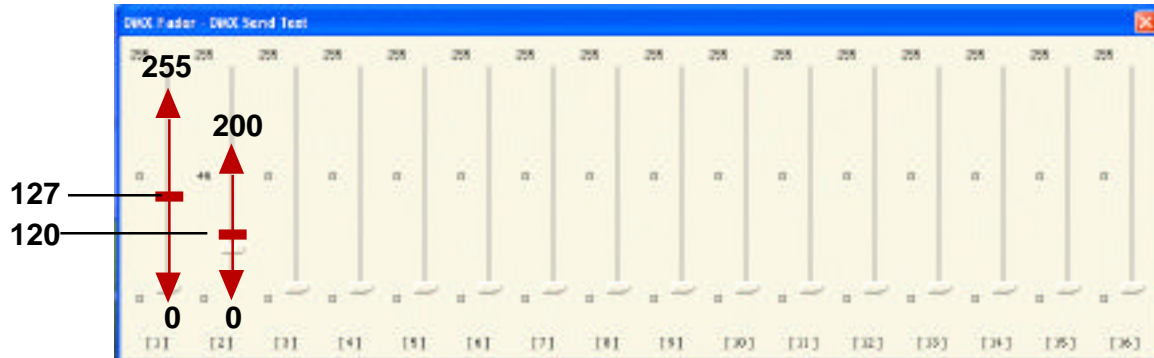
Set the DMX DC motor module to a base address, (value 1 to 511) the **M-S** DIP switch(3) to **M** position and the **L-R** DIP switch(2) to **R** position.

Connect controller to the DMX network and start DMX software control program / control console. Set DMX channel 1 to midway (value 127) and DMX channel 2 to a number less than value 127.

Switch on the two power supplies to the Controller and Motor, the motor should **NOT** move. Increase DMX channel 2 to a new value of 200. The motor should start to hum and rotate very slowly. The speed and direction of rotation on the motor may now be controlled by the different value levels on channel 1. If the motor does not respond, make sure you have nothing connected across the Limit Switch wire terminal, there is a valid DMX signal and the DMX base address is set correctly.

For On-Board Operation (local), any incoming DMX signal is disregarded and the motor speed and direction is controlled only by the Local on-board potentiometer and remote Limit Switches / E-Stop if connected to DC motor controller.

DMX Control Software - Virtual Slide Channel Controller



Motor Power ON
Motor Power OFF

Motor Speed / Direction Control

Channel 1:

Value 0 would be motor full speed reverse (CCW)

Value 127 (+ or - depending on motor type) **NO** motor motion.

Value 255 motor full speed forwards (CW)

Channel 2: must be greater than 127 to enable the amplifier (Motor Power ON).

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DMX Signal Overview

Servo Mode 300 Degrees of position control - Left / Right

DMX Signals

The DC Motor controller expects to receive 2 consecutive bytes to operate correctly.
(byte1-Position, byte 2- Motor ON / OFF)

In **Servo Mode**:

Byte-1 represents the **set position for the servo**:

- 0 = Fully CounterClockwise Position
- 255= Fully Clockwise Position
- 127= Center Position

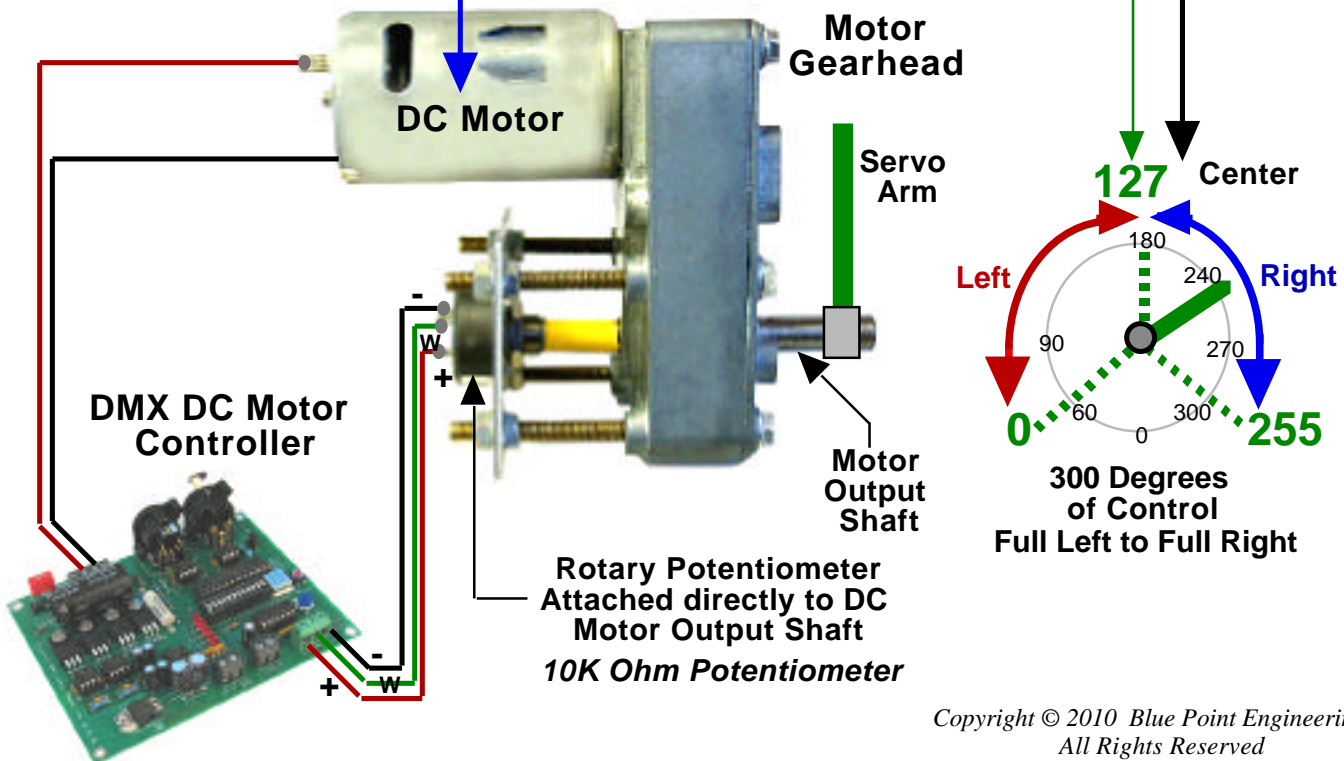
Clockwise (CW) 

CounterClockwise (CCW) 

Byte- 2 enables or disables the motor drive amplifier (Power).

Channel 2 must be greater than 127 to enable the amplifier (Motor Power ON).

Byte-1 Channel-1	Servo Control			Mode= MOTOR
	Motor Position	LEFT ←	Center	RIGHT →
Value	0 to 127	127 (+/-)	127 to 255	
Byte-2 Channel-2	Value- 0 to 127	Servo Motor Power OFF		
	Value- 128 to 255	Servo Motor Power ON		



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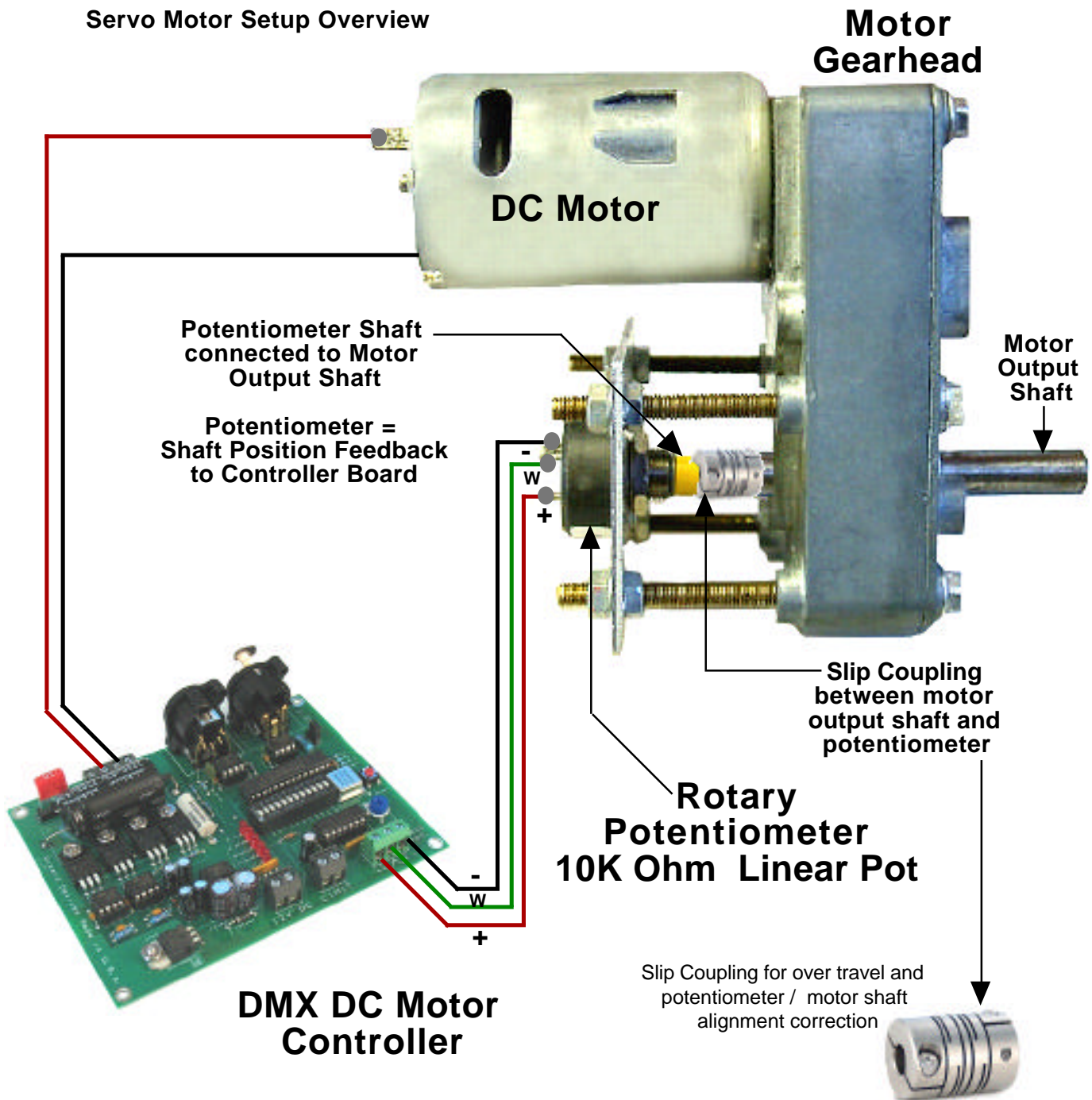
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EXAMPLE: Motor Control - Servo Mode
Servo Motor Setup Overview



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EXAMPLE: Motor Control - Servo Mode

Servo Operation

Set the DMX DC Motor base address **M-S** DIP switch(3) to **S** and the **L-R** DIP switch(2) to **R**.

Connect DC Motor board to the DMX network and start a DMX control software. Set DMX Channel 1 to (position center) value **127** and DMX Channel 2 to a value of **125** (motor power OFF).



Setup the Potentiometer to the Servo Motor Output Shaft (see example on servo motor setup) Connect a 10K ohm linear feed back potentiometer to the 3-way terminal block on board. The feed back potentiometer must be physically driven by the motor / mechanism you are controlling and incorporate a slip coupling in case of over travel by the motor or connected mechanical assembly.

The servo will give approximately 300 degrees of control- if this is less or more than you require, you will need to include appropriate gearing into your equipment to give this amount of rotation. Linear potentiometers may also be use. For long-term usage, we recommend a high quality feed back potentiometer with a high mechanical cycle rating. You can expect approximately only 25,000 cycles with standard carbon type potentiometers before servo position errors start.

Make sure power supplies are turned **OFF**, Connect the electronics (Board) power supply and the DC motor power supply.

Warning:

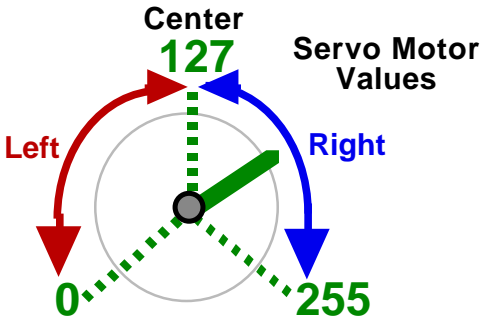
Before connecting the motor supply, keep in mind you have a 50/50 chance of having the motor wire (M+ / M-) connections reversed. Make sure you can disconnect the motor power supply quickly to stop any motor rotation!

Switch on the two power supplies to the controller and motor. The motor should **NOT** move. Increase DMX Channel 2 value to **200**. The motor should start to hum and rotate until the feed back potentiometer value set from DMX Channel 1 matches the exact set point value you set earlier (example - 127). If the motor continues to move, switch **OFF** the power and reverse the motor connections. (**M+ / M-**)

To move the motor to a new position and hold, change the control values on DMX Channel 1 to different values (0-255) this should cause the servomotor to move to these new positions values and hold.

If the motor does not respond, make sure you have nothing connected across the Limit Switch terminal, there is a valid DMX control signal and the DMX Motor board base address is set correctly.

Channel-1 127 (+/-)	Servo Control Mode= MOTOR			
	Motor Position	LEFT	Center	RIGHT
	Value	0 to 127	127 (+/-)	127 to 255
Channel-2 127	Values	0 to 127 Servo Motor Power OFF 128 to 255 Servo Motor Power ON		



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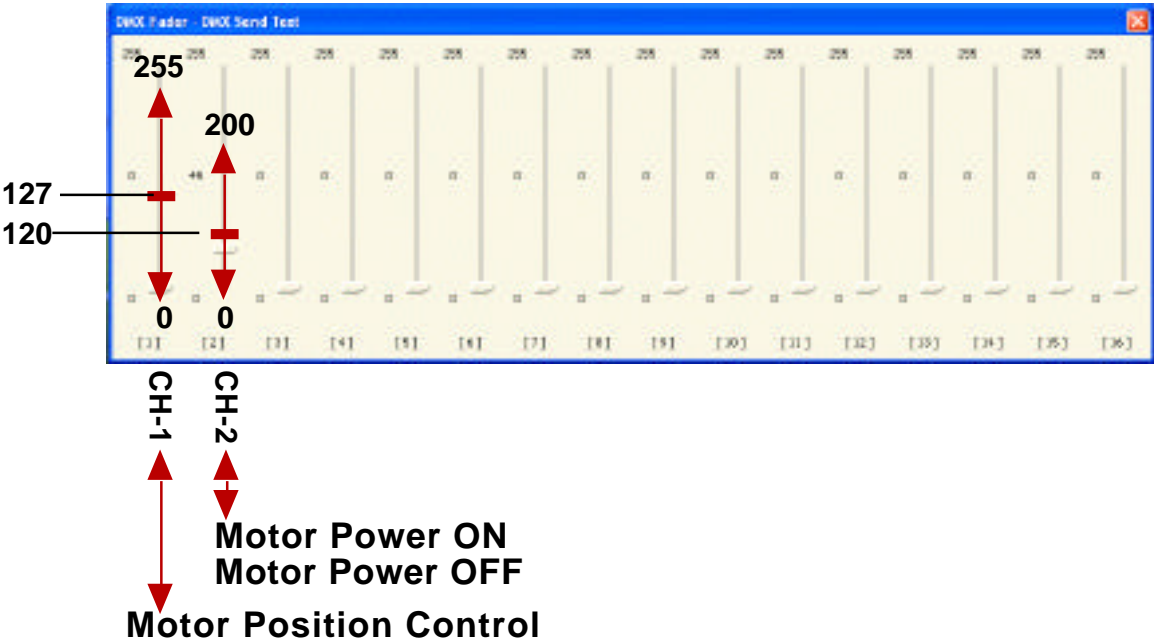
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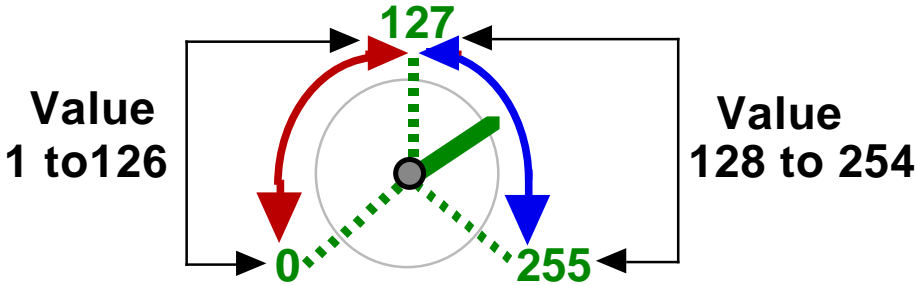
EXAMPLE: Motor Control - Servo Mode
DMX Control Software - Virtual Slide Channel Controller



Channel 1:
 Value 0 would be servo motor full left position and hold
 Value 127 (+ or - depending on motor type) servo motor at center position and hold.
 Value 255 motor full right position and hold.
 Values between 1 and 254 will move the servo motor to various positions left and right of center position and hold until new position value command is received.

Channel 2: must be greater than 127 to enable the amplifier (Motor Power ON).

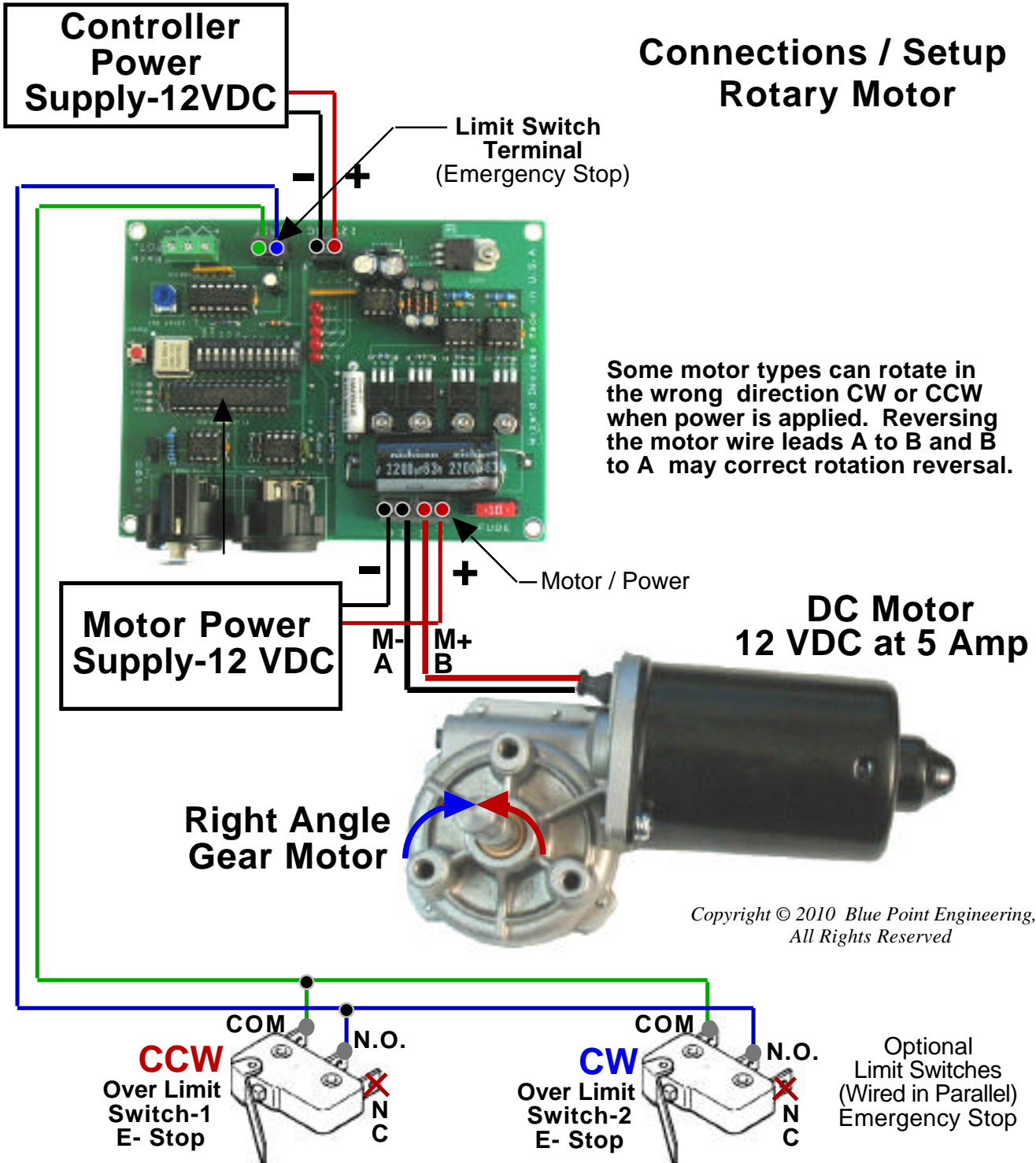
Set new values on DMX Channel 1 to move the servo motor to different positions and hold.
 Try new values on DMX Channel 2 to 126 to Power Motor OFF / 128 + for motor Power ON.



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DMX DC Motor Driver Board

Connections / Setup Rotary Motor



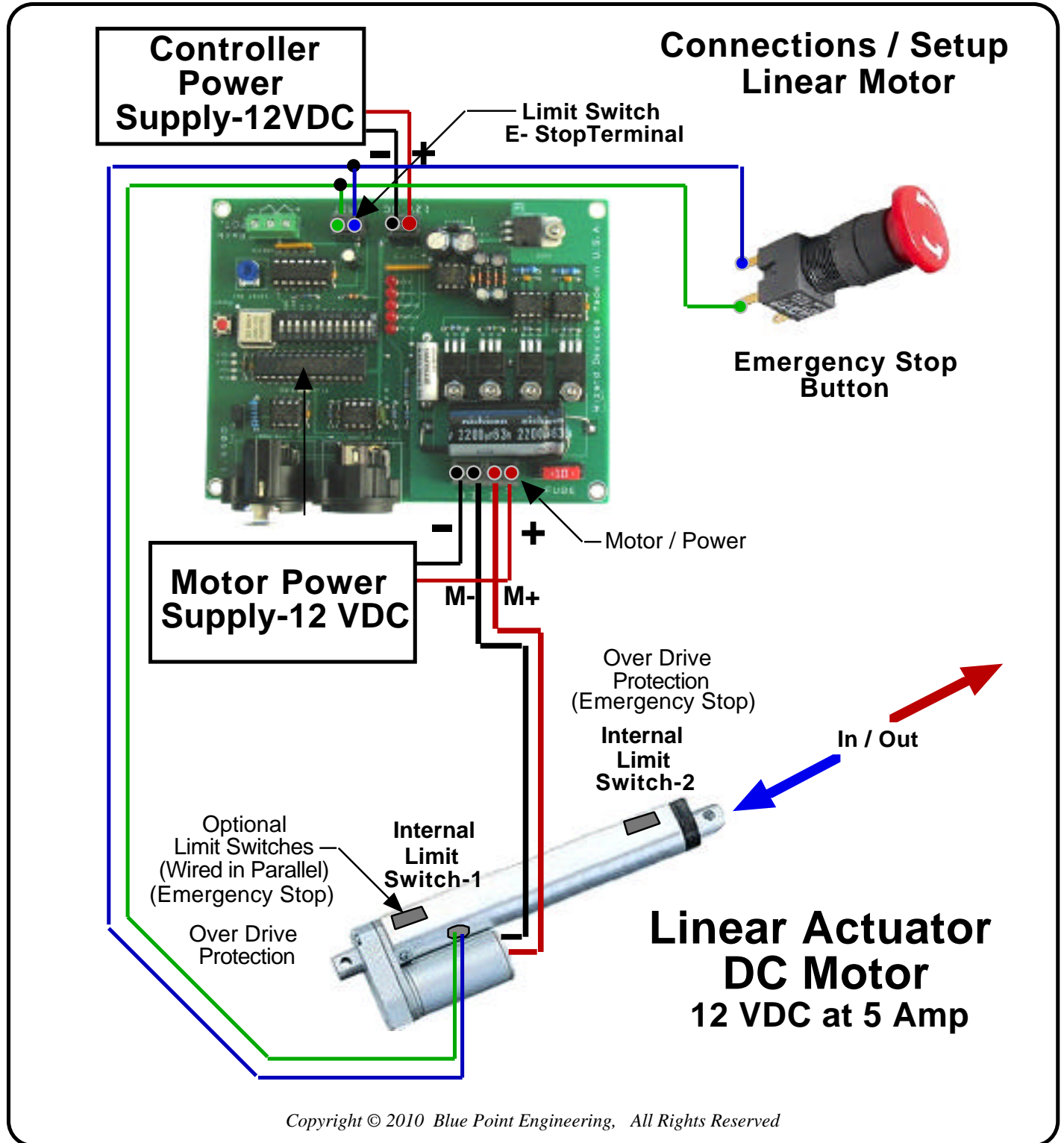
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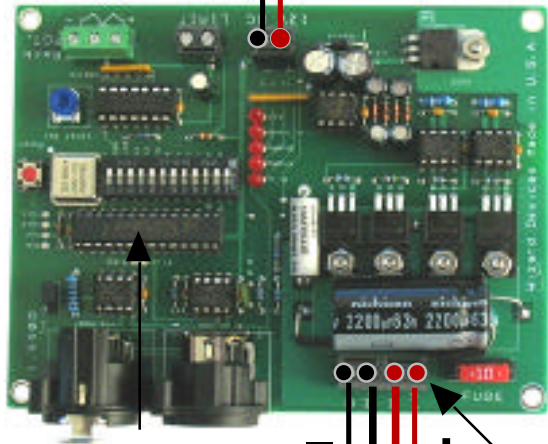
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DMX DC Motor Driver Board

Connections / Setup DC Motors

Controller Power Supply-12VDC

Motor Power Supply-6 VDC

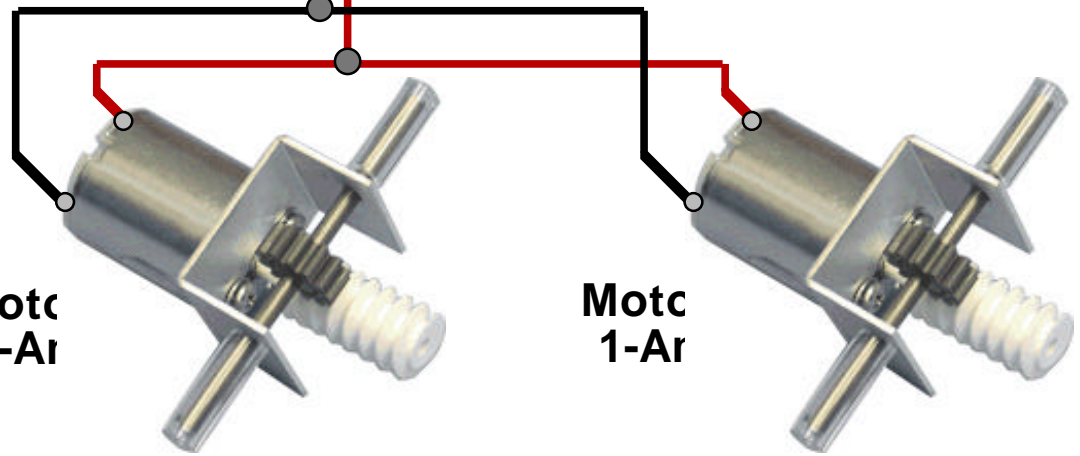


M- M+ Motor / Power

DC Motors 6 VDC at 2 Amp

Motor 1-Ar

Motor 1-Ar



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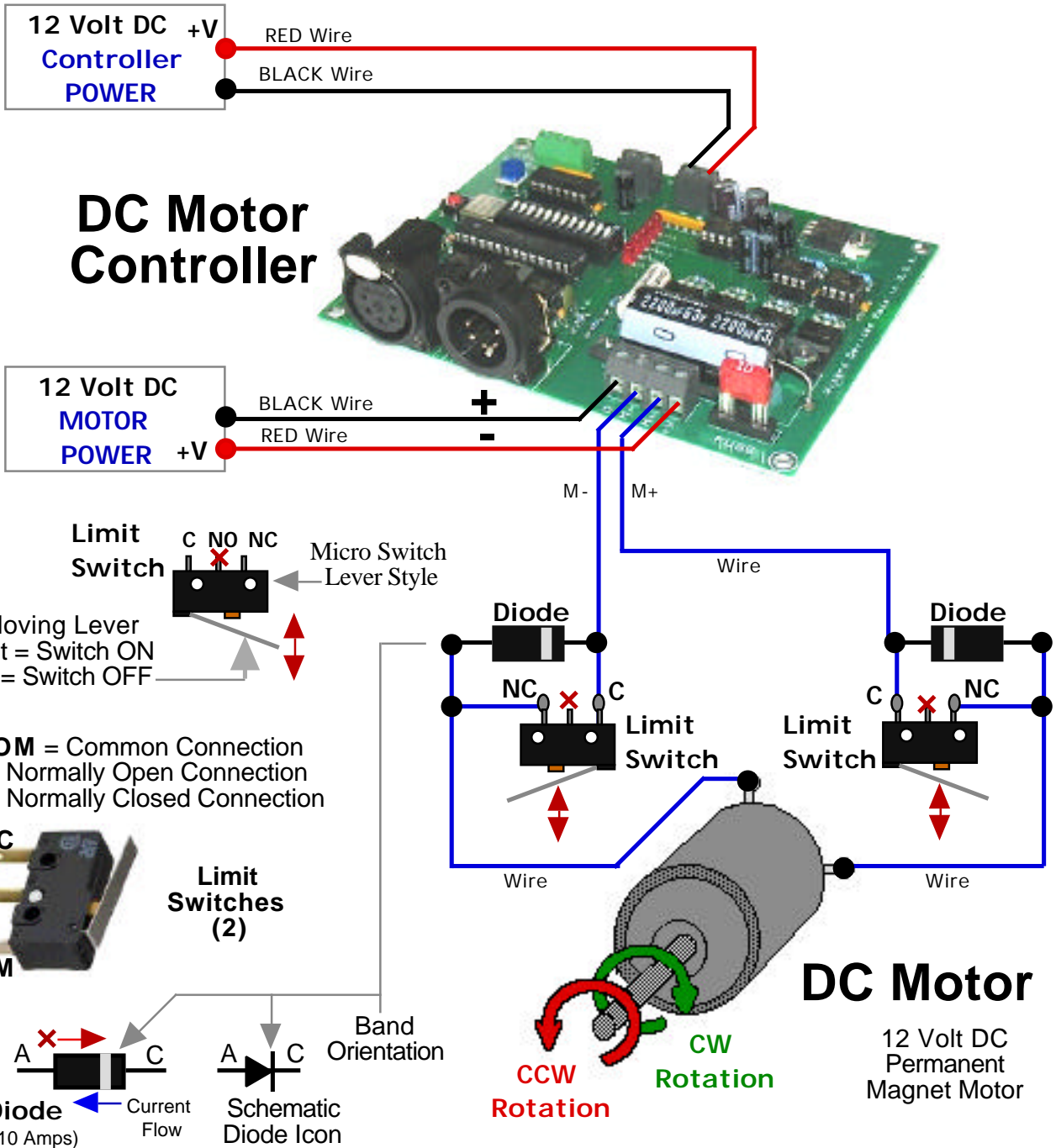
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Motor Rotation Control with Limit Switches



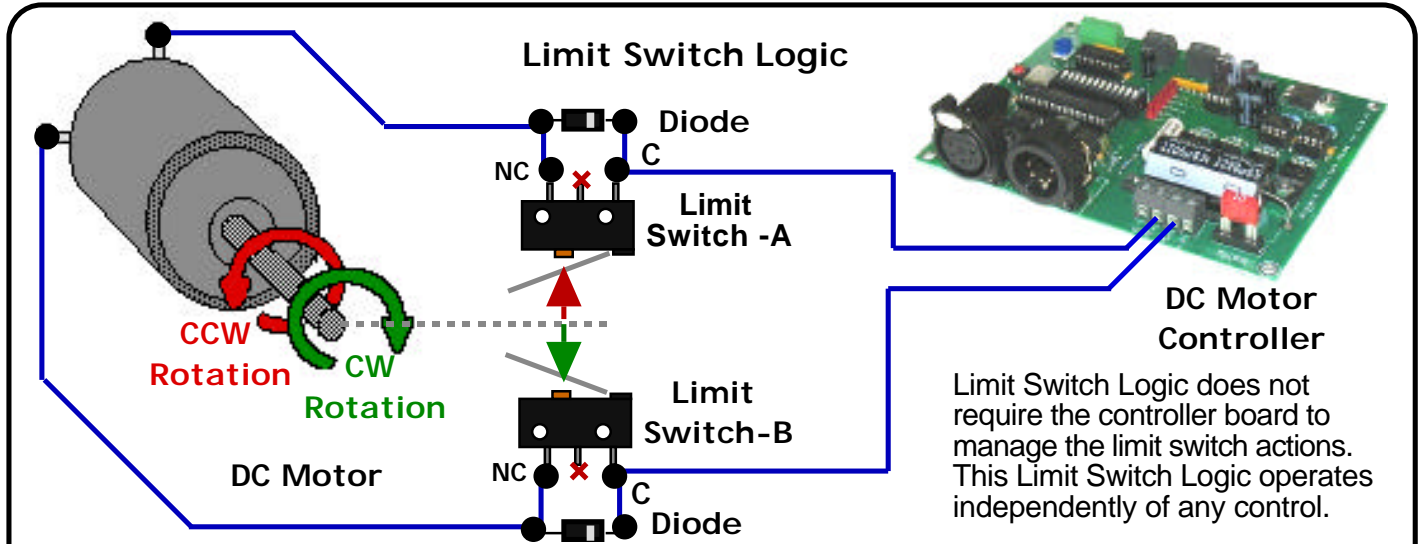
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Limit switches are used to stop a motor when it rotates to a specific location or has moved a connected mechanical device to a specific point and / or stops the motor from causing damage to itself or the attached mechanical device being moved. When limit switches are operational, the motor can rotate CW or CCW between the two limit switches. The limit switches are wired in the normal closed configuration (NC) allowing electricity to pass through to the motor.

Example: Motor is rotating left (CCW) and hits limit switch-A. Limit switch-A has now been de-activated, (Turned OFF) the motor has stopped rotating to the left (CCW), no power is going to the motor now. The motor can no longer move CCW. To move motor to the right (CW) rotation the diode on Limit Switch -A now must conduct current past the open switch to allow the motor to power back on and start motor rotation to the right (CW). The connected diode takes the place of the open switch, allowing current to flow one way now, bypassing the open switch. When the move right (CW) command is transmitted by the controller board, motor will move CW, since diode is completing the circuit needs to power the motor. As the motor moves away from the activated limit switch - A, the switch is reset to the normal closed position, allowing current to flow back through the switch, bypassing the diode now and re-setting the switch for the next hit limit action. The same event will occur for Limit Switch-B when hit and deactivated. Diode act as a one-way street allowing selected voltage polarity to pass through only, while blocking biased polarity voltage from passing through. This action prevents electrical shorting between the limit switch connections, as the motor controller reverses power between positive and negative voltage to the motor.

Limit Switch Logic

Switch A	Switch B	Motor Status
ON	ON	CCW or CW
OFF Diode	ON	CW
ON	OFF Diode	CCW



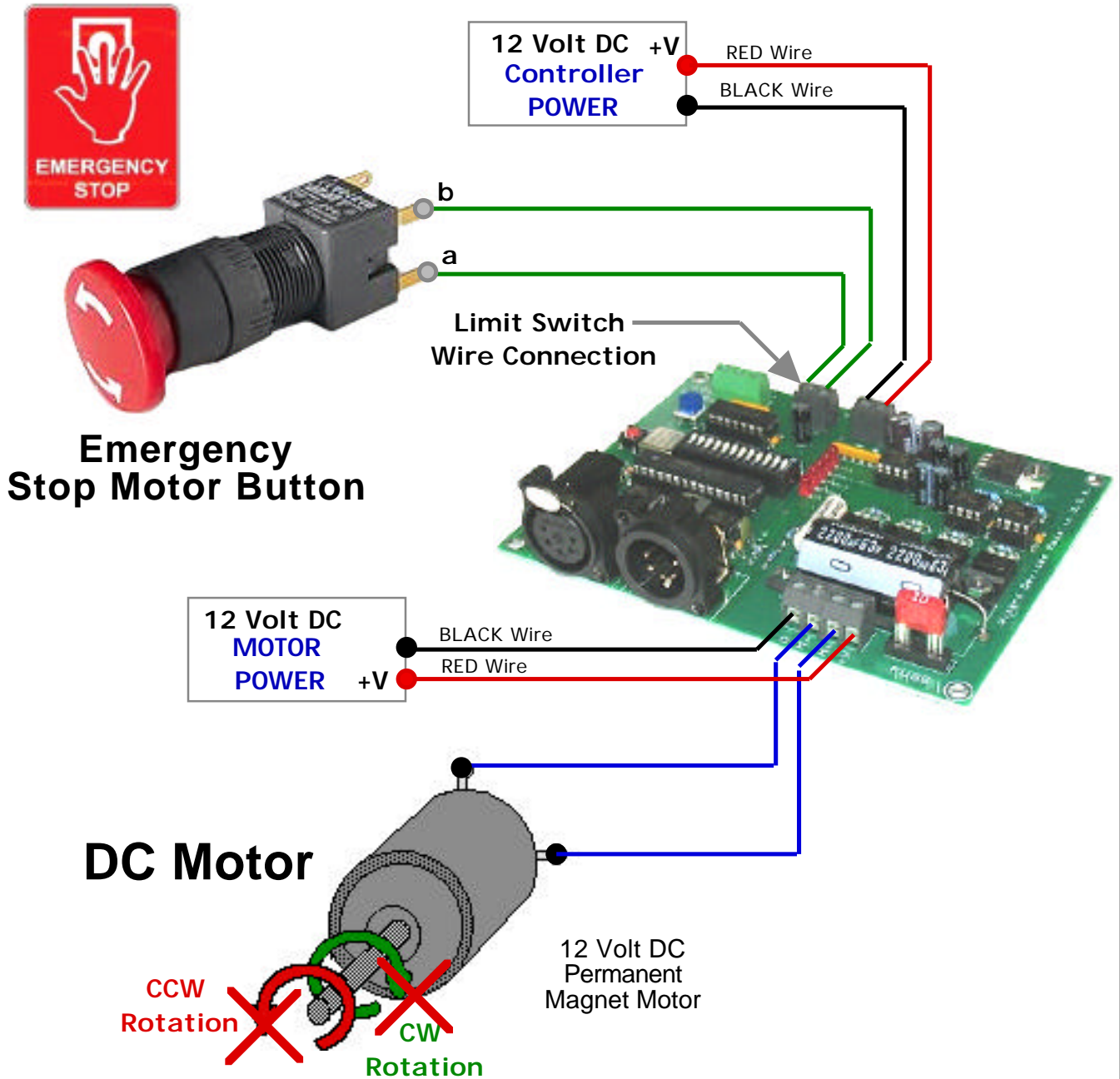
NOTE: Limit Switches are wire as a Normal Closed connection (NC). Power will flow through the switch until it has been activated to the Open position (NO). On open position NO power will flow to the connected DC Motor.

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Emergency Stop of DC Motor Rotation



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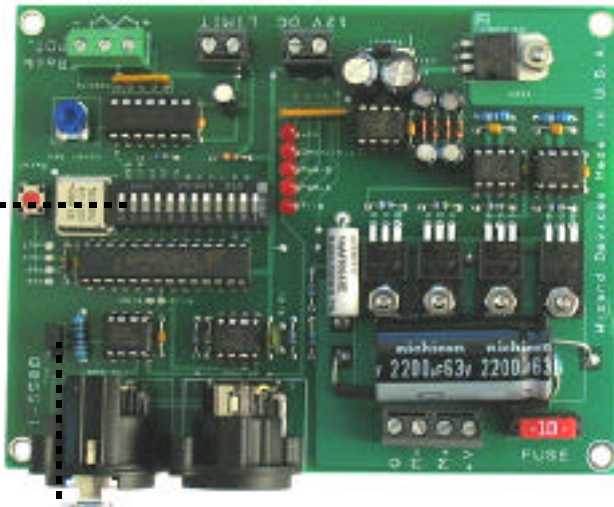
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Notes / Worksheet:

DMX DC Motor BOARD NO: _____

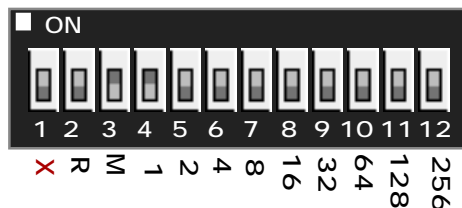
DMX DC Motor BOARD Application: _____

Output Application



TRM = (ON /OFF) _____

Addressing



Addressing

Value	0	1
	OFF	ON

SW-2	_____	_____
SW-3	_____	_____
SW-4	_____	_____
SW-5	_____	_____
SW-6	_____	_____
SW-7	_____	_____
SW-8	_____	_____
SW-9	_____	_____
SW-10	_____	_____
SW-11	_____	_____
SW-12	_____	_____

Addressing

DMX Position

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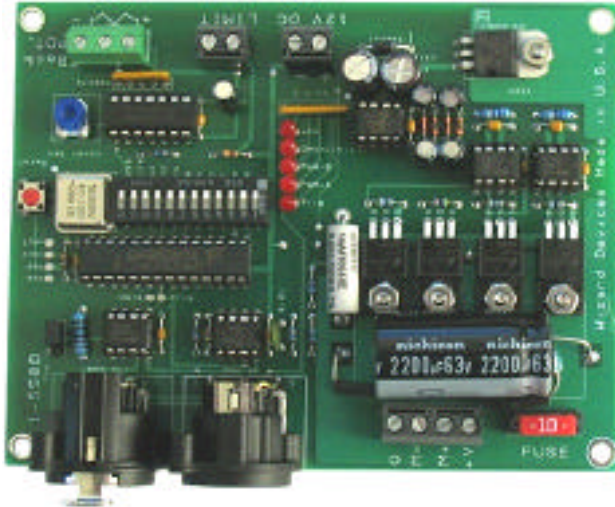
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DMX DC Motor Driver Board

Setup / Application Worksheet:



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