



## G210 STEP MOTOR DRIVE

REV 16: August 6, 2009

GECKODRIVE, INC.  
14662 FRANKLIN AVE  
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TUSTIN, CA 92780  
(714) 832-8874

Thank you for purchasing the G210 drive. The G210 selectable step drive is warranted to be free of manufacturing defects for 1 year from the date of purchase. Anyone who is dissatisfied with it or is unable to make it work will be cheerfully refunded the purchase price if the G210 is returned within 15 days of the purchase date.

### PLEASE READ FIRST BEFORE USING THE G210

Before beginning, be sure to have a suitable step motor, a DC power supply suitable for the motor and a current set resistor. The motor's rated phase current must be between 0.3 Amp and 7 Amps. The power supply voltage must be between 4 times and 20 times the motor's rated voltage. The current set resistor may be a 1/4 Watt, 5% component. Finally have a STEP and DIRECTION pulse source available.

### G210 TERMINAL WIRING

The G210 uses a 2-piece modular main connector. The connector is split in two pieces; terminals 1 through 6 (power supply and motor leads) and terminals 7 through 12 (control interface). Each can be removed separately by pulling the connector body upwards and off of the mating header pins on the G210. The connectors must initially be removed to mount the G210 to a heatsink or chassis.

- |                    |  |
|--------------------|--|
| <b>TERMINAL 1</b>  | Power Ground<br>Connect the negative (black) lead of your power supply to this terminal.                                 |
| <b>TERMINAL 2</b>  | Power (+)<br>Connect the positive (red) lead of your power supply to this terminal. It must be between +18VDC to +80VDC. |
| <b>TERMINAL 3</b>  | Motor Phase A<br>Connect one end of your "Phase A" motor winding here.   |
| <b>TERMINAL 4</b>  | Motor Phase /A<br>Connect the other end of your "Phase A" motor winding here.  |
| <b>TERMINAL 5</b>  | Motor Phase B<br>Connect one end of your "Phase B" motor winding here.   |
| <b>TERMINAL 6</b>  | Motor Phase /B<br>Connect the other end of your "Phase B" motor winding here.  |
| <b>TERMINAL 7</b>  | Disable<br>This terminal will force the winding currents to zero when shorted to ground (TERMINAL 12).                   |
| <b>TERMINAL 8</b>  | Direction<br>Connect the DIRECTION signal to this terminal.  |
| <b>TERMINAL 9</b>  | Step<br>Connect the STEP signal to this terminal.  |
| <b>TERMINAL 10</b> | Common<br>Connect the controller's +5VDC supply or signal ground, depending on your jumper setting.                      |
| <b>TERMINAL 11</b> | Current Set<br>Connect one end of your current set resistor to this terminal.  |
| <b>TERMINAL 12</b> | Current Set<br>Connect the other end of your current set resistor to this terminal.                                      |

### POWER SUPPLY WIRING

- |                   |  |
|-------------------|--|
| <b>TERMINAL 1</b> | Power Ground<br>Connect the power supply ground to term.1  |
| <b>TERMINAL 2</b> | Power (+)<br>Connect the power supply "+" to this terminal |



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The power supply voltage must be between 24 VDC and 80 VDC. The maximum power supply current required is 67% of the motor's rated phase current. An unregulated power supply may be used as long as the voltage stays between the limits; keep the ripple voltage to 10% or less for best results. The drive has a 2 second power-on reset time before the motor is energized.

**CAUTION!** Power supply voltage in excess of 80 VDC will damage the G210.

If the power supply is more than 1 foot (300 mm) away from the G210, a 470uF capacitor must be connected across the G210's power supply terminals. Keep the capacitor lead length to 1 inch (25 mm) or less.

**CAUTION!** Never put a switch on the DC side of the power supply! This will damage, if not destroy, your drive!

The choice of power supply voltage depends on the high speed performance required of the motor; doubling the voltage doubles the motor's high speed power. In all cases the power supply voltage should be no less than 4 times or no more than 25 times the motor's rated voltage. The motor may not run as smoothly as possible if the power supply voltage is less than 4 times the motor's rated voltage. A power supply voltage greater than 25 times the motor's rated voltage will overheat and damage the motor, even if it is not turning. Motor winding inductance should be 500uH or greater, but generally no more than 7mH.

A more accurate calculation of power supply voltage is to find your motor's inductance, and put it into the following equation.

$$32 * (\sqrt{\text{mH inductance}}) = \text{Power Supply Voltage}$$

If your motor has 2mH of inductance, the equation would look as follows.

$$32 * (\sqrt{2}) = 45.12\text{V}$$

### MOTOR CONNECTION

- TERMINAL 3** Phase A  
Connect one motor winding to this terminal
- TERMINAL 4** Phase /A  
Connect the other end of the winding to this terminal
- TERMINAL 5** Phase B  
Connect the other motor winding to this terminal
- TERMINAL 6** Phase /B  
Connect the other end of the winding to this terminal

Connect one motor winding to terminals 3 and 4. Connect the other winding to terminals 5 and 6. Turn the power supply off when connecting or disconnecting the motor. If the motor turns in the wrong direction, reverse the motor winding connections to terminals 3 and 4.

**CAUTION!** Do not short the motor leads to each other or to ground; damage will result to the G210.

4-wire, 6-wire and 8-wire motors may be used. When 6-wire motors are used, they may be connected in half winding or full winding. This is equivalent to an 8-wire motor connected in parallel or series. If a motor is connected in series or full winding, the motor's phase current rating is half of its parallel or unipolar rating. The choice depends on the high-speed performance required; a parallel-connected motor will provide twice the power of a series-connected motor at the same power supply voltage.

### DISABLE PIN

- TERMINAL 7** Disable  
This terminal will force the winding currents to zero when shorted to ground (TERMINAL 12).

Shorting this input to ground (term. 7 to 12) forces winding currents to zero and stops all output switching activity. The G210 will continue totalizing step and direction inputs if any are sent. The power supply current drops to less than 15mA. The motor will return to its original position when the disable input is released if no step pulses have been sent and the motor has not been moved more than 2 full steps.

### STEP AND DIRECTION INPUTS

- TERMINAL 8** Direction



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Connect the DIRECTION line to this terminal.

**TERMINAL 9** Step  
Connect the STEP line to this terminal.

**TERMINAL 10** Common  
Connect this terminal to the controller +5VDC supply or signal ground, depending on your jumper setting.

These inputs are optically isolated from the rest of the drive. Terminal 10 is the common anode connection for the opto-isolators and must be connected to a +5 VDC supply or signal ground, depending on your jumper setting.

These inputs are meant to be driven by standard TTL logic or other driver capable of sinking 16mA of current. The minimum logic "0" time is .5uS while the minimum logic "1" time is 4uS. Microstepping occurs on the falling edge of the step input.

### CURRENT SET RESISTOR

**TERMINAL 11** Current Set  
Connect the current set resistor to this terminal.

**TERMINAL 12** Current Set  
Connect the other end of the current set resistor to this terminal.

This input programs the G210's current output to the motor windings. The G210 will accommodate motor winding currents from 1 to 7A and 0.3 to 2A. Use the following equation to calculate the value, (in kilo-ohms) of the current set resistor:

$$R \text{ (in kilo-ohms)} = 47 * I / (7 - I) \text{ or for the low current range, } R = 47 * I / (2 - I)$$

Here are the current set resistor values for motor current in .5A increments. Round the appropriate answer to the nearest 5% resistor value.

- a. 1A – 7.8K
- b. 1.5A – 12.8K
- c. 2A – 18.8K
- d. 2.5A – 26.1K
- e. 3A – 35.25K
- f. 3.5A – 47K
- g. 4A – 62.67K
- h. 4.5A – 84.6K
- i. 5A – 117.5K
- j. 5.5A – 172.33K
- k. 6A – 282K
- l. 6.5A – 611K
- m. 7A – OPEN

### HEATSINKING

The G210 needs heatsinking for current settings greater than 3 amps. The case temperature (measured on the bottom plate) should not exceed 70 degrees C, and for best life should be kept to 50 degrees or less. Use heatsink compound between the G210 and the heatsink.

**CAUTION!** Current settings above 3 Amps without a heatsink will result in damage to the G210.

The drive must be heatsinked to a piece of aluminum, preferably with fins and a fan to increase heat dissipation and surface area. Do not screw the drives directly to the door of your control cabinet, as this will typically not provide adequate heatsinking properties.

### OPTION JUMPER BLOCK

The G210 has four settable options. These options are enabled and disabled via the jumper block shunt settings. See the diagram below for how to set the shunts. The four options are described below.

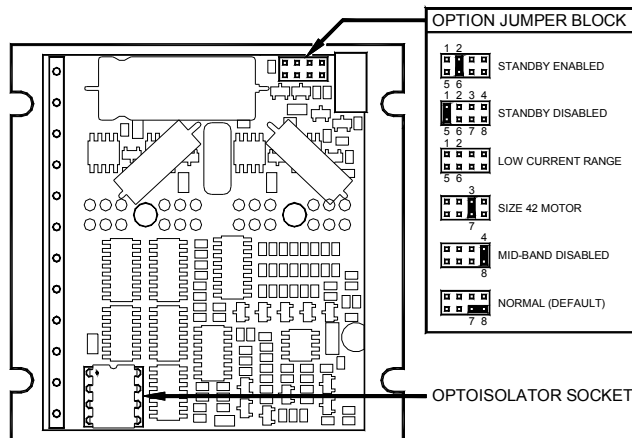
**(1) AUTO CURRENT REDUCTION:** The G210 reduces motor phase current to 33% of the set value when the motor is stopped. If enabled, this reduction occurs 1 second after the last step pulse is sent to the drive. Auto current reduction can be enabled or disabled.

**(2) REDUCED CURRENT RANGE:** In addition to the normal current range (1A to 7A), the G210 can also operate over a reduced current range (0.3A to 2A). This range is used for motor phase currents of less than 1A. Auto current reduction is not available for this reduced current range.

**(3) NEMA-42 MOTOR:** Use this option if the drive is to be used with NEMA-42 frame size motors. This option adjusts the mid-band compensation circuit for optimum performance with this size motor.

**(4) MID-BAND COMPENSATION DISABLE:** Some step pulse sources generate very “ragged” timing. If the pulse-to-pulse period varies by more than +/-30%, the drive may have problems counting that step pulse. This option disables the mid-band compensation circuit, making the drive insensitive to this timing restriction. As a consequence, the motor may exhibit mid-band instability problems.

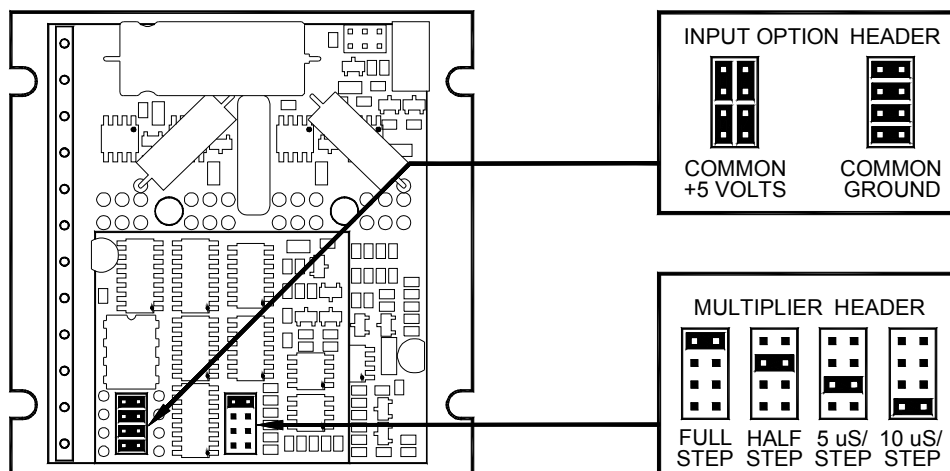
**ADJUST:** This trimpot adjusts the motor for the smoothest possible low-speed operation. Set the motor speed to about 1/4 revolution per second, and then turn the trimpot until a distinct null is noted in the motor’s vibration. This will result in the most even microstep placement for a given motor and power supply voltage.



### STEP PULSE MULTIPLIER JUMPER SETTINGS

#### **MULTIPLIER OPTION HEADER**

The G210 has a built in STEP PULSE MULTIPLIER. This circuit makes the G210 selectable for full-step, half-step, 5 microstep and 10 microstep operation. In all cases the motor will move with microstep smoothness. Use the MULTIPLIER HEADER to select the desired resolution. Do not operate the drive without a jumper.





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### INPUT OPTION HEADER

The INPUT OPTION HEADER allows the STEP and DIRECTION opto-isolators to be configured as either common ground or common +5VDC.

If the G210 inputs are driven by a source that has only ground available, such as a PC parallel port, move the 4 jumpers on the header so that it looks like the COMMON GROUND setting. Connect the input driver ground to TERM 10 on the main connector. If the G210 inputs are driven by open collector transistors or standard TTL gates, move the 4 jumpers on the header so that it looks like the COMMON +5VDC setting.

### CONVERTING THE G210 TO A G210

The G210 can be converted to a G210 by installing the G901 step pulse multiplier board. Remove the cover of the drive, and then use a small pair of needle-nose pliers to remove the opto-isolator from its socket. Plug the G901 board into this socket and replace the cover.

### REMOVING AND REPLACING THE COVER:

The STEP PULSE MULTIPLIER and the INPUT OPTION settings are jumpered internally. It is necessary to remove the cover of the drive to change these settings from their default values. Please follow the steps below on how to remove and replace the cover to avoid damaging the drive:

#### REMOVING THE COVER:

- 1) Remove the two 2-56 phillips-head screws on the bottom of the drive.
- 2) Gently lift the back of the cover upward until the LED clears the rectangular hole
- 3) Slide the cover backwards while still lifting until it clears the drive.

#### REPLACING THE COVER:

- 1) Make sure the LED is vertical relative to the drive printed circuit board.
- 2) Slide the cover forward over the drive while lifting the back of the cover.
- 3) When the cover is fully forward, look to see the LED is aligned with the hole.
- 4) Gently press the cover down, making sure the LED moves into the hole.
- 5) Replace the screws on the bottom of the drive.

It is recommended to use small needle-nose pliers or tweezers to move the jumpers on the internal headers.

### RESTORING FACTORY DEFAULTS

To restore the G210 to the factory settings set the trimpot to the 11 o'clock position, put the option jumper block jumpers on "STANDBY ENABLE" and "NORMAL", and set the step pulse multiplier to 10 microstep and COMMON +5V.

### DISCLAIMER

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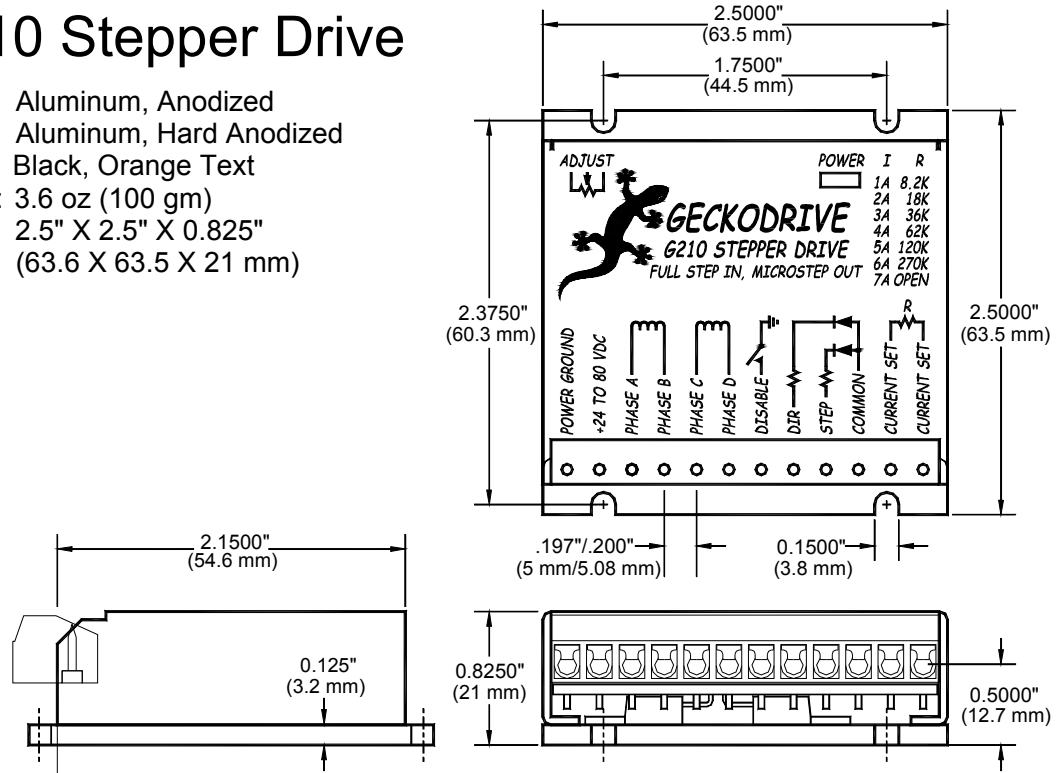
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## G210 Stepper Drive

Cover: Aluminum, Anodized  
 Plate: Aluminum, Hard Anodized  
 Color: Black, Orange Text  
 Weight: 3.6 oz (100 gm)  
 Size: 2.5" X 2.5" X 0.825"  
 (63.6 X 63.5 X 21 mm)



### SPECIFICATIONS

|                         |  |
|-------------------------|--|
| Supply Voltage:         | 24 to 80 VDC                                       |
| Phase Current:          | 1 to 7 Amps and 0.3 to 2 Amps (2 ranges)           |
| Auto Current Reduction: | 33% of set current, 1 second after last Step Pulse |
| Size:                   | 2.5"W, 2.5"D, .85"H (63.5mm, 63.5mm, 21.5mm)       |
| Mounting Pattern:       | 4 6-32 screws, 1.75" by 2.375" (44.5 mm, 60 mm)    |
| Quiescent Current:      | 15 Ma or less                                      |
| Weight:                 | 3.6 oz. (100 gm)                                   |
| Step Frequency:         | 0 to 200 kHz                                       |
| Step Pulse "0" Time:    | 0.5 uS min (Step on falling edge)                  |
| Temp:                   | 0 to 70 C  |
| Step Pulse "1" Time:    | 4 uS min   |
| Humidity:               | 0 to 95 % (non-condensing)                         |
| Direction Setup:        | 1 uS min (20 uS min hold time after Step edge)     |
| Power Dissipation:      | 1 to 18 W (1 to 7 Amps)                            |

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