



G540 4-AXIS DRIVE

REV 4: AUGUST 17, 2010

GECKODRIVE, INC.
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Thank you for choosing to purchase the G540 4-Axis Drive System. If you are dissatisfied with it for any reason at all within two weeks of its purchase date, you may return it for a full refund provided it is cosmetically unmarred and undamaged electrically in any way. Geckodrive Inc. fully warrants the G540 against workmanship defects for 1 year after its purchase date.

PLEASE READ FIRST BEFORE USING THE G540

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 Amps and 3.5 Amps. Using a motor with a higher current rating will cause a proportional loss in torque, meaning a 5A motor will get 3.5/5 (70%) of its maximum torque. The power supply voltage must be determined by the inductance equation listed later or be between 4 times and 20 times the motor's rated voltage. The current set resistor may be a 1/4 Watt, 5% part. Finally have a STEP and DIRECTION pulse source available.

STEP 1: CONNECT POWER

Connect your power supply positive to TERMINAL 11 and negative to TERMINAL 12. The power supply voltage is determined by multiplying the square root of the motor's inductance by 32, as in the example below for a 2mH rated motor:

$$32 * (\sqrt{2}) = 45\text{VDC}$$

Be sure that your power supply is turned OFF when connecting or disconnecting it from the G540. Failure to do so may result in physical damage to the connectors.

CAUTION! Never put a switch on the DC side of the power supply! This will damage, if not destroy, your drive due to a current inrush when the switch is first thrown.

CAUTION! Power supply voltage in excess of 50 VDC will damage the G540.

Turn the power supply on and make sure that a red LED comes on. Once you have verified that the drive lights up turn your power supply off before continuing.

STEP 2: INSERT E-STOP OR JUMPER

The G540 is designed to fault unless there is a normally closed switch (functionally identical to a jumper wire) between TERMINAL 10 and TERMINAL 12 on the 12-PIN TERMINAL BLOCK. Without TERMINAL 10 shorted to ground the G540 will remain disengaged to the motors and will not respond to commands. The red LED will be illuminated if there is no jumper connecting these two terminals.

STEP 3: DISABLE CHARGE PUMP

The G540 has a switch allowing you to disable the charge pump feature, which makes it possible to verify the G540 works without having to have your DB25 cable plugged in. The switch is located near the 12-PIN TERMINAL STRIP on the top of the drive. Flip the switch to DISABLE and apply power to the G540; you should have a green LED lit indicating that setup is successful thus far.



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STEP 4: CONNECT MOTORS

Wire your motors to the included DB9 solder cup and secure the backshell connectors. If your motors are rated below 3.5A you must use a current set resistor across PIN 1 and PIN 5. The resistor is calculated by taking the current in amps and multiplying by 1000. If your motor is rated at 2.8A per phase you will have to use a 2.8K 5% 1/4W resistor. If your motor is rated at 3.5A or above you can safely not use a current set resistor; however, your G540 will not go into current standby mode which will result in increased motor heating.

At this point you should have holding torque on the motors and a green LED lit. If you do not then the motor is wired incorrectly or is damaged.

STEP 5: CONNECT DB25 CABLE

If you have holding torque and a green LED you can plug in your DB25 straight through cable to the G540 and your computer. Use the pinout on page 5 to set up your program's output pins or load the G540 XML configuration file from the G540 product page on the Geckodrive website.

Your step pulse width must be at least 2uS wide and the pulse polarity for the step and direction signals are ACTIVE HIGH.

STEP 6: TEST FUNCTIONS

After you configure your CNC program it is time to test the G540 for functionality. You should be able to move all axes at this time.

STEP 7: ADJUST TRIMPOT

The G540 is composed of four individual G250 motor controls, each of which has a trimpot on board to adjust low speed smoothness. In your CNC program set the axis being adjusted to move at 2 revolutions per second and use a non-conductive screwdriver to turn the trimpot in the ADJUST hole on the top of the drive. If you do not have a non-conductive screwdriver you may use a standard screwdriver, but be careful not to touch any components other than the trimpot. The trimpot has 270 degrees of motion and will have an audible "sweet spot" when it is in proper position. This position will change with each motor so be sure to readjust if you change motors.

STEP 8: OPTIONAL CONNECTIONS

The following connections are completely optional and are not required to make the G540 operate.

INPUTS: The G540 has four general purpose inputs called INPUT 1, INPUT 2, INPUT 3 and INPUT 4 on the MAIN TERMINAL BLOCK. They are at POSITION 1, POSITION 2, POSITION 3 and POSITION 4 respectively on the terminal block. These inputs may be used as limit switches or for any other purpose. SPST switches can be used with these inputs. One end of the switch goes to the input, the other end of the switch goes to ground (POSITION 12).

OUTPUTS: The G540 has two general purpose outputs called OUTPUT 1 and OUTPUT 2 on the MAIN TERMINAL BLOCK. They are at POSITION 5 and POSITION 6 respectively on the terminal block. These outputs may be used to drive relay coils or for any other purpose. The outputs are rated at 1A and 50VDC



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maximum. Connect one end of the load to the output and connect the other end of the load to a positive DC voltage. This voltage may be the G540 power supply or it may be a separate power supply having a different voltage.

ANALOG OUTPUT: This is a 0V to +10V opto-isolated analog output intended for use with VFD drives. VFD OUT goes to 0VDC while the G540 is disabled. Connect VFD GND, VFD OUT and VFD +10V to the VFD drive inputs. Make sure the VFD drive positive voltage does not exceed +12VDC. Do not short VFD OUT to any other terminal. Do not reverse polarity to VFD GND and VFD +10V or the G540 may be damaged.

CHARGE PUMP: The G540 is equipped with a charge pump (watchdog timer) that disables the drive without a 10 kHz signal on pin 16 of the DB25 port. You can enable this by reversing what was done in STEP 3 and making sure that your parallel port is set to EPP mode. To do this, go into BIOS and set your parallel port to either "EPP" or "Send/Receive"; most parallel cards are set to ECP or "Send Only" by default.

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TROUBLESHOOTING

Generally speaking, there are only a few reasons why the G540 will not function as expected. The most common are listed below.

PROBLEM: G540 UNRESPONSIVE (RED LED LIT CONSTANTLY)

SOLUTION: This is the most common fault and can be caused by several problems. First, double check that a jumper wire or normally closed switch is present between PIN 10 and PIN 12 on the 12 POSITION TERMINAL BLOCK. Next, turn the CHARGE PUMP SWITCH to the OFF position; if the green LED comes on then there is a problem with your CNC program not putting out a charge pump signal on PIN 16. If those do not work, check the motor for holding torque; if you do not have holding torque move on to the next section.

PROBLEM: NO MOTOR HOLDING TORQUE

SOLUTION: Verify that your motor is connected to the G540 with the DB9 connector and that it is wired as it says in the motor's datasheet. Check the LED indicators to verify that power is being applied to the G540. Lastly, make sure that you have an appropriately sized current set resistor. If there is not one present or it is grossly undersized you may have burned out your motor and it could be shorted internally.

PROBLEM: NO LEDS LIT

SOLUTION: Verify that the power supply is plugged in correctly to the 12-PIN TERMINAL BLOCK. If it is and power is applied with no LEDs being lit up, you have most likely had the fuse blow open. To check the fuse you must first remove the cover. The fuse is located by the 12-PIN TERMINAL BLOCK on the underside of the motherboard; you can pull the motherboard off of the G250 drives to access it. Next, use an ohmmeter to check for continuity on the fuse, which looks like a green 1/4W resistor. If the fuse is destroyed you may contact Geckodrive for replacement fuses or order spares online with part number F2318-ND from www.digikey.com.

PROBLEM: INPUTS OR OUTPUTS NOT WORKING

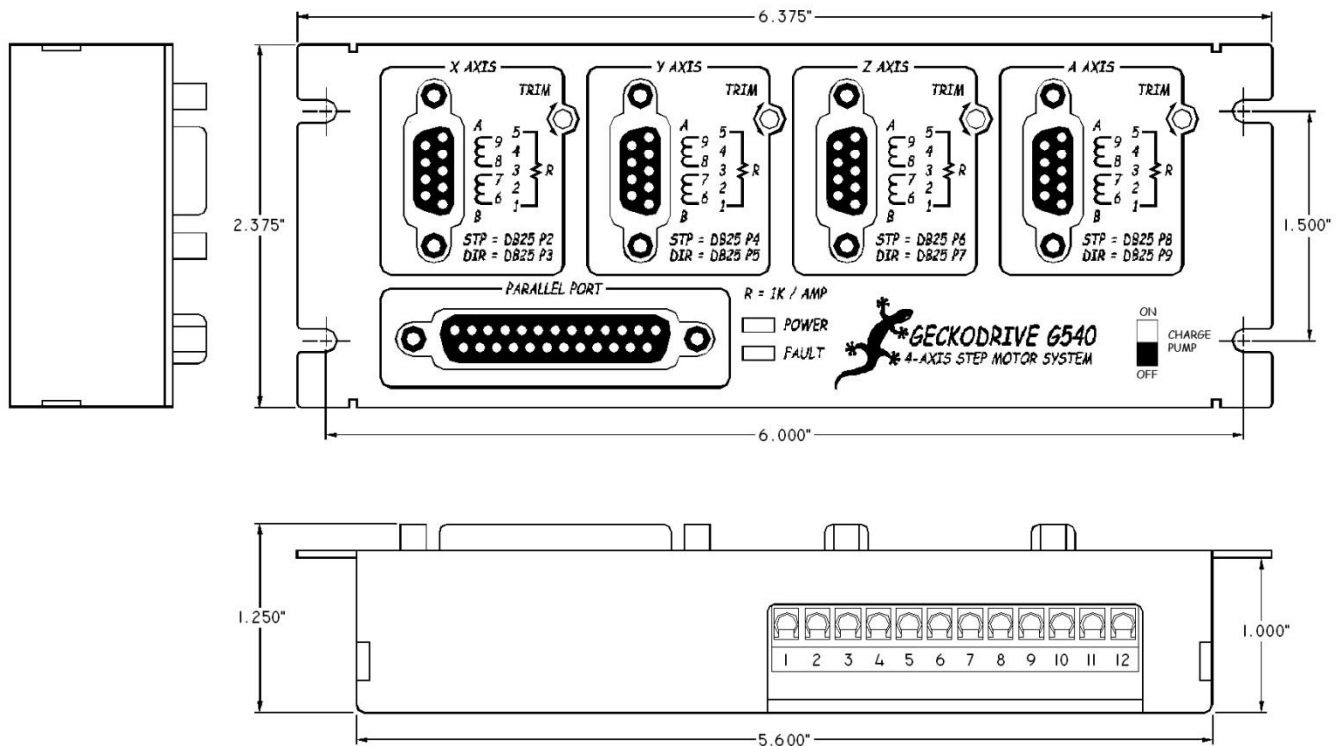
SOLUTION: This problem is most often caused by a problem with the parallel port or the parallel cable. Use an ohmmeter to verify that your cable is a straight through cable and not a crossover or a printer cable. Next, go into BIOS and make sure that your parallel port is set to EPP or "Send/Receive" mode. If your parallel port is on your motherboard and is not a PCI card then the problem could be that it is incapable of EPP operation. Use a PCI parallel card and see if the problem persists.

PROBLEM: G540 GETS HOT

SOLUTION: The G540, being a stepper drive, is meant to get warm. While operating at its maximums the G540 can get up to 70C (158F) comfortably; heatsinking is mandatory if the temperature gets above that range. On the Geckodrive website is a document titled "G540 Heatsink Experiment" that discusses issues of overheating. If the G540 is in a control cabinet or an area with limited airflow it is required to put an intake and exhaust fan in the enclosure. Please read the cited document if you have further questions.

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DB9 MOTOR CONNECTORS:

Pin 1	CURRENT SET resistor
Pin 2	GND
Pin 3	GND
Pin 4	GND
Pin 5	CURRENT SET resistor
Pin 6	PHASE B motor wire
Pin 7	PHASE /B motor wire
Pin 8	PHASE A motor wire
Pin 9	PHASE /A motor wire

MAIN TERMINAL BLOCK:

Pos 1	INPUT 1 (DB25 pin 10)
Pos 2	INPUT 2 (DB25 pin 11)
Pos 3	INPUT 3 (DB25 pin 12)
Pos 4	INPUT 4 (DB25 pin 13)
Pos 5	OUTPUT 1 (DB25 pin 17)
Pos 6	OUTPUT 2 (DB25 pin 1)
Pos 7	VFD GROUND
Pos 8	VFD OUTPUT
Pos 9	VFD +10VDC
Pos 10	DISABLE input (E-STOP)
Pos 11	SUPPLY +18 to +50VDC
Pos 12	POWER SUPPLY GROUND

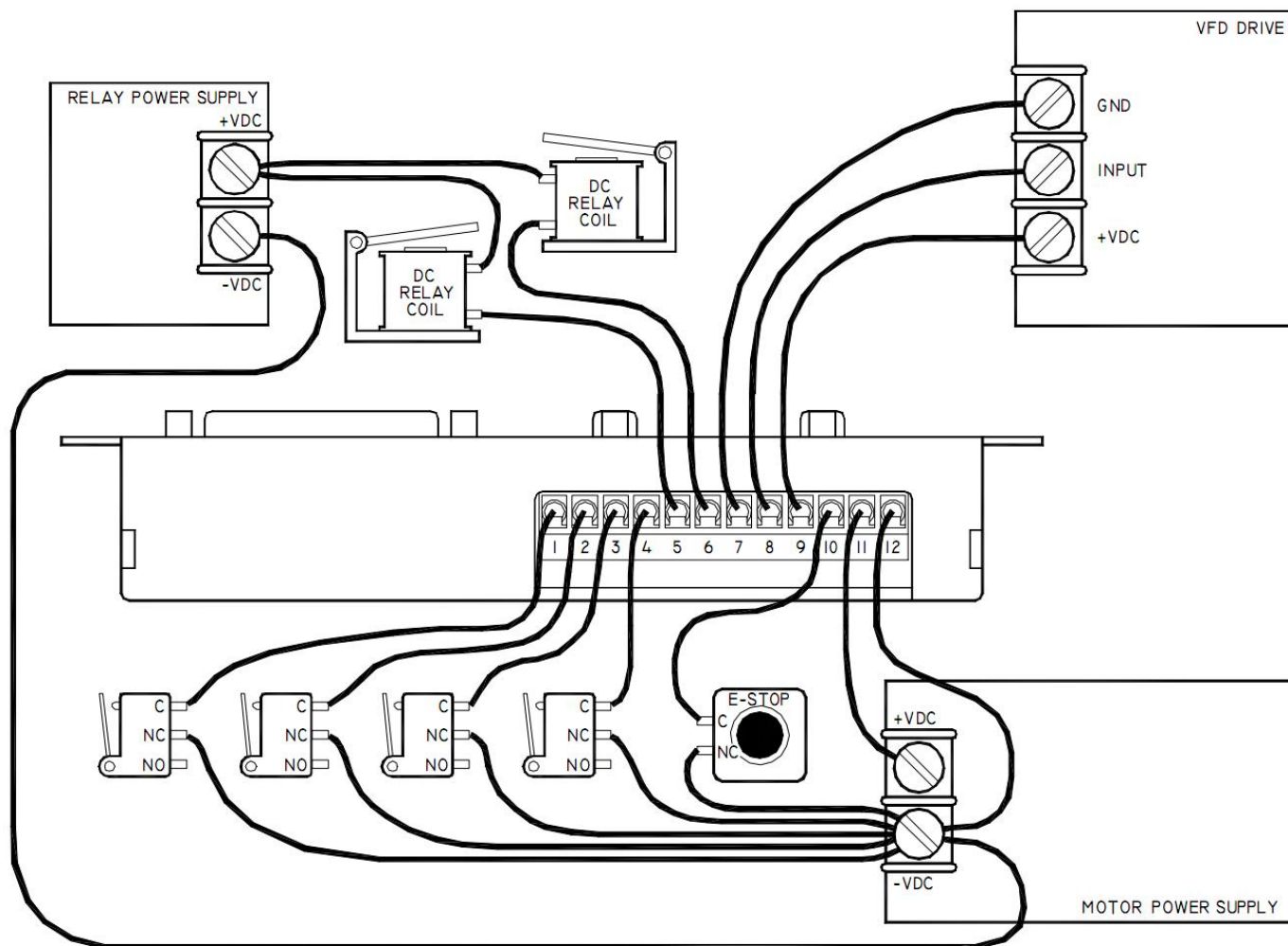
DB25 LPT CONNECTOR:

Pin 1	OUTPUT 2
Pin 2	X-AXIS STEP
Pin 3	X-AXIS DIRECTION
Pin 4	Y-AXIS STEP
Pin 5	Y-AXIS DIRECTION
Pin 6	Z-AXIS STEP
Pin 7	Z-AXIS DIRECTION
Pin 8	A-AXIS STEP
Pin 9	A-AXIS DIRECTION
Pin 10	INPUT 1
Pin 11	INPUT 2
Pin 12	INPUT 3
Pin 13	INPUT 4
Pin 14	VFD PWM (50Hz)
Pin 15	FAULT (input to PC)
Pin 16	CHARGE PUMP (>10kHz)
Pin 17	OUTPUT 1
Pin 18	GND
Pin 19	GND
Pin 20	GND
Pin 21	GND
Pin 22	GND
Pin 23	GND
Pin 24	GND
Pin 25	GND

SPECIFICATIONS:

Four 10-microstep motor drives
 0 to 3.5A rated phase current
 18VDC to 50VDC supply voltage
 Mid-band resonance compensation
 Auto standby current (70% current)
 Short-circuit protected
 Opto-isolation on all LPT signal pins
 Two 1A at 0 to 50VDC rated outputs
 Four SPST to GND inputs (TTL)
 Opto-isolated analog output for VFD drive
 FAULT indicator LED, signal to PC
 POWER indicator LED
 I-SET resistor on motor connector
 TRIM adjust for motor smoothness
 Panel mount (5.7" by 2.4" hole dim.)
 Anodized aluminum package
 No heatsink needed below 40C ambient
 Easy to service removable drives
 Modular PCB design with no internal wires
 Conservative ratings, premium components

Sample Wiring Diagram





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G540 CUTOUT DIAGRAM

This drawing is to scale. Use it as a guide for mounting your G540.

