



G540 Breakout Board

Setup, Maintenance, and Operations Guide

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Welcome to Panther Automation!

Congratulations on your purchase of a universal G540 breakout board!

At Panther Automation, we recognize that the experience of soldering the small connectors necessary to make motor connections to the G540 can be a frustrating experience. We designed this board to allow motor connections to be made to the G540 drive system without any soldering whatsoever.

The D-Subminiature Connector (also known as the DB or Sub-D connector) was created in 1952 by ITT Corporation. It was designed to provide a small connector to connect computer peripherals together. It comes in many variants, but most – if not all – configurations use a trapezoid shaped shell and a number of pins. These pins can vary in size and quantity, and contain varying numbers of rows of pins.

One of the most common configurations is the DB9, which is among the smallest of connectors in this class. It provides 9 pins for signal connectivity.

The legendary Gecko G540 uses 7 of these 9 pins for connections to motors. The DB9 connector is capable of carrying the amount of current the G540 can produce. However, the DB9 connector was not originally designed for this purpose, thus it is ideally suited for much smaller wires than would be used to carry the amount of current present here. With the amount of current present in this application, normally 16 to 18 gauge wires are used. Wires this size can be very difficult to solder to the connectors that mate to the drive, owing to the connectors original design being for much smaller wires.

The wires must be very carefully trimmed to make a neat connection that is compact enough to fit into the plastic shell of the connector. Even those well experienced in soldering can have a very tough time getting it right.

This breakout board has been designed to allow the user to make connections to the G540 by means of a terminal strip, allowing the connections to be made with only a screwdriver.

Additionally, the G540 uses a very clever system to set the motor current. A resistor, connected across two of the pins of the DB9 connector is normally used. The value (resistance or impedance) of this resistor is read by the G540's electronics and used to set the motor current. If a very specific current is required for a motor, a very specific resistor must be chosen, one which may very well not be one of the "common" values of resistor that would be found in a local electronics component retailer such as Radio Shack. This leaves the user with the choice of dealing with a very large electronics supply house such as Mouser or Digi-Key, or choosing the "closest available value" to what they need.

This breakout board allows the current to be set for each motor without the use of individual resistors, further simplifying installation. Rather, a variable resistor – one for each channel – is employed to allow the motor current to be set simply by setting the dial. This also carries the advantage that ANY resistance can be chosen, as the dial allows for an infinite granularity in the resistance set.

What is Included

The breakout board package contains the following:

1. The G540 Breakout Board.
2. (4) 4-40 screws to secure the breakout board to the drive.

Required Tools for Installation and Setup

The following tools will be needed to install and configure the G540.

1. A 3/32" SAE hex key wrench (Allen® Wrench)
2. A small flat-bladed screwdriver.
3. A digital multimeter

A digital multimeter, if not available, can be purchased at any home improvement store, hardware store, or local electronics retailers such as Fry's or Radio Shack. They are also widely available on Amazon.com, Parts Express, MCM Electronics, Jameco Electronics, etc.

An expensive or elaborate meter is not needed for this application. In fact, if it is desired to keep costs down, the cheapest multimeter available is almost certainly more than suitable for this job. The only required feature is that it have a resistance (ohms) function, which is fairly universal in all digital meters of any price point.

The method of operation of a multimeter varies depending on the actual meter. Refer to the instructions provided with the meter if you are unfamiliar with the operation of the meter.

If you do not have a digital multimeter, you can set the motor current roughly without one. However doing so runs the risk of overdriving the motor and causing either stress on the coils or premature failure of your motors.

Installation

It is assumed that the motor cables have been installed in such a way as to meet your requirements and that the motor cables are brought to a location near the drive. It is further assumed that you have completed any non-motor wiring to the drive (power, limit switches, etc) and have mounted the drive in a suitable manner.

Any wiring other than that on the breakout board should be completed according to GeckoDrive's specifications and recommendations. The terminals on the breakout board will work best with 16 – 18 gauge stranded wire.

Step 1: Disconnect all power to the drive!

Step 2: Install the Breakout Board onto the Drive

Align the breakout board over the drive, being careful to orient the connectors in the proper direction so that they line up over the connectors on the drive.

Gently push down on the breakout board to fully seat the connectors. Apply pressure evenly across the board to ensure a firm seating of the board across all four connectors.

Step 3: Secure the breakout board to the drive

Note: This step works best if the drive is oriented vertically or even upside down.

Note: Four screws are provided, two for the X axis connector and two for the A axis connector. It is not necessary to install screws on the Y or Z axis connectors, and screws for this are not included.

Place a screw onto the tip of a 3/32" hex key wrench. Reach through the holes one each side of the connector for the X axis with the screwdriver and tighten the screw just to the point of being snug. Do not overtighten the screw.

Note: If you overtighten the screw, it may cause the stud on the G540 to unthread if you try to remove it later, or even break off. Be very careful to just snug down the screw, no more.

Repeat this process with the other two screws on the A axis connector.

These four screws sufficiently hold the board in place. It is not necessary to screw down all four connectors, thus only four screws are included with the board.

Step 4: Connect the Motors

Using the datasheet of the motor, identify the motor wires for proper connection. Remove several inches of sheath from the motor cable. If the cable is shielded, prepare the shield wire for connection as well. In the case of shielded cable, it is recommended to remove an extra inch or so of sheath, and trim the individual conductors to be about one inch shorter than the shield wire, to allow the shield wire some extra room for bending after installation.

Warning: Do not tin the stripped wire ends with solder. Doing so will eventually cause a failed connector. These connectors are designed to work without solder.

Strip approximately ¼" from each conductor of the cable.

Gently insert each wire into the appropriate terminal. If ¼" was stripped from each conductor, nearly all of the exposed portion of conductor should slide into the terminal. If it will not slide in, ensure that the screw is loosened sufficiently for it to do so. Snug each screw until the connection is secure. Do not overtighten.

If the insulation of the conductor enters the terminal, then remove it and strip a little extra. Insulation getting into the terminal can cause a weak connection.

Be careful to ensure that all strands of the wire go into the terminal opening and do not bunch up as they are being pushed in. Stray strands of wire can cause short circuits and cause your G540 to fault.

Repeat this process for all wires.

*Note: If shielded cable is being used, the shield should be connected to ground either by use of the terminal provided on the breakout board (SHLD), OR at the motor end. **NEVER ground the shield at both ends of the cable!***

IMPORTANT: If you are connecting an A axis to this breakout board, please review the section on the A-Axis at the end of this manual.

Step 5: Adjust Current (perform this procedure for each axis you have connected)

Do not perform this procedure with the drive powered on.

Refer to the documentation for the motors to determine what current the motors require. If you are using different motors for different axes, you must calculate the current for each motor separately.

If the motor requires 3.5 amps or more of current, simply rotate the appropriate knob fully clockwise using a flat bladed screwdriver and disregard the following instructions.

Setting current using a digital multimeter:

The G540 calculates current based upon a resistor that is connected to the motor connector. This resistor is calculated as 1 amp per 1000 ohms of resistance. Therefore, for a 2.5 amp motor, the ideal resistance is 2500 ohms, or 2.5 kilo-ohms (abbreviated 2.5K).

The G540 automatically reduces current to the motors when they are idle to protect the motors from overheating. It will not do so if it cannot detect a resistance of 3.5K or less connected. Therefore, the G540 Breakout Board is designed to allow a range of 0-3.48K of adjustment. 3.48K ensures that it will always detect a resistance of less than 3.5K, thus allowing the current idle mode to function properly. Therefore, if you wish to set your current to 3.5 amps, simply set for maximum current.

Once you have identified the desired current for your motor, perform the following steps:

1. Set your multimeter for resistance measurement according to the manufacturer's instructions. If your meter is manual ranging, you must set a range appropriate to read at least 4000 ohms. On most manual ranging meters, you will find a 200 ohm, 2K ohm, 20K ohm and 200K ohm range. In this case, set your meter for the 20K range.
2. Refer to figure 1. Locate the current set test points on the board (circled in red) nearest the channel you are setting.
3. Place one lead of the meter on each of the pins of the test point for the channel/axis you are working on. Your meter will register a value of somewhere between 0 and 3480 ohms.
4. Adjust the current adjust knob using a flat-bladed screwdriver until the meter reads the desired value.

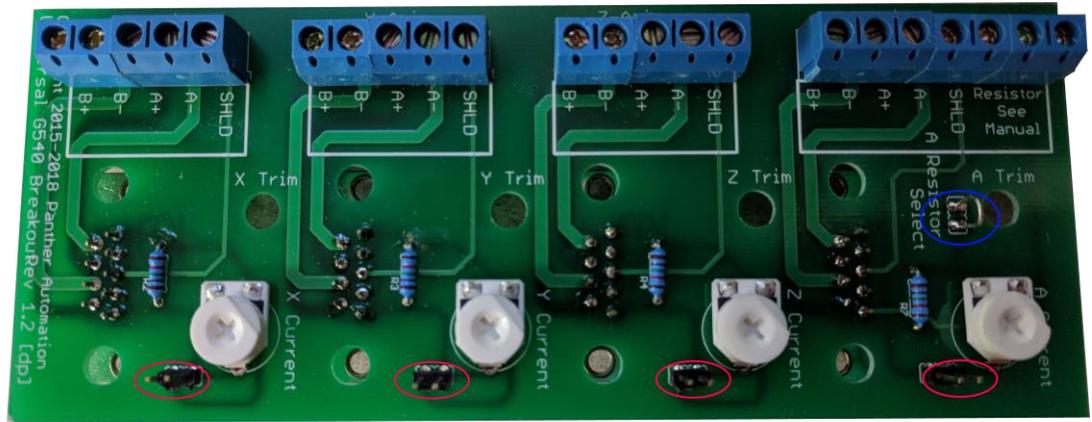


Figure 1: G540 Version 2 Breakout Board

Setting Current without a digital multimeter:

If you do not have a digital multimeter, you can set the motor current roughly. To do so, adjust the knob for the desired axis from one extreme to the other to familiarize yourself with the range of movement of the knob. Then, set the knob roughly proportional to the amount of current. For example, if you wanted to set for 2 amps, 2 amps is 57% of 3.5, so position the knob at roughly 50-60% from it's full counter-clockwise position.

A-Axis

This breakout board can be used with an A-axis in one of two ways.

Method 1: As a regular Axis or Channel.

If your application calls for an A-Axis motor that is permanently installed on the machine OR it is removable, but the only one being used, then you can set up this channel just like the others. The board comes from us set up this way.

In this application, you do not use the 6th and 7th terminals on the A-Axis terminal strip. Only use A+, A-, B+, B- and SHLD.

Method 2: As a variable, multi-accessory Axis or channel.

This application would apply if you have multiple potential accessories that you want to plug into the A-Axis at different times. For example, you might be using it with a CNC router that has a rotary axis and a rotary table that are connected at different times for different types of projects. These accessories may have different motors with different current requirements. In this case, you can configure this board to use an external resistor instead of the on-board circuitry for setting motor current.

In this setup, you would place the resistor inside the motors connector just as is documented in the G540 manual. This allows you to put a different resistor on/in each accessory cable or connector so that each accessory gets the correct motor current automatically when it is plugged in. If you want to use this function, you should CUT the jumper labeled "A RESISTOR SELECT" on the board. Referring back to figure 1, it is circled in blue.

Warning: Cutting the A RESISTOR SELECT jumper on the board will DISABLE the onboard current setting dial and associated circuitry.

Cut this jumper with a small wire cutter, then slightly bend the cut loops apart so they do not touch.

Once this jumper is cut, a resistor can be connected across the "Resistor" terminals on the A-axis, just as is documented in the G540 manual.

Warning: NEVER use an external resistor on the A-Axis terminal strip if the "A RESISTOR SELECT" jumper is not cut.