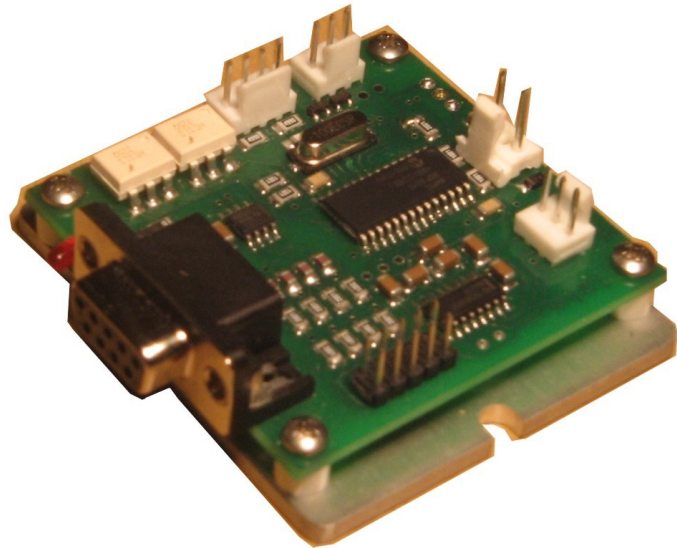


Step-Lok Manual V1.0 (preliminary)

Last edited Feb 23 / 2015



Closed loop adapter for Stepper motor Drives

- Adds closed loop reliability to any Step / Direction stepper drive
- Supports Differential or Single ended encoders
- Fault output to stop controller is error limit is exceeded
- Opto isolated Step/Direction inputs
- 1 or 2 X Step input multiplier
- 2 or 4 X Encoder line multiplier
- Can also be used as a DRO (digital readout) for the axis.
- Settings are programmable by RS232 and ViperTune

DISCLAIMER

Larken Automation assumes no responsibility for any personal injury or damage caused by use of its products. Only electrically qualified personal should attempt to install the electrical modules.

High voltage can be lethal and proper safety procedures must be followed. Motors and drives should be properly grounded to prevent electrical shock.

Safety glasses should be worn ,since electrical components can explode causing injury or blindness

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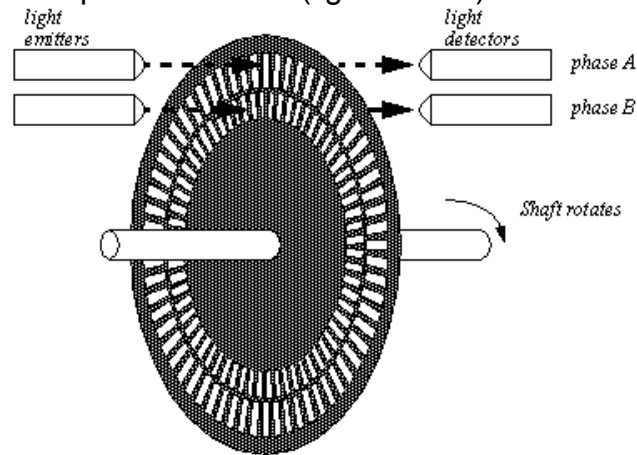
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Website: www.Viperservo.com

Website: www.LarkenCNC.com

Closed Loop Basics

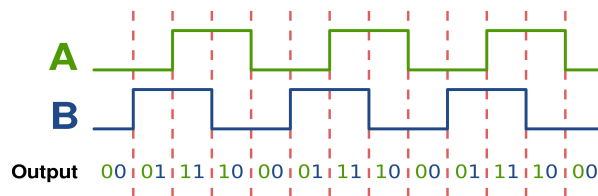
A closed loop system has an optical encoder that provides feedback to the controller. This typically can have from 100-5000 counts per turn. The most popular type of encoder is the optical encoder, which consists of a rotating disk, a light source, and a 2 photodetectors (light sensor).



The disk, which is mounted on the rotating shaft, has many slots in it. As the disk rotates, these slots interrupt the light emitted onto the photodetector, generating a digital or pulse train.

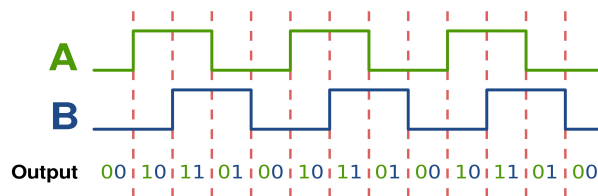
Forward rotation

B "leads" A



Backwards rotation

A "leads" B



The encoder has 2 square wave outputs. They are staggered at 90 deg. This way one is leading the other when turning CW and then trailing the other when turning CCW. These are Channel A and B. The controller can tell which way the motor is turning by the A-B sequence

There may be an optional Index output also. (The index is not used by the StepLok)

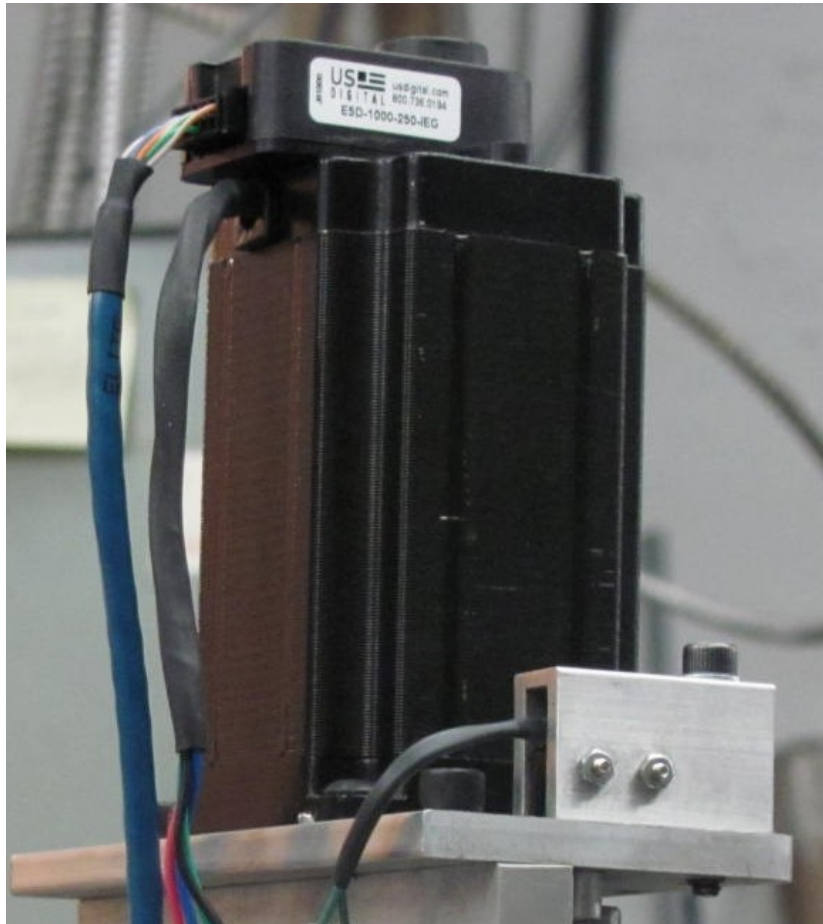
A **differential encoder** has 2 outputs for A channel and 2 outputs for B channel. The second output is an inverted version of the original and is designed to drive a twisted pair cable to cancel noise. Differential encoders are recommended for motors with cables longer than 4-6 feet.

Encoder Line count is the number of lines per turn. With-in the StepLok the line count is decoded 2 or 4 times finer(quadrature), so with a 1000 line encoder, the StepLok sees 4000 counts/turn. This is not to increase machine resolution, but to give the drive more counts to reduce error.

The **Step Multiplier** setting multiplies each incoming step pulse (from the cnc controller) by its value. So with a 1000 line encoder there are 4000 encoder counts per turn. With a step-multiplier of 1 you would have 4000 steps/turn. With a step multiplier of 2 you would have 2000 steps/turn. With a step multiplier of 10 you would have 400 steps/turn.

The StepLok can handle up to 625Khz encoder frequency (assuming good cableing)

A good source for encoders is US-Digital.com We recommend the E5 and E6 series with the differential output option.



StepLok Operation and setup

The Steplok is an encoder interface for a stepper motor system. The internal Encoder count must equal the internal Step count.

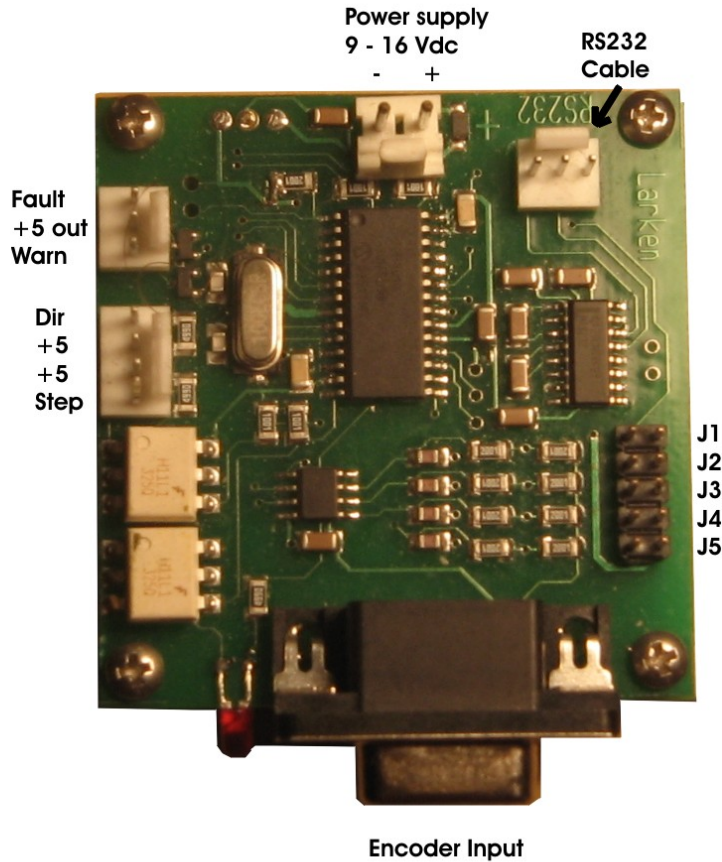
There are software settings Decoding the encoder line count by 2x or 4x. Also you can set a Step multiplier of 1, 2 or 4 X as well

Stepper Drive resolution X step-multiplier = Encoder Line cnt X Decode Mult

Here are examples of useable encoders and Stepper drive resolutions

500 line encoder with 4X decoder and a 2000 step/rev Stepper drive
1000 line encoder with 2X decoder and a 2000 step/rev Stepper drive
400 count encoder with 2X decoder and a 800 step/rev Stepper drive
400 count encoder with 2X decoder and a 200 step/rev Stepper drive and 4x step multiplier

Step-Lok Connection diagram



The StepLok requires a 9-16 DC powersupply with a current rating of 300ma.
A 1 amp powersupply can power all 3 StepLok modules for a 3 axis system.

The Step/Dir inputs will operate on either a 3.3 or 5 volt input.

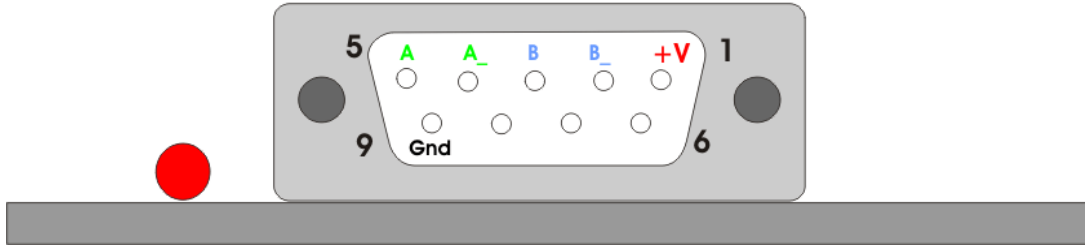
The RS232 programming cable is available from Larken Automation

J1 - 4 X encoder line decoder (no jumper = 2 X encoder line decoder)

J2 - 2 X Step multiplier (no jumper = 1 X Step multiplier)

Encoder connections

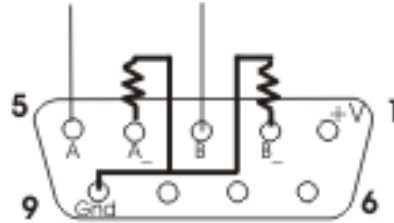
Differential Encoder Connections



Pin 1	+5 volts output for encoder power
Pin 2	Channel B input (inverted)
Pin 3	Channel B input
Pin 4	Channel A input (inverted)
Pin 5	Channel A input
Pin 6	N/C
Pin 7	N/C
Pin 8	N/C
Pin 9	Gnd for encoder power (common)

Single Ended encoders

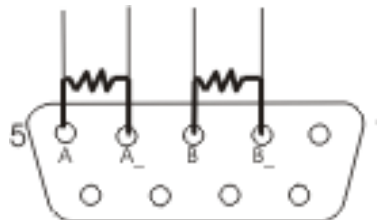
When connecting a single ended encoder, the unused input should be pulled to ground with a 2K ohm resistor (2000 ohm 1/4 watt).



Single Ended Connections

Terminating long cables

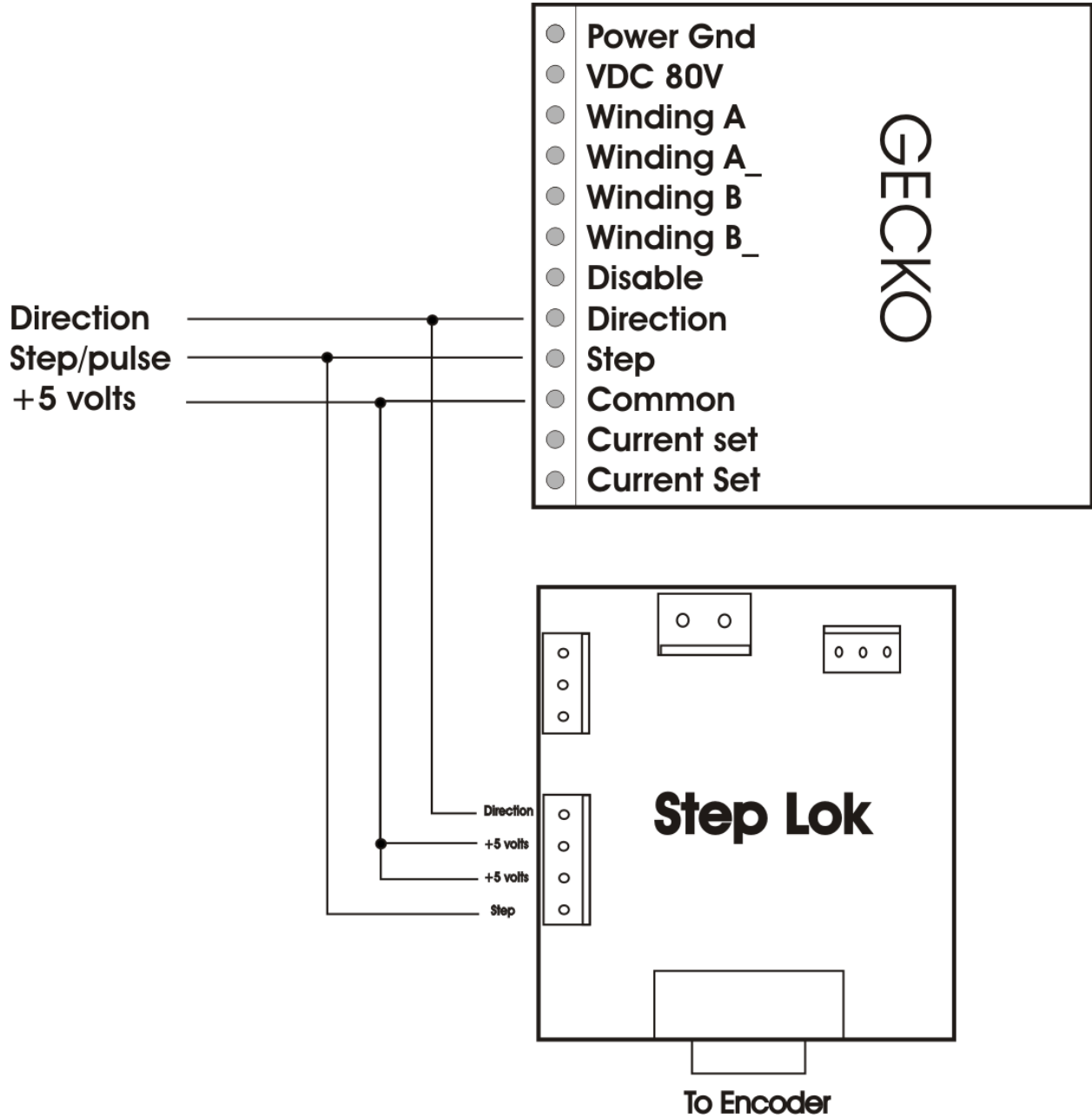
A differential encoder is recommended for any cable longer than 6 feet (2 meters). For very long cables it is sometimes necessary to put a terminator resistor across the differential pairs. The resistor value is usually 150 ohms (1/4 watt), A 0.05uF capacitor may be put in series with the resistor to reduce power consumption..



Terminator resistors

Step / Direction connections

Connecting the StepLok with a Gecko stepper drive



Error Indicator LED

When an error is flashed, the StepLok will hold down the Estop signal until the error is removed. You can add a Fault override switch (normally closed) in this estop line to allow the operator to jog the machine while holding the switch to recover from a warning error.

It will flash the RED led a count indicating the error number

LED error count

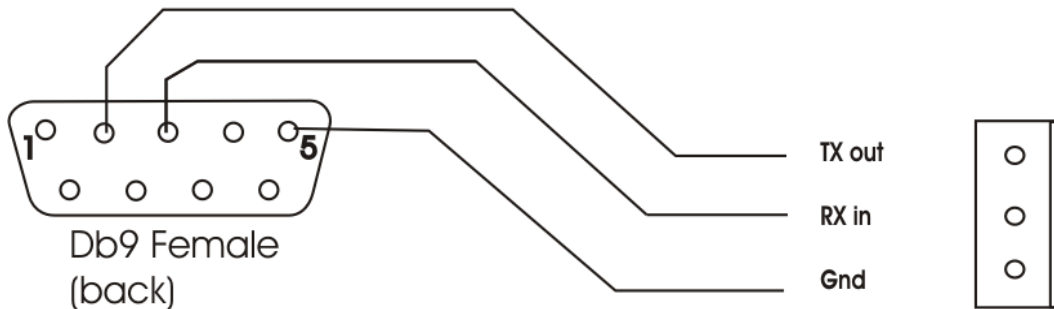
- 3 Encoder Range (warning)**
- 5 Encoder Trip (Fault)**

Programming the Step2linear with Vipertune

The Step2lin board is programmed by connecting to a PC using the serial RS232 port. A cable can be made as described above or purchase from Larken Automation

The RS232 settings are 38600 Baud, 8 1 N

Rs232 serial cable



For More info in Vipertune download the Vipertune manual.
and the viper command set is at the end of this document.

Settings can also be loaded with Hyperterm or Teraterm

Run the windows **Hyper Terminal** program from the Accessories group. Create a New session using Comm1, 9600 baud, 8,1,N. In the advanced tab, set Flowcontrol to 'None'

If Hyper-term isn't on your system then it can be installed from your windows cd rom or downloaded from the internet.

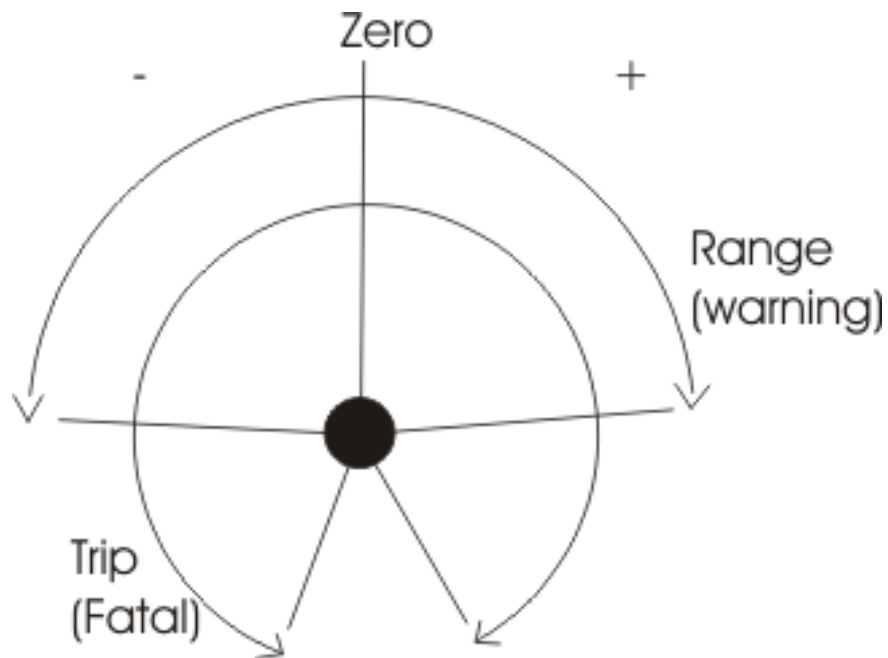
All commands are entered in lowercase and followed by a 'carriage return' <cr>.

Encoder Limit settings

There are 2 settings to signal that the following error is out of range.

The **Range** setting can be set to output a error warning to stop the cnc controller if the following error is to high. This will hold down the Estop signal, but **not disable** the Viper drive.

The **Trip** setting **will disable** the drive if exceeded, and hold down the Estop to the cnc controller.



Both Trip and Range are in quadrature counts (lines x 4) so to set the Trip command to 3/4 of a turn of a 500 line encoder, the setting would be 1500

This setting is designed to **protect** the drive and motor when an extreme out of range is detected. The max setting allowed for the Trip command is 4000.

