BL100-RO BLDC Driver

User Manual

Version 1.01

RMS Technologies

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Thank you for purchasing this BLDC Driver. The BL100 driver is warranted to be free of manufacturing defects for one (1) year from the date of purchase.

PLEASE READ BEFORE USING

Before you begin, ensure there is a suitable DC Power Supply. Under any circumstances, do not exceed +48 VDC.

DISCLAIMER

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Special Symbols

Indicates a WARNING and that this information could prevent injury, loss of property, or even death (in extreme cases).

BL100-RO User Manual

Product: BL100-RO

Version: 1.01

Date: 01/03/2012

Version History		
Version	**Date**	**Description of Changes**
1.00	10/25/2010	New User Manual
1.01	01/03/2012	Bug Fixes, Closed (Analog) w/ Ramp.

Table of Contents

1. FEATURES

- Input voltage from 12VDC to 48VDC
- Peak current up to 20 Amps Peak
- Continuous current up to 10 Amps
- Maximum wattage of 500 Watts (more than 500 Watts requires a larger heat sink)
- Hall sensor orientation: 120° apart, 5V output, 30 mAmps max
- Chopping frequency of 20kHz
- Three fault outputs via Red LED (flashes on and off)
    - Wrong connection of hall sensors by the user
    - Short or over-current
    - Motor is connected but no rotation
- Closed-loop with hall sensors for speed control
- Direction of rotation change via input change (0VDC is one direction, 3-10VDC is opposite direction)
- Direction mode which allows potentiometer to be used to rotate motor forwards and reverse based on pot value, i.e. 0-1.65V is one direction, and 1.65V-3.3V is reverse direction.
- Brake input, which will stop motor rotation suddenly using 0V or 10V (3V or higher is high signal)
- Speed control via 0-5VDC or 0-10VDC with external voltage input (select 5V or 10V option via jumper)
    - Option of using on-board pot for evaluation purposes
    - User can input their own voltage using the boards 2-pins (Power and Ground)
    - A simple jumper on the board changes from on-board pot usage to user's input
- Speed reader output that outputs the speed of the motor in the form of a square wave
- GUI Software provided for easy installation and operation
- User selectable P & I values for smoother motion via closed loop with the hall sensors
- Communication via RS485, RS232 or USB converter card kits available

Default Settings

Function	Description
Driver Mode	Closed loop with on-board pot for speed control
Speed potentiometer mode	Absolute; On-board pot will rotate motor from 0 to 4000 RPM
Kp	900
Ki	3000
# of rotor poles	4
Brake	High – no braking
Direction	High – CW direction
Enable	High – enabled motor
Max Speed	4000 RPM

2. ELECTRICAL SPECIFICATIONS

Supply voltage: +12 to 48VDC
Continuous current: Up to 10 Amps
Peak current: Up to 20 Amps

I/O Specifications:

- 3 Optically isolated inputs
  - Brake, Direction, Enable
  - Voltage: 0 to 10 VDC
    - Low signal: 0VDC
    - High signal: 2.2V to 10 VDC
  - Current: 10 mAmps maximum

- 1 Optically isolated output
  - Pulse output

3. OPERATING SPECIFICATIONS

Operating Temperature:

- Storage Temperature: -20 to 90° C
- Operating Temperature: -20 to 75° C

Duty Cycle:

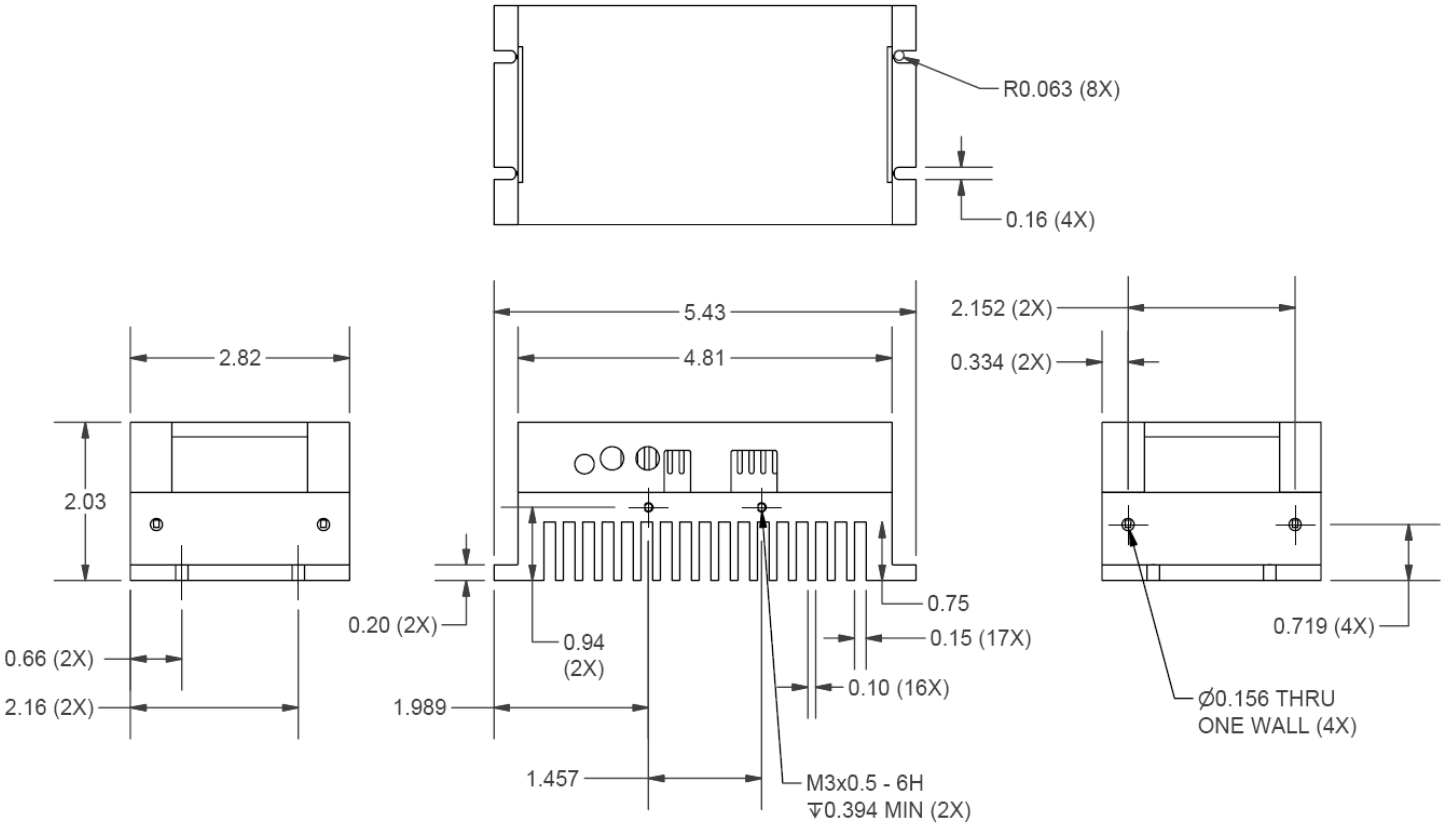
- 100% as long as the heatsink does not exceed 75°C

Communication Specifications

Baud rate: 57600 bps
RS485, Half Duplex
Stop Bits: 1 bit
Parity: None
No Hardware control

4. MECHANICAL SPECIFICATIONS

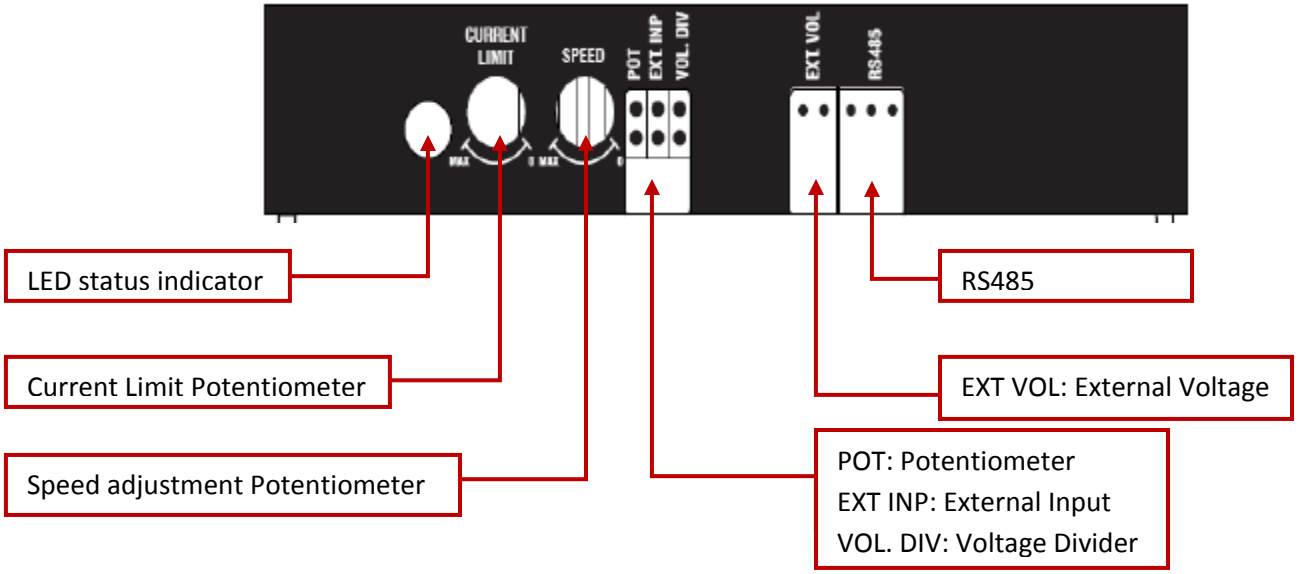
Size: 5.43” x 2.82” x 2.03 (LxWxH)
Weight: 1.25 lbs
Mounting: #6-32 screws (x 4)
Heatsink: Black anodized aluminum



5. PIN ASSIGNMENTS

Function	Description
V+	+12 to 48VDC power supply
V-	Power supply return (Ground)
Brake	This input stops the motor from running, but does not turn power off. Default is high signal and motor will operate. To brake the motor, tie this input to power supply ground.
Direction	This input changes direction. Default is high, Clockwise. Tie this input to power supply ground to change direction to Counter-clockwise.
Enable	This input enables or disables the drive and power is cut off. By default, a high signal enables the unit. Tie this input to ground to disable the drive.
Pulse Out	For a 2-pole motor, this outputs 3 Pulses per Revolution (PPR). For 4-pole motors, it outputs 6 PPR, for 8-pole motors, it outputs 12 PPR.
Opto Com	This requires a 5 volt input. It powers the following inputs: brake, direction, and enable. The user can also choose to supply their own 5V to this pin.
5V	This is a 5 volt output, used for the Opto Com. Place a wire from Opto Com to 5V in order to use the internal 5V supply. With this method, there is no opto isolation, and the main power supply line shares a circuit with the inputs.

Function	Description
GND	Hall Sensor Ground Pin is connected to this pin.
Hall C	Hall C is connected to this pin.
Hall B	Hall B is connected to this pin.
Hall A	Hall A is connected to this pin.
5V	The hall sensor's 5V is connected to this pin.
Phase C	Motor Phase C is connected to this pin.
Phase B	Motor Phase B is connected to this pin.
Phase A	Motor Phase A is connected to this pin.



Function	Description
LED status indicator	LED will flash on/off if the following occurs: Wrong connection of hall sensors by the user Short or over-current to motor Motor is connected but no rotation
Current Limit Potentiometer	This sets the continuous motor current limit from 0 to 10 Amps (MIN = 0, MAX = 10). **Only functions in closed loop modes.**
Speed Potentiometer	This sets the motor's rated speed from 0 to 4000 RPM as the max default setting. To change the max value, use the GUI.
POT (Potentiometer) Jumper	Put a jumper along the two leftmost pins in order to use the on-board pot for speed control.
EXT INP (External Input) Jumper	Put a jumper along the two middle pins in order to connect an external voltage supply to vary the speed. This works in conjunction with VOL. DIV jumpers.
VOL. DIV (Voltage Divider) Jumper	Put a jumper along the two rightmost pins in order to use an external voltage supply of 0-10VDC. When this jumper is taken off, the external supply is from 0-3.3 VDC.
External Voltage	Add your own voltage supply (either 0-10V or 0-3.3V depending on the jumper status of VOL. DIV). Vary the speed using your own voltage supply.
RS485	Connect to the PC via RS485 communication.

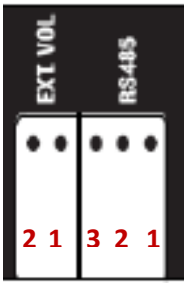
External Voltage

Pin	Function	Description
1	+V	+3.3V or 10V
2	GND	0VDC

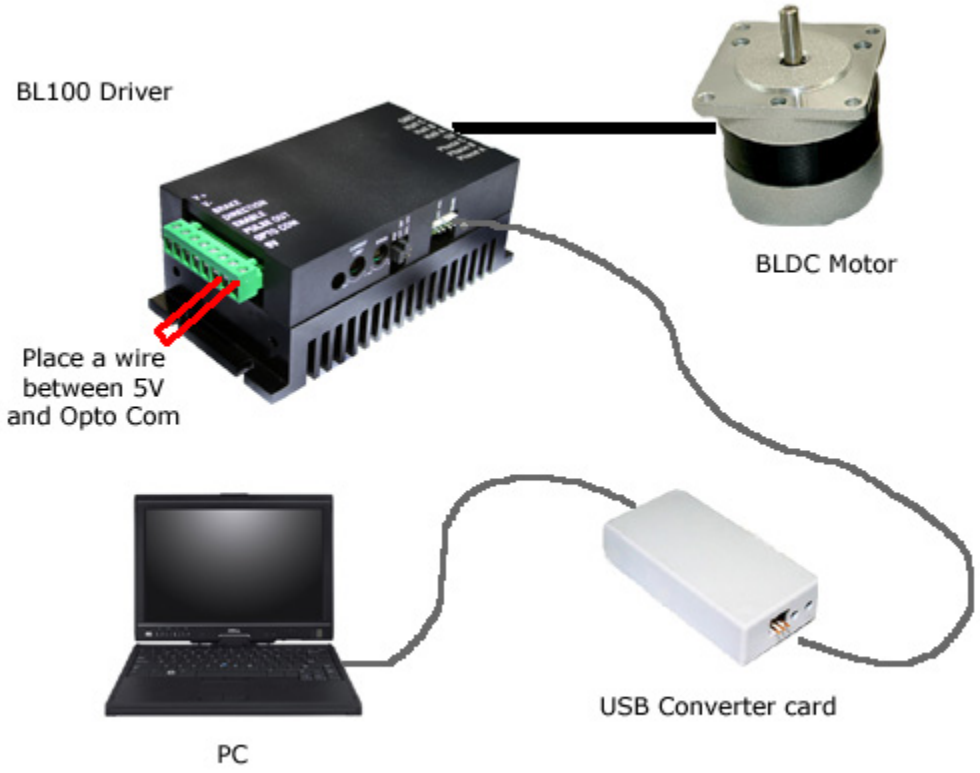
RS485 Communication

Pin	Function	Description
1	RS485A (-VE)	A(-) Communication
2	Ground (GND)	Ground
3	RS485B (+VE)	B(+) Communication

Pin Number Locations



6. CONNECTION SPECIFICATIONS



1. Connect your BLDC motor phases A, B, C and the hall sensor signals A, B,C, 5V, and Ground. Place a wire between 5V and Opto Com to provide 5 volts to the opto supply.
2. Download driver files for the USB Converter card from Lin Engineering, and connect to the BL100 via RS485 cable (3-pin to 3-pin cable)
3. Connect the USB card to a PC via a USB cable
4. Download the GUI to operate the device.
5. Apply +12 to 48VDC where +VDC goes to "+V" and Ground goes to "-V" (WARNING: Do not reverse pins as it will damage the board and possibly the motor)
6. Motor should be able to rotate freely by adjusting the Speed potentiometer.

7. CONFIGURING AND CONTROLLING THE UNIT

USING INTERNAL 5V SUPPLY

The easiest way to get started is to connect the unit as shown in Section 6, using the internal 5V supply. With this method, the brake, direction, and enable inputs should tie to power supply ground for a low signal.

Brake Input

Input	Function	Connection
High	Motor runs	No connection (by default, input is high)
Low	Motor brakes	Tie input to power supply ground

Direction Input

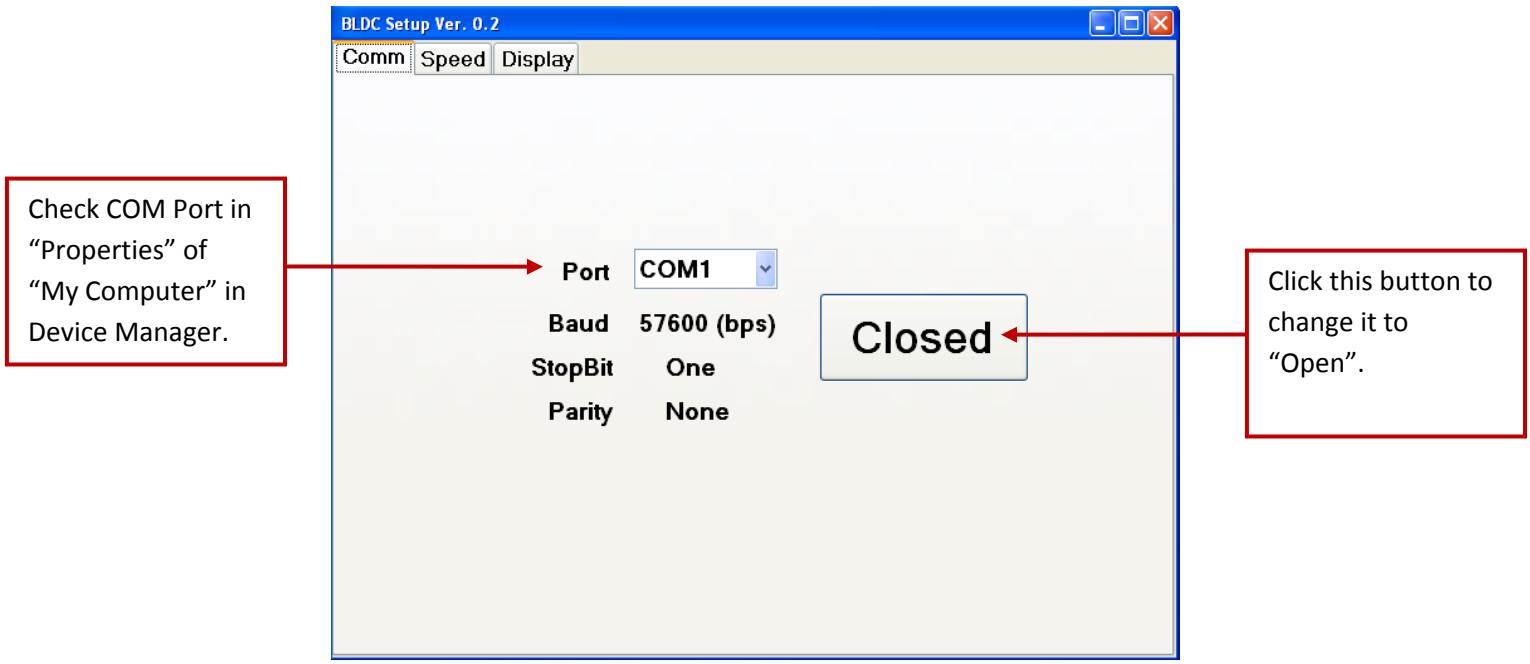
Input	Function	Connection
High	Runs CW	No connection (by default, input is high)
Low	Runs CCW	Tie input to power supply ground

Enable Input

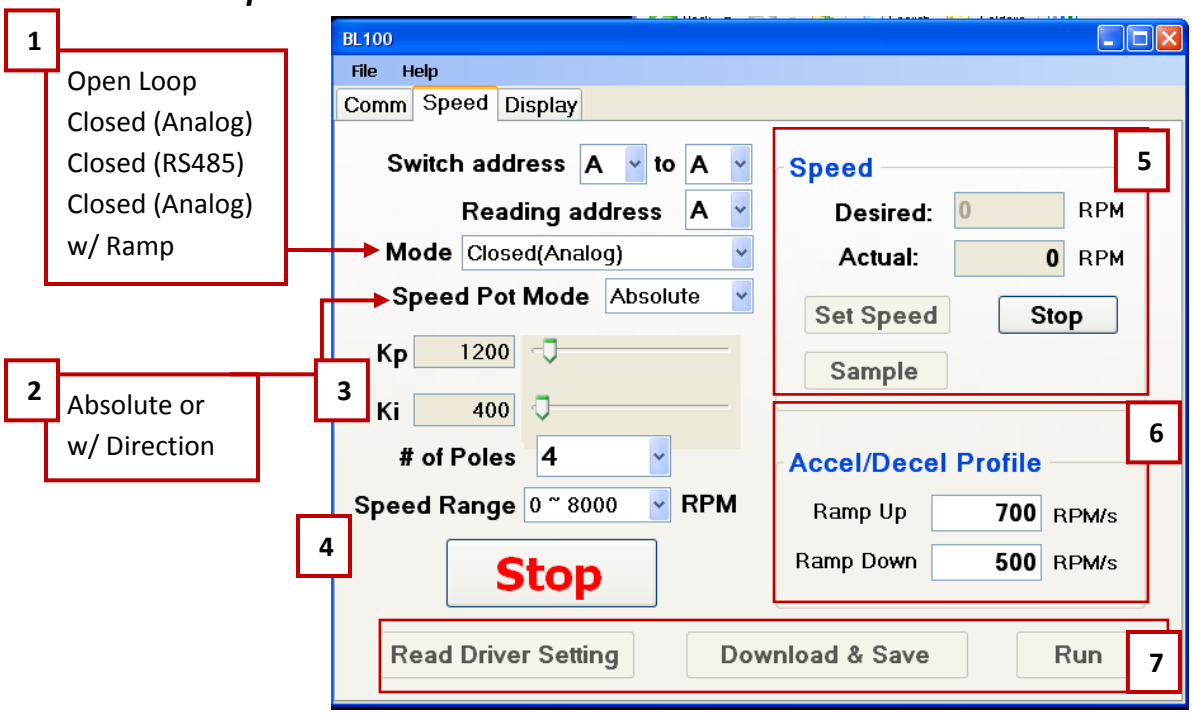
Input	Function	Connection
High	Motor runs	No connection (by default, input is high)
Low	Motor is disabled	Tie input to power supply ground

USING GUI SOFTWARE

Communication



Speed



1. Mode

Function	Description
Open loop	Runs open loop
Closed (Analog)	Driver runs closed loop with hall sensors where speed is controlled via Speed pot (or external voltage).
Closed (RS485)	Driver runs closed loop with hall sensors where speed is controlled via the GUI software or through user's own code. ***Be sure to first turn the speed limit potentiometer all the way to zero in order for this mode to work.***
Closed (Analog) w/ Ramp	Driver runs closed loop with hall sensors where speed is controlled via Speed pot (or external voltage), and acceleration ramp may be defined.

2. Speed Pot Mode

Function	Description
Absolute	The speed potentiometer will rotate motor from 0 to max speed.
w/ Direction	The speed potentiometer will rotate the motor CW or CCW at the extreme settings of the pot. In the middle, motor should stop motion. Max speeds will be half of the Speed Range setting. **Only functions in closed loop modes.**

3. Kp & Ki Values

These values affect the smoothness of motion. Load the motor and try different Kp and Ki values.

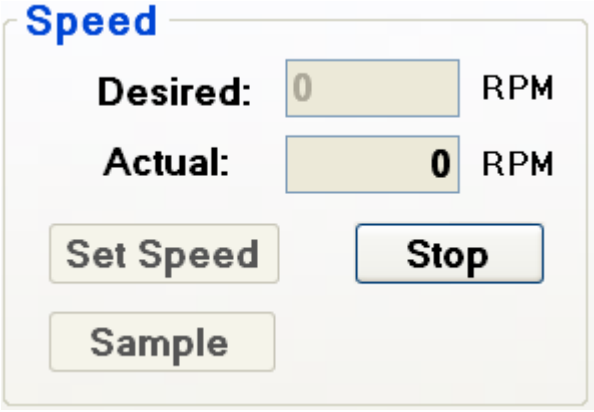
4. **Speed Range**

This sets the overall speed range of the motor. The speed potentiometer "max" value uses this setting. The maximum speed the motor can go is motor dependent.

5. **Speed Section**

When **Mode** is set to "Closed (RS485)" use this section to:

- Set desired speed
- Click "Set Speed" to set desired speed and run the motor
- Click "Sample" to begin sampling data points.
- Sampling may be performed in closed analog modes.

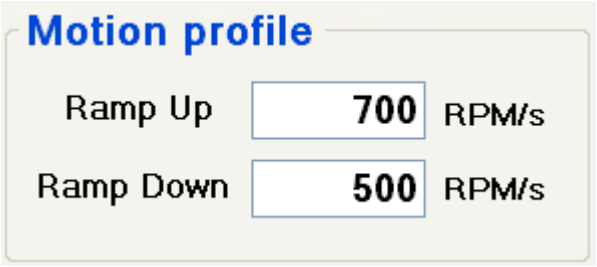


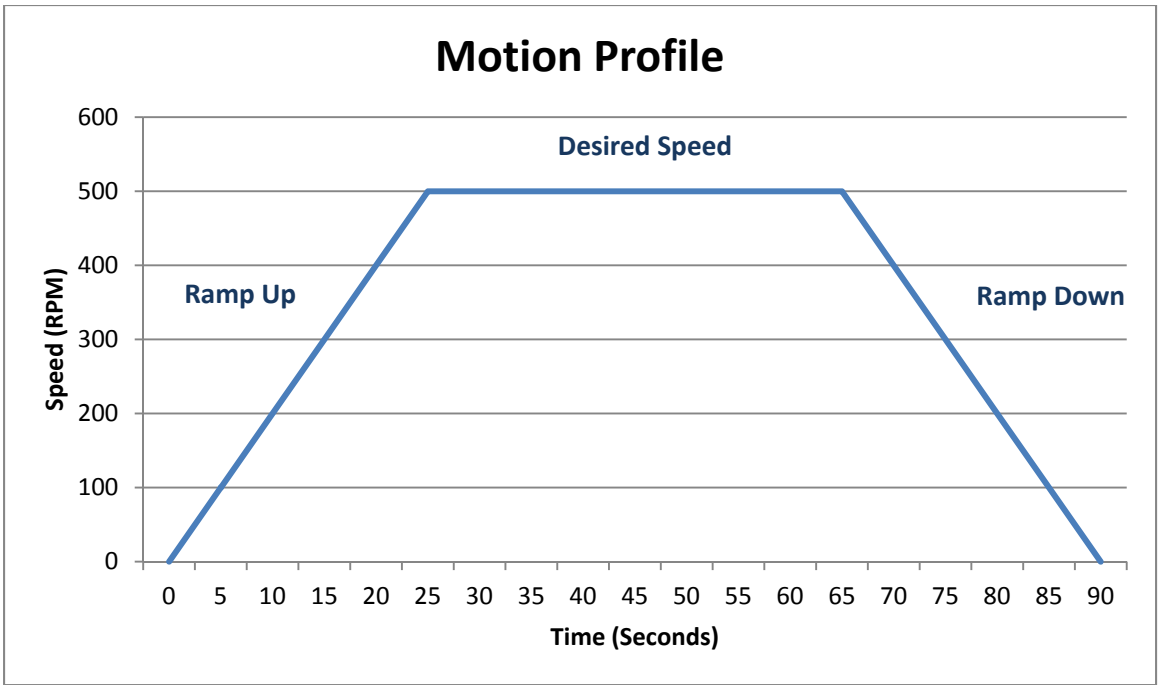
6. **Motion Profile Section**

When **Mode** is set to "Closed (RS485)", or Closed (Analog) w/ Ramp, use this section to:

- Set Ramp up acceleration profile
- Set Ramp down acceleration profile

When user clicks "Set Speed" OR "Run", motor will use ramp up, ramp down, and desired speed as the motion profile.



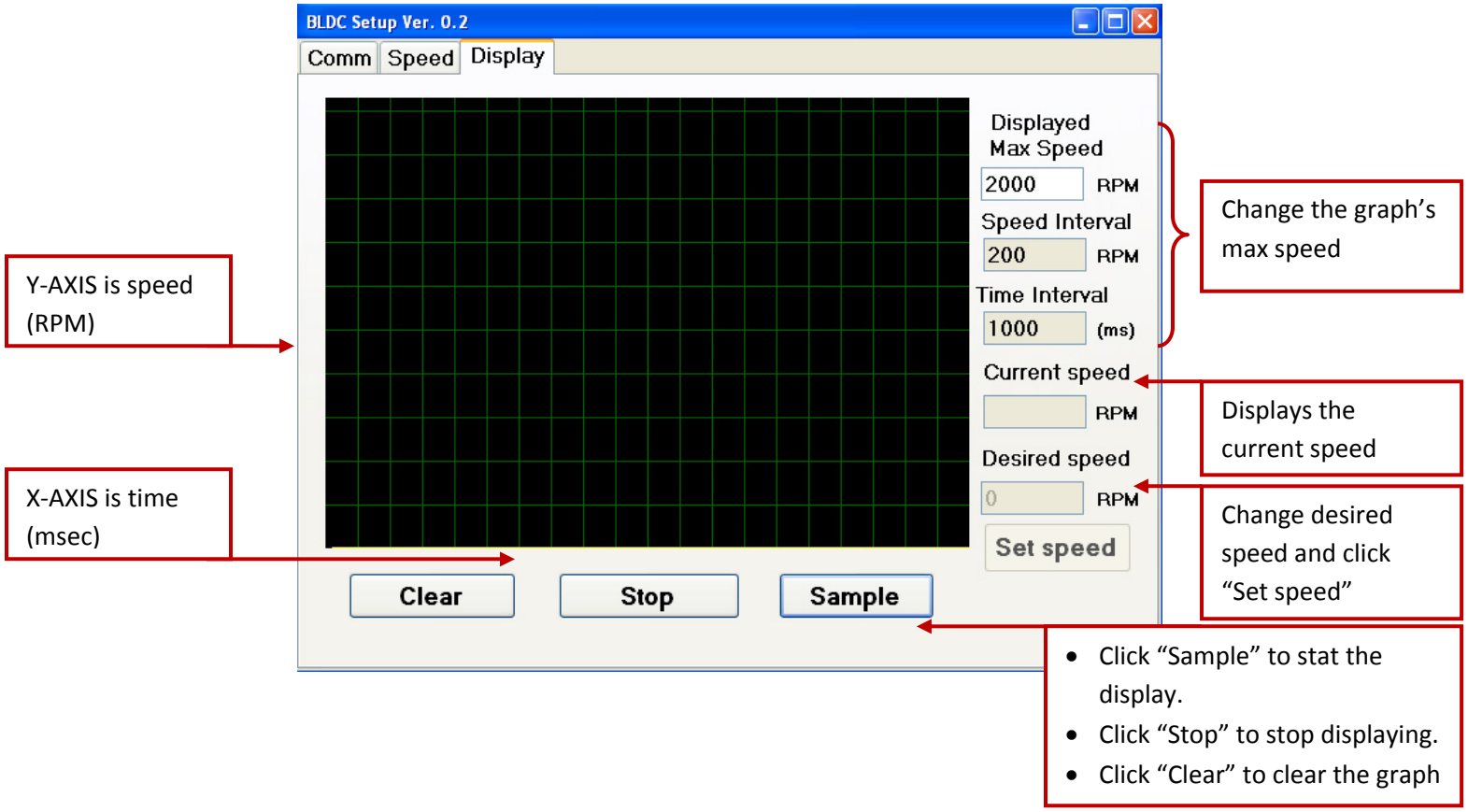


The GUI uses the following parameters to set the motor's motion profile when set to "Closed (RS485)" Mode.

7. **Download, Save, Run**

Read Driver Setting: Read settings currently stored to the board
Download and Save: Download the settings to the driver board and run with current settings.
Run: Run the current motion profile
Stop: Emergency stop button. Motor will stop motion immediately

Display



This simply displays the motor's motion profile during operation. User can also change the desired speed on the fly.