GR-MOT1

GIMSON ROBOTICS

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User Instructions

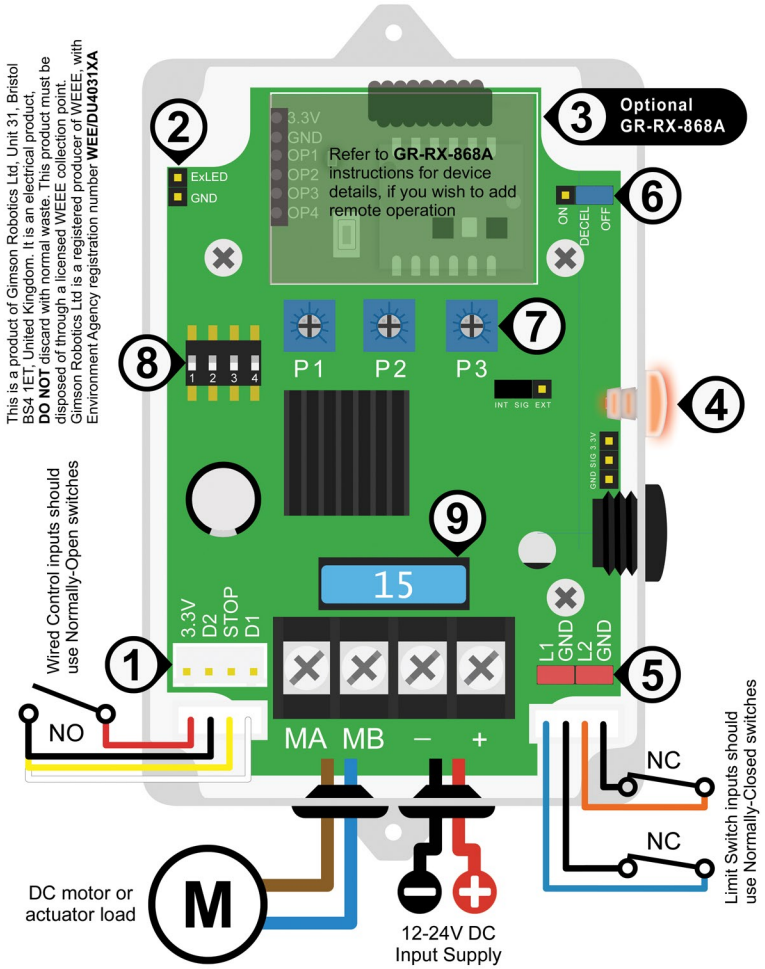
gimsonrobotics.co.uk/GR-MOT1

The **GR-MOT1** is a general purpose and highly adaptable motor control module exclusive to Gimson Robotics. The device allows brushed DC motor loads of between 12 - 24V DC, and of up-to 11A, to be controlled via wired switch inputs (external low-current switches), and/or via an optional RF receiver module (with the addition of part reference **GR-RX-868A**, leading to the combined reference **GR-MOT1-RX**).

The controller features **adjustable directional current limiting** (different limiting values may be set for each control direction D1 and D2), **speed control**, **selectable control modes** (momentary or latching, for both wired and remote inputs), **limit switch inputs**, **control status indications** (LED indication of various controller states), **voltage and temperature protections.**

Every control unit is supplied mounted in an enclosure (100 x 68 x 40mm, ANC160 ABS) with flanged tabs at each end for easy mounting (each with a 3.5mm diameter hole). Four M4 cross-head screws attach the lid to the enclosure base. Dual black grommets at one end of the enclosure allow wires to pass through for connection to a row of four screw terminals for connection to external leads. Towards one side of the terminal block are input terminals indicated with a **+** for positive DC input, **-** for negative or ground input, for connection to a DC supply of between 12 to 24V (10 - 30V absolute limits). To the other end of the terminal block are those labelled **MA** and **MB**, for connection to a DC motor or actuator load. The side of the enclosure features both a hole blanking plug (to allow for access to internal input/output connectors) and also a translucent light guide to the Red status LED on the board.

The controller is primarily designed for low-duty actuator operation due to the lack of an external heat sink. Sustained higher-current loads may trigger the overtemperature response, especially at lower output speed settings (which are less efficient than higher ones).



1 Wired Control

A 4-way connector (2.54mm XH) in this corner of the board allows for wired switch connections via one of two included 4-wire plugs:
Red to 3.3V, **Black** to D2, **Yellow** to STOP and **White** (to D1).
Connecting +3.3V via external switches to any of the other 3 wires activates that input. Inputs here are tolerant of up-to +12V, if using externally supplied switch currents.

2 External LED

This 2-way male 2.54mm header allows for the optional connection of an external LED to flash simultaneously with the STATUS LED. The output is in parallel with the on-board LED, the output is 3.3V and **any load must be less than 5mA**.

3 Optional GR-RX-868A Receiver

Two controller versions are available, one with wired control only (**GR-MOT1**) and one with a **GR-RX-868A** RF receiver module added (**GR-MOT1-RX**). This plugs in via a 6-pin header on the board. **If using the version with remote receiver, you must read the GR-RX-868A module instructions before use**. The controller prioritises wired inputs over remote inputs, though 'STOP' has the same priority for both inputs.

4 Status LED

Status LED sequences:

1 x 300ms blink every 10 seconds = Idle (no input active, output OFF)

3 x repeating blink = High overcurrent event (>20A). Reset STOP or opposite move

Fast flashing = Overtemperature OR voltage error (see explaination section B)

4 x repeating blink = Sensor error (DIP Switch or Limit Switch out of range)

2 x flash (once) = Low current dropout (0A recorded for >1s, so output turned off)

Solid ON = Current Limit Breached OR 'STOP' input currently active

5 Limit Switch Inputs

On-board inputs **L1** and **L2**, are as-standard bridged with **RED** shorting links ('jumpers') between each pin and **GND** (ground) to enable movement in both directions, but these can be replaced (via the included 4-way connector with Black, Orange and Blue wires) with either one or two Normally-Closed (NC) limit switches.

If (via the switches) L1 is disconnected from GND then movement will be prevented in the D1 direction, or if L2 is disconnected movement will be prevented in the D2 direction. The inputs are monitored with an analog (voltage) sensor, **ensure that the combined wire & switch resistance does not exceed 5Ω** (Ohms).

Dual limit example

Single limit example

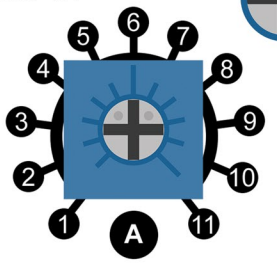
If using a single limit switch, ensure that the other 2 limit terminals are still bridged to enable movement in that direction

6 Regen Deceleration ON/OFF

The controller is able to *either* regeneratively brake (DECEL ON) over 500ms, or hard-brake (DECEL OFF) by shorting the motor terminals together, upon the end of each movement. Move the shorting link (jumper) across the 3 pins here to select either ON or OFF. OFF is the default setting, **ensure that the power supply can handle a regenerative current if turning to ON**. STOP always triggers a hard brake.

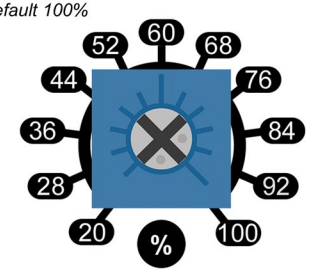
7 P1 - P3 Adjustments

P1: D1 Current Limit (1 to 11A)
P2: D2 Current Limit (1 to 11A)
Defaults ~6A



P1 and P2 adjust the controller current limit thresholds (see box A) whilst P3 adjusts the maximum output speed (PWM percentage) from the controller. Operation should be tested carefully after any change, allow for +/-10% variability from dial position to controller output.

P3: Maximum Speed 20-100%
Default 100%



8 DIP Switch Settings

Default settings (switch away from 'ON'):
SW 1: **Wire Input Momentary** Mode
SW 2: **Remote Momentary** Mode
SW 3: **High Sensitivity Overcurrent** (60ms)
SW 4: **Auto-Reverse upon overcurrent OFF**

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Switch moved towards 'ON':
SW 1: **Wire Input Latching** Mode
SW 2: **Remote Latching** Mode
SW 3: **Low Sensitivity Overcurrent** (120ms)
SW 4: **Auto-Reverse 2s upon overcurrent ON**

A Overcurrent Protections

Via **P1** and **P2** (see box 6) the maximum current that the controller will allow on its output can be adjusted to between 1-11A **for each control direction** (**P1 = direction D1, P2 = direction D2**). The sensitivity of both directions of overcurrent protection is set with SW 3 of the DIP switch (see box 2), toggled between 60ms (high sensitivity) or 120ms (low sensitivity), which is the time for the current to **exceed** the adjusted threshold before a hard stop is applied. **If an overcurrent event has occured, the STATUS LED will illuminate solidly ON until the overcurrent state is reset by an opposite direction movement command or a STOP input. Movement in the same direction again will be prevented until the state is reset.**

Additionally, the controller has a fixed high-overcurrent protection feature, whereby if it sees >20A for >20ms on the output, it will stop the output in the same fashion as a normal overcurrent event, but will instead indicate this state with a triple repeating flash (see box 7).

An optional **Auto-reverse mode** (set via DIP switch SW 4) is intended to **automatically send the output in the opposite direction to an overcurrent event for 2 seconds** if enabled.

B Voltage & Temperature Protections

Voltage: The controller monitors the input voltage and will trigger an under or over-voltage error (with hard stop) if *either*:

1. The supply goes **above 30V, or below 10V**.
2. From the beginning of a movement (output off), the measured **supply voltage increases by more than 20%** (for >10ms) during the cycle (including during deceleration).

Feature #2 is intended to reduce the risk of damage to a power source if it is unable to handle regenerative currents from the controller. If either 1 or 2 triggers, output is stopped and disabled for at least 10 seconds, with fast-flash indication.

Temperature: An on-board temperature sensor is configured to trigger and stop the output at approximately 75°C, and to reset once the temperature falls below 60°C. The overtemperature state uses the same LED indication as the voltage error state.

Technical Information

Part ID	W/o remote module: **GR-MOT1**. With remote module: **GR-MOT1-RX**
Operating Voltage	12 - 24V DC (limits 10-30V)
Output	19.6kHz PWM output, up-to 11A maximum sustained load
Idle Current	Between 9mA (wired only, LED off) to 35mA (LED on, GR-MOT1-RX)
Wired Input Logic	HIGH (ON) 3.3-12V, LOW (OFF) 0-1V
Accelerations	800ms Acceleration, 500ms or 0ms Decel (see Regen mode select)
Ambient Temperature	-10°C ~ 40°C (with on-board overtemperature cut-off above 75°C)
Device Standards	EN 55014-1:2021, EN 55014-2:2021, EN 62368-1:2020, RoHS 2015/863

9 On-Board Fuse

On-board fuse, **15A** ATOF Littelfuse Ref: 0287015 (32V) Automotive standard sized blade fuse.

Due to the overcurrent protections on the output (see box A), this fuse is in place as a secondary failsafe, and is not likely to fail in most applications.

⚠ It is critical that all warnings on this document are adhered to, *Gimson Robotics Ltd* declines liability for damages caused by not following these instructions.

⚠ This equipment is not intended for use by children, and should be mounted or stored safely away from their access.

⚠ As this is a general purpose electronic device (and not a product with a defined end application) it is the user's responsibility to ensure that their usage of it, and any connected power sources and loads, meets all applicable regulatory requirements.

⚠ The device is not designed or suitable for use in safety-critical applications. It should not be used in any system directly affecting the control or operation of passenger vehicles (land, water or air).

⚠ If using the device with the RF module accessory (GR-RX-868A, combined reference GR-MOT1-RX), you must read and follow the seperate instructions provided for that device too, and of any connected remote controls. As explained on its instructions, extra precautions should be taken if the remote receiver module is incorporated.

⚠ Internal components may get very hot during loaded operation, allow the device to cool down before removing the enclosure lid.