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Motor Runner B
User's Guide

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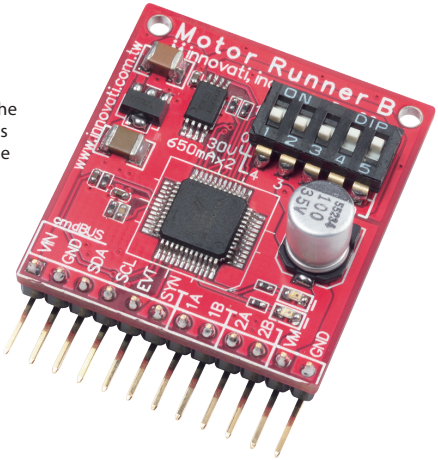
Innovati's Motor Runner B Module can control two DC motors simultaneously through simple commands. It can change the rotation speed of the motor at any time, and obtain the current settings of the motor, including the rotation speed and the direction.



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Errata

We hope that our users will find this user's guide a useful, easy to use and interesting publication, as our efforts to do this have been considerable. Additionally, a substantial amount of effort has been put into this user's guide to ensure accuracy and complete and error free content, however it is almost inevitable that certain errors may have remained undetected. As Innovati will continue to improve the accuracy of its user's guide, any detected errors will be published on its website. If you find any errors in the user's guide please contact us via email service@innovati.com.tw. For the most up-to-date information, please visit our web site at http://www.innovati.com.tw.

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Product Overview

Innovati's Motor Runner B Module can control two DC motors simultaneously through simple commands. It can change the rotation speed of the motor at any time, and obtain the current settings of the motor, including the rotation speed and the direction. Please use "MotorRunnerB" as the module object name in program.

Application

- Forward and backward motor control such as for model car driving. By using speed difference between the two wheels, the turning direction can be controlled.
- Control the motors in different directions so that the object can be moved. Forwards/backwards and left/right, such as in the control of a mechanical arm.
- Can be used to connect to a small fan to control the blowing strength.

Product Features

- The commands for two motor modules can be executed at the same time.
- Provide continuous output current of ±650mA. (Peak current can be ±750mA.)
- The highest allowed input voltage is up to 30V.
- Internal PWM current control at a fixed frequency of 1KHz.
- Provide automatic shut down protection against overheating (165°C).
- Provide protection against current overload.
- Provide crossover-current protection and under voltage lock-out (UVLO).
- With the brake command, it can rapidly stop the motion of the motor.
- Provide 256-step rotation speed variation.
- The commands for two motors to rotate in different directions at different speeds can be executed at the same time.
- By using the commands, it is easy to obtain the current status of the rotation speed or direction of the motor.

Connection

Directly setup the ID switches to the required number, and then connect the cmdBUS™ cable to the corresponding pins on the BASIC Commander® (shown in the following figure). Then the required operations can be performed through the BASIC Commander®. DC power (6~12V) and ground should be connected to VIN and GND pin.

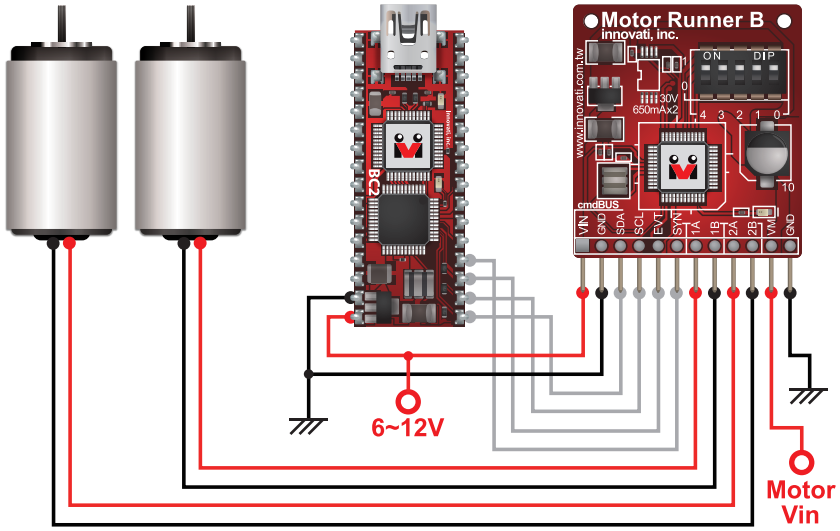

Figure 1: Connect Motor Runner B with BASIC Commander® and Motors

Product Specifications

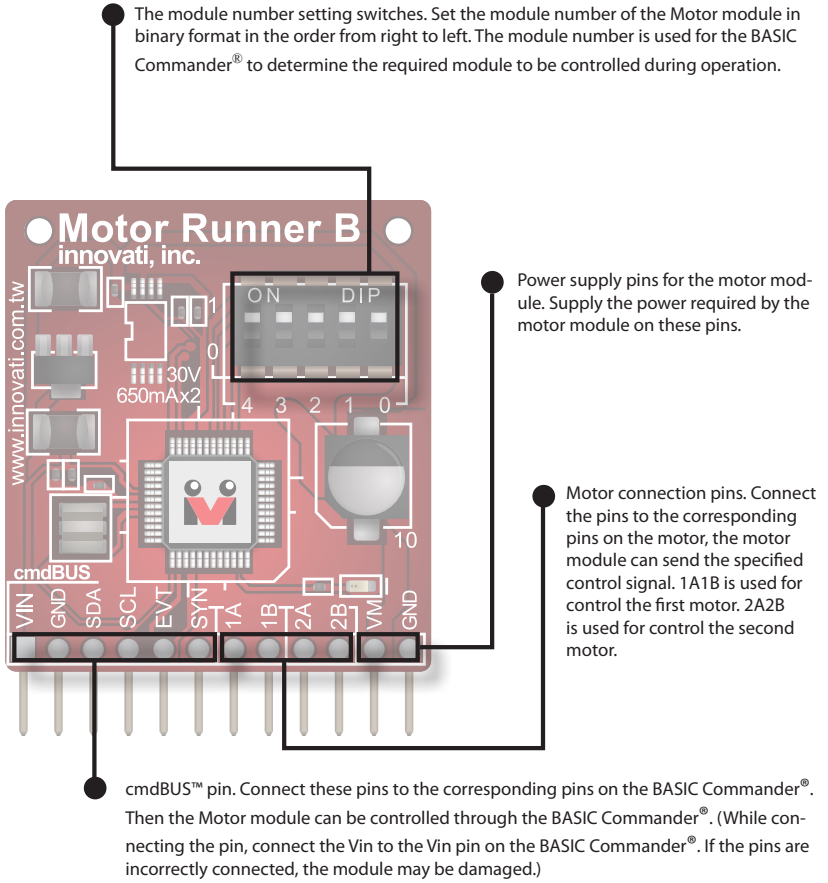

Figure 2: Module And Switch Pin Assignment

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
		V_{DD}	Conditions				
I_{DD}	Operating Current	7.5	No I/O	—	11	—	mA
f_{pwm}	PWM Output frequency	—	—	—	500	—	Hz

Table 1: Operating Current Characteristics (T_A=25°C)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Load Supply Voltage Range	V_M	Operating, I_{OUT} = ±650mA, L= 3mH	5	-	30	V
Output Saturation Voltage	$V_{CE(SAT)}$	Source Driver, I_{OUT} = -400mA	-	1.7	2.0	V
		Source Driver, I_{OUT} = -650mA	-	1.8	2.1	V
		Sink Driver, I_{OUT} = +400mA, V_S = 0.5V	-	0.3	0.5	V
		Sink Driver, I_{OUT} = +650mA, V_S = 0.5V	-	0.7	1.3	V
Motor Supply Current (No Load)	$I_{M (ON)}$	Both bridges ON (forward or reverse)	-	3.0	5.0	mA
	$I_{M (OFF)}$	All INPUTs = 2.4V	-	<1.0	200	μA
Thermal Shutdown Temp.	T_J		-	165	-	°C
Thermal Shutdown Hysteresis.	△T_J		-	15	-	°C

Table 2: Motor Electrical Properties (T_A=25°C, V_M=30V)

Thermal Protection

The thermal protection circuit is used to automatically break the circuit if the internal temperature of the driver IC rises to 165°C. If this happens the motor will stop operating. When the temperature has decreased by 15°C, the protection circuits will automatically conduct the circuit connection and the motor will continue with its previous operations.

Current Limit Protection

Refer to the right figure. When the H-bridge starts to output, the current will increase as the motor speed starts to increase. When the current value exceeds I_{TRIP} (as is in the Enlargement A in the lower right figure), the H-bridge output stops. The current transmission will continue after the next clock of the internal oscillator is generated (as the INTERNAL OSCILLATOR shown in the lower right figure). In this way, the operation is repeated but limited to within the range shown in the figure.

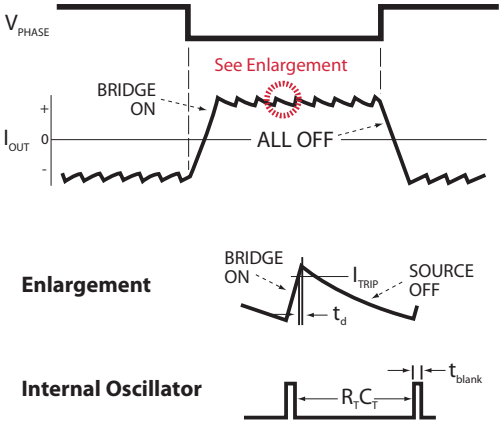

Figure 3: Thermal Protection

Precautions For Operations

The Motor Module provides two sets of connection pins for two separate motors. Ensure that the connected motor is a DC motor.

At 25℃ ambient temperature, the power dissipation is 1.4W.

Absolute Maximum Ratings:

Operating Temperature : 0℃~70℃ (excluding the motors)
Storage Temperature : -50℃~125℃

Commands

The following table lists all the unique commands provided with the Motor Runner B Module. Note that essential words in the commands will be written in **bold** type and ***italics*** in bold type. The bold type word must be written exactly as shown, whereas the italic bold type words must be replaced with the user values. Note that the innoBASIC™ language is case-insensitive.

Command Format	Description
Motor Acceleration Commands	
BackwardA(*Duty*)	Command A, B or both A and B is used for controlling Motor A, B or A&B to rotate backwards, and the rotation speed of the motor is set by the byte value ***Duty***, ***DutyA*** and ***DutyB*** ranging from 0 to 255. A higher duty value
BackwardAB(*DutyA*, *DutyB*)	
BackwardB(*Duty*)	
BackwardDual(*Duty*)	
ForwardA(*Duty*)	Command A, B or both A and B is used for controlling Motor A, B or A&B to rotate forwards, and the rotation speed of the motor is set by the byte value ***Duty***, ***DutyA*** and ***DutyB*** ranging from 0 to 255. A higher duty value
ForwardAB(*DutyA*, *CycleB*)	
ForwardB(*Duty*)	
ForwardDual(*Duty*)	
Motor Stop Commands	
BrakeA()	Rapidly stop the Motor Module A, B or both A and B operations.
BrakeB()	
BrakeDual()	
StopA()	Stop Motor Module A, B or both A and B operations.
StopB()	
StopDual()	
Setting and Status Reading Commands	
GetDCA(*Duty*)	Get the duty setting for rotation speed of Motor A or B and store it in the byte variable ***Duty***. A higher value represents a higher rotation speed setting.
GetDCB(*Duty*)	
GetDirA(*Dir*)	Get the rotation direction setting of Motor A or B and store it in the byte variable ***Dir***. Value 0 represents forward, and value 1 represents backward.
GetDirB(*Dir*)	
SetDCA(*Duty*)	Set the duty for rotation speed of Motor A, B or both ***A*** and ***B*** specified by the byte value ***DutyA***, ***DutyB*** or Duty ranging from 0 to 255. A higher value represents a higher rotation speed setting.
SetDCAB(*DutyA*, *DutyB*)	
SetDCB(*Duty*)	
SetDCDual(*Duty*)	
SetDirA(*Dir*)	Set the rotation direction of Motor A, B or both ***A*** and ***B*** specified by the byte value ***Dir***, ***DirA*** and ***DirB***. Value 0 represents forward, and value 1 represents backward.
SetDirAB(*DirA*, *DirB*)	
SetDirB(*Dir*)	
SetDirDual(*Dir*)	

Table 3: Command Table

Example Program

```
Peripheral myMotor As MotorRunnerB @ 0          'Set module number to 0

Sub Main()
    Debug CLS
    MyMotor.ForwardDual(200)                    'Two motors to rotate forwards
    Pause 3000
    MyMotor.StopDual()                          'Stop the two motors
    Pause 3000
    MyMotor.BackwardDual(200)                   'Two motors to rotate backwards
    Pause 3000
    MyMotor.SetDirDual(0)    'Set to the opposite direction, i.e. forwards
    Pause 3000
    MyMotor.SetDCDual(150)   'Change the speed of the two motors to 150
    Pause 3000
    MyMotor.BrakeDual()      'Rapidly stop the two motors
    Pause 3000
End Sub
```

Appendix

Module ID Setting Table

DIP Switch	ID	DIP Switch	ID	DIP Switch	ID	DIP Switch	ID
	0		8		16		24
	1		9		17		25
	2		10		18		26
	3		11		19		27
	4		12		20		28
	5		13		21		29
	6		14		22		30
	7		15		23		31

Table 4: Module ID Setting Table