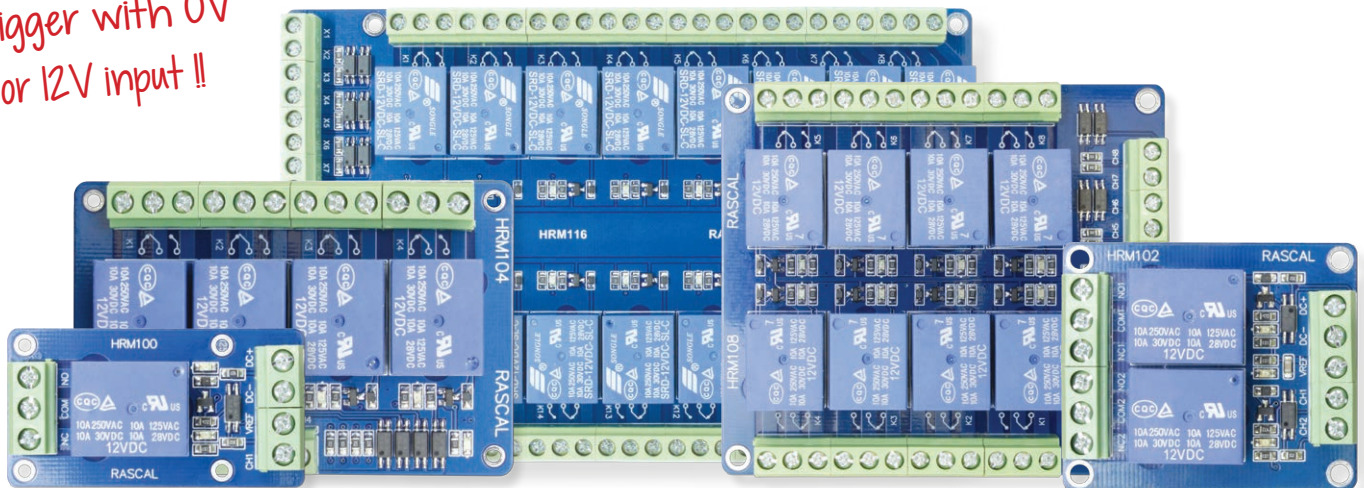


Rascal™ Handy OPTO Isolating Relays

Trigger with 0V
or 12V input !!



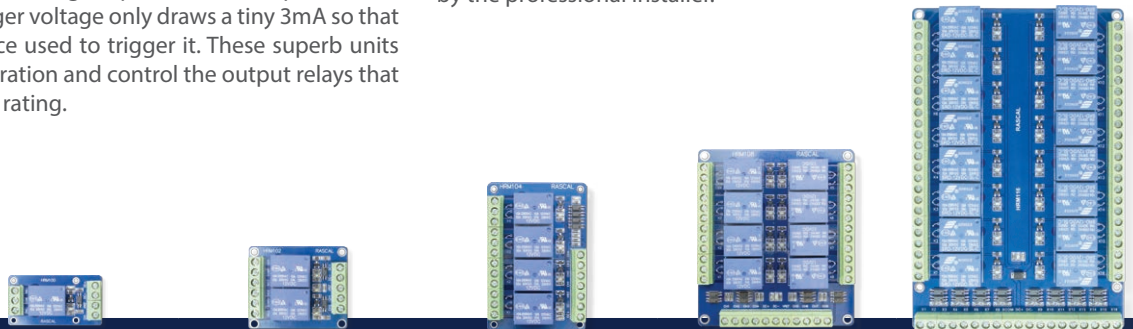
A superb range of handy relay modules for the professional engineer.

The Rascal Handy Relays boast “opto isolation” of input to output for added safety and to ensure circuits are truly electrically isolated.

For maximum versatility you can select the Rascal Relays to either be triggered by a low input (0V) or a high input (12V). The opto isolator input also means that the trigger voltage only draws a tiny 3mA so that it does not overload the device used to trigger it. These superb units are industry standard 12V operation and control the output relays that have a maximum 240VAC 10A rating.

There are 1, 2, 4, 8 and 16 way models so that you can pick the correct Rascal relay to suit your application for a neat and professional job.

Typical uses are for linking and controlling independent systems together such as CCTV, burglar or fire alarms, access control, gate automation, lighting and HVAC but they can be used in multiple ways by the professional installer.



| Comparison | HRM100 | HRM102 | HRM104 | HRM108 | HRM116 |
|-----------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Relays | 1 x N.O./N.C | 2 x N.O./N.C | 4 x N.O./N.C | 8 x N.O./N.C | 16 x N.O./N.C |
| Input Voltage | 12V DC | 12V DC | 12V DC | 12V DC | 12V DC |
| Trigger Voltage | Selectable 0V or 12V | Selectable 0V or 12V | Selectable 0V or 12V | Selectable 0V or 12V | Selectable 0V or 12V |
| Output Relay(s) | 240V AC 10A | 240V AC 10A | 240V AC 10A | 240V AC 10A | 240V AC 10A |
| Dimensions | 50 x 27mm | 50 x 42mm | 75 x 50mm | 90 x 79mm | 152 x 100mm |

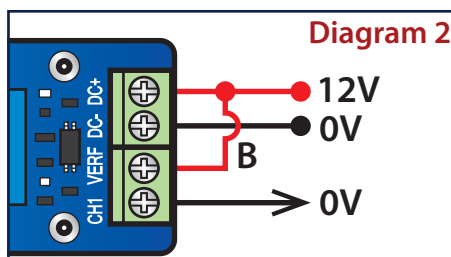
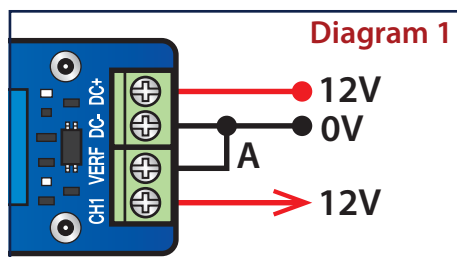
Selecting a Positive or Negative Trigger

You can trigger the Rascal Opto isolators with either a positive or negative trigger input.

To trigger using a positive input (12V) simply connect VREF to 0V as in diagram 1 with link A.

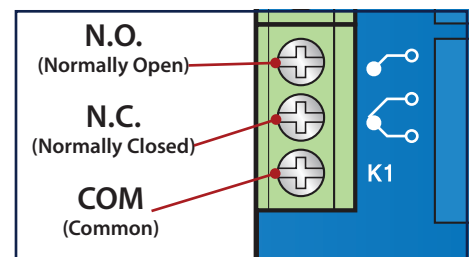
To trigger with a negative input (0V) connect VREF to 12V as in diagram 2 with Link B.

**Note - on the 16CH model HRM116 VREF is labelled XCOM. On Multi relay models if you select a positive or negative trigger it applies to all the individual relays on the board. You can't mix positive and negative inputs on the same PCB.*

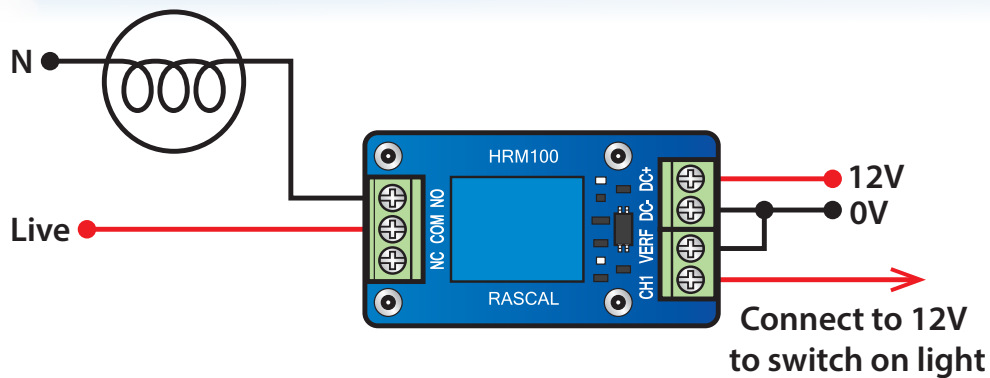


Identifying Terminals

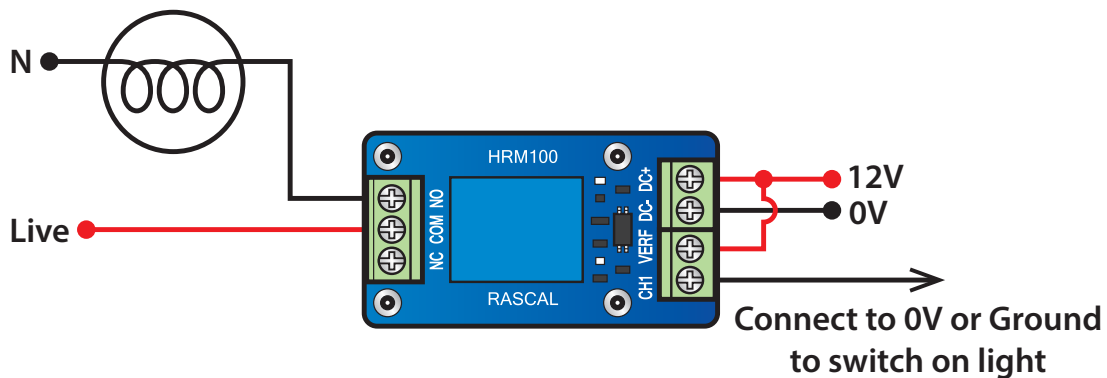
On the 4, 8 and 16 relay models the N.C. & N.O. terminals are marked with symbols. Below is an example as to how relay 1 would be marked and what the symbols mean. The trigger for each relay is labelled as CH e.g. CH1 for relay 1 or X e.g. X1



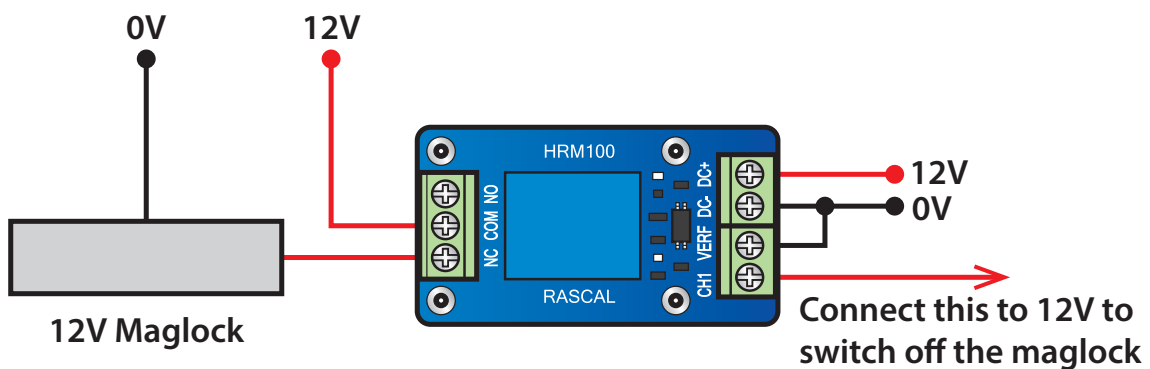
Application Example 1 - Lighting a Bulb when 12V Power is Applied



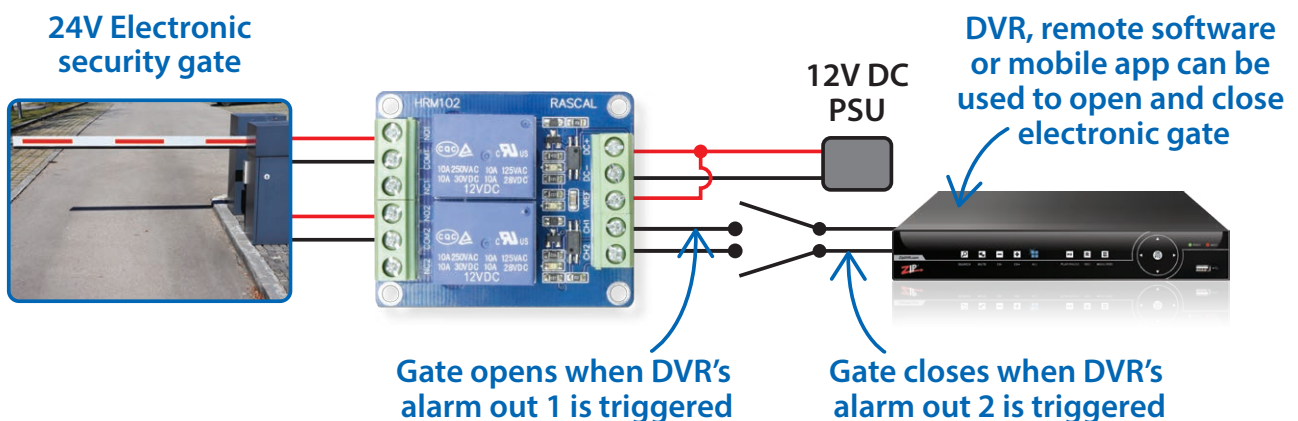
Application Example 2 - Lighting a Bulb when 12V Power is Removed



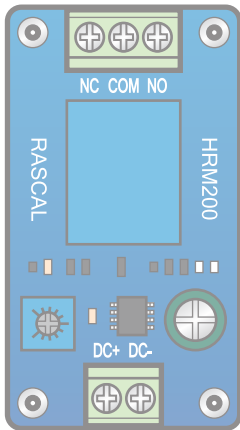
Application Example 3 - Releasing a Maglock when 12V Power is Applied



Application Example 4 - Opening and Closing a Security Barrier



Rascal™ Handy Delay On-Off Relay



Actual Size !
(30mm x 54mm)



Adjustable Delay →



This mini relay module can either open or close contacts at a 0-20s adjustable delay when you apply 12V to it. It's so tiny at 30*54mm it can even be housed in other equipment.

Providing a perfect solution to delay the switch on or switch off of lights, door locks, bells, buzzers and so on, it's an absolute bargain for any professional installer's toolbox.

If you need a delay on or off longer than 20 seconds then look at our 10 function relay (HRM250 below) with a delay of up to 10 days!

| Feature | HRM200 |
|---------------|----------------|
| Relays | 1 x N.O/N.C |
| Input Voltage | 12V DC |
| Output Relay | 240V AC 10A |
| Timers | 1 (Built-in) |
| Delay | 0 - 20 Seconds |
| Dimensions | 30 x 54mm |

Simple Operation

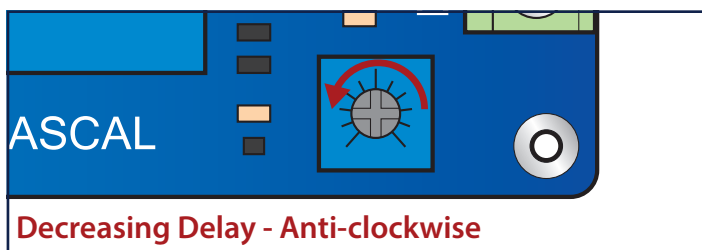
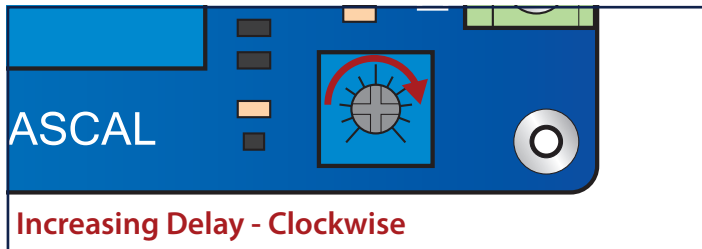
When you apply 12V to its input terminals it starts a timer going, when the timer is finished the relay energises. With the relay having both normally open contacts and normally closed contacts you could either make or break a circuit when the timer expires.

To adjust the timer simply turn the blue timer adjuster clockwise to increase the time and anticlockwise to decrease the time. The maximum time is around 20 seconds and the minimum is 0s

When you are turning the blue adjuster take care to use a small precision screwdriver for the task as it is only a PCB mounted potentiometer and it is easy to damage it with "brute force" and physical damage to this is not covered under warranty.

Because you start the timer by applying power to the HRM200 you have to keep power to the PCB or the timer can not run, therefore this simple timer can not be triggered by just a short pulse.

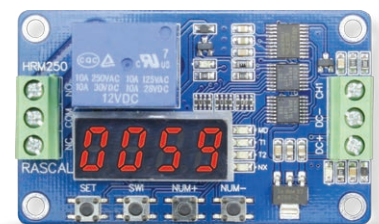
If you wish to trigger a delay with a short pulse say from a push button you will need a timer that has a "trigger input", if that's your requirement have a look at HRM250 (below) as this can be triggered via "power on" or "trigger in".



Also Available

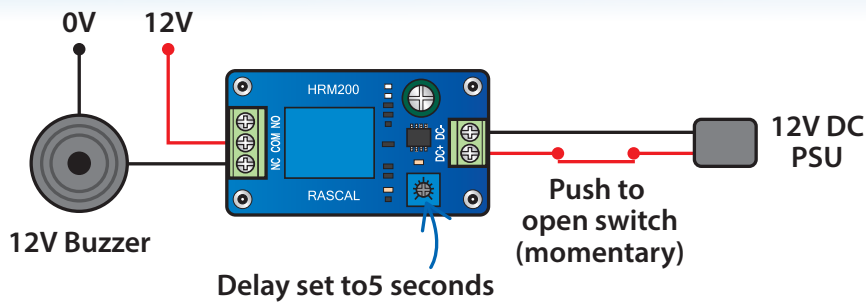
The Rascal handy 10 function relay has not 1 but 2 timers to switch relay contacts on and off in a number of ways - for up to 10 days!

- ✓ Adjustable Delay - 0.005s To 270hrs
- ✓ 10 Delay, Loop & Continuous Functions
- ✓ 240V AC 10A Relay
- ✓ 2x Built-in Timers
- ✓ Built-in LED Display
- ✓ Saves Settings Even When Power Removed

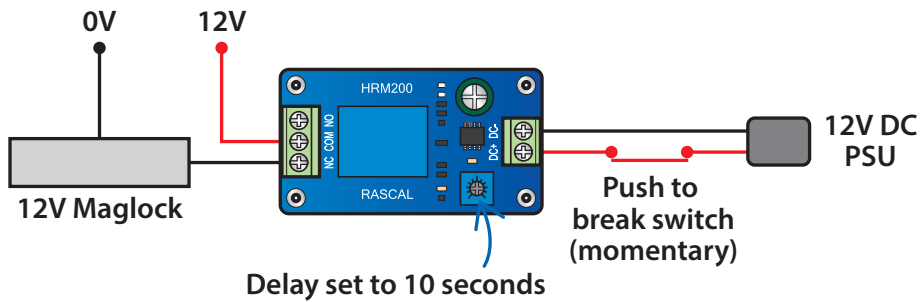


HRM250

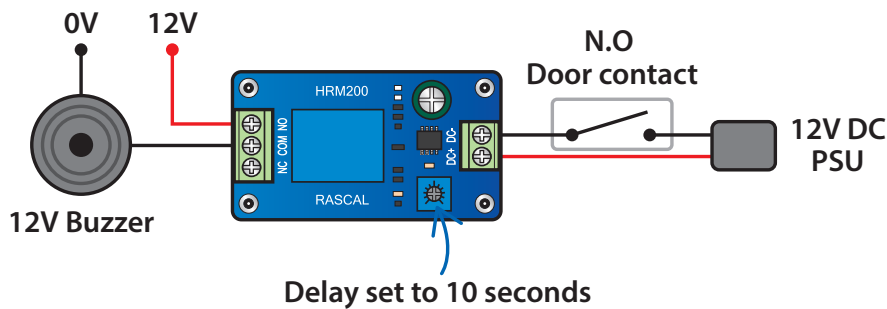
Application Example 1 - Buzzer Sounds for 5s when Button is Pressed



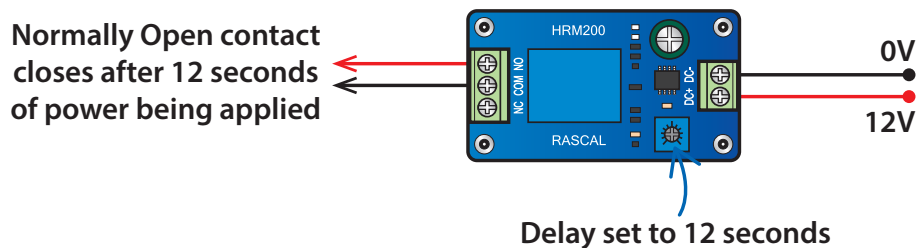
Application Example 2 - Maglock is Released for 12s when Button is Pressed



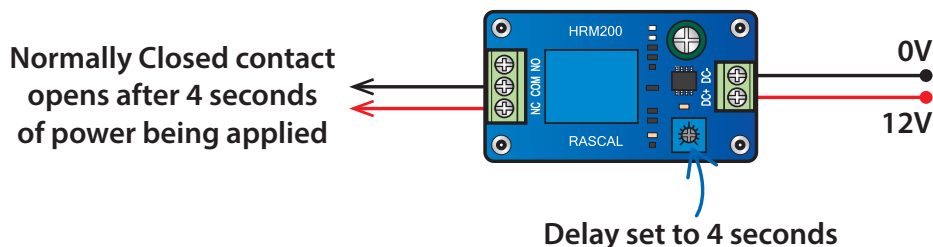
Application Example 3 - Buzzer Sounds for 10s when Door is Opened



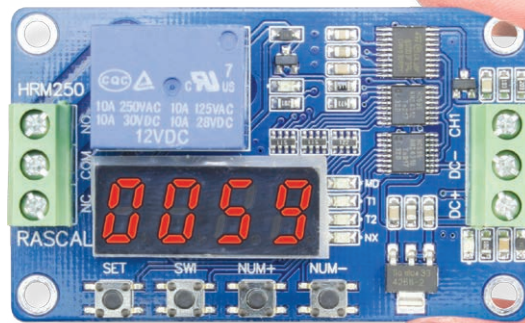
Application Example 4 - Contacts Close After 12s of Power Being Applied



Application Example 5 - Contacts Open After 4s of Power Being Applied



Rascal™ Handy Relay



HRM250

This versatile relay module has two independent timers built into it so it can be set up to switch the relay contacts on and off in a variety of ways. With each timer being adjustable for 0.005s up to 270hrs (over 10 days!) it's a really versatile little rascal!!

It has a total of 18 main functions which include the useful delay on and delay off functions, useful for sounders, gates, doors and lights.

A built in LED display allows the user to set up the device to the function they require.

The HRM250 has a non-volatile memory so once set up if the power is removed it will remember its settings.

18 Functions

The HRM250 really has 10 main functions but 8 of these 10 functions can be initiated in two different ways. You can either start the function by applying power to the HRM250 or start the function by applying a trigger voltage to it with power permanently applied to the HRM250. Therefore in total it has $10+8=18$ functions.

The first 1-8 functions are triggered when you actually Power up the device, i.e. apply 12V to it. These are 8 different timing functions.

Functions 9 and 10 are "toggle" and "mimic" functions where the relay toggles or mimics a trigger input to it. For functions 9 & 10 the HRM250 needs power permanently applied to it.

Functions 11-18 are really the same as the first 8 timer functions but these are initiated by a trigger input whilst the HRM250 has permanent power to it.

When using a trigger input it needs to be a "positive trigger" this means the trigger signal is between 8 and 12V usually it will be at the supply voltage of 12V.

1. **Power up** - Delay switch on
2. **Power up** - Delay switch off
3. **Power up** - Delay switch on followed by delay switch off
4. **Power up** - Delay switch off followed by delay switch on
5. **Power up** - Continuous loop starting with relay off then on
6. **Power up** - Continuous loop starting with relay on then off
7. **Power up** - Set number of "N" loops starting with relay off then on
8. **Power up** - Set number of "N" loops starting with relay on then off
9. **Toggle mode** - Trigger input toggles output
10. **Mimic mode** - Relay energizes whenever input trigger present
11. **Positive trigger** - Delay switch on
12. **Positive trigger** - Delay switch off
13. **Positive trigger** - Delay switch on followed by delay switch off
14. **Positive trigger** - Delay switch off followed by delay switch on
15. **Positive trigger** - Continuous loop starting with relay off then on
16. **Positive trigger** - Continuous loop starting with relay on then off
17. **Positive trigger** - Set number of "N" loops starting with relay off then on
18. **Positive trigger** - Set number of "N" loops starting with relay on then off

All parameters are permanently saved once set. The functions and parameters can be reviewed or changed at a later time.

Useful Notes

- ✓ Functions 01 to 08 start automatically when the power is turned on
- ✓ Functions 09 to 18 require a trigger to start
- ✓ 20ms is required via the CH1 input
- ✓ Timer1 can be adjustable between 0.005 seconds and 270 hours
- ✓ Timer2 can be adjustable between 0.005 seconds and 270 hours
- ✓ CH1 = Pulse input 1
- ✓ N = Repeat count

Summary of Functions

| Function | Relay at Power on | When T1=0 | When T2=0 | "N" Value | High Pulse on CH1 (Also restarts all functions) | Notes |
|----------|-------------------|-----------|-----------|-----------------|--|-------------------|
| 01 | OFF | ON | | Time Multiplier | | |
| 02 | ON | OFF | | Time Multiplier | | |
| 03 | OFF | ON | OFF | Time Multiplier | | |
| 04 | ON | OFF | ON | Time Multiplier | | |
| 05 | OFF | ON | OFF | Time Multiplier | | Repeats when done |
| 06 | ON | OFF | ON | Time Multiplier | | Repeats when done |
| 07 | OFF | ON | OFF | Loop # | | |
| 08 | ON | OFF | ON | Loop # | | |
| 09 | OFF | | | | Toggles - ON / OFF via pulse on CH1 | |
| 10 | OFF | OFF | | | Mimics | |
| 11 | OFF | ON | | | Starts Timer1 | |
| 12 | OFF | OFF | | | Relay On - Start Timer1 | |
| 13 | OFF | ON | OFF | | Starts Timer1 | |
| 14 | OFF | OFF | ON | | Relay On - Start Timer1 | |
| 15 | OFF | ON | OFF | | Starts Timer1 | Repeats when done |
| 16 | OFF | OFF | ON | | Relay On - Start Timer1 | Repeats when done |
| 17 | OFF | OFF | ON | Loop # | Starts Timer1 | |
| 18 | OFF | OFF | ON | Loop # | Relay On - Start Timer1 | |

Detailed Functions

Function 01 - Delay on after power up

- Power on starts Timer1 and relay will be off
- When Timer1 = 0s the relay will turn on
- Function then stops
- Timer1 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 02 - Delay off after power up

- Power on turns on the relay and starts Timer1
- When Timer1 = 0s the relay will turn off
- Function then stops
- Timer1 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 03 - Delay On - then switch off after second adjustable delay

- Power on starts Timer1 and relay will be off
- When Timer1 = 0s the relay will turn on
- Timer2 Starts
- When Timer2 = 0s the relay will turn off
- Function then stops
- Both timers can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 04 - Delay Off - then switch on after second adjustable delay

- Power on turns on the relay and starts Timer1
- When Timer1 = 0s the relay will turn off
- Timer2 Starts
- When Timer2 = 0s the relay will turn on
- Function then stops
- Both timers can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 05 - Power on Continuous Loop Timing - Mode A

- Power on starts Timer1 and relay will be off
- When Timer1 = 0s the relay will turn on
- Timer2 Starts
- When Timer2 = 0s the relay will turn off
- The function is then repeated
- Both timers can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will reset and restart the function

Function 06 – Power on Continuous Timing - Mode B

- Power on turns on the relay and starts Timer1
- When Timer1 = 0s the relay will be off
- Timer2 Starts
- When Timer2 = 0s the relay will turn on
- The function is then repeated
- Both timers can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will reset and restart the function

Function 07 – Power on - Set number of Loops Timing - Mode A

- Power on starts Timer1 and relay will be off
- When Timer1 = 0s the relay will turn on
- Timer2 Starts
- When Timer2 = 0s the relay will turn off
- Repeat the function "N" times
- Both timers can be adjustable between 0.005 seconds and 270 hours
- "N" can be set to between 1 and 9999 loops
- High pulse on CH1 will reset and restart the function

Function 08 – Power on - Set number of Loops Timing - Mode B

- Power on turns on the relay and starts Timer1
- When Timer1 = 0s the relay will be off
- Timer2 Starts
- When Timer2 = 0s the relay will turn on
- Repeat the function "N" times
- Both timers can be adjustable between 0.005 seconds and 270 hours
- "N" can be set to between 1 and 9999 loops
- High pulse on CH1 will reset and restart the function

Function 09 - Toggle Mode

- At power ON, relay will be off
- High pulse on CH1 will turn on the relay
- High pulse on CH1 will turn off the relay

Function 10 - Mimic Mode

- At power ON relay will be off
- High pulse on CH1 will turn on the relay
- Remove the High pulse on CH1, then when Timer1=0s the relay will turn off

Function 11 – Positive Trigger starts Delay On

- At power on relay will be off
- High pulse on CH1 will start Timer1 (High pulse is 3-12V)
- When Timer1 = 0s the relay will turn on
- High pulse on CH1 will restart function
- Timer1 can be adjustable between 0.005 seconds and 270 hours

Function 12 - Positive Trigger starts Delay OFF

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- Timer1 will start
- When Timer1 = 0s the relay will turn off
- High pulse on CH1 will reset and restart the function
- Timer1 can be adjustable between 0.005 seconds and 270 hours

Function 13 - Positive Trigger starts delay On - then switch off after second adjustable delay

- Power on starts Timer1 and relay will be off
- High pulse on CH1 will start Timer1
- When Timer1 = 0s the relay will turn on
- Timer2 now starts
- When Timer2 = 0s the relay will turn off

- High pulse on CH1 will reset and restart the function
- Both timers can be adjustable between 0.005 seconds and 270 hours

Function 14 – Positive Trigger starts delay Off - then switch on after second adjustable delay

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- Timer1 will start
- When Timer1 = 0s the relay will turn off
- Timer2 now Starts
- When Timer2 = 0s the relay will turn on
- High pulse on CH1 will reset and restart the function
- Both timers can be adjustable between 0.005 seconds and 270 hours

Function 15 – Positive Trigger starts Continuous Loop Timing - Mode A

- Power on relay will be off
- High pulse on CH1 will start Timer1
- When Timer1 = 0s the relay will turn on
- Timer2 now Starts
- When Timer2 = 0s the relay will turn off
- High pulse on CH1 will reset and restart the function
- The loop now repeats.
- Timer1 can be adjustable between 0.005 seconds and 270 hours

Function 16 - Positive Trigger starts Continuous Loop Timing - Mode B

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- Timer1 will now start
- When Timer1 = 0s the relay will turn off
- Timer2 now Starts
- When Timer2 = 0s the relay will turn on
- High pulse on CH1 will reset and restart the function
- The loop now repeats
- Timer1 can be adjustable between 0.005 seconds and 270 hours

Function 17 - Positive Trigger starts Set number of Loops Timing - Mode A

- At power on relay will be off
- High pulse on CH1 will start Timer1
- When Timer1 = 0s the relay will turn on
- Timer2 now starts
- When Timer2 = 0s the relay will turn off
- The loop repeats "N" times
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- N can be between 1 and 9999 loops
- High pulse on CH1 will reset and restart the function

Function 18 - Positive Trigger starts Set number of Loops Timing - Mode B

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- Timer1 will start
- When Timer1 = 0s the relay will turn off
- Timer2 now Starts
- When Timer2 = 0s the relay will turn on
- The function repeats "N" times
- Both timers can be adjustable between 0.005 seconds and 270 hours
- N can be between 1 and 9999 loops
- High pulse on CH1 will reset and restart the function

Operating Instructions

The operating mode and timing parameters can be set with the four buttons and the LCD display. All parameters will be automatically saved when they are set.

Buttons

There are 4 buttons:

SET
SWI
NUM +
NUM -

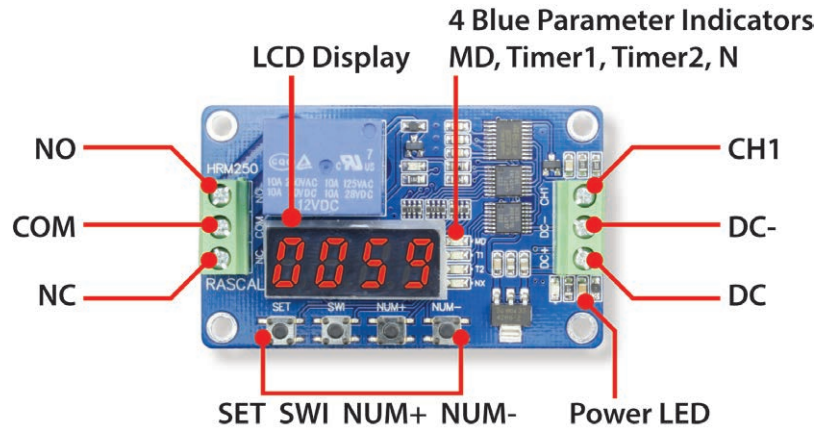
They all have short and long presses:

Short presses

are less than 1 second long

Long presses

are more than 1 second long



Operating modes

- Normal Operation
- Parameter view
- Parameter setting

LED display

- Used to set or view the timing parameters

LED indicators

4 blue parameter indicators:

MD: Active program function (01 to 18)
On = Timing stopped
Flashing = Timing function has completed

Timer1: Timer one - 1 to 9999 seconds
On = Displays current Timer1 value
Flashing = Timer1 is counting

Timer2: Timer two - 1 to 9999 seconds
On = Displays current Timer2 value
Flashing = Timer2 is counting

N: Varies for each function. See N Function opposite
On = Displays current N value

1 red power on indicator

1 blue relay active indicator

N Functions

Functions 01-06

- LED display indicates the "time multiplier" for Timer1 and Timer2
- Time base varies from 00 to 99
- 00 = .005 second time multiplier (for very fine timing)
- 01 = 1 second time multiplier
- 99 = 99 second time multiplier
- First two LED digits indicate time multiplier for Timer1
- Second two LED digits indicate time multiplier for Timer2

Example 1

- N = 0101 Timer1=0015 Timer2=0060
- Both Timers each have a 01 second time multiplier
- Timer1 will count 15 seconds
 $01 * 15 = 15$ seconds
- Timer2 will count 60 seconds
 $01 * 60 = 60$ seconds

Example 2

- N = 0050 Timer1=0015 Timer2=0060
- Timer1 has a .005 second time multiplier
- Timer2 has a 50 second time multiplier
- Timer1 will count 0.075 seconds
 $.005 * 15 = 0.075$ seconds
- Timer2 will count 3000 seconds
 $50 * 60 = 3000$ seconds

Example 3

- N = 9999 Timer1=9999 Timer2=9999
- Both Timers each have a 99 second time multiplier
- Both Timers will count 989,901 seconds which is 275 hrs app
 $99 * 9999 = 989,901$ seconds

Functions 07, 08

- LED display indicates "number of LOOPS"
- In these functions the "time multiplier" is set to 01 or 1 second per Timer1 and Timer2 unit
- The number of LOOPS can range from 1 to 9999

Operating Mode

When turned on

- The LED display shows the current function in operation
- When the function is complete, the LED display shows the current function number
- Such as: "-- 0 1" for function 01

SET Button

- A short press on the SET button enters into the power saver mode
- The LED display goes blank
- The program continues to work normally
- Press SET again to turn the LED display back on
- Long press the SET button enters into Parameter Setting Mode

SWI Button

- Long press on the SWI button enters into Parameter View Mode

NUM+ Button

- Long press NUM+ button puts the unit into the 10 second automatic power saving mode
- The LED display will blink twice to signal that the mode has been enabled
- After entering the power saving mode, if no buttons are pressed within 10 seconds, the LED display and LEDs will turn off (Power and Relay LEDs are not turned off)
- The program will continue to run
- Short press SET to turn on the LED display temporarily
- Long press NUM+ again to exit the automatic power saving mode
- LED display must be on before you can disable automatic power saving mode
- Short press on Set to turn on LED display
- The LED display will blink three times to indicate the mode has been cancelled

NUM- Button

- Long press on NUM- causes a timing reset and stop
- MD light on solid = Stopped
- A short press on NUM- will start the timing from the beginning
- MD light flashing = Running

Parameter View Mode

- You can view the parameters of the current function
- Long press on SWI will enter into parameter view mode
- The MD LED indicator will be on
- Short presses on the SET button will rotate through the parameters. The MD, Timer1, Timer2 and N LEDs indicate what parameter is being displayed
- Long press the SWI button will enter back into Operating Mode

Parameter Setting Mode

- This mode allows you to set the active function and its timing parameters
- A long press on the SET button will enter into Parameter Setting mode
- A short press on the SET button will rotate through the four parameters as shown by the LEDs:
- MD – Function select
- Timer 1
- Timer 2
- N – Options
- The LED display will be flashing, showing the value of the current parameter
- Short press of the SWI button will rotate through the four parameter choices (MD, Timer1, Timer2 & N)
- Short press the NUM+ or NUM- button will increment or decrement the currently flashing digit
- Long press the SET button to save the parameters and enter back into Operating Mode

Examples

Example 1 - Controlling a lamp

Turn ON for one hour, then turn OFF

Setup:

- MOD="-- 02" Function 02 - Timing Disconnect
- Timer1="3600" 3600 seconds or 1 hour
- Timer2="xxxx" x can be any value as this setting is not needed
- N="01xx"01 = Timer1 setting is in 1 second units. (xx= not used)
- A long press on SET button to enter into Parameter Setting Mode
- MD LED should be on
- If not, short press on SET button several times until MD LED is on
- Press NUM+ or NUM- buttons to adjust the LED display to "-- 12"
- Use SWI button to switch between digits
- Short press SET button to turn on T1 LED
- Press NUM+ or NUM- buttons to adjust the LED display to "3 6 0 0"

- Use SWI button to switch between digits
- Short press SET button TWICE to turn on NX LED
- No need to set Timer2 as Function 02 does not use Timer 2
- Press NUM+ or NUM- buttons to adjust the LED display to "0 1 0 1";
- Use SWI button to switch between digits
- Long press SET button to save settings and exit Parameter Setting Mode
- The function starts running immediately

Example 2 – Powering a machine

When power on, the machine will run to the following:

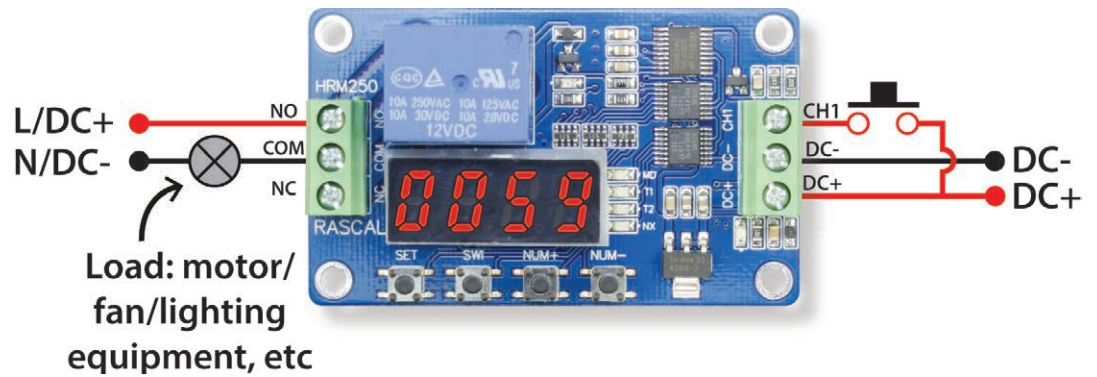
- Run for 1 hour
- Stop for 10 minutes
- Repeat the above 5 total times
- Turn off

Parameters:

- MD="-- 0 8" Function 08 - Limited Cycle Timing Mode B
- Timer1="3 6 0 0" Timer 1 = 3600 seconds or 1 hour
- Timer2="0 6 0 0" Timer 2 = 600 seconds or 10 minutes
- N="0 0 0 5" LOOP count = 5

Wiring Notes

Make sure your DC power supply has sufficient current capability to run the HRM250 and your load. If the DC power supply is too small and the HRM250 energizes the load it could cause the DC voltage going to the HRM250 to drop too low, causing it to reset.



Specification

If you are using one 12V power supply for both the HRM250 and your load make sure it has sufficient current capability to run the HRM250 and your load. If the DC power supply is too small and the HRM250 energizes the load it could cause the DC voltage going to the HRM250 to drop to low, causing it to reset.

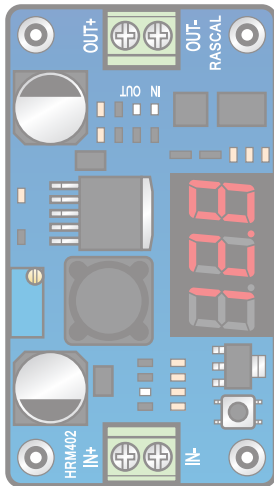
If you are using the HRM250 to run drive a mains rated load you must wire it in accordance with any applicable wiring regulations. For inductive loads these can take far more power at start up and “weld” relay contacts together so for inductive loads you must use a contactor where appropriate.



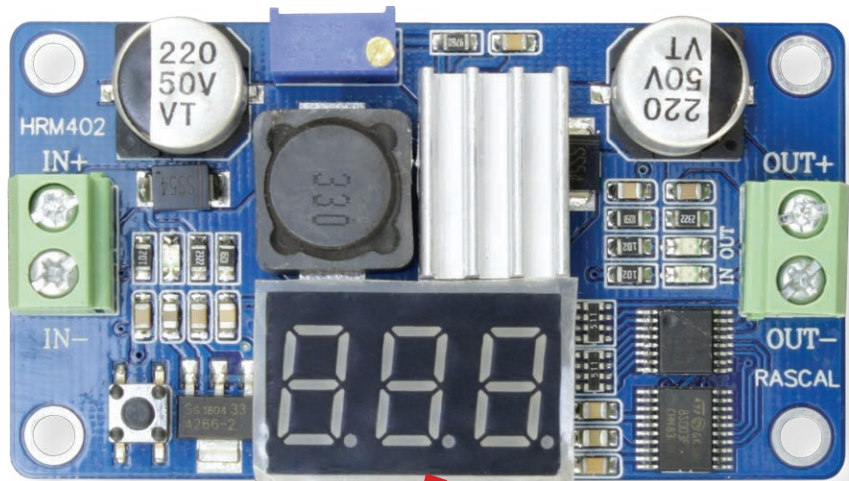
| Feature | HRM250 |
|---------------|--|
| Relays | 1 x N.O / N.C |
| Input Voltage | 12V DC |
| Current | Relay On - 50mA / Relay Off - 15mA / Relay & Display Off - 3mA |
| Output Relay | 240V AC 10A |
| Dimensions | (L) 66mm x (W) 40mm x (H) 20mm |

NB. For inductive loads use an appropriate contactor.

Rascal™ Handy DC-DC Voltage Booster + Display



Actual Size !
(35mm x 64mm)



Built in Voltmeter !!

HRM402

The Mini HRM402 Voltage Booster measures just 64mm x 35mm so it's tiny enough to fit in other equipment and actually contains a built in LED voltmeter. The output voltage can be turned up to 30V DC by simply turning a small adjuster on the PCB and by pressing a switch on the PCB you can oscillate between the input and output voltage so it's very engineer friendly!

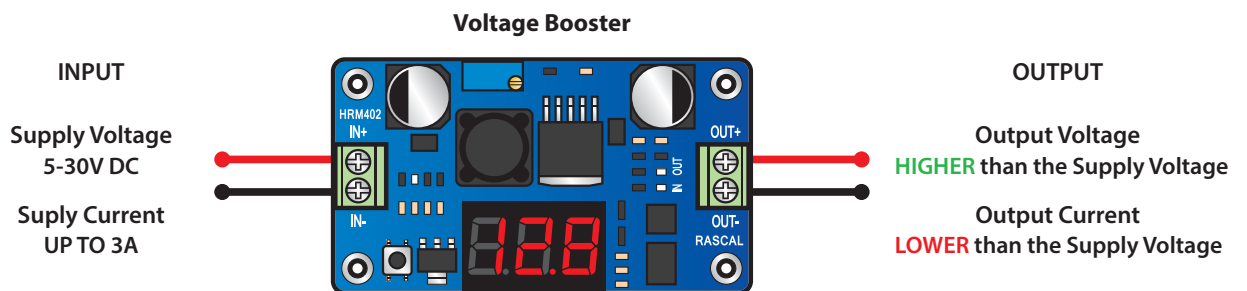
It can deliver a higher voltage output of 5-30v DC from a lower voltage input. It has an adjustable potentiometer to vary the output voltage and an LED voltmeter that can show either the input or output voltage, toggled by a simple push-button.

It may be used to:

- Increase the voltage from a temporary supply, e.g. a battery
- Address voltage drop on in a cable whereby a camera does not have sufficient power to work



| Feature | HRM402 |
|-----------------------|---|
| Input Voltage | 5-30V DC |
| Input Current | Up to 3A continuous |
| Output Voltage | 5-30V DC |
| Output Current | Dependent upon voltage setting and input current |
| Protection | Input reverse voltage protection Output short circuit protection Output overcurrent protection Over temperature protection |
| Operating Temperature | -30 °C to + 70 °C |
| Dimensions | 65 x 35 mm |
| Mounting | 4 x 3.0mm Ø holes |



Power Delivery and Booster Startup

This device is not capable of increasing the total power available so as the output voltage is increased there is a corresponding decrease in the available current and vice versa.

It takes its own power from the input supply so it is important to ensure that the input supply has a high enough rating to deliver sufficient power to the load and this device. If the supply voltage is too low or the current draw on the input power supply causes it to go into 'overload protection mode', the booster will not power up.

Cable Voltage Drop

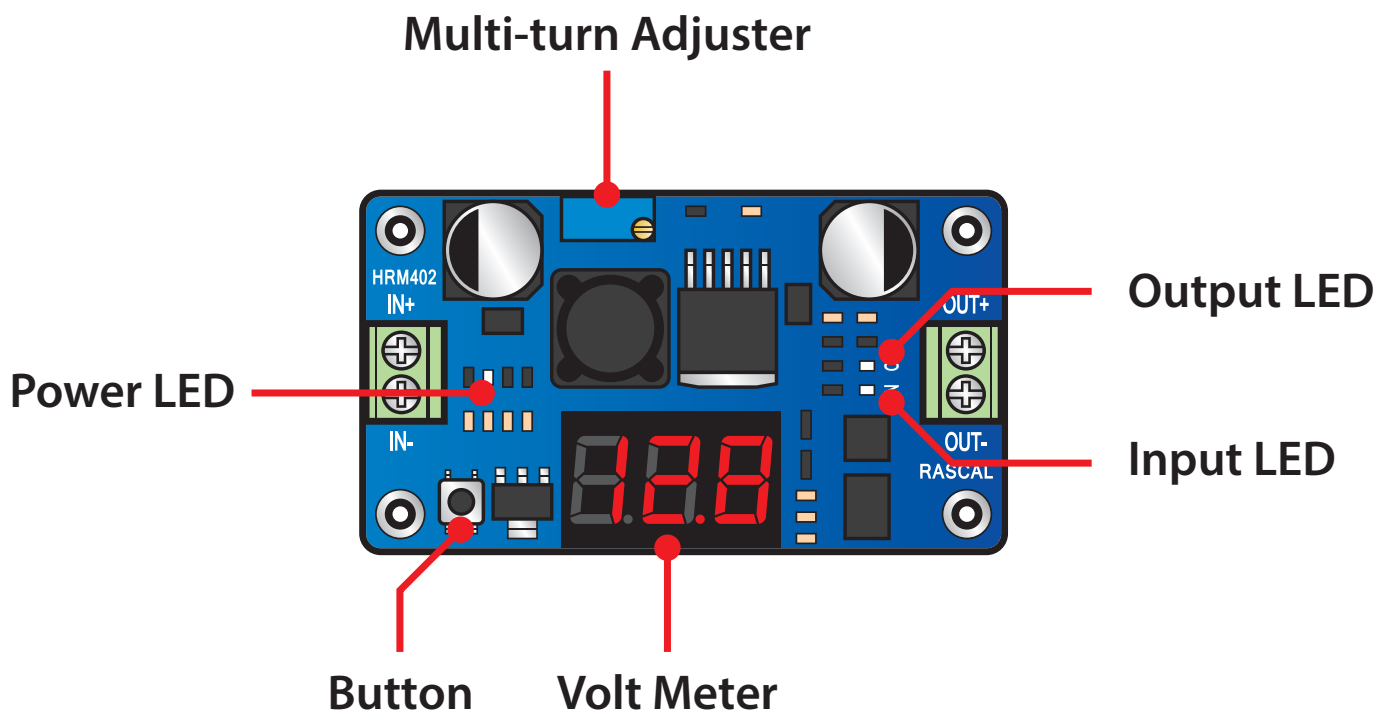
The voltage drop in a cable depends on the resistance of the cable and the amount of current drawn by the load. When installing the booster on the end of a cable run it will require more current to increase the voltage and keep the power the same. The downside of this is that we then have a bigger voltage drop we require even more current, this ends in a downward spiral of more current and higher voltage drop to the extent whereby the booster may stop working. As a guide at 12V with a 500mA load you can boost about 2V.

If you are trying to overcome voltage drop at 12V you may want to consider using a POW061 24V AC to 12V DC converter. With double the voltage the current is halved and hence the volt drop. The POW061 is very voltage tolerant and will output 12V with the input as low as 18V AC.

See TIP No 140 on the System Q website for a guide on cable and voltage drop.

www.systemq.com/pdf/techtips/Tip0140-How-to-fit-CCTV-How-to-combat-voltage-drop.pdf?pdf=tip140

Setting Up

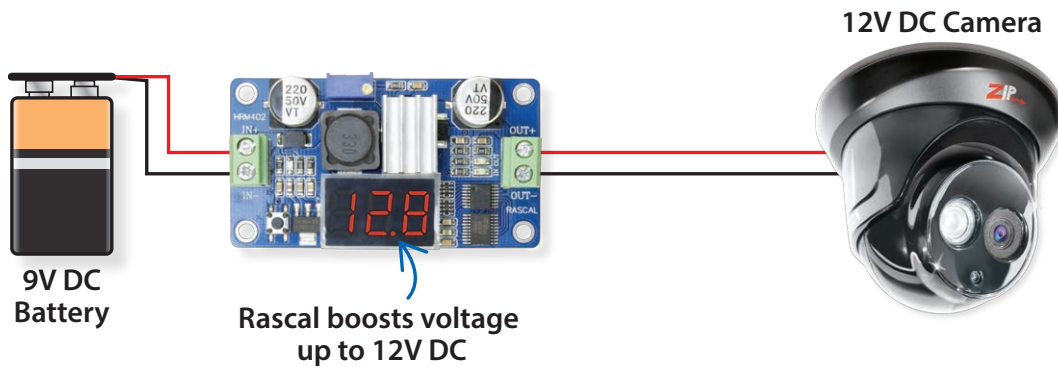


Important: do not attach your load until you have powered up your booster and set the output voltage to a safe voltage for your equipment.

1. Connect the power supply and turn on. The Power LED and OUT LED will light. The display will come on showing the output voltage.
2. Turn the small multi turn adjuster to set the output voltage. Clockwise to increase, anti-clockwise to decrease.
3. Turn off the power and connect your load.
4. Turn the power back on and all should be working.

Note: If you want to see the input voltage a short press of the button will toggle between the input and output. The blue IN and OUT LEDs indicate which is being displayed. A one second press of the button turns the display off if you no longer need to see it. If you have turned the display off then a short press of the button will turn it back on.

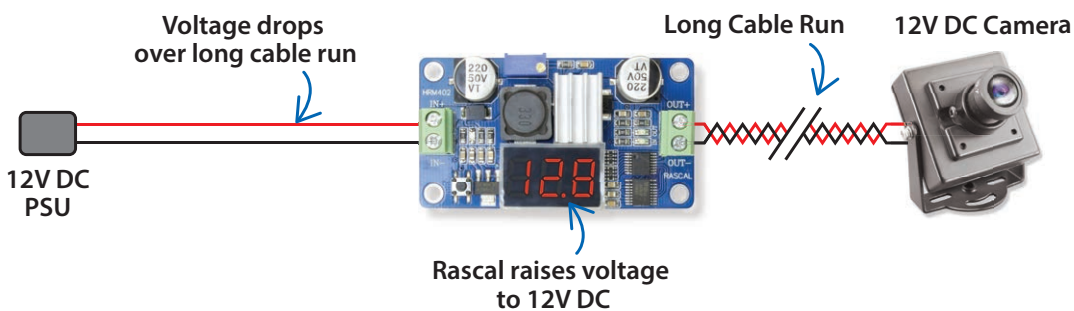
Application Example 1 - Running a 12V Camera off a 9V Battery



Probably the simplest use for the booster is to increase your power supply voltage if you do not have the correct voltage power supply or perhaps you want to use a battery for testing. Just make sure your power source can supply enough current.

Application Example 2 - Using a Booster to Overcome Voltage Drop

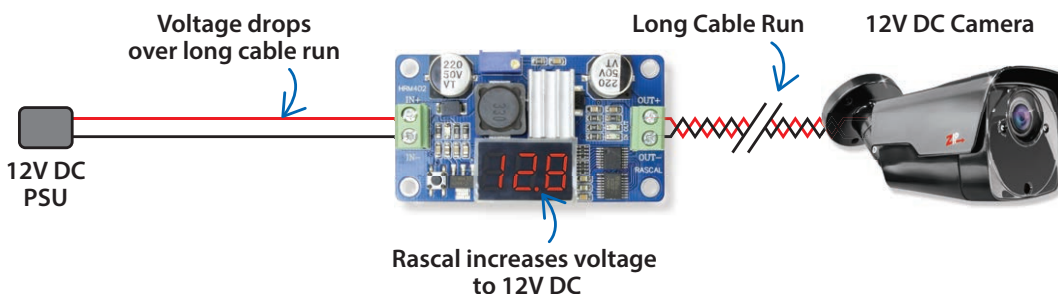
Constant Load



If the load is constant then this is very easy to set up just adjust the voltage until you get the correct voltage at your load. You will need to use a meter to measure the voltage at your load for this as the booster will show the voltage before the voltage drop in the cable.

Application Example 3 - Using a Booster to Overcome Voltage Drop

Variable Load



If the load varies such as a camera with IRs coming on and off then a little more care has to be taken as the voltage drop in the cable and hence the voltage at the load will also vary.

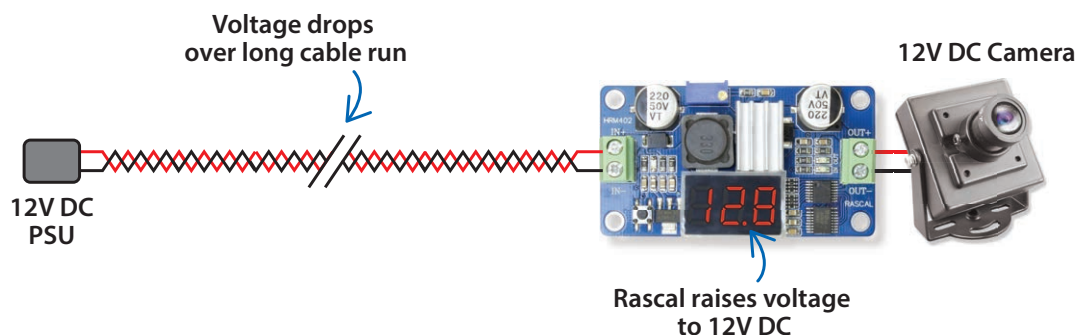
The best way to set this up is with the load at its lowest e.g. for a camera with infrared LEDs, IRs off (less current means less volt drop in the cable).

The voltage at the load will now be at its highest and can be set so that it does not exceed maximum voltage for your load.

You can now increase your load (turn the camera IRs on) and check that it is still working.

Application Example 4 - Using a Booster to Overcome Voltage Drop

Adding the Booster at the Load



This will not work in all situations, for the booster to increase the voltage it has to draw more current and this will increase the voltage drop on the cable. If this voltage drop is too high then this will stop the booster working. In most circumstances you may only get a 1-2V gain (As a guide at 12V with a 500mA load you can boost about 2V and at 24V with a 200mA load you can boost about 3V).

Trouble Shooting

| Symptom | Reason | Suggestion |
|--|----------------------------------|---|
| Power LED glowing faintly, voltage display is off or dim | The input voltage is too low | Check that the input to the booster does not drop below 5V at switch on |
| | The output load is too high | Try reducing the load if possible or if not try reducing the output voltage this will also reduce the current required |
| | The start-up current is too high | Works when the load is disconnected and reconnected. Make sure your power supply can provide enough current for start-up. This will be slightly higher than the running current. If the power supply is OK then try larger cable between the power supply and the booster |
| Power LED is off and no voltage display | No power or output short circuit | Check the input voltage is 5V or above |

Note: You will find that the booster can cope with a bigger voltage drop if the load is applied after the booster is powered up. Check that the booster will work if you turn the power off and back on with the load connected. The higher start-up current when powered on with the load connected may stop the booster powering up correctly.