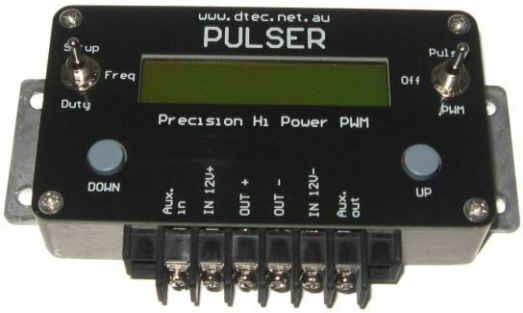
Pulser- Variable Duty Cycle (PWM) Driver

Operating Instructions



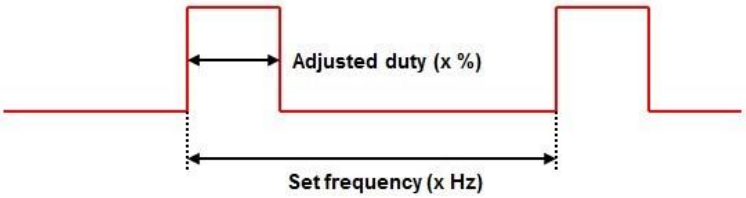
What is Pulser?

'Pulser' is a professional heavy duty diagnostic tool for driving components that use Pulse Width Modulation (PWM or 'duty cycle' control) in their operation.
You can accurately set the duty cycle and frequency to test the operation of a whole range of components.

Pulser can also produce pulses of a programmable Hi/Lo duration and count out a set number of these. It can also be triggered and reset from a remote button if desired.
This makes it perfect for testing/calibrating injectors or ignition systems. It can easily form part of the testing equipment for such tasks as injector flow testing, measuring 'dead time' (voltage dependent delays) or ignition coil testing and dwell time mapping.

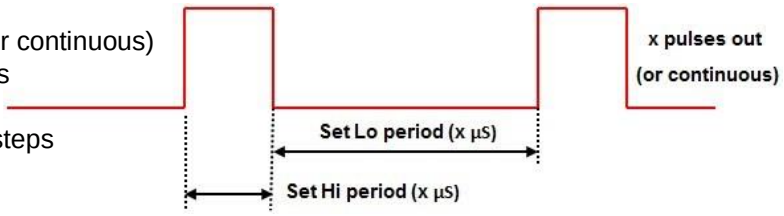
PWM mode-
Drive devices and output PWM signals.

- Frequency choice of 10, 20, 40, 80, 200, 400 800, 1000, 2000, 4000, 8000, 10000 Hz
- Duty adjustable from 0 – 100%



Pulse mode-
Drive devices and output pulse signals.

- Set number of pulses produced from 1 to 5000 (or continuous)
- Set Hi & Lo period from 15 - 65400µs in 1µs steps
  or
- Set Hi & Lo period from 150 - 654000µs in 10µs steps



Tip: 1000µs = 1ms = 0 .001second

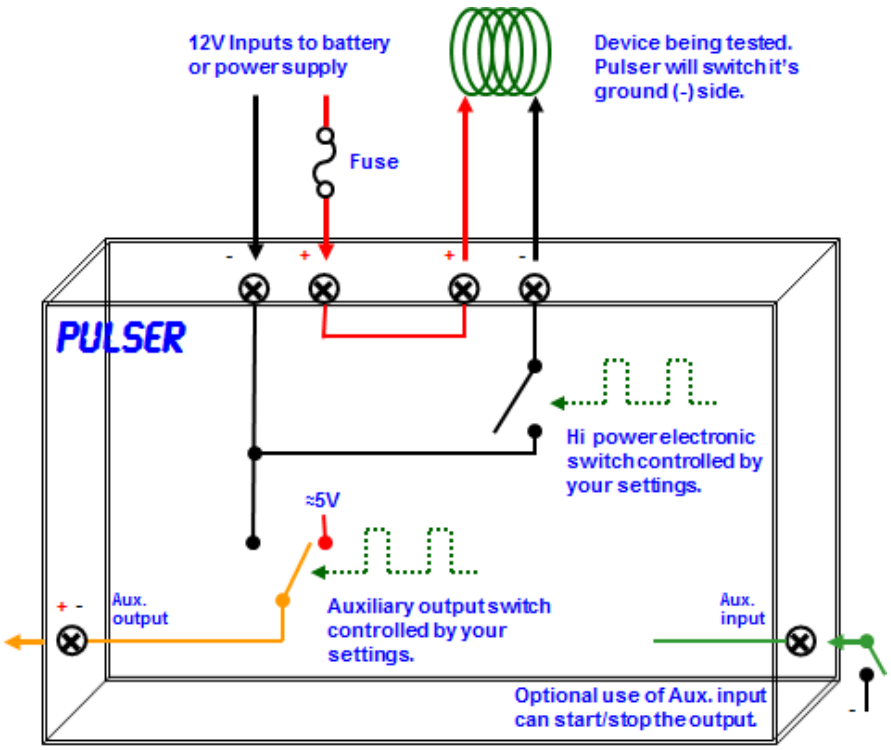
Operating concept-

Pulser is capable of directly controlling high current devices such as solenoids, motors, valves, lamps etc.

It does this by switching the device under tests ground side using MOSFET technology (a high efficiency electronic switch). It incorporates internal protection from harmful voltage 'spikes' produced when controlling motors and solenoids ('inductive' loads).

An auxiliary output switches between ground and approx. 5V at the same time as the main circuit. This is designed to drive external injector drive circuits or coil driver circuits.

An auxiliary input allows a switch to be fitted to ground and can remotely stop/start PWM operation or start/reset the output pulse counter in pulse mode.



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Setting up for testing-

Provided in the kit is a fused main power lead.

- Connect red wire to the “IN 12V+” screw terminal.
- Connect black wire to the “IN 12V-” screw terminal.

There are also two test leads provided (alligator clip or mini female spade).

- Choose one as required and connect to “OUT-“ and “OUT+“ screw terminals.

Controls-

The RH ‘Mode’ switch selects between output OFF, PWM or Pulse modes.

In PWM mode:
The LH ‘Setting’ switch allows adjustment of Frequency or Duty cycle.
“Setup” setting position is not relevant for PWM mode.

In Pulse mode:
The LH ‘Setting’ switch allows adjustment of Lo or Hi pulse times.
“Setup” setting position is active when the mode switch is “Off”
“Setup” setting position adjusts the output resolution (1 or 10µs steps) and the number of pulses to output. If less than 1 or greater than 5000 pulses are set then the output will show as continuous (“Cont. “).

General operation notes:

- Holding the up or down button will adjust rapidly.
- Your settings are recorded in memory and restore at power up.
- Setup is only used for Pulse mode (mode must be ‘Off’).
- When mode switch is OFF you can still make adjustments with the up and down buttons. These are then applied when the mode is changed back from OFF.

NOTE: The data displayed when the mode is OFF will be for the last mode that was displayed e.g. if it is in PWM mode then turning to OFF will leave the PWM settings displayed and adjustable ready for PWM mode again.

Using the ‘Auxiliary Output’ (optional)-

The auxiliary output drives a signal out to act as a signal generator for testing power transistors, ignition modules or other devices triggered from a square wave signal. It is capable of delivery 50mA current pulses (it is ‘driven’ both Hi and Lo between your power supply’s ground and approx.5V positive). Even though the output has internal protection, care is needed that the device being tested will not draw excessive current or that it will not be damaged by direct connection to supply voltage.

Auxillary output is not designed to drive loads directly; it is primarily for signaling other devices. We suggest a globe (such as a standard automotive test light) or a resistor is used in series to limit the current when testing (i.e. the current from the auxiliary terminal passes through the globe), this will prevent damaging Pulser and help protect the device being tested. If you need further advice on this please contact us first!

Using the ‘Auxiliary Input’ (optional)-

The auxiliary input can optionally be used to remotely trigger the Pulser unit.
To use it connect a switch between the “IN 12V-” screw terminal and the “Aux. in” screw terminal i.e. the Auxiliary input is grounded for operation.

In both PWM and Pulse mode the output will be deactivated (OFF) for as long as the switch is ON i.e. as long as ‘Aux. in’ terminal is grounded there will be no output.

In Pulse mode the pulse counter will also reset when the switch is released prior to the pulse output resuming.

Procedure for testing PWM devices-

1) Connect 12V (12 volt) inputs to a battery or power supply.

2) Turn the mode switch to “Off”, this makes sure the device is not operated until your settings are made.

3) Connect the two output wires to the device you wish to test/operate.

4) Use the setting switch to select “Duty” or “Freq” and press the “UP” “DOWN” buttons to make a setting. Holding the buttons down will cause a fast change of duty cycle, whereas single presses change 1% at a time.

5) Turn the mode switch to “PWM” to operate. Adjust duty or frequency as required.

Tips for testing in PWM mode:

- Start with low duty cycle settings if driving an unknown device and then gradually increase. This will prevent excessive current from potentially flowing.
- Turn on only as long as needed, this will reduce the current flow and heat in the device.
- Keep the frequency low (e.g. 1kHz) unless specifically required, this reduces internal heating.
- You may need to experiment with different frequencies. Some devices will not operate if too high (their response is slow) e.g. most diesel Timing valve control (TCV) work as slow as 20Hz. Others, such as positioning solenoids will not operate if frequency is too low (they respond to each pulse and ‘jerk’ or ‘vibrate’).
- A greater duty cycle percentage means a greater current flow. Some manufacturers of equipment quote their test numbers the wrong way around e.g. a low duty cycle is more current. If you find this error then simply invert their figure. So if they say 30%, you would set 70% for the same result!

Procedure for testing injectors in Pulse mode-

Basic injector operation can be confirmed by directly connecting injector across the output terminals. However for precision testing (flow rates and voltage dependency ‘dead’ time testing) this is NOT suitable.

Using the auxiliary output in Pulse mode connected to a suitable injector driver allows setting a specific injector pulse duration and number of pulses. A set number of pulses are handy if measuring flow rates whereby the test fluid is captured and its volume noted or weighed. An adjustable power supply can be connected to the injectors if testing the voltage dependency on flow rate.

DTec offer an inexpensive accessory that mimics a typical vehicle ECU injector driver circuit and is strongly recommended for those seeking more than a basic injector test.

Procedure for testing ignition systems in Pulse mode-

The auxiliary output in Pulse mode acts as a signal generator for testing coils with inbuilt power transistors (module), external ignition modules or other devices triggered from a square wave signal.

NOTE: Do not directly drive ignition coil primary connections with Pulser. The inbuilt protection will clamp the primary voltage and inhibit a spark from the coil.

To test a coil without an inbuilt transistor we suggest using an external ignition module. DTec also offer an inexpensive accessory (power transistor) for testing coils and mapping coil dwell vs voltage requirements.

Tips for testing ignition systems:

- Start with a short pulse Hi period so as to not turn on the test coil for too long i.e. set a dwell period of about 1500µs (1.5ms). Leaving a long Lo period between pulses will allow the coil/driver to cool down.

- We suggest a globe (such as a standard automotive test light) or a resistor is used in series to limit the current when testing (i.e. the current from the auxiliary terminal passes through the globe), this will prevent damaging Pulser and help protect any unknown device being tested.

Precautions and Limitations-

- If you blow Pulser's inline fuse then the display will blank out. Replace fuse*, reduce duty cycle setting, reduce time device is operated for and check the device for wiring shorts or very low resistance (i.e. it draws excessive current).
- Auxiliary output has protected, but still be careful how you use it. Some knowledge of the device being tested will be required to utilize it fully.
- Pulser is repairable! Please contact us for service if you have inadvertently damaged the unit.

NOTE: 25A is fitted; you can lower to provide extra protection when first testing unknown devices if you wish!

Specifications-

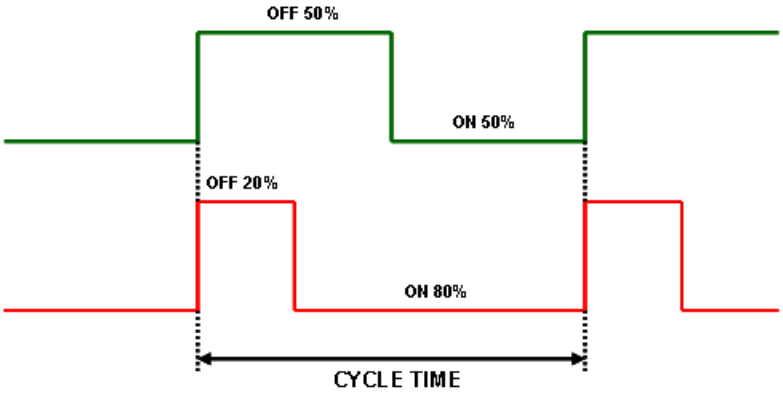
- Duty cycle can be from 0-100% in 1% steps
- Frequency can be altered from 10Hz to 10kHz in convenient steps
- Pulse Lo and Hi periods can be set from 15 - 65400µs in 1µs steps or 150 - 654000µs in 10µs steps
- A set number of pulses can be produced from 1 to 5000 (or continuous)
- Precision microprocessor controlled, settings are stored in memory so they remain when turned off
- Fast and slow setting modes for easy and quick operation
- Output can be quickly switched off/on, allows for quick comparisons (e.g. if checking diesel pump timing vales)
- Continuous current of > 55 Amps* due to Ultra low resistance when on (minimal power loss and heating)
- Can handle brief current 'spikes' of >500 Amps
- Auxiliary output sends out a signal (up to 50mA driven both Hi and Lo) to test devices requiring a square wave input

*The current rating depends on factors such as wire sizing, speed of switching, temperature etc. Pulser is fitted standard with a 25 Amp fuse, feel free to fit a lower fuse rating for protection when testing unknown devices. The lower the switching frequency, the higher the current capability.

If you are unsure of its suitability for your application then please contact us.

What is 'PWM' and 'Duty cycle'?

Devices that require changing current levels to operate usually have this controlled by varying the 'duty cycle', that is the On:Off ratio is altered (frequency however is fixed). This concept is technically known as Pulse Width Modulation or PWM (a fancy way of saying we vary the time we pulse the device on for)



Imagine these signals are operating a switch at high speed to turn on a device. The frequency shown with both has remained the same (they have the same cycle time). What has changed is the amount of that time that has been spent ON compared to OFF (known as 'duty cycle').

Therefore the average current flow each through the device would be different with both signals, as one spends more time on than the other.

If the frequency used is high enough the device being driven will see a smooth current flow. For example, if it was globe brightness being controlled then at a high frequency the globe will not even appear to flash. The filament will not have time to even cool or heat up; it just appears as a constant glow.

In PWM mode Pulser allows you to set a test frequency and then vary the duty cycle from 0 to 100% to test/operate devices in the same way a factory computer would.