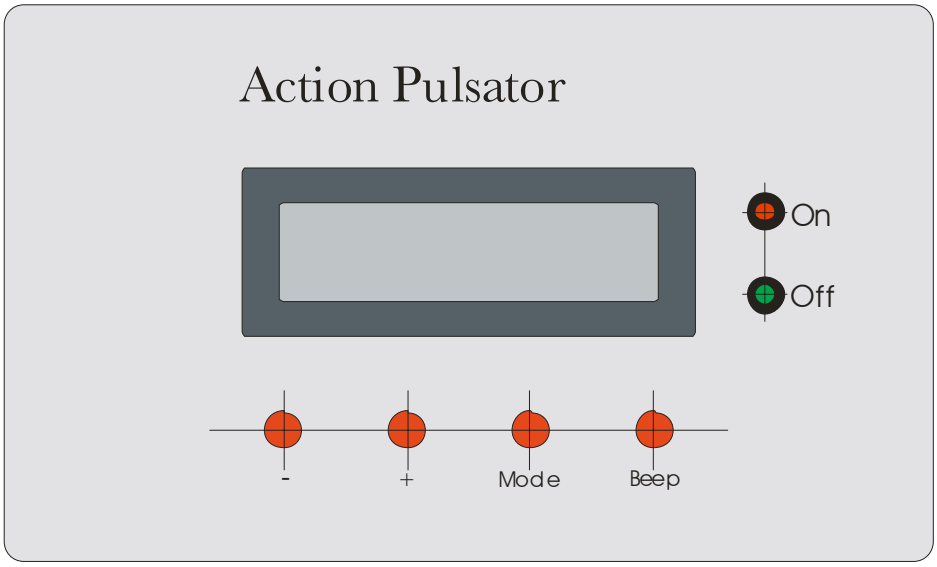
The OMP II Organ Magnet Pulsator



Welcome to the OMP II organ magnet pulsator

What is it for?

The OMP II was devised for testing electro-pneumatic organ actions for their speed of operation. It has a wide range of operating parameters, more than are presently visualised for its task. It is processor controlled for accuracy.

It was implemented by an employee of a major British organ building Company for testing actions for their organs.

Ease of use was one of its requirements, so I hope this particular objective has been realised.

It has an alphanumeric display, so it can tell you what it's doing at any particular time.

What does it do?

The pulsator switches an output at speeds defined by its user. These speeds currently vary from 1Hz to 32Hz. To be totally honest, any speed less than 8 Hz is a bit superfluous, but they're here anyway! Also, for an organ builder, any speed faster than 24 Hz is theoretical (more likely 12Hz,) as the final (pneumatic power stage) will not be able to operate beyond this speed by a "Country mile"!!!

Anyway, the upper limit is as fast as I imagine it would ever need to operate at, but could be changed to suit other users' requirements within reason. Any special needs can be addressed later by correspondence.

Its output

The output can be set to give symmetrical on-off times. This is necessary for testing the repetition of an action.

There is an asymmetric output facility which essentially tests for the minimum time required to make an action work. In this mode, the pulsator can also test the release/recharge potential of an action. This may sound confusing, but will be explained later.

The output is negative, as just about any standard organ control systems have negative outputs. This could be altered for specific requirements by request. In future production models, there may be two outputs, one negative-going and one positive-going. I don't want to make things too complicated here however, as that gives more scope for potential disasters!

The pulsator has a rather large load capacity. Why is this? Well; organ builders like me can be testing an action, and can possibly allow the output leads to be inadvertently "shorted" (yes - I know - it's possible for this to happen in the "heat of the moment".)

The pulsators "output stage" was designed to handle a load of 6 amps pretty well constantly (and more than this for a short while.) The unit should however be protected by a 5 amp fuse. Testing of stuff needing more than 1 amp is not realistically deemed to need a pulsator such as this; we're just testing the "front ends" of actions here are we not?

How can it be used?

Learning how the unit is controlled is the first step to knowing how it is intended to be used. The following explains its functions more thoroughly, starting with the control buttons.

The controls

The pulsator has four control buttons. They are:-

1	-	Makes the output slower by 1 Hz, or alters the attack/release.
2	+	Makes the output faster by 1 Hz, or alters the attack/release.
3	Mode	Sets the pulsator for "Repetition" or "Attack/Release" mode.
4	Beep	Toggles beep on/off.

In the repetition mode, the "+" and "-" buttons simply increase or decrease the output frequency. This *attack* thing will be explained in more detail soon however.

Testing the repetition

This is the primary function of the pulsator. The "on" and "off" times are equal. It's just the frequency of them which is changed. The frequency can be changed by the use of the "+" and "-" buttons.

In this mode, the pulsator displays "Mode- Repetition" on its top line, then the frequency in Hz on the bottom line. Below is an oscilloscope type depiction of the repetition mode.

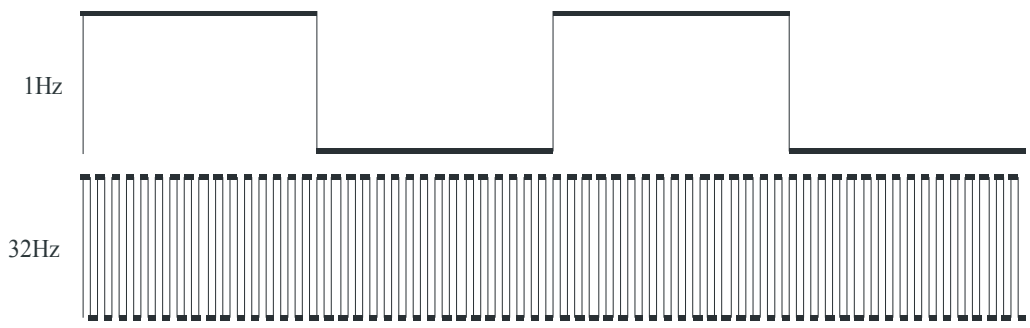


Fig1. A two second sample of output in repetition mode

Testing for quick on-off/off-on times (attack/release)

To enable this mode, the mode button has to be pressed, so the pulsator is displaying "Mode-Attack" on the top line of the display. The mode button toggles the pulsators action in the opposite mode with every press.

In the "Attack" mode, the on time is shorter than the off time in positions 1-16. The off time is shorter in positions 17-32. In the positions 1-16, the pulsator tests how quickly the action could respond to a small "blip" on the keyboard. In positions 17-32 the pulsator tests how quickly an action can be released then recharged. For the technically minded, it alters the "mark to space" ratio. To see what is meant by this, read on.

The time that the outputs are tested against, are all half a second in this mode. Again, here is a pictorial representation to make all the above a bit clearer.

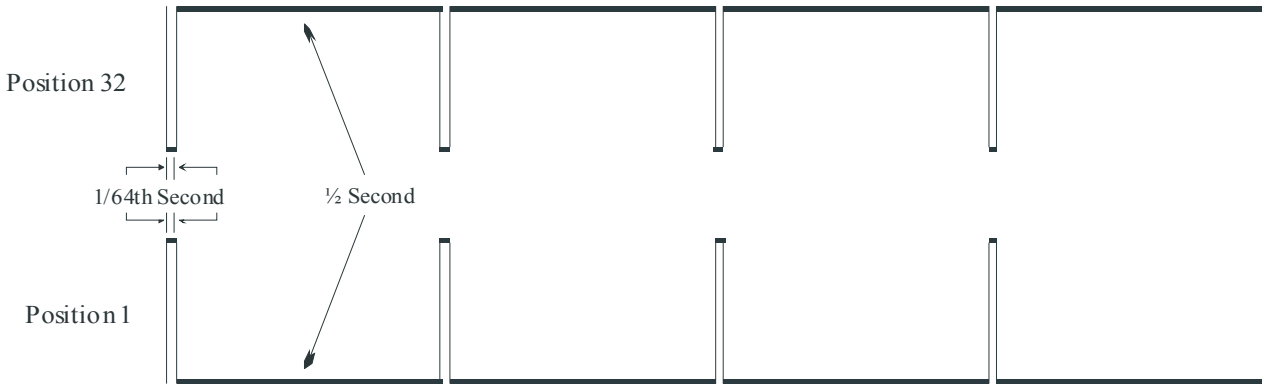


Fig2. Samples of 4 cycles output in attack/release mode

Beep

The forth button is to toggle an internal beeper on or off. This was included, as it tells the user what they *should* be getting from the action they're testing.

It remembers!

When the pulsator has been turned off (maybe for a few years even,) it starts in the same mode, with same frequency settings etc. that it had when it was last used. To do this, it "flashes" a small bit of its memory with the last alteration made to it. Agreed, this is not an important feature, but it keeps some sense of continuity! It saves having to enable/disable things like the beep function.

Specifications follow on the next page.

Specification

Supply voltage	9-18V
Maximum load	6 amps (3Ω)
Minimum Frequency	1Hz
Maximum Frequency	32Hz
Display	16x2 line LCD display (no backlight)
Accuracy	Controlled by 3.579545 MHz Crystal

The following is the actual time taken for a given frequency over 1 second, therefore at 1Hz, the pulsator is 99.9999721% accurate.

1Hz 0.999999721 Seconds	17Hz 1.000069
2Hz 0.999997486	18Hz 1.000082
3Hz 1.000002	19Hz 0.999930438
4Hz 1.000002	20Hz 1.000082
5Hz 0.999993016	21Hz 1.000149
6Hz 1.000002	22Hz 0.99988574
7Hz 0.999993016	23Hz 1.0001
8Hz 0.999993016	24Hz 0.999921498
9Hz 1.000002	25Hz 1.000015
10Hz 0.999993016	26Hz 1.000038
11Hz 0.999984076	27Hz 1.000002
12Hz 1.000002	28Hz 0.999993016
13Hz 0.999979606	29Hz 0.999930438
14Hz 0.999993016	30Hz 1.000082
15Hz 1.000015	31Hz 0.99988574
16Hz 0.999993016	32Hz 0.999957257

All the above data was determined by simulation using the MPLAB simulation tool.

Release/revision history

04/2004 - Pulsator working on breadboard. A long time dormant thereafter, until..

08/2005 - Processor speed increased to 3.5 MHz for faster times (from 24Hz to 32 Hz.) Further speed increases can be used if desired from now-on.

12/2005 - Original 2 stage output increased to 3 stage to stop short blip on "turn-on", also to gear towards driving a hefty output! Software modified accordingly.

02/2006 - First non-prototype released and used. No comments from user, so presumed okay until *I* found a problem (08/2006)!

08/2006 - Hardware brownout protector added to avoid rather serious data ***and*** program corruption on slowly decaying power supplies. The internal processor brownout protection didn't seem to arrest all cases!

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Negative output version

Positive output version

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