ALM-017

'Pamela's NEW Workout'

- Operation Manual -

Introduction

'Pamela's NEW Workout' is a compact programmable clocked modulation source for your Eurorack modular synthesiser system. It provides 8 highly editable outputs producing various control voltage signals correlated and synced to a BPM based master clock.

Building on the original 'Pamela's Workout', this new evolved model maintains the original's form factor and intuitive workflow but improves and adds many new features with upgraded hardware, a new OLED display and rewritten software.

Each output is now able to provide not just clocked triggers but also rhythmic waveforms with many parameters controllable directly and via assigning to external CV control. Pamela has grown beyond a clever clock and now provides almost limitless synced modulation possibilities.

Improvements have been made to overall clock stability and integration with external clocks and devices. Also new are dedicated MIDI and Din Sync clock outputs available via optional expander module(s).

Please enjoy your next generation workout!
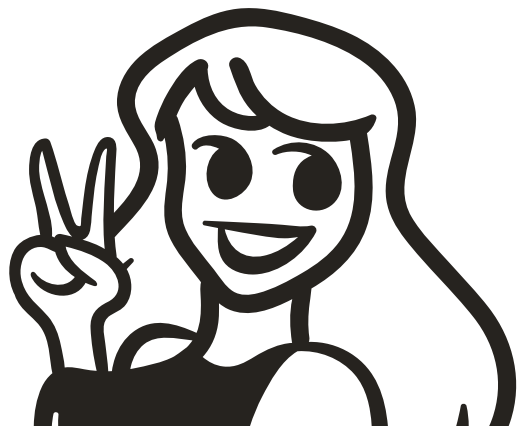
Features

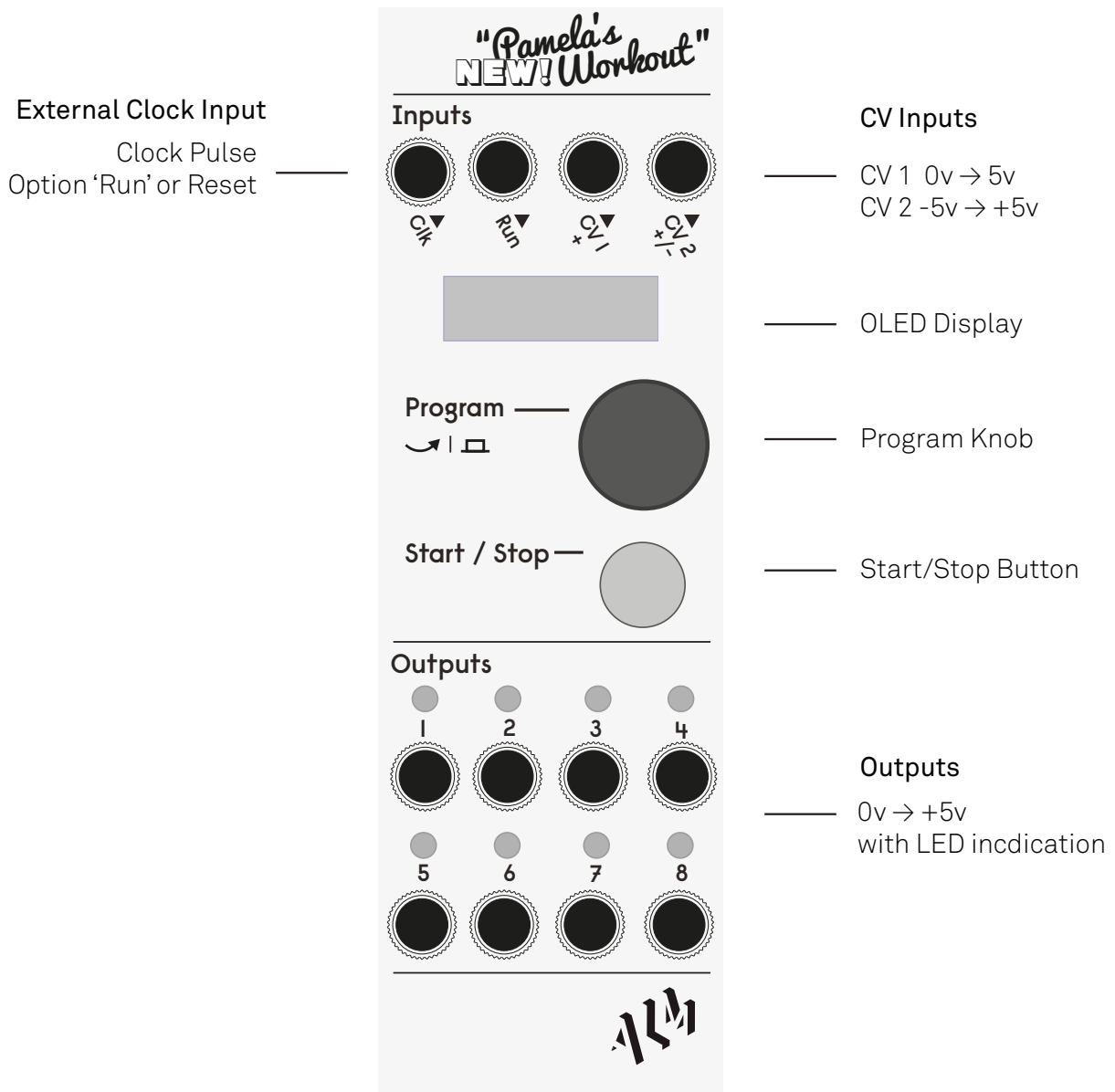Pamela's NEW Workout provides a wide range of features in a compact space. They include;

- BPM based clock with tempo rates 10-300BPM.
- 8 Clocked voltage outputs each with independent adjustable;
  - Clock divisors and multipliers from /512 to x48 including various non integer factors.
  - Gated, Triangle, Sine, Envelope & random base waveforms.
  - Waveform level and pulse width / skewing.
  - Phase, Delay and delay division (for complex swing)
  - Euclidean and random step skipping with beat based looping for rhythm creation
- All output parameters assignable to x2 CV inputs with individual software offset, attenuation and monitoring.
- Per output and group saving and loading to 200 banks.
- Voltage and direct control of clock stop/start, reset and rate..
- Sync to an external clock input at 48 to 1 PPQN.
- Realtime intuitive user interface with high resolution LED display.
- Provides dedicated DIN Sync and MIDI clock output via optional expander(s).
- Easy firmware upgrades via USB port.
- Skiff friendly / Reverse power protection.
- Made in England.

Technical Specifications

- Supply: *+12V 50mA Max / -12v 0.5mA*
- Size: *8 HP*
- Depth: *22mm (including power header)*
- Outputs: *0-5v buffered low impedance. 10 bit res. 500Hz max update freq.*
- Inputs: CV 1 0v-5v / CV 2 -5v-5v / Clock, Run - rising edge 700mV min.

Core Operation

Panel Layout

"Pamela's
NEW! Workout"

Inputs

Clk ▼ Run ▼ +cv1 ▼ +/- cv2 ▼

External Clock Input

Clock Pulse
Option 'Run' or Reset

CV Inputs

CV 1 0v → 5v
CV 2 -5v → +5v

OLED Display

Program
↰ | ⊓

Program Knob

Start / Stop

Start/Stop Button

Outputs

1 2 3 4

5 6 7 8

Outputs

0v → +5v
with LED incdication

ALM

Getting Started

If you are already friends with the original Pamela then usage of the NEW workout will be very familiar but hopefully clearer and much more feature rich.

When initially powered on, Pamela's NEW Workout's display shows the current clock tempo setting in beats per minute (BPM). Clicking and then twisting the main blue program knob highlights and then adjusts this BPM value between its maximum and minimum values when turned. Clicking again deselects.
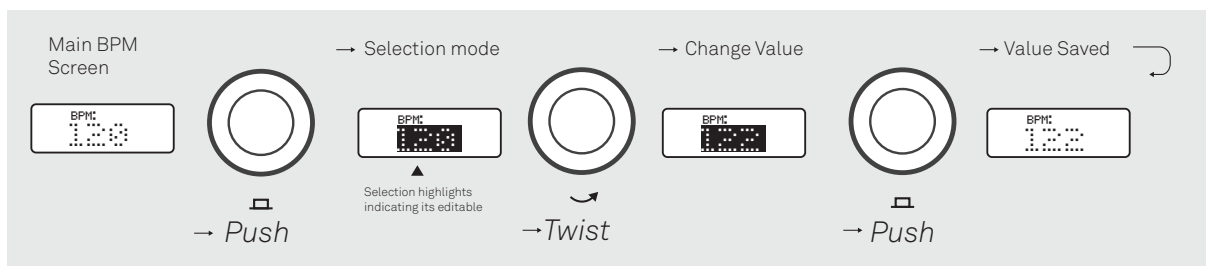
Clicking the 'Start / Stop' button starts the clock with this selected BPM tempo shown on the display. With the clock now running, synced voltage are sent through each of the output jacks, the level indicated by their relevant green LED's.

Clicking the 'Start / Stop' button again stops and resets the clock

Basic Per Output Modifier Adjustment

The timing of each output can be adjusted to varying factors of the set tempo. These factors or 'modifiers' can be either divisors or multiples of the main clock tempo. For example, a modifier of 'x2' means there will be two steps or output pulse (with a output set to a gate) per beat. A modifier of '/2' means a step every other beat.

Also outputs can be set to be permanently on or off, to just trigger once at clock start or stop (for reset external sequencers) or assigned to a CV input for external control - more later.

To adjust an output modifier from the BPM display (unselected) twisting the program knob will now cycle through each of the eight numbered output 'screens' before before returning back to the main BPM screen.
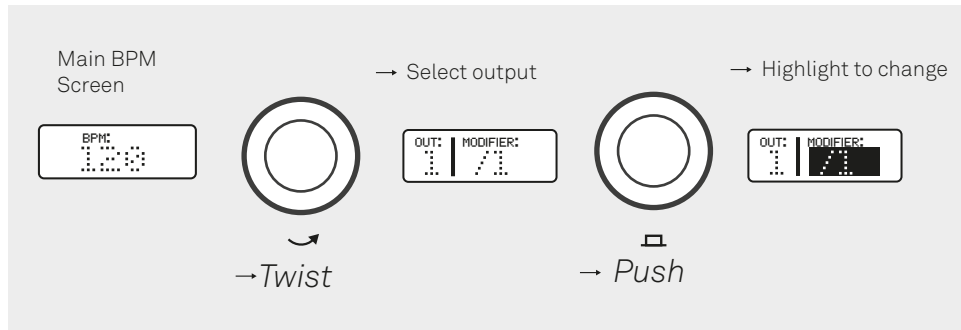
Each output is represented by the output number (on left) together with the current set modifier value for that numbered output. The modifier value is either a multiplier, a divider or a special value (on, off, pulse) correlated to the set BPM clock speed.

Not all modifier values are integers - some are decimal values for triplet and dotted type timings.

There are also 4 special 'utility' types of modifier mainly for working with external devices; constant 'on' and 'off' gates, a single initial start pulse and a single final pulse fired when the stops (both indicated by pulse symbol).

Clicking the program knob will highlight the selected modifier and turning will then cycle through the various available values. Clicking again will exit.

Extended Per Trigger Adjustment

Each output can be further adjusted through 'extended parameter settings' allowing for very complex clock synced modulations and rhythmic sequences. These extended parameters can be split into 3 categories; those which alter the output wave shape with respect to the modifier timing, those which algorithmically skip or adjust timing steps (allowing rhythms to be built) and the saving, recall and reset of a full output parameter setup.

Note the extended parameters are not available for the special utility modifier types.

With an output screen selected, pushing and holding the program knob for just over 1 second will access the extended output parameter selection.
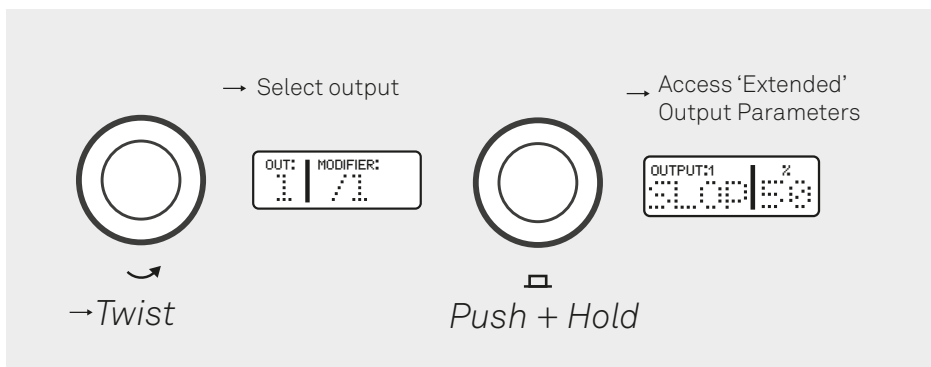
The various parameters can be cycled through and edited by use of the program knob just as when editing output modifiers. Each screen is represented by a parameter and the corresponding current set value. To exit back up to the main output modifier screen, click and hold the program knob again for just over 1 second.

Many output parameter values are in percentages of total 'step time'. The step time is derived from the selected trigger modifier. For example a divisor of /2 would have a step time of 2 beats, *4 would be a quarter of a beat.

Any output parameter value can also be assigned to be CV controlled via either CV input. See the Voltage control section for more info on this.

The output parameters are as follows:

Wave

Select between Gate / Triangle / Sine / Envelope / Random output waveforms.

A full cycle of a waveform covers a single step.

Level

The voltage output level in percent 0-100% of maximum 5v output.

Width

A percentage width - applicable to step time but actual function depends on selected output waveform type;

- *Gate* - percentage of step cycle that is non zero (at selected level)

- *Triangle & Sine* - essentially skews the waveform - i.e at 50% a triangle is a triangle, at 100% is it a saw.

- *Envelope* - The release time in percentage of total step time.

- *Random* - no effect

Phase

References the start point on the chosen output waveform. For example starting the triangle at 50% phase would start it mid way.

Delay

The % of total step time before waveform generation starts, before then, output level will be 0. The end of the waveform cycle will clipped.
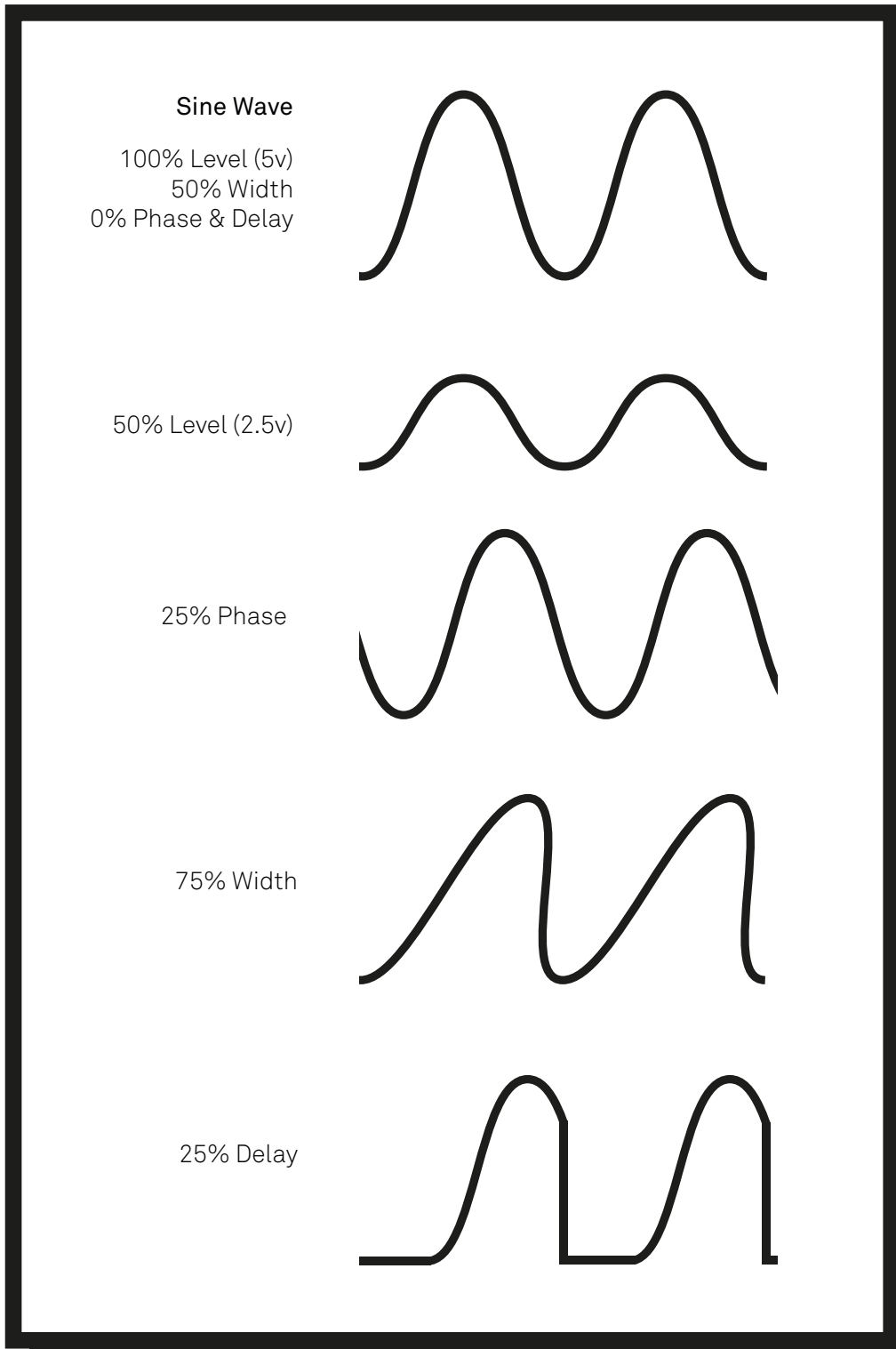
Note the delay divisor must be set for this to take effect!

Dly / (delay divisor)

Sets which steps the delay parameter (if set) alters. For example a divisor of '1' would delay every step - '2' every other step, '3' every third etc.

Note a divisor of 2 will make a classic 'swing' type effect.

Sine Wave

100% Level (5v)
50% Width
0% Phase & Delay

50% Level (2.5v)

25% Phase

75% Width

25% Delay

Effect of output parameter on waveform output.

Slop

Percentage indicating the likelihood of timing errors being introduced. 'Humanises' the output timing.

Euclidean Parameters

Euclidean rhythms are made from a simple algorithm which takes a numbers of steps and hits (or triggers) and produces a pattern based the hits being as equidistant from each other as possible. See https://en.wikipedia.org/wiki/Euclidean_rhythm for more info.

Pamela is able to map euclidean patterns on to an output and to then skip steps when they are not a hit. Three parameters are available for setting up a pattern.

The parameters are:

EStep

Sets the number of steps used for a full Euclidean pattern.

ETrig

Sets the number of 'triggers' or 'hits' for Euclidean pattern generation. Must be less than the number of steps.

ERot

Rotates the defined Euclidean pattern by the specified number of steps.

RSkip

Percentage likelihood of a step being completely skipped. Together with the loop parameter this can be used to build rhythmic loops.

Loop

Specifies the number of actual beats (note NOT steps) at which the the output is effectively reset. This can be used to loop both the random waveform and random skip parameters as well as reset and 'sync' euclidean timings.

This is a very useful melody and rhythm generator when used with the random waveform, 'Level' and 'RSkip' parameters.

Setting to zero re-seeds the random number generator.

Note the random seed is saved so loops can be recalled.

Output settings saving, loading and resetting.

Pamela will automatically save and remember current output settings between power cycles. Further to this outputs can be saved to and recalled from individual banks grouped by letter in sets of 8. Thus there are 26 save banks in all (a-z) each with 8 output 'slots'.

Save

Saves all set output values to a selected bank.'

Click the program knob to then scroll to a selected bank and then clicking again will performing the save ('??' will be displayed again). Alternatively 'NO' can be selected to abort the save operation.

Saving *may* introduce timing errors if done whilst clock is running.

Load

Works just like the save operation but rather than save, loads a set of output values from a selected bank and slot.

Reset

Sets all output parameters to basic initial values.

Loading, Saving and Reseting ALL 8 outputs at once.

A full bank (i.e 8 grouped by letter) of outputs can be loaded, saved or reset via the BPM sub menu. Long hold the program knob on the BPM screen and then scroll to the 'All outputs' screens.

Voltage Control

As well as direct user control, Pamela's clock and outputs can be assigned to external voltage control via 4 upper external signal inputs - clock, run, CV 1 & CV 2.

CV Assigning

An output modifier and many of its extended parameters can be externally voltage controlled by assigning its parameter value to either of the CV inputs.

CV 1 responds to voltages between 0 and 5v, whilst CV 2 responds to voltage between -5 & +5v (ie with 0 being 50%). Voltages input outside of this range are safe but will be ignored.

With a value assigned to a CV input, it can be further controlled by setting a per parameter attenuation and offset value to the incoming CV value. Pushing and holding the encoder knob whilst a parameter CV option is highlighted (in selection) will access sub screens to set these values as well as provide the ability to visually monitor the applied CV value.
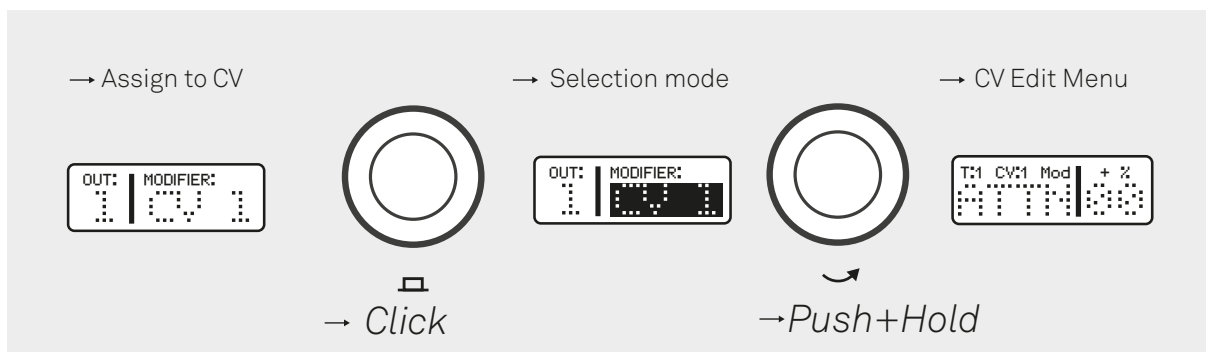
The set attenuation value can be either positive or negative which in effect inverts the CV value (i.e just like an attenuverter)

Multiple parameters can be assigned to the same CV input and each parameter has its own attenuation and offset parameters.

Note CV 1 only responds to positive voltages.

External Clock Control.

Pamela can be driven by, and thus sync to, an external clock. This could be something simple like square wave LFO or something slightly more complex like a Din Sync signal from external hardware patched into the 'Clk' and run inputs. You can also control the tempo directly with just a voltage level.

For syncing to work, Pam needs to know the external clocks ratio of ticks to a quarter note - this is known as the Pulses Per Quarter Note (PPQN) value. Pam also needs to know if it should start the clock automatically when an external clock signal is detected or wait for an external signal via the 'Run' input to go high and then start the clock.

By default Pam is setup to follow a Din Sync like clock. This has a PPQN of 24 and uses the run input to start and stop the clock. (NOTE: You can use an ALM004 - D.S.G or adapter cable to connect to a Din Sync style connector - see Appendix IV)

To change these settings - select the top level BPM clock screen and then press and long hold the program knob for just over 1 second. The 'external' Clock sub menu will be displayed. From this sub menu you can change both the expected PPQN value or assign it to 'CV" where a voltage level (Patch to to CV1) controls tempo.

If you sync to an external clock and the BPM gets set to 10, then you very likely have an incorrect PPQN value set, which is too high

The next 'Run?" screen allows you to set if the run input is used to start the clock ('Y') or ignore and start the clock automatically when a clock input is detected ('N'). The Run input becomes a reset input if Run is set to 'N'.

The two external clock sub menu screens will also display the BPM of a detected external clock (if present) and will display a warning if the external clock tempo is not constant and thus unstable. This may well likely mean the external is clock is unable to provide a workable clock to sync too.

It is not recommended you sync Pam to computer sourced MIDI clocks. Modern computers tend to give MIDI hardware (particularly over USB) a low priority compared to other system events. This notoriously leads to timing errors in

generating the midi clock and thus any slave devices will not sync correctly. For syncing to a computer it is recommend an audio track based clock is used or you use Pamela as the master with MIDI clock from the expander to DAW.

Always use as higher PPQN value as possible (24 recommended) for best sync accuracy. Use of a Run signal is preferred as there is less guesswork involved as to what speed to start the clock at and when to stop it.

If an external clock is sloppy then Pam will be too! It can't fix an external clock. It is HIGHLY recommend you use Pamela as your master clock as this is what Pamela was primarily designed for! It is EXTREMELY stable. Through use of the optional expanders both dedicated Din Sync and Midi clock outputs can be gained (See Appendix III)

Limited Warranty

From the date of manufacture this device is guaranteed for a period of 2 years against any manufacturing or material defects. Any such defects will be repaired or replaced at the discretion of ALM. This does not apply to;

- Physical damage arising for mis treating (i,e dropping, submerging etc).
- Damage caused by incorrect power connections.
- Overexposure to heat or direct sunlight.
- Damage caused by inappropriate or mis-use.
- Use of incorrect or non official firmware

No responsibility is implied or accepted for harm to person or apparatus caused through operation of this product.

By using this product you agree to these terms.

Support

For the latest news, additional info, downloads and firmware updates please visit the ALM website at http://busycircuits.com and follow @busycircuits on twitter.

Questions? email help@busycircuits.com .

APPENDIX

I: Service Mode & Calibration

Holding down the program knob whilst powering the unit will access the service menu. This mode allows subtle calibration of the core internal clock (lower value slower, higher faster. Default 16), clearing and resetting of the internal saved outputs, and testing of the OLED display. The service mode will also display current firmware version.

Pressing the start button will exit and Pamela will start as normal.

II: Firmware Updates

Pam is able to receive firmware upgrades by connection to a computer via the mini usb slot on the side of the unit. You should disconnect the Eurorack power connection when performing a firmware upgrade, just the a usb cable should be connected.

To perform the upgrade you need to install the 'dfu-util' program on your computer. It is available from ***http://dfu-util.sourceforge.net/*** for Windows, Mac OS and Linux. It is a command line program that needs to be run from the terminal. It is highly recommended you perform the upgrade from Mac or Linux. Very limited support is available for windows.

Mac Install

The easiest way to install dfu-util on mac is to first install 'brew' by following the instructions at http://brew.sh . Then in the Terminal App run 'brew install dfu-util'.

Windows Install

Download win32 binaries from http://dfu-util.sourceforge.net/ - version 0.8 is recommended,

Install Zadzig from http://zadig.akeo.ie/ and launch.

Remove Pamela from your modular system and disconnect power. *UNPOWERED* connect Pamela to you computer via the mini usb jack at the side. Ideally with no other usb devices connected.

Tick 'list all devices' from the 'options' menu. From the devices drop down menu select 'STM 32 BOOTLOADER' . Then select 'WinUSB' from the driver list and click install driver.

You should now be ready to follow dfu-util instructions below.

Linux Install

Dfu-util should be available in your distribution's of choice package manager.

Update Procedure

Remove Pamela from you modular system and disconnect power. *UNPOWERED* connect Pamela to you computer via the mini usb jack at the side of the unit. Ideally with no other usb devices should be connected to your computer.

Then run the following command in the Terminal ;

```
dfu-util  -a 0 -d 0x0483:0xdf11 --dfuse-address 0x08000000 -D
firmware.bin
```

Replace 'firmware.bin' with the location of the firmware you wish to install. All should be on a single line. For example, on mac, if you had downloaded 'alm0117-167.bin' to your home downloads directory, you would run;

```
dfu-util  -a 0 -d 0x0483:0xdf11 --dfuse-address 0x08000000 -D ~/
Downloads/alm017-167.bin
```

And then press 'Enter'.

The update process should take just a few seconds. Do not unplug whilst the update is happening. When completed disconnect the usb and plug back into your Eurorack system with power now connected. Note Pams display will remain blank during the update process. You should see something like;

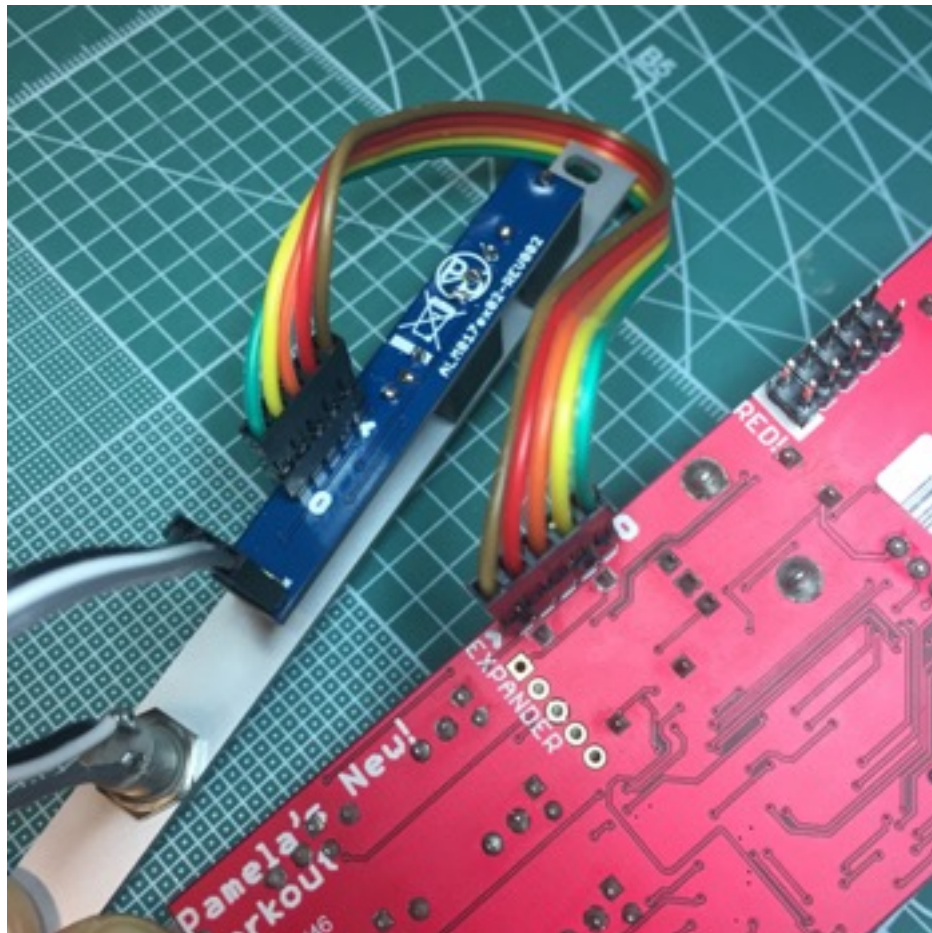Updating the firmware is likely to clear all saved outputs.

Please use only official firmware audio files when made available from the BusyCircuits website.

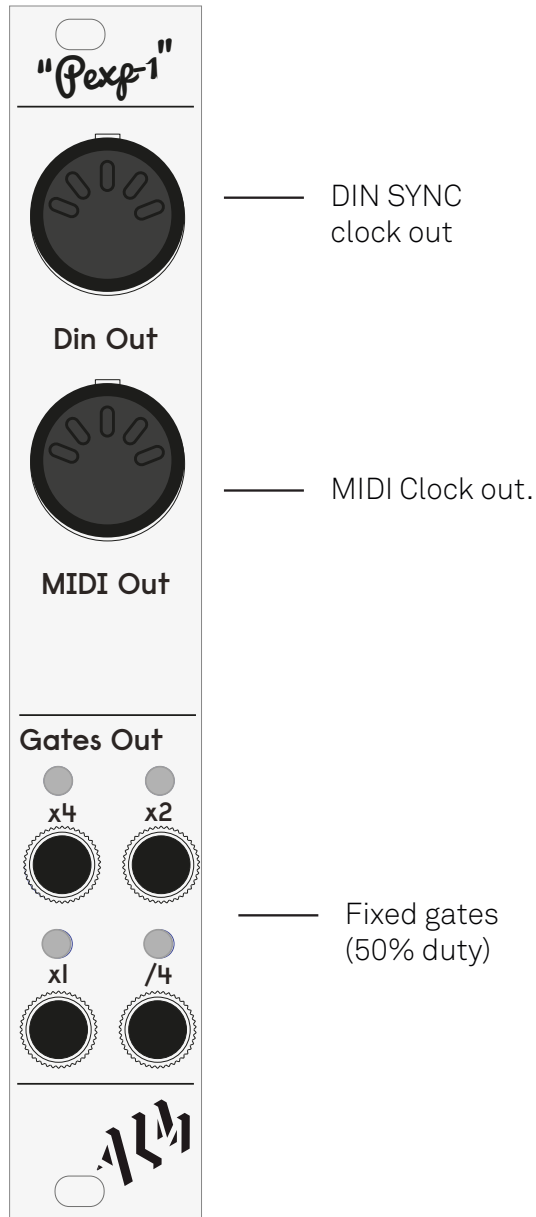A nicer UI program for firmware upgrade is planned!

III : Expanders

There are two optional expander modules available for use with Pamela's NEW Workout (*not the original Pamela!*). Both extend Pamela's functionality adding primarily a midi clock and other extra outputs.

Both modules connect to the 5 pin header on the back of Pamela via the cable supplied with the expander. Match the respective '**<**' and '**o**' symbols by the connector;

Pexp-1

DIN SYNC
clock out

Din Out

MIDI Clock out.

MIDI Out
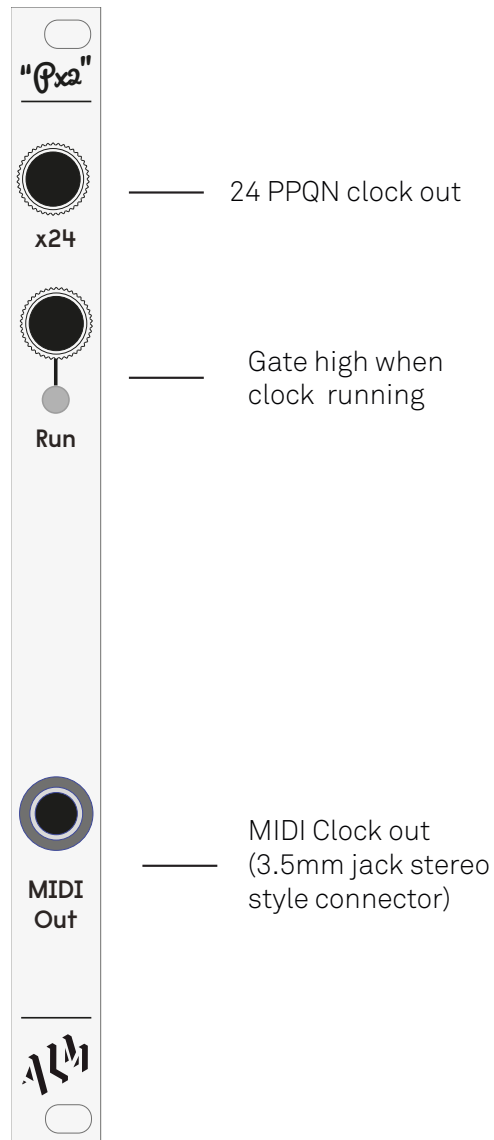
Gates Out

x4   x2

Fixed gates
(50% duty)

x1   /4

4HP module Provides Din Sync and MIDI clock outputs with DIN type connectors.
4 further fixed buffered gate outputs - x1 / x4 / x2 / /4 (5v / 50% duty) are also
provided with LED indication. Everything is synced to the main Pamela clock.

Note use of expander increases +12v rail current requirements by 25ma.

Pexp-1

Pexp-2

24 PPQN clock out

Gate high when
clock running

MIDI Clock out
(3.5mm jack stereo
style connector)

2HP module featuring 3.5mm jack type midi clock output and a x24 clock and run jack outputs.

The jack outputs can be used to sync a second Pamela, derive a Din Sync output signal via an ALM D.S.G or adapter cable. The 3.5mm jack can be switched between differing 3.5mm MIDI configurations by reversing the jack connector on the rear of the module. Matching the connector indicator to the '*' on the board will work with Arturia devices whilst reversing will work with Korg and Make Noise.

15ma extra current requirement.

IV: DIN Sync

'DIN Sync' is an interface introduced by Roland in the 1980s for the timing synchronization of synths, sequencers and drum machines etc. The interface uses a 5 pin DIN connectors but by means of a simple jack plug adapter (purchased or DIY), Pamela's NEW Workout can be used with DIN Sync devices.

5 Pin DIN Rear View
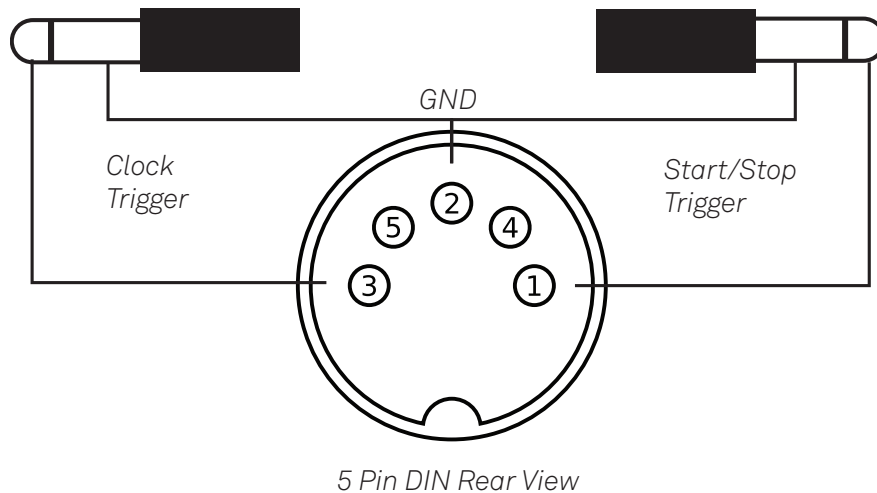
By connecting a DIN Sync clock to the clock input (with a setting of 24 PPQN - the default) and the start/stop to the run input Pamela will run as a DIN Sync slave syncing to an external clock signal.

By using two trigger outputs, one set as a 24 multiplier connected to the DIN Sync clock trigger and the other set as a constant gate connected to the DIN Sync Start/Stop trigger Pamela can act as a DIN Sync master and drive external DIN Sync devices.

ALM004 - 'D.S.G' provides such an adaptor in eurorack module format. Also a suitable adaptor cable is made by 'Expert Sleepers' with the code' 'DJ-1200' .A

Further to this the 2 outputs can be freed up by using either of the expander modules Din Sync output - the EXP 1 also include a Din Sync socket (Output only!) so an adaptor may not be needed.