Application Note

How to use the TOMBAK as an AWG (Arbitrary Waveform Generator)

Multiboard Series

TOMBAK : Synchronization electronic board

How to use the TOMBAK as an AWG (Arbitrary Waveform Generator)

Pre-requirement: Before using the TOMBAK board, make sure you followed all the instructions mentioned in the Operating Manual

1. Introduction

When used as an AWG, TOMBAK can generate special pulse waveforms with up to 4000 steps of down to 5 nanosecond.

TOMBAK, can also be used to generate Burst pulses with non-repetitive frequency and/or with adjustable amplitude.

The Shape-OUT SMA connector can be connected to the analog input of a dedicated external modulation instrument like an AOM (acousto-optic modulator), an EOM (electro-optic modulator), a SOA, a scanning system or a laser…

It is thus possible to create some Burst with nearly any shape and number of pulses up to 4000 pulses per Burst.

This is particularly interesting within a mode locked laser with MOPA configuration when someone wants to generate some burst from the oscillator part. Generating special exponential Burst shape can pre-compensate the deformation of the burst through the amplifiers and help maintaining a nice shape at the output of the MOPA laser.

2. Timing diagrams

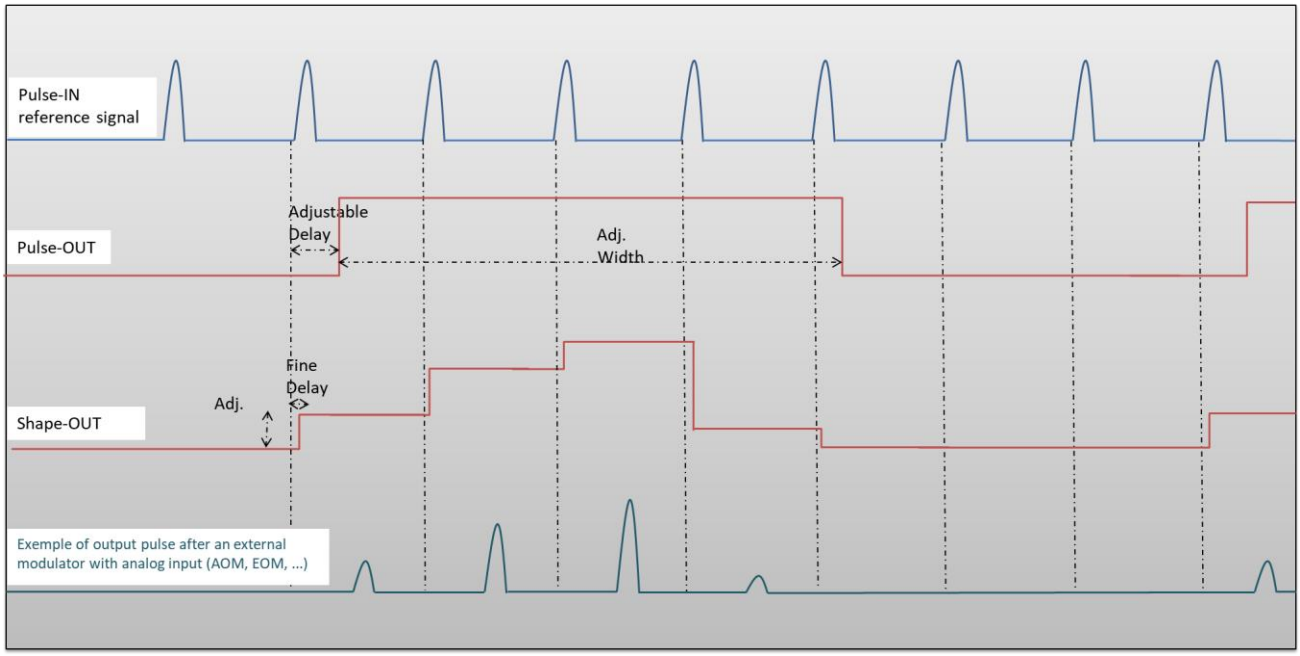


Figure 1 : Analog (Shape-OUT) and digital (Pulse-Out) outputs with amplitude, delay and pulse width adjusted signals from input

3. Synoptic

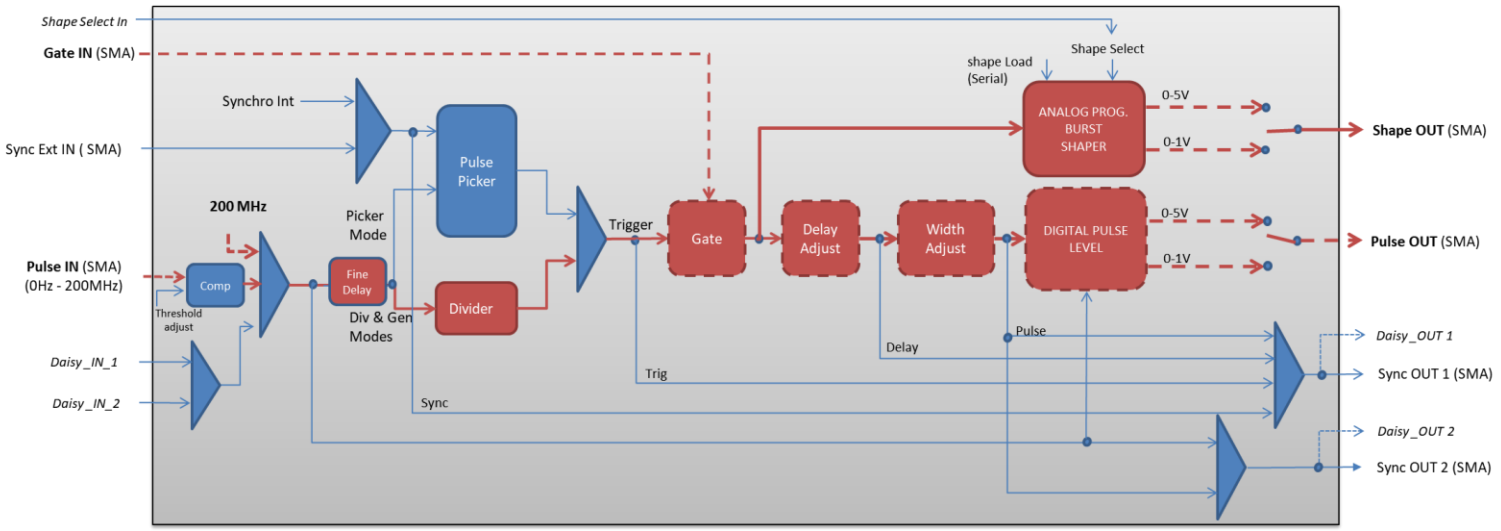
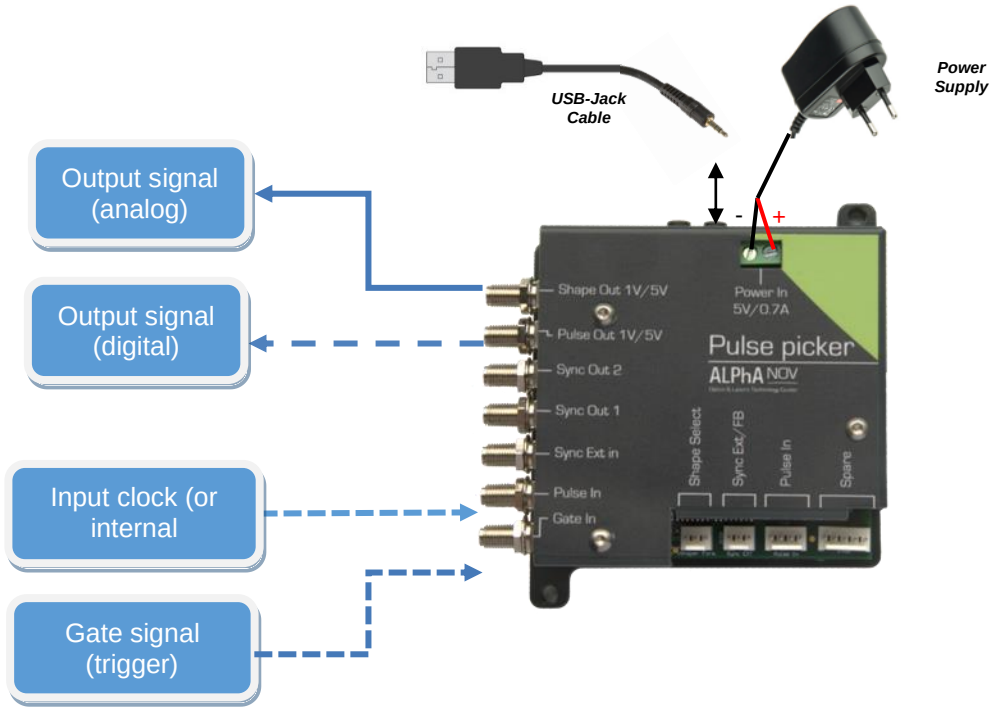


Figure 2 : Main firmware features used in AWG / Burst shaper mode (dashed lines are optional)

4. Cabling

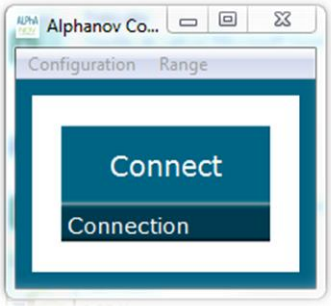
The steps given below in () are optional and link to previous configuration described in **§** Erreur ! Source du renvoi introuvable. **p.** Erreur ! Signet non défini. (Gate feature), in **§** Erreur ! Source du renvoi introuvable. **p.** Erreur ! Signet non défini. (Burst generator using the Gate input), and in **§** Erreur ! Source du renvoi introuvable. **p.** Erreur ! Signet non défini. (Frequency divider).

1. Plug the USB-Jack cable in the "*USB In"* connector
2. (Plug your reference signal (clock) in the "*Pulse In"* SMA connector)
3. (Plug your trigger/gate signal in the "*Gate In"* SMA connector)
4. The signal will output on the "*Shape Out*" SMA connector
5. Finally, plug the power supply to the "*Power In*" connector to power on the board



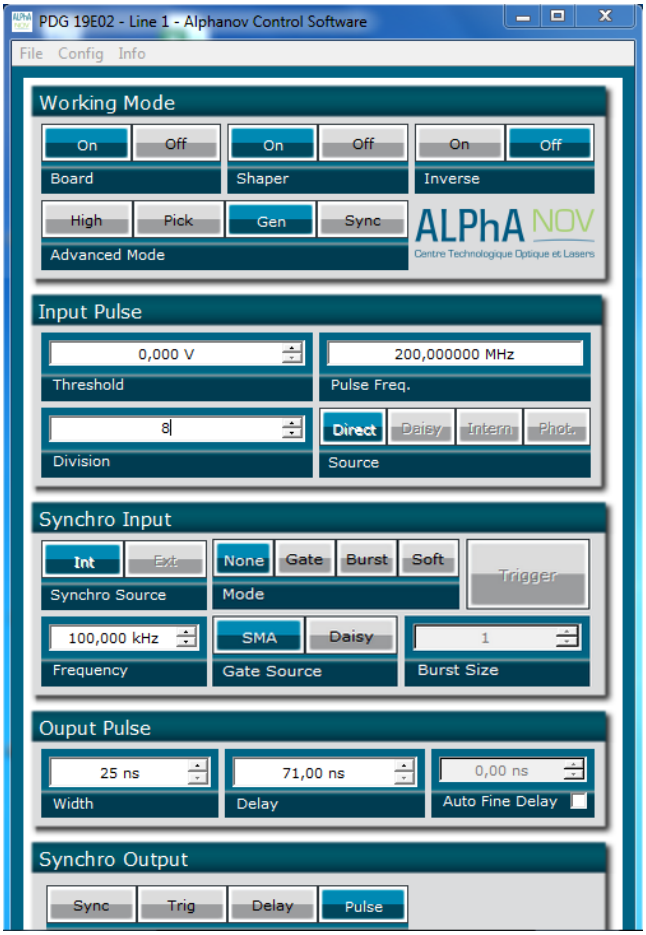
5. Software configuration

Launch the Aerodiode Control Software and click on *Connect* to start the Tombak hardware detection. The software automatically detects the Tombak board.



A window will appear for each Tombak connected to the computer.

The main configuration windows must be configured as follow :

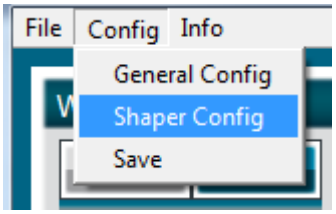


- Working Mode window :
  - Set the **Board** On
  - Set the **Shaper** button to **On**
  - Set the **Inverse** button to **Off** unless you need to invert the output signal
  - Set **Advanced Mode** to **Nothing** (use external clock) or **Gen** (use 200MHz internal frequency)

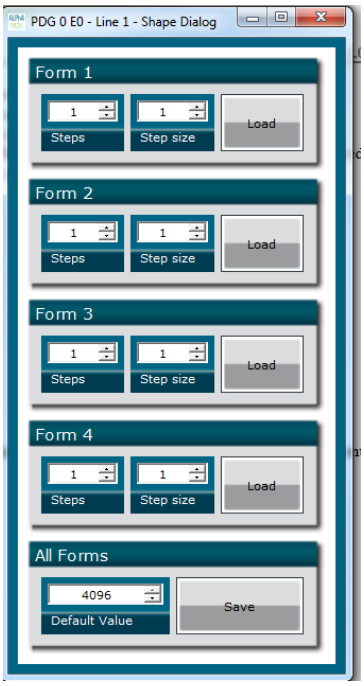
- Input pulse window :
  - (Configure the **Threshold** voltage so that the input **pulse frequency** is detected and equal to your pulse generator system)
  - Set the **Division** factor **according to your application**
  - Set the input pulse **Source** to **Direct**

- Output Pulse window :
  - Choose the output **delay value**
  - Choose the output **pulse width**
  - **Auto Fine Delay** may be let in auto mode or manual if you need to adjust the fine delay from reference signal to each shape point (see Figure 1).

- Configure shape :
  - Open the **shaper config** window by clicking on the “Shaper Config” in the bar menu



  - The following window will appear. **Load a .csv file** by cliking on Load



  - The **.csv file** should be like this (example and explanation) :

```
4
1000
3000
4095
500
0
```

```
Number of points - 1
Value in bit for 1st point (from 0 to 4095)
Value in bit for 2nd point  (from 0 to 4095)
Value in bit for 3rd point  (from 0 to 4095)
Value in bit for 4th point  (from 0 to 4095)
...
```

Please note that repetitive values of 0 could be used to make non-uniform period between pulses.

The maximum number of points is 4000.

- The **number of points, called steps**, should be automatically detected after uploaded the file
- The step size should be leave to 1 or could be higher if you want to change the point after several reference pulses (for example a step size of 2 will change the level one time for two pulses

Don’t forget to save the settings by clicking on the “Save” button in the bar menu.