

Application Note How to use the TOMBAK as a Pulse-Picker

Multiboard Series

TOMBAK : Synchronization electronic board



Pulse-IN reference signal	Λ			\square		\land	\square	
Ext Sync IN or Internal signal								
Pulse-OUT	Adjustab	le Delay	ıdj. Width		<	·····×·	>	





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How to use the TOMBAK as a Pulse Picker

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

1. Introduction / Overview

When someone wants to generate a pulse (open a time domain door) at a low repetition rate (for example Hz/kHz range) which must be synchronized with a high frequency signal/clock (for example 100MHz range), There is two solutions :

- 1. The most immediate is to divide the clock signal frequency. Using the Tombak for that is described in the first part of this document. **See page 3**
- 2. When the low frequency pulse/door must also be synchronized with a low frequency external or internal signal (in other word, when we want a low repetition rate pulse at a repetition rate of a low repetition rate trigger BUT synchronized with a high frequency clock), the solution is to use the PICK mode of the Tombak. Note that in this last case, if the low frequency trigger is not synchronized with the high frequency clock, there will be a unavoidable Jitter which value is 1/clock frequency. **See page 8**

In both case above, the TOMBAK opens a door with adjustable delays and adjustable width.



Mode 1 : Pulse Picking using the Divider mode

1 Timing Diagram



Figure 1 : Frequency divided, delayed and pulse width adjusted signal from input to output



Figure 2 : Main firmware features used in frequency divider mode

3. Cabling

- 1. Plug the USB-Jack cable in the "USB In" connector
- 2. Plug the signal generator (i.e. the signal you want to delay) in the "*Pulse In*" SMA connector
- 3. The software adjustable delay and pulse width signal will output on the "*Pulse Out*" SMA connector
- 4. Finally, plug the power supply to the "*Power In*" connector to power on the board





4. Software configuration

Launch the ALPhANOV 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 :

PP 17E01 - Line 1 - Alphano	Control Software		- • ×
Working Mode			
On Off	On O	Cn	Off
Board	Shaper De	Inverse	
Advanced Mode	Gen		
Input Pulse			
2,00 V	10	100,0 kHz	
2	e l	Direct D	laisy
Division	Sour	ce	
Ouput Pulse			
1,000 µs 😨 Width	100,00 ns Delay	Auto Fine D	s 😒 Velay 🔛
Synchro Input			
ht	None Ga	te Burst	Soft
Source	Mode 1		
Frequency	Burst Size	Trics	
Synchro Output			
Sync Trig	Delay	ALPhA	NOV

- Working Mode window :
 - Set the **Board On**
 - Set the Shaper button to Off
 - Set the **Inverse** button to **Off** unless you need to invert the output signal
 - o Unset all Advanced Mode

Working Mode							
On Off On Off				On	Off		
Board		Shaper		Inverse			
High	Pick	Gen	Sync				
Advanced Mode							



- 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
- Synchro input windows :
 - Source : not used in this mode
 - Mode : None
 - Frequency : not used in this mode
 - Burst size : not used in this mode





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ault settings) : Synchro Output

Synchro ouput window (default settings) :
 Source : Pulse

Don't forget to save the settings by clicking on the "Save" button in the bar menu.





5. Main features

Frequency divider factor	[1 - 10^9]
 Adjustable pulse width resolution (for pulse width [5ns - 510ns]) resolution (for pulse width [511ns - 2⁶²ns]) 	[5ns – >>1000s] 2ns 5ns
Adjustable pulse delay resolution 	[70ns – >>1000s] 10ps
 Jitter for delay < 570ns & pulse width < 510ns for any other delay & pulse width 	<200 ps RMS 1.5 ns RMS
Input PulseIn voltage	30 mV – 3,3V
Input maximum frequency	200 MHz
Output Voltage	1 / 3,3 / 5 Volts (hardware setup)
Output maximum frequency	20 MHz



Mode 2 : Pulse Picking using the Pick mode

1. Timing Diagram



Figure 3 : External or internal signal synchronized with Pulse-In signal.





3. Cabling

- 5. Plug the USB-Jack cable in the "USB In" connector
- 6. Plug the signal to synchronize in the "Sync Ext in" SMA connector. (only for external signal synchronization). If signal to synchronize is internally generated, no signal needed on "Sync Ext in".
- 7. Plug the reference signal (i.e. the signal on which "Sync Ext In" signal or



"internal signal" will be synchronized with) in the "Pulse In" SMA connector

- 8. The synchronized signal will output on the "Pulse Out" SMA connector
- 9. Finally, plug the power supply to the "*Power In*" connector to power on the board



4. Software configuration

Launch the ALPhANOV 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 :



PP 17E01 - Line 1 - Alphan	📅 PP 17E01 - Line 1 - Alphanov Control Software					
File Config Info						
Working Mode						
On Off	On	Off	On Off			
Board	Shaper		Inverse			
High Pick	Gen	Sync				
Advanced Mode						
Input Pulse						
2,00 V	A		100,0 kHz			
Threshold		Pulse Freq				
1	•	Direct	t Daisy			
Division		Source				
Ouput Pulse						
1,000 µs	100,00	ns	0,00 ns 🚖			
1,000 µs 🗼 Width	100,00 Delay	ns 💂	0,00 ns 💌 Auto Fine Delay 🔲			
1,000 µs ↓ Width Synchro Input	100,00 Delay	ns 💽	0,00 ns 💌 Auto Fine Delay 📄			
1,000 µs 🚊 Width Synchro Input	100,00 Delay	ns 🛓	0,00 ns 🔄 Auto Fine Delay 🔲 Burst Soft			
1,000 µs 🔄 Width Synchro Input Int Ext Source	100,00 Delay None Mode	ns 💌	0,00 ns 🐑 Auto Fine Delay 🔲 Burst Soft			
1,000 µs Width Synchro Input Int Ext Source 10,000 kHz ♀	100,00 Delay None Mode	ns 🔍 Gate	0,00 ns 🔄 Auto Fine Delay 🗍 Burst Soft			
1,000 µs È Width Synchro Input Int Ext Source 10,000 kHz È Frequency	100,000 Delay None Mode 1 Burst Size	ns 🔍	0,00 ns 🔄 Auto Fine Delay 📄			
1,000 µs Width Synchro Input Int Ext Source 10,000 kHz Frequency Synchro Output	100,000 Delay None Mode 1 Burst Size	ns v	0,00 ns 🔄 Auto Fine Delay Burst Soft			
1,000 µs Width Synchro Input Int Ext Source 10,000 kHz Frequency Synchro Output Synchro Output	100,000 Delay None Mode 1 Burst Size	ns 🔍	0,00 ns 🔄 Auto Fine Delay 📄			
1,000 µs 💮 Width Synchro Input Int Ext Source 10,000 kHz 🔄 Frequency Synchro Output Sync Trig Source	100,00 Delay Mode 1 Burst Size	ns 🔍 Gate	0,00 ns Auto Fine Delay Burst Soft Trigger ALPHA NOV Contro Technologique Dyloque et Lasers			

- Working Mode window :
 - o Set the Board On
 - $\circ~$ Set the Shaper button to Off
 - Set the **Inverse** button to **Off** unless you need to invert the output signal
 - Set Advanced Mode to Pick

Working Mode							
On	Off	On	Off	On	Off		
Board		Shaper		Inverse			
High	Pick	Gen	Sync				
Advanced Mode							

- Input pulse window :
 - Configure the Threshold voltage so that the input pulse frequency is



detected and the same as your pulse generator system

- Set the **Division** factor to **1**
- Set the input pulse Source to Direct

Input Pulse							
2,00 V 🚔	100,0) kHz					
Threshold	Pulse Freq.						
1	Direct	Daisy					
Division	Source						

- Output Pulse window :
 - Choose the output **delay value**
 - Choose the output **pulse width**
 - Auto Fine Delay may be let in auto mode



- Synchro input windows :
 - Source :
 - Set Int to synchronize an internal generated signal with Pulse-In signal.
 - Set Ext to synchronize an external signal (connected to Ext-In connector) with Pulse-In signal.
 - Mode : None
 - Frequency :
 - ⇒ If internal source is selected, set the output signal Frequency you need to synchronize.
 - ➡ If external source is selected, Frequency shows the input Ext-In signal frequency
 - Burst size : not used in this mode

Synchr	ro Inpu	ut				
Int	t	Ext	None	Gate	Burst	Soft
Sourc	ce		Mode			
10	0,000 k	Hz 🚖	1	A V	Tric	Ider
Frequency Burst Size		ing	<u>, go</u> ,			

- Synchro ouput window (default settings) :
 - Source : Pulse



Don't forget to save the settings by clicking on the "Save" button in the bar menu.





5. Main features

 Adjustable pulse width resolution (for pulse width [5ns - 510ns]) resolution (for pulse width [511ns - 2^{^62}ns]) 	[5ns – >>1000s] 2ns 5ns
Adjustable pulse delay resolution 	[70ns – >>1000s] 10ps
Input Ext-In Voltage Logic Low Logic High 	[0-0.8V] [1.7-3.3V]
Input PulseIn voltage	30 mV – 3,3V
Input maximum frequency	200 MHz
Output Voltage	1 / 3,3 / 5 Volts (hardware setup)
Output maximum frequency	20 MHz

