User guide
for Matlab

Introduction

US-Key can be used in Matlab with a file called LecoeurUS which allows to call the device's DLL. The different functions of this device are accessible by this file which can have an extension ".dll" ou ".m".

In the directory "c:\saphirp\Matlab examples", you can find 2 folders with the following names :
- "Matlab before V7.1" which contains LecoeurUS.dll
- "Matlab since V7.1" which contains LecoeurUS.m

In function of the Matlab software version, copy all folder elements (for the corresponding folder), into your work directory (for example, the Matlab's work directory)

Warning : you mustn't have the files of each folder at the same time in your work directory, if not you will have errors during the launching of the example file.

In the same directory "Matlab examples", you have 2 example files (french and english) which contains all functions available to communicate with the US-Key. Copy this file into your work directory (the same that the DLL repertory) and to launch it in Matlab.

If you have several US-Key connected to your PC, you pass a parameter (parameter P1 of each function) which will contain the US-key number that you will want to read or to configure. Each time that you connect an US-Key at your PC, Windows affects a number in function of the connection order of each US-Key. The first connected device takes the number 0, the following 1, ...

Functions	Call syntax	Description
Init usb	LecoeurUS('Init usb',P1)	**Initialization and DLL loading** ➢ **P1 : US-Key number (0 -> 7)**
load configuration	LecoeurUS('load configuration',P1,1)	**US-Key's parameters loading** ➢ **P1 : US-Key number (0 -> 7)**
Prf	LecoeurUS('Prf',P1,P2)	**PRF (Pulse Repetitive Frequency)** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : PRF (KHz)**
voltage	LecoeurUS('voltage',P1,P2)	**Transmitting pulse voltage level** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Voltage of 30 to 230 Volts**
width	LecoeurUS('width',P1,P2)	**Transmitting pulse width** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Width of 0 to 255 (0 => no pulse)**
pulse delay	LecoeurUS('pulse delay',P1,P2)	**Delay between the beginning of the digitalization window and the transmitting pulse** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Delay by step of 1.6µs (P2*1.6µs)**

Functions	Call syntax	Description
filter/mode	LecoeurUS('filter/mode',P1, P2,P3)	**Filter selection and also of Transmitter/Receiver mode connected or disconnected** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Filter type** - **0 => 1.25 MHz** - **1 => 2.5 MHz** - **2 => 5 MHz** - **3 => 10 MHz** - **4 => Broad band** ➢ **P3 : Mode** - **0 => Transmitter/Receiver connected** - **1 => Transmitter/Receiver disconnected**
Gain	LecoeurUS('Gain',P1,P2)	**Variable gain** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Variable gain of 0 to 79.9 dB**
scale delay	LecoeurUS('scale delay',P1,P2)	**Digitalization delay** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Digitalization delay in µs**
samplingfreqmode	LecoeurUS('samplingfreqmode',P1,P2,P3)	**Selection of the sampling frequency and also of Transmitter/Receiver mode** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Sampling frequency** - **0 => 160 MHz** - **1 => 80 MHz** - **2 => 40 MHz** - **3 => 20 MHz** ➢ **P3 : Mode** - **0 => Transmitter/Receiver connected** - **1 => Transmitter/Receiver disconnected**
gate position	LecoeurUS('gate position',P1,P2,P3)	**Configure gate position** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Gate number (1 -> 3)** ➢ **P3 : Gate position in µs**
gate width	LecoeurUS('gate width',P1,P2,P3)	**Configure gate width** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Gate number (1 -> 3)** ➢ **P3 : Gate width in µs**
gate hight	LecoeurUS('gate hight',P1,P2,P3)	**Configure gate level trigger** ➢ **P1 : US-Key number (0 -> 7)** ➢ **P2 : Gate number (1 -> 3)** ➢ **P3 : Gate trigger level in %**

Functions	Call syntax	Description

relays	LecoeurUS('relays',P1,P2)	**Type of alarm (on appearance or disappearance of an echo for example)**
		➢ **P1 : US-Key number (0 -> 7)**
		➢ **P2 : Type of alarm coded in binary (Porte3 Porte2 Porte1), 1 bit for one gate**
		  - **0 => Alarm on appearance**
		  - **1 => Alarm on disappearance**

Ascan	LecoeurUS('Ascan',P1,P2,0,P3,P4)	**Data acquisition**
		➢ **P1 : US-Key number (0 -> 7)**
		➢ **P2 : Data type**
		  - **0 => HF**
		  - **1 => A-scan**
		➢ **P3 : Number of samples**
		➢ **P4 : Wave type to display**
		  - **0 => Full rectified**
		  - **1 => Negative**
		  - **2 => Positive**

measures	LecoeurUS('measures',P1)	**Measures reading of each gate**
		➢ **P1 : US-Key number (0 -> 7)**
		➢ **Output table format :**
		  - **Alarm Gate1**
		  - **Amplitude Gate1**
		  - **Distance Gate1**
		  - **Alarm Gate2**
		  - **Amplitude Gate2**
		  - **Distance Gate2**
		  - **Alarm Gate3**
		  - **Amplitude Gate3**
		  - **Distance Gate3**