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Electronic bagpipes *a-pipes*

User's guide

November 2018

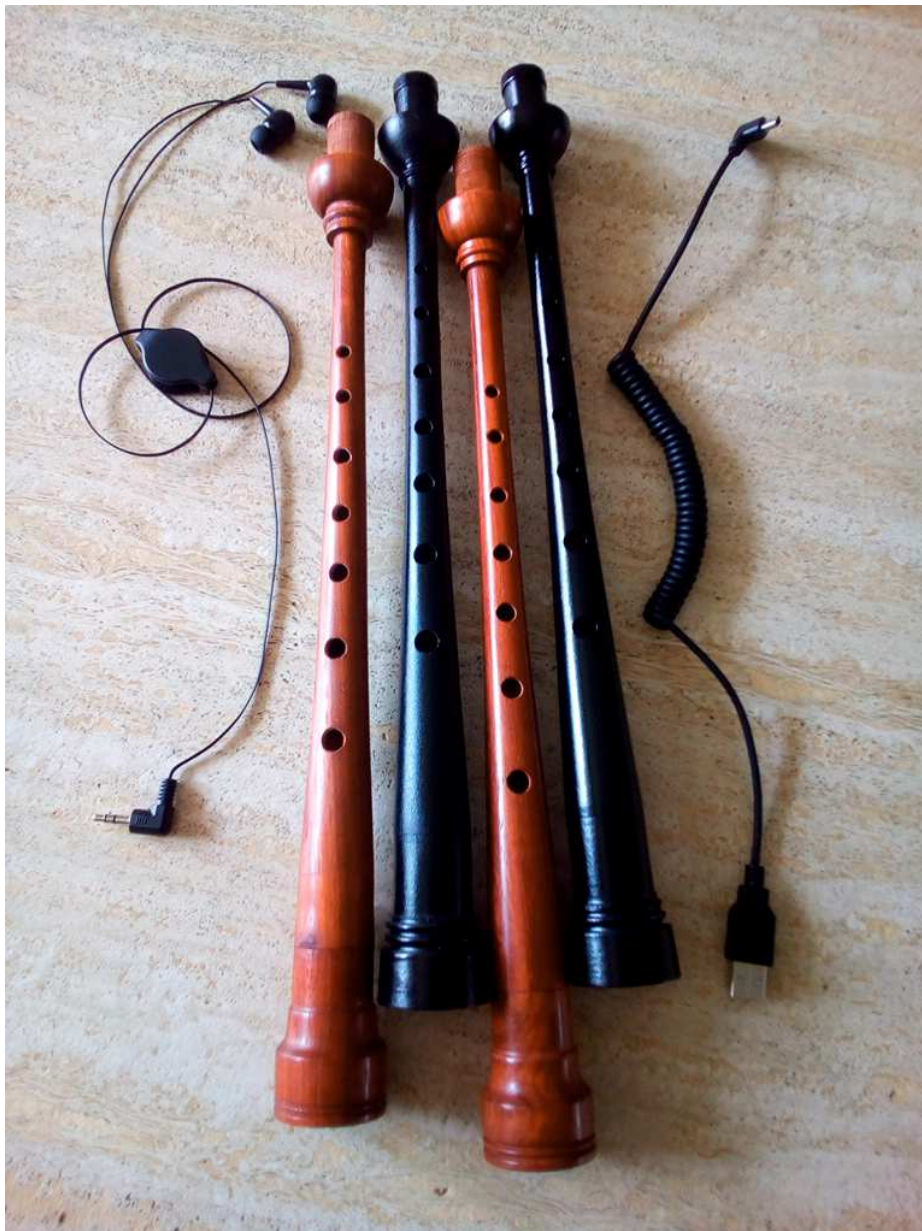


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1 Presentation

This document is the user's guide for electronic bagpipes *a-pipes* and its remote software.

2 Warning

- Because of opened holes, the *a-pipes* is sensitive to extreme moisture environment; direct contact with water shall always be avoided.
- For both plastic and wooden models, due to the fineness of the shape and the presence of holes, the chanter can split in case of violent impact or fall.

3 Power the a-pipes

The device is powered by a single AAA battery (rechargeable or not).

In case of using a non rechargeable battery, because of a lightly reduced length, it can be necessary to stretch the metallic spring on negative pole.

3.1 Battery insertion

The battery must be inserted into the battery holder with positive pole on its largest side; the positive pole should lightly exceed on this side.



Inset the battery holder, beginning with its largest side, then press it.



A power switch is used for starting the device.

It can alternatively be powered through a mini USB cable even if battery is drawn or absent. No switch on needed in such case.

Warning : if the power source is a smartphone, its battery could be quickly drawn.

When *a-pipes* plays no notes, no drones, no metronome and is not connected by Bluetooth or USB, it automatically enters in snooze mode; then battery drawing is dramatically reduced. In this mode, it needs one second or more to turn back to operational mode.

A "battery low" alert sounds when battery level reaches a low limit (one little beep every 20 seconds, then doubled, tripled and so on as available power decreases).

3.2 Battery choice and usage

A 1800mA rechargeable 1.5V battery theoretically allows continuous playing during 37 hours. The *a-pipes* can play without Bluetooth even with a drawn battery (until 1V).

But when Bluetooth is active, it requires a minimum voltage of 1.3V. If the voltage falls under this limit, the *a-pipes* will always reboot at Bluetooth activation; on the other hand, the *a-pipes* remains operational for hours without Bluetooth.

For these reasons :

- A not too old 1.2V rechargeable battery, fully refuelled, allows more than 50 minutes with Bluetooth activated.
- An 1.5V rechargeable battery, allows more than 3 hours with Bluetooth activated.
- An 1.5V non rechargeable battery, allows more than 3 hours with Bluetooth activated.

Despite the very lower battery drawn of the radio, the same rules apply. This is due to an initial short current peak at start; if battery level is low, *a-pipes* should perpetually reboot.

3.3 Before playing

Before attempting to play, it is necessary to fill every holes with fingers once. Without that, holes would stay for a while in an undetermined state.

3.4 Environment

A_pipes is able to play in any situation : strongest darkness, full sunshine, stage lights and strobes ...

Fingers dryness or moisture level has no impact on it.








4 Standalone *a-pipes* control









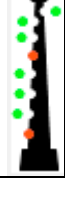
A-pipes configuration can be set up only using the remote control software on a PC.





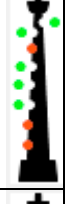




All others user's action are done using magic fingerings; holes are numbered from 0 (upper) to 7 (lower).

All these fingerings - but drones and chanter start commands - are allowed only when not playing.




Once fingering is applied, it is necessary to maintain it as is until action completion.

	Covered holes	Acknowledgement	Action
	0 7	5 low beeps (like an old fashion horn)	Bluetooth power on if it was off. Since V2.5 : not affected by powering off.
	0 7	2 low beeps (like an old fashion horn)	Since V2.4 : Bluetooth power on if it was on. Since V2.5 : not affected by powering off.
	0 6 7	5 higher beeps (like an old fashion horn)	Radio power on - for at least 60 seconds - if it was off. Since V2.5 : not affected by powering off.
	0 6 7	2 higher beeps (like an old fashion horn)	Since V2.4 : Radio power on if it was on. Since V2.5 : not affected by powering off.
	0 2 3 4 5 6	None	Drones start after up to 2 seconds.
	0 1 2	None	Chanter + Drones start (since V1.3).
	0 1 2 4 5 6	None	Immediate chanter start on a E.

	4 5 6	None	Instrument start indication : no note is played while this fingering is present, next valid fingering will play the relevant note.
	4 5 6 7	None	Instrument stop.
	0 1 7 (first time)	3 low beeps	Prepare the device to record. must be confirm.
	0 1 7 (second time)	5 low beeps	Confirm recording ==> recording starts. Recording ends when 500 notes have been stored or at instrument stop (5 low beeps are played). Recorded tune is saved into EEPROM, so it is not affected by powering off.
	1 2 7	None	Playback the previously recorded tune.
	1 7	1 high bib (5 high beeps if maximum is reached)	Turn audio volume up; volume level is saved into EEPROM, so it is not affected by powering off.
	2 7	1 low bib (5 low beeps if minimum is reached)	Turn audio volume down; volume level is saved into EEPROM, so it is not affected by powering off.
	3 4 7	None	Metronome start; metronome state and tempo are both saved into EEPROM, so they are is not affected by powering off.
	3 7	None	Metronome's tempo tuning; regularly hit hole 3, with hole 7 maintained closed, until the tempo is ok.

	4 7	2 low beeps	metronome stop.
	5 7	1 beep = simple gain, 2 beeps = double gain	Switch audio gain from 1 to 2 and vice versa; doubling the gain is useful when outputting sound to speakers. output gain is saved into EEPROM, so it is not affected by powering off.
	Until V1.7 : 6 7	Audible sound change	Circularly switch to next instrument. Choice is saved into EEPROM, so it is not affected by powering off.
	Since V1.8 : 1 6 7	Audible sound change	Circularly switch to next instrument. Choice is saved into EEPROM, so it is not affected by powering off.
	Since V2.8 : 2 6 7	Audible pitch change	Increase global pitch. Choice is saved into EEPROM, so it is not affected by powering off.
	Since V2.8 : 3 6 7	Audible pitch change	Decrease global pitch. Choice is saved into EEPROM, so it is not affected by powering off.
	Since V2.8 : 4 6 7	Audible pitch change	Reset global pitch to default. Choice is saved into EEPROM, so it is not affected by powering off.
	Since V2.15 : 0 1 2 3 4 6	Plays a Cnat/REb or a C#/RE	Toggles permanent accidental on C/RE.
	Since V2.15 : 0 1 3 4 5 6	Plays a Fnat/SOLb or a F#/SOL	Toggles permanent accidental on F/SOL.

5 Special fingerings

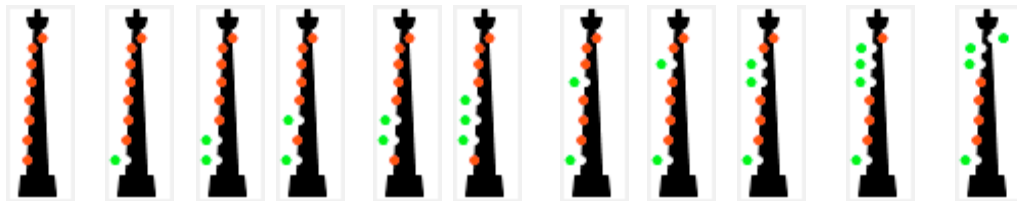
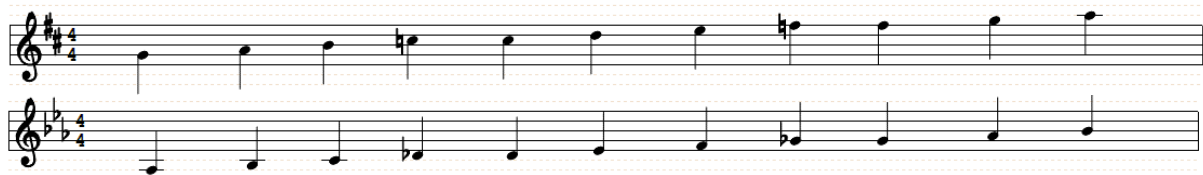
	Doigté	Effet
	Covered holes : 0, 1, 2, 5, 6	Vibrato on E
	Covered holes : 0, 1, 2, 3, 6 et 7	Vibrato on D
	Covered holes : 0, 1, 2, 3, 5, 6 et 7	Vibrato on D
	Hole 7 partially covered	Glissando low A

6 *a-pipes* fingering in bagpipes mode

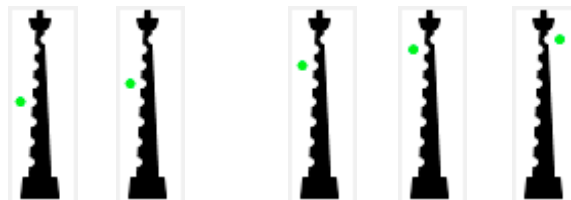
The first fingerings line shows legacy notes.

The second fingerings line shows corresponding grace notes.

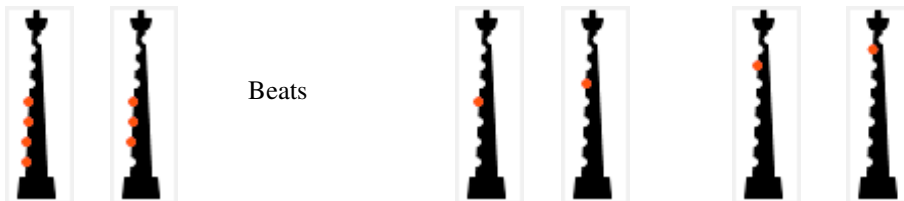
The third fingerings line shows corresponding beat notes.



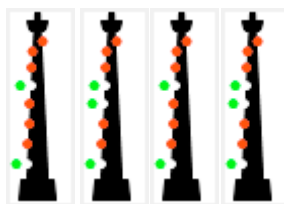
Grace notes



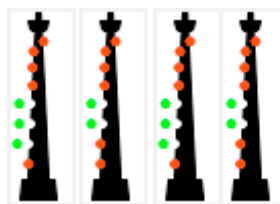
Beats



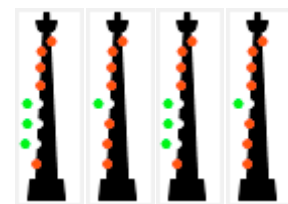
Vibrato on E/FA



Vibrato on D/MI



Vibrato on D/MI –
alternate fingering



Glissando on
LowA / LA : by
progressively #7
hole uncovering



7 Use the *a-pipes* with a *a-box*

First connect the jack 3.5mm output of your *a-box* to a headphone or HIFI equipment using an appropriate cable – not included.

When planning to use MIDI features - if your *a-box* supports this option - connect the MIDI cable before powering on the *a-box*.

Power the *a-box* using the USB cable included with your *a-pipes*. This cable can be plugged into a mobile phone charging adapter.

Orient the *a-box* so that its silkscreen faces the *a-pipes*. This point is important because *a-pipes* emission power level is very low.

After some seconds, the *a-box* plays some two tones klaxon sound : it is ready to communicate with one *a-pipes*.

If *a-pipes* is not set up for automatic radio start, start it using the dedicated magic fingering (see previous table); the *a-pipes* then plays the same sound on its output jack (two tones klaxon).

A few seconds after, the *a-box* plays the beginning of « Flower of Scotland »; this means that it has recognised the *a-pipes* and is ready to playback with a tiny latency time (one millisecond) everything incoming from it : all *a-pipes* instruments, metronome, glissendi, vibrati and volume controls.

If the *a-box* was powered down, after 60 seconds, the *a-pipes* will timeout and play a quick two tones sound, indicating that connection failed and that radio has been powered down (this timeout duration doesn't take into account snooze periods – without sound produced and fingers moves).

If the *a-box* is USB plugged to a computer or an Android device, the remote software will recognise it and will access to the *a-pipes* through the *a-box*, as usual.

Notice :

- this mode is not accessible when the MIDI cable is plugged in,
- set up actions will not always succeed when *a-pipes* plays.

After powering down the *a-pipes* or after radio shutdown, just issue the magic fingering without restarting the *a-box*.

Range can easily exceed 17 meters outdoor, without obstacles. Communication will be disturbed by player displacements.

Electric *a-pipes* drawn in radio mode is significantly lower than in Bluetooth mode.

8 *a-pipes* connection to a computer using USB

Connect *a-pipes* to the computer using a male type A USB → male mini USB cable.

Next, use the remote software (see §12) or a terminal emulator (see §13).

8.1 On Windows

If the CH340/CH341 driver is not automatically recognized, let download it from http://www.wch.cn/download/CH341SER_ZIP.html

8.2 On Linux

On Linux, USB driver installation should be done as root :

- On 64 bits machines : first install the 32 bits libraries :

```
sudo apt-get install libasound2-plugins:i386
sudo apt-get install libx11-6:i386
```
- Extract the CH341 driver's tar ball *CH341SER_LINUX_NOTRACE.tgz* into */tmp* :

```
cd /tmp
tar xzf <tar ball folder>/CH341SER_LINUX_NOTRACE.tgz
cd CH341SER_LINUX
make
mv /lib/modules/2.6.32-431.el6.i686/kernel/drivers/usb/serial/ch341.ko /lib/modules/<kernel
release>/kernel/drivers/usb/serial/ch341.ko.origine
cp ch34x.ko /lib/modules/< kernel release >/kernel/drivers/usb/serial/ch341.ko
rmmod ch341
insmod /lib/modules/< kernel release >/kernel/drivers/usb/serial/ch341.ko
```
- Allow access to the USB / serial device for all users :

```
echo 'KERNEL=="ttyUSB0", MODE="0666"' > /etc/udev/rules.d/10_ttyUSB0.rules
```

This name « /dev/ttyUSB0 » is the one used by the remote software.

8.3 On Mac OS X

The CH340/CH341 driver is not automatically recognized, let download it from http://www.wch.cn/download/CH341SER_ZIP.html

9 *a-pipes* connection to an Android smartphone using USB

Connect *a-pipes* to the smartphone using a male mini USB → male “OTG” micro USB.
Then use *a-pipes* application, available for free on *GooglePlay*.

10 *a-pipes* connection using the *a-box*

Connect the *a-box* to the computer or the Android device using USB.

The remote software will recognise the *a-box* and will dialog with the *a-pipes* through the *a-box*.

11 *a-pipes* connection using Bluetooth 2.0

Bluetooth link use is only available for communications with the remote software. Running on a PC (Windows, Linux or MacOSX) or an Android smartphone.

No standard Bluetooth device such as headphones or speakers can be used with the *a-pipes*.

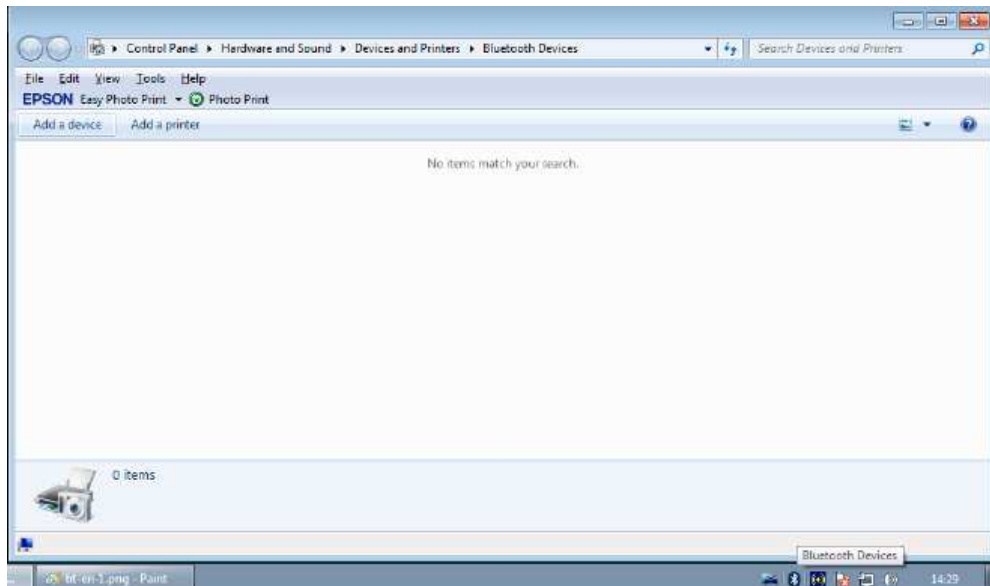
If *a-pipes* is powered through USB, *Bluetooth* communication is not supposed to work.

If *a-pipes* has not been configured for automatic Bluetooth activation at boot time, use the magic fingering on *a-pipes* for starting Bluetooth : an old fashion horn should sound; it means that Bluetooth is powered on for a period of 90 seconds.

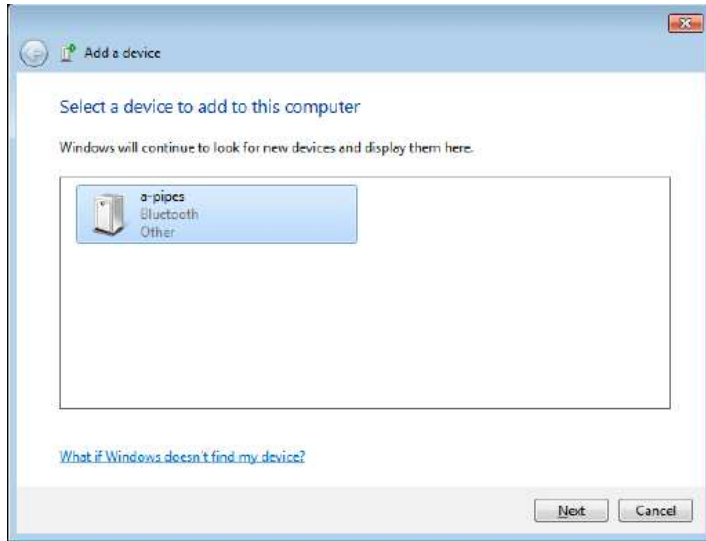
After the timeout, if no communications with the remote software occurred, the Bluetooth is automatically powered off: a lower but similar sound is issued.

11.1 On Windows

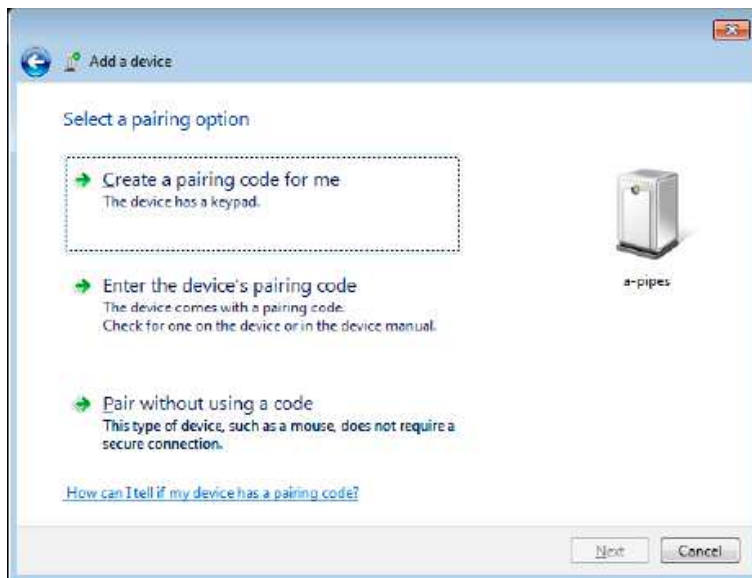
Double click on the Bluetooth icon at the bottom right of screen : a configuration panel is displayed



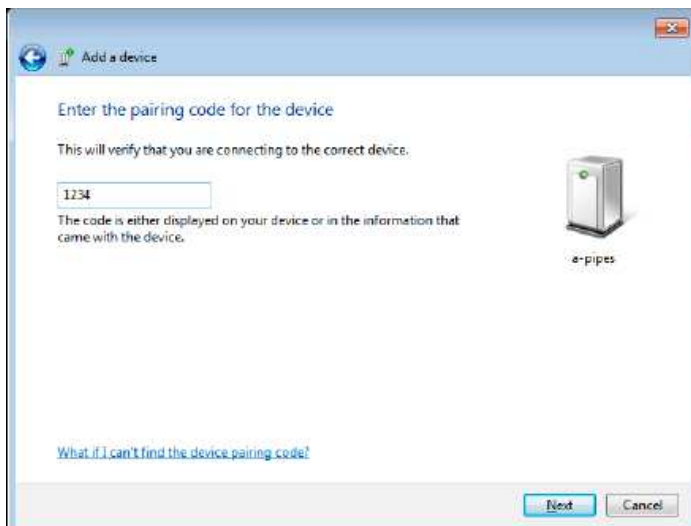
Click on the tab « Add a device »; after a while the *a-pipes* should appear :



Double click the *a-pipes* icon, then select « Enter the device's pairing code »



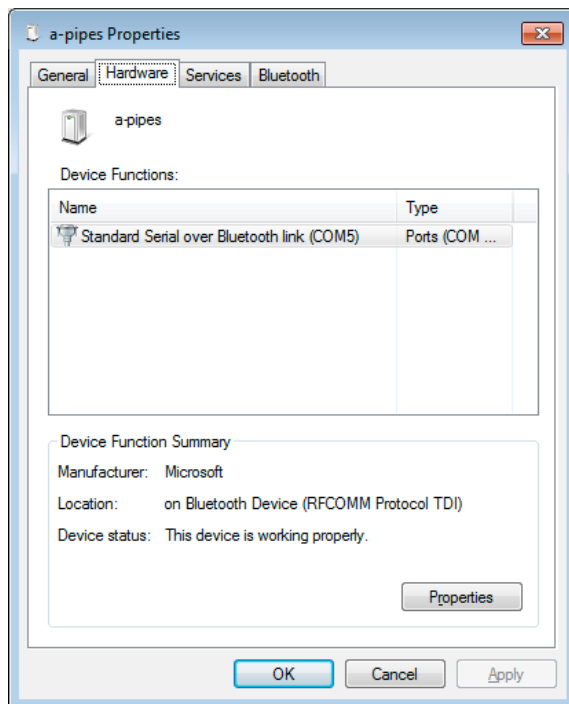
Then enter « 1234 » code :



Then *a-pipes* appears as a device.



Double click on the *a-pipes* icon and get its associated COM port (COM5 here) from Hardware section.



This port name is the one used by the remote software.

11.2 On Linux

As *root* :

- If Bluetooth is not already started : « *service bluetooth start* »
- Lookup at Bluetooth devices : « *hcitool scan* »
- Keep *a-pipes* address (e.g. : 0F:15:2E:09:0C:05)
- Associate this address to a RFCOMM serial device: « *rfcomm bind /dev/rfcomm0 0F:15:2E:09:0C:05* »

This name (*/dev/rfcomm0*) is the one used by the remote software.

11.3 On Mac OS X

Redaction pending.

11.4 On Android

Start Bluetooth on *a-pipes* then on the Android device; Android will search for new Bluetooth devices and find the *a-pipes*.

Click on it and enter PIN code “1234”.

Now *a-pipes* is associated to your Android device.

Use the *a-pipes* application available for free on *GooglePlay*; it will automatically detect the *a-pipes*.

12 *a-pipes* set up with the remote software

12.1 Software installation

12.1.1 On Windows

Unzip the *a-pipes_windows.zip* file.

On Windows, no proper installation is required : only the executable file « *a-pipes.exe* » is needed.

The remote software creates then maintains a user's preferences file named « *a-pipes.opt* » and located in the directory pointed by \$USERPROFILE environment variable, typically "*C:\Documents and Settings\<USER>*".

12.1.2 On Linux

Unzip the *a-pipes_Linux.zip* file.

As the final user, create on the desktop a file named « *a-pipes.desktop* » containing these lines :

```
[Desktop Entry]
Version=1.0
Type=Application
Terminal=false
Name=a-pipes
Exec=<chosen folder>/a-pipes
Icon=< chosen folder >/a-pipes.gif
```

The remote software creates then maintains a user's preferences file named « *a-pipes.opt* » and located in the directory pointed by \$HOME environment variable.

12.1.3 On Mac OS X

Unzip the *a-pipes_MacOSX.zip* file.

The remote software creates then maintains a user's preferences file named « *a-pipes.opt* » and located in the directory pointed by \$HOME environment variable.

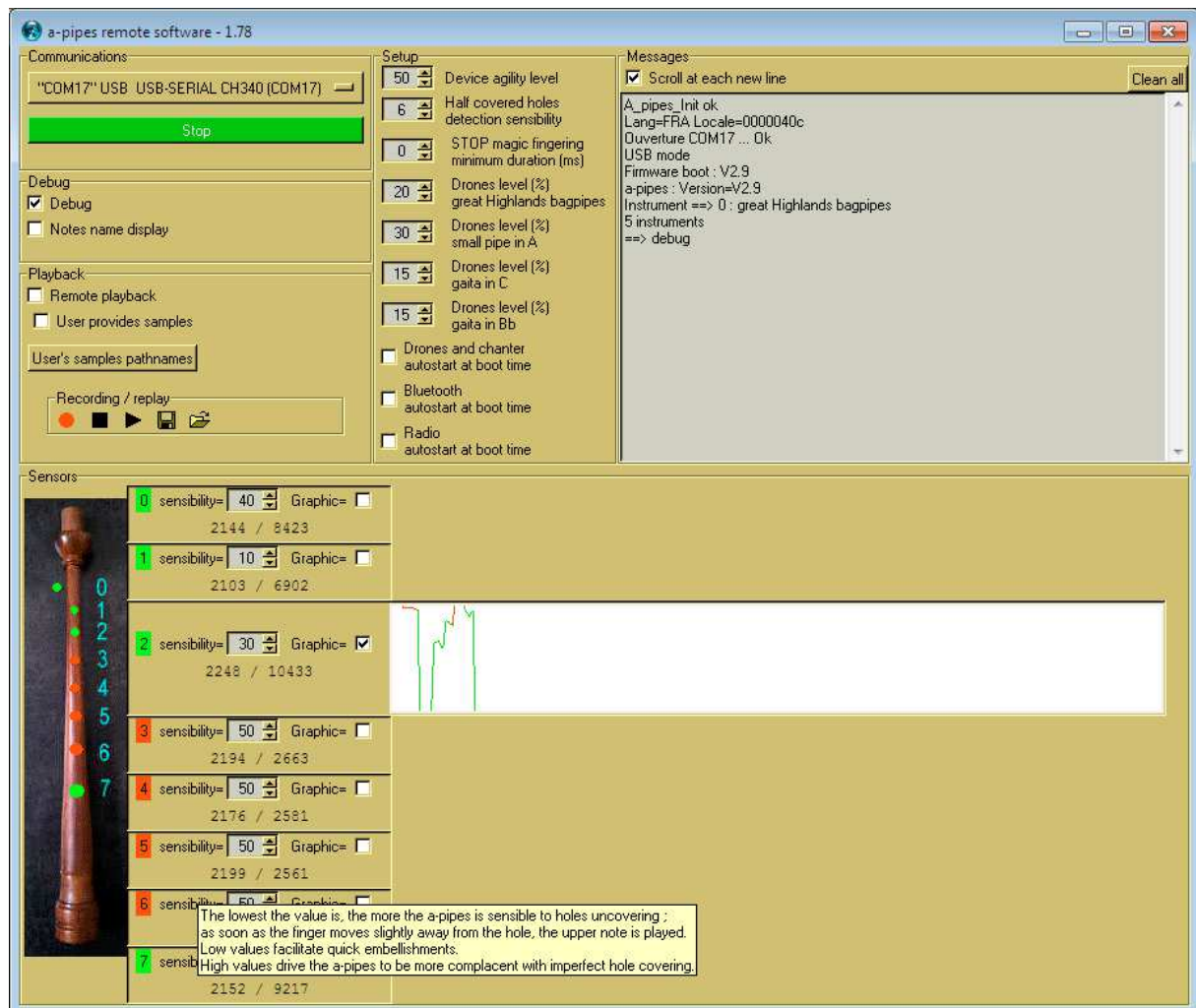
12.1.4 On Android

The application can be automatically installed for free from GooglePlay.

12.2 Software's features

The remote software allows, from a graphical application, to set up *a-pipes* configuration.

Warning : this software cannot be used while the MIDI adapter (if any) is plugged into the *a-pipes*.



All parameters are written into *a-pipes* EEPROM, so they don't disappear when device is powered off.

Adjustable parameters from "Setup" frame are :

- Device agility level : range 0 to 100. When reducing this value, *a-pipes* becomes less reactive (can be used by absolute beginners for masking playing faults). Increasing it makes the *a-pipes* more reactive but increase electric drawing; can be interesting for high speed jigs.
- Half covered holes detection sensibility : the sensibility level into a range 0 to 20. The highest the value is, the best hole's half covering is detected (applies to gaita half covered fingerings, but also sliding notes). Lowering this setting makes the *a-pipes* more tolerant with imperfect fingerings. A 0 value can be adapted to high speed jigs.
- 8 hole's individual sensibilities : the lowest the value is, the more the *a-pipes* is sensible to hole's uncovering; as soon as the finger moves slightly away from the hole, the upper note is played. Low values facilitate quick embellishments. High values drive the *a-pipes* to be more complacent with imperfect hole covering; it also apply to hole #0 (HA grace note) and hole #7 (birl).

- STOP magic fingering duration : the minimum duration for the STOP magic fingering, in milliseconds. Set it to avoid unwanted device stop during approximate fingerings.
- Drones and chanter autostart at boot time : when not set, *a-pipes* plays a short “flower of Scotland” melody at boot time (with drones if battery powered, without drones else) , then waits for a magic fingering. When set, *a-pipes* plays at boot time both drones and chanter (a E note) instead.
- Bluetooth autostart at boot time or not (not operational when powered by USB).
- Radio autostart at boot time or not (not operational when powered by USB).
- Vibrato on E and vibrato on D activation (since firmware V2.13) : enable / disable the “vibrato” feature.

In complement, two options are available in the « Debug » frame :

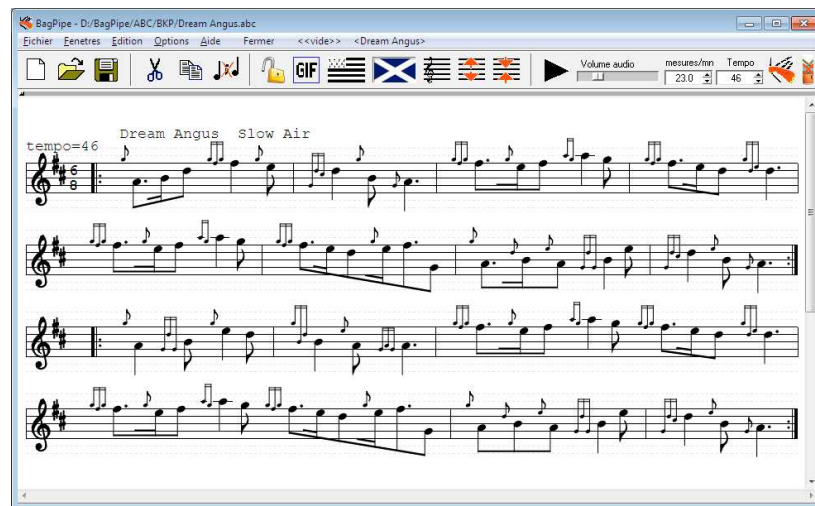
- Debug : displays twice per second all 8 holes states (current covering value, maximum covering value); an optional realtime graph is available.

Debug mode is incompatible with music playing, because it monopolises the *a-pipes* CPU and makes it too slow for playing.

- Notes display : displays notes names in realtime.

The « Playback » frame allows the computer to :

- Play notes issued from *a-pipes* using native sounds at 44100Hz / 16 bits
- Play notes issued from *a-pipes* using user’s samples (See chapter 14 Remote playing)
- Record notes issued from *a-pipes*, play it back and store the tune into a «*a-pipes*» file; *BagPipe* composing software can read such file and transforms it automatically into an ABC music sheet. *BagPipe* software is downloadable for free at <http://r.fifi.free.fr/BagPipe>



13 *a-pipes* setup with a terminal emulator

Warning : this feature is no more available since firmware release V2.10.

Recommended terminal emulators are :

- « Droidterm » on Android,
- « Tera Term » on Windows.

Communication speed (baudrate) should be set to 115200 bauds, 8 bits, no parity.

The whole dialog mode with user is textual.

All commands are very short; each command line should be followed by an Enter keypress (CR = carriage return, LF = new line, or both).

- Command « ? » : asks for current setup.
Notice : due to an Android bug, this command can have no answer; in such case, the user should issue a « d0 » command. This will unblock the USB driver and the answer to command « ? » will be received.

Output example :

```
e=500
d=0
g=50
S=10
B0=20
B1=30
B2=15
B3=15
i=0
h=5
n=5
a=0
A=0
s0=110
s1=30
s2=40
s3=30
s4=30
s5=30
s6=30
s7=70
```

- Command « v » : sensors state is continuously displayed on the upper lines of the window :
line 1 : sensor number,
line 2 : current covering value/10,
line 3 : max/10,
line 4 : sensibility,
line 5 : state (0=opened, 1=covered)

Display example :

```
0 1 2 3 4 5 6 7
260 294 267 258 259 260 251 267
260 296 269 259 261 261 252 268
110 30 40 30 30 30 30 70
0 0 0 0 0 0 0 0
-----
```

- Command « s » : sets sensor's sensibility value for one hole.
Example for #2 hole : "s2=45"

- Command « g » : sets global agility (maximum = 50 = default value)
Example : "g45"
- Command « a » : (since V1.3) toggles drones+notes autostart mode.
- Command « A » : (since V1.7) toggles Bluetooth autostart mode.
- Command « B » : (since V1.3) sets drones volume for one instrument numbered from 0 to 4.
Example : « B0=30 » 30% volume for instrument #0 (great Highland bagpipes)
- Command « h » : sets half covered holes detection sensibility level (range 0 to 20)
Example : « h18 »
- Command « S » : sets the minimum duration for STOP magic fingering (milliseconds / 10)
Example : « S240 » : STOP magic fingering should be maintained for more than 2.4 seconds
- Command « b » : Bluetooth power on (for 90 seconds)
- Command « d0 » : end of debug mode
- Command « x » : *a-pipes* reboot
- Command « Z » : full factory reset then reboot; total duration = 1 minute

14 Remote playing

Let launch the remote software, then connect it to *a-pipes* using USB or Bluetooth.

Check « Remote playback » option in the « Playback » frame; now all notes will be played by the computer at HIFI quality level (44100Hz, 16 bits PCM); the *a-pipes* jack output doesn't need to be plugged.

In case of Bluetooth connection; a little latency time (5ms) appears between the fingering and the remote playback. This latency is not that disturbing.

If the user wishes to provide its own samples for remote playback (e.g. his own bagpipes recorded at 96000 Hz and 16 bits), he has to place its 11 to 20 WAV files (RIFF/PCM) into a dedicated folder, then he makes the remote software pointing to this folder.

Files count depends on instrument type : typically 11 for bagpipes and 20 for gaitas.

Every files should have the same audio format (sampling frequency, bits count) and should have one single channel.

Each file can contain a note lasting seconds, or the minimum periodic sequence of the sound; notes are played from a perpetual loop.

All fingering whose file is not provided will be ignored.

Filenames should respect the following fingering/filename associations :

Holes state, from top to bottom (C=covered, O=open, M=half covered)	Filename	Comment
Drones	drones.wav	
C C C C C C C C	0.wav	
C C C C C C C O	1.wav	
C C C C C C O O	2.wav	
C C C C C O O O	3.wav	
C C C C O C O O	3.wav	
C C C C O O O O	4.wav	
C C C O O O O O	5.wav	
C C O O O O O O	6.wav	
C O O O O O O O	7.wav	
O O O O O O O O	8.wav	
C C C C C O O C	3.wav	played if a-pipes is not in gaita mode
C C C C O O O C	4.wav	played if a-pipes is not in gaita mode
C C C O C C C O	5.wav	played if a-pipes is not in gaita mode
C C O O C C C O	6.wav	played if a-pipes is not in gaita mode
C O O O C C C O	7.wav	played if a-pipes is not in gaita mode
O O O C C C C O	8.wav	played if a-pipes is not in gaita mode
C C C C C O C O	9.wav	played if a-pipes is not in gaita mode
C O C O C C C O	10.wav	played if a-pipes is not in gaita mode
C O C C C C C O	8.wav	played if a-pipes is in gaita mode
C C C C C C M O	9.wav	played if a-pipes is in gaita mode
C C C C C O C O	10.wav	played if a-pipes is in gaita mode
C C C O C C O O	11.wav	played if a-pipes is in gaita mode
C C O C O O O O	12.wav	played if a-pipes is in gaita mode
C C O C O C O O	12.wav	played if a-pipes is in gaita mode
C C O C O C C O	12.wav	played if a-pipes is in gaita mode
C O C O O O O O	13.wav	played if a-pipes is in gaita mode
O C O O O O O O	13.wav	played if a-pipes is in gaita mode

C O C O C C C O	13.wav	played if a-pipes is in gaita mode
O O C C O O O O	14.wav	played if a-pipes is in gaita mode
O C C C C C O O	14.wav	played if a-pipes is in gaita mode
O C C C C C O O	15.wav	played if a-pipes is in gaita mode
O C C C C M O O	16.wav	played if a-pipes is in gaita mode
O C C C C O O O	17.wav	played if a-pipes is in gaita mode
O C C C O O O O	18.wav	played if a-pipes is in gaita mode
C C C O C C C O	-----	fingering reserved for bagpipes ==> not interpreted in gaita mode

15 Troubleshooting

- My *a-pipes* periodically sounds short beeps sequences when not playing : battery becomes low.
- My *a-pipes* reboots continuously : battery is too low.
- My *a-pipes* becomes crazy; when using the remote software, I see a lot of aberrant settings : by mistake, the *a-pipes* stayed powered for a while until battery was fully drawn.

It is necessary to use the remote software for resetting all settings to default : place the pointer at messages window bottom then press « Z » + enter key; *a-pipes* reboots after one minute with its factory settings.

If it doesn't fix, update all settings manually.

- When powered on, my *a-pipes* plays strange sounds instead of the five first notes of "Flower of Scotland"; I hear a high A followed by N low A : optical failure of sensor number N → Please contact us.