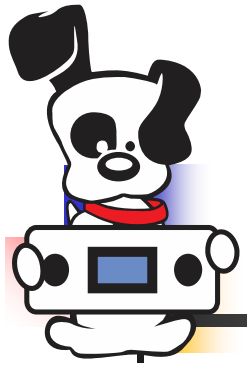
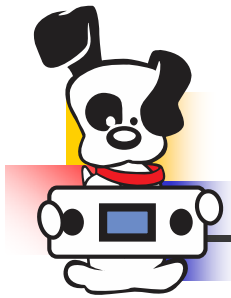


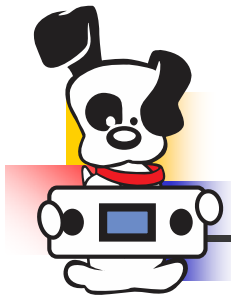
KodeKLIX for PUP

Sounds and Music



Sounds and Music

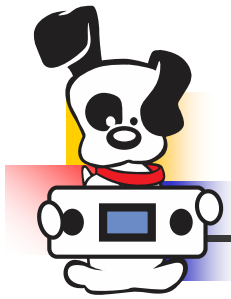
- Sound capabilities of the PICAXE
- How to use the SFX Designer
- How to add sounds and effects to your apps
  - Foreground sounds
  - Background sounds



Sounds and Music - PICAXE

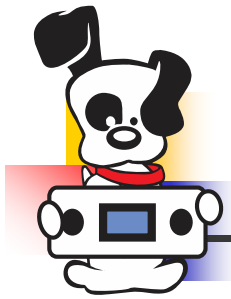
- The very first PICAXE chips only had the SOUND command
  - SOUND is a foreground command – everything stops whilst the sound is played
  - SOUND allows for 255 sounds
    - 0-127 are notes (ascending scale)
    - 128-255 are pseudo noise effects (ascending frequency)
  - SOUND allows for duration control

```
'========================
' play SOUND
'========================
{
let b0=64
let b1=250
Sound, _Speaker,(b0,b1)
}
```



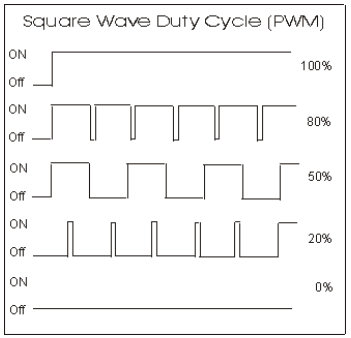
Sounds and Music - PICAXE

- The M series onwards have introduced PLAY and TUNE commands
  - Both PLAY and TUNE are also foreground commands – everything stops whilst the sound is played
  - PLAY outputs a predefined tune stored in the PICAXE chip
  - TUNE allows notes to be played
    - However, by playing notes one at a time using a coding loop the TUNE can be played whilst other code gets its change to execute



Sounds and Music - PICAXE

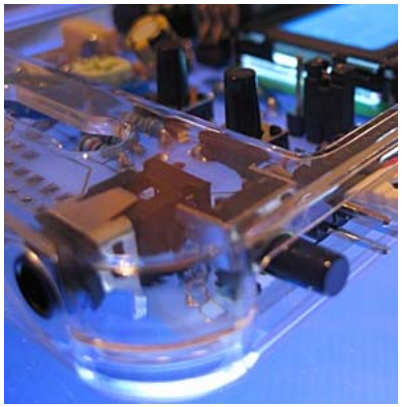
- Some PICAXE chips also support PWM
  - PWM = Pulse Width Modulation
  - PWM = square wave output



- When PWM is connected to sound device, like a peizo speaker, sound is heard
  - PWM can be done in the background if the PICAXE hardware supports it
  - This means that sounds can continue play whilst your code gets on with other tasks

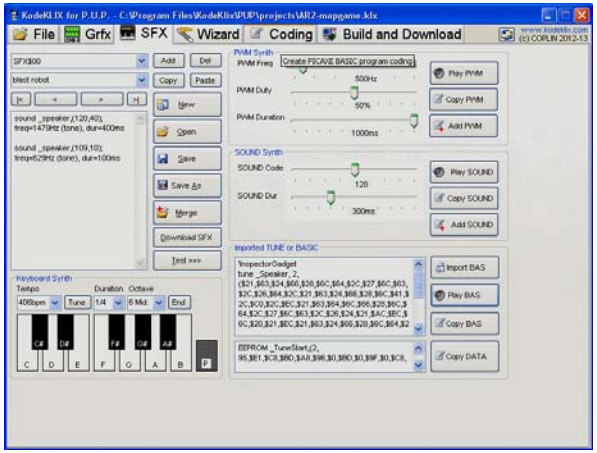
Sounds and Music - PUP

- The PUP hardware supports up to two sound channels
  - One foreground and one background (PICAXE 20M2 and 20X2)
  - One foreground channel with PICAXE 20M
  - The two sound channels are combined by the PUP circuit hardware and output as one signal
  - The output of one channel can affect the signal from the other

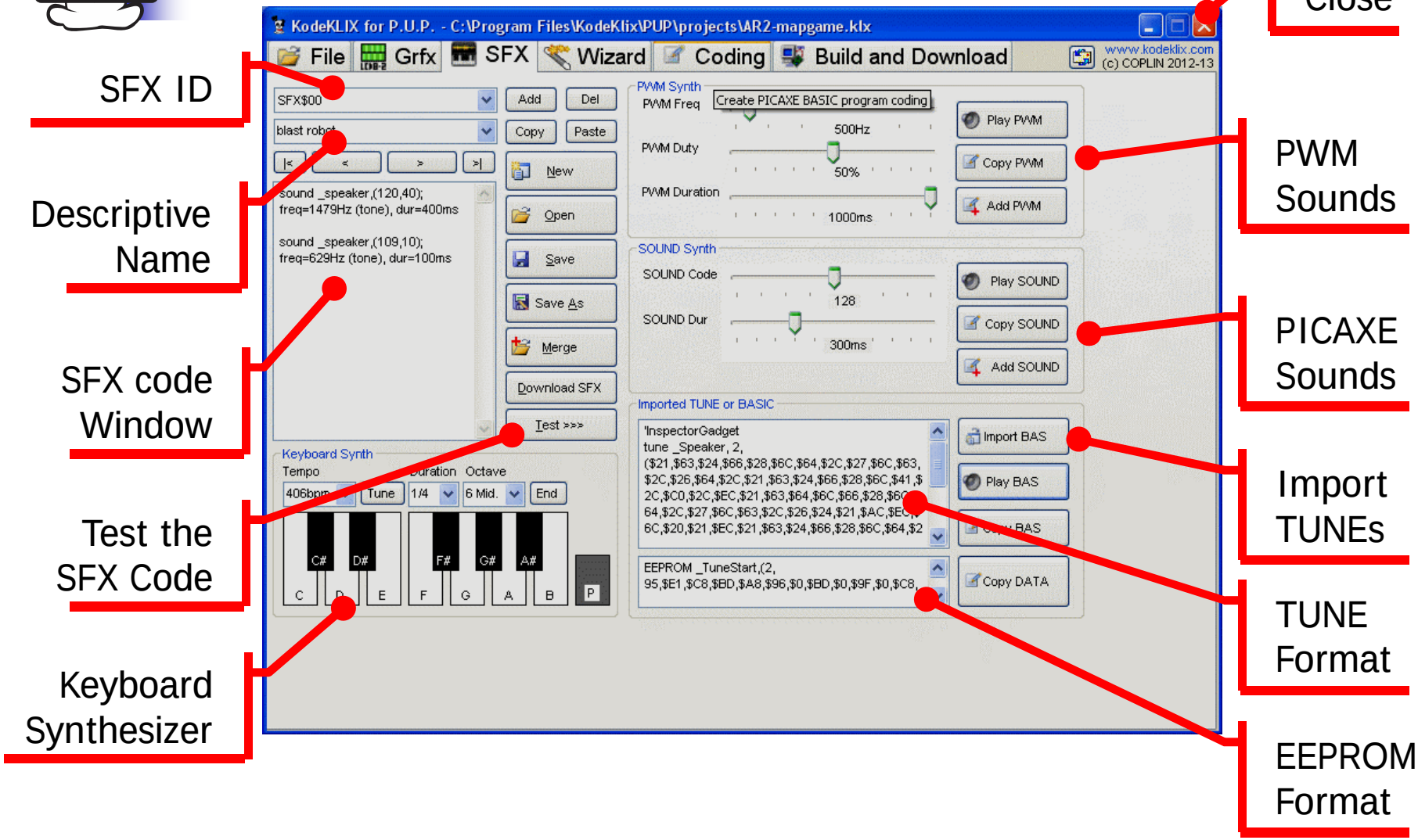


SFX Designer and Manager

- Create your own sound effects (SFX)
- Create your own TUNEs
- Import TUNEs from the PICAXE library
- Convert SFX and Tunes to PUP code
- New PWM based SFX and TUNE formats
- Manage sound creation libraries
  - Share these with other KodeKLIX users



SFX – CloseUP Guide



SFX ID

Descriptive Name

SFX code Window

Test the SFX Code

Keyboard Synthesizer

Close

PWM Sounds

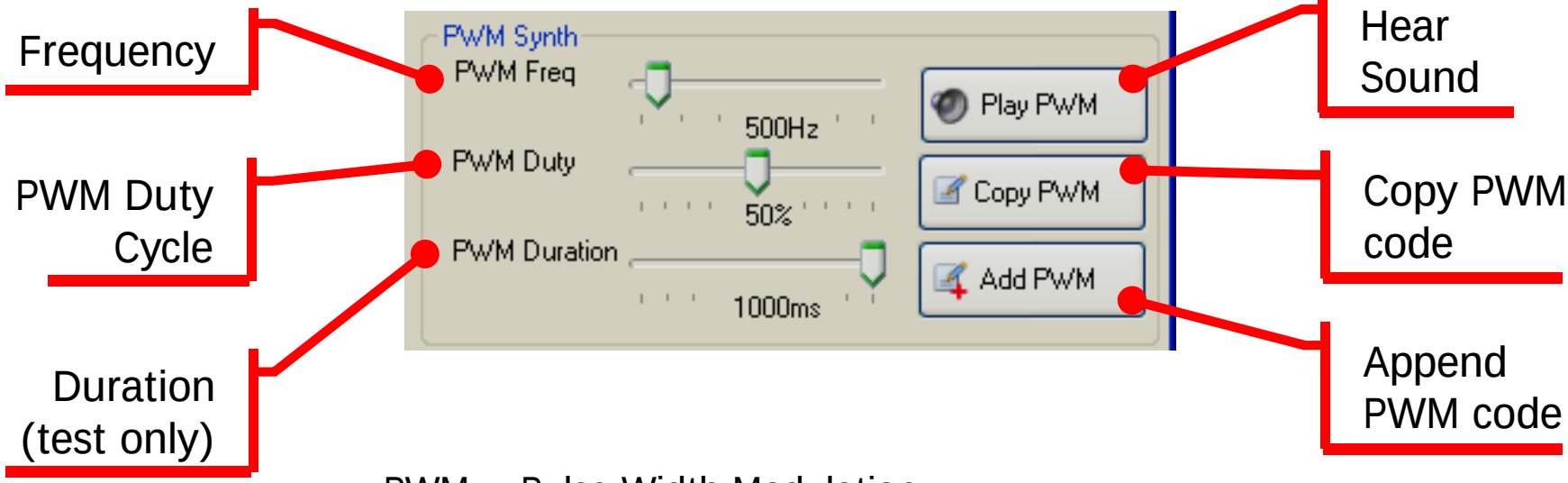
PICAXE Sounds

Import TUNEs

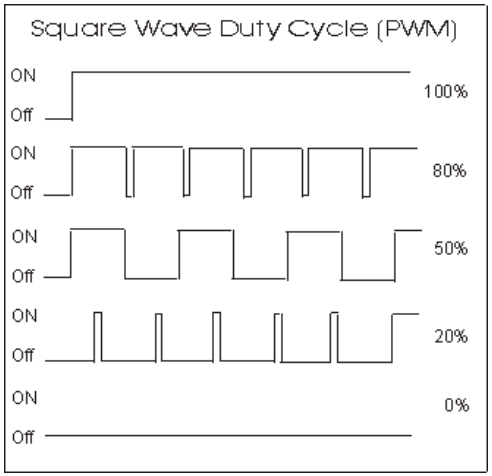
TUNE Format

EEPROM Format

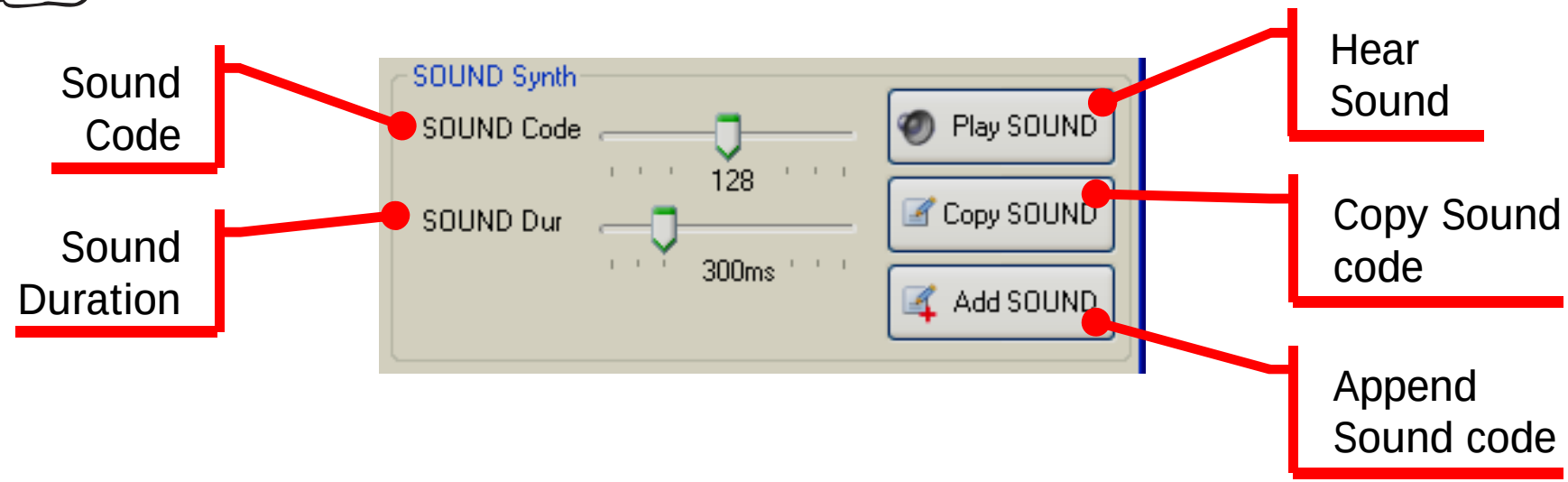
SFX – PWM Synthesizer



- PWM = Pulse Width Modulation
- Sound is not square waves, but it's the best the standard PICAXE can do...
- PWM is hardware controlled, and will continue playing whilst program runs
- Duty cycle adjusts volume
  - 50% is max volume
  - <50% or >50% is quieter
  - 0% or 100% is "off"

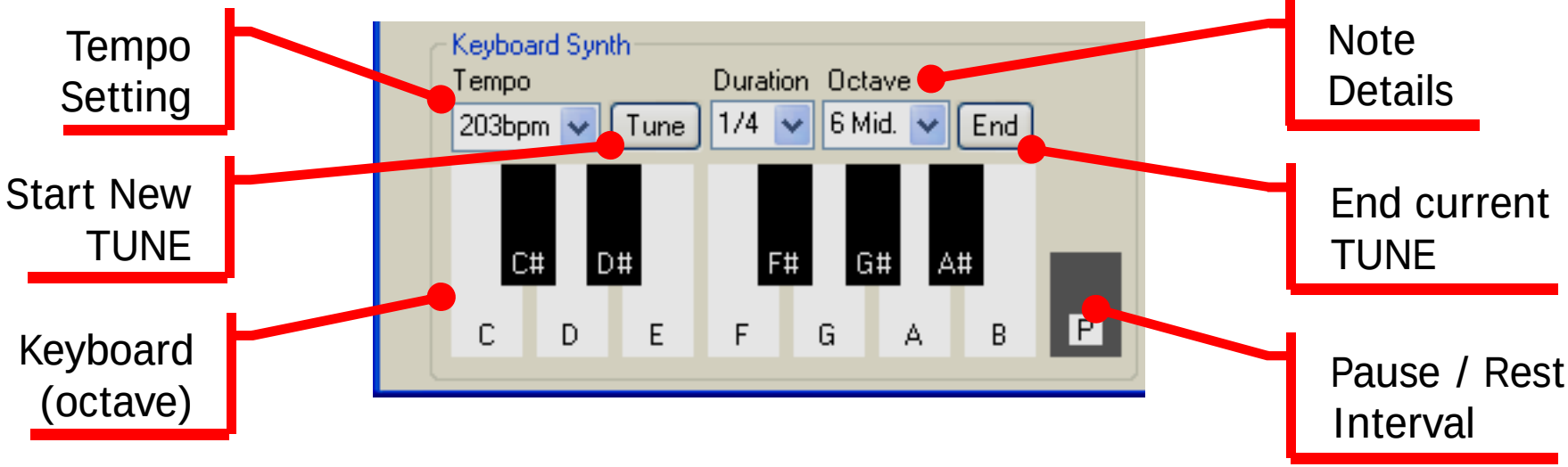


SFX – Sound Synthesizer

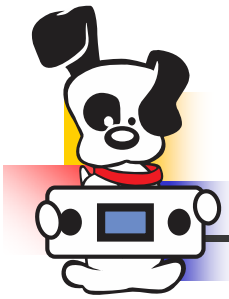


- PICAXE Chips produce sounds
  - Sounds are played in the foreground, so the PICAXE pauses whilst the sound is played
- Codes 0-127 are “notes” or square wave tones/notes
- Codes 128-255 are “noises” or sound effects
  - Randomised square waves for game effects such as explosions, shots, etc
  - KodeKLIX includes full playback database

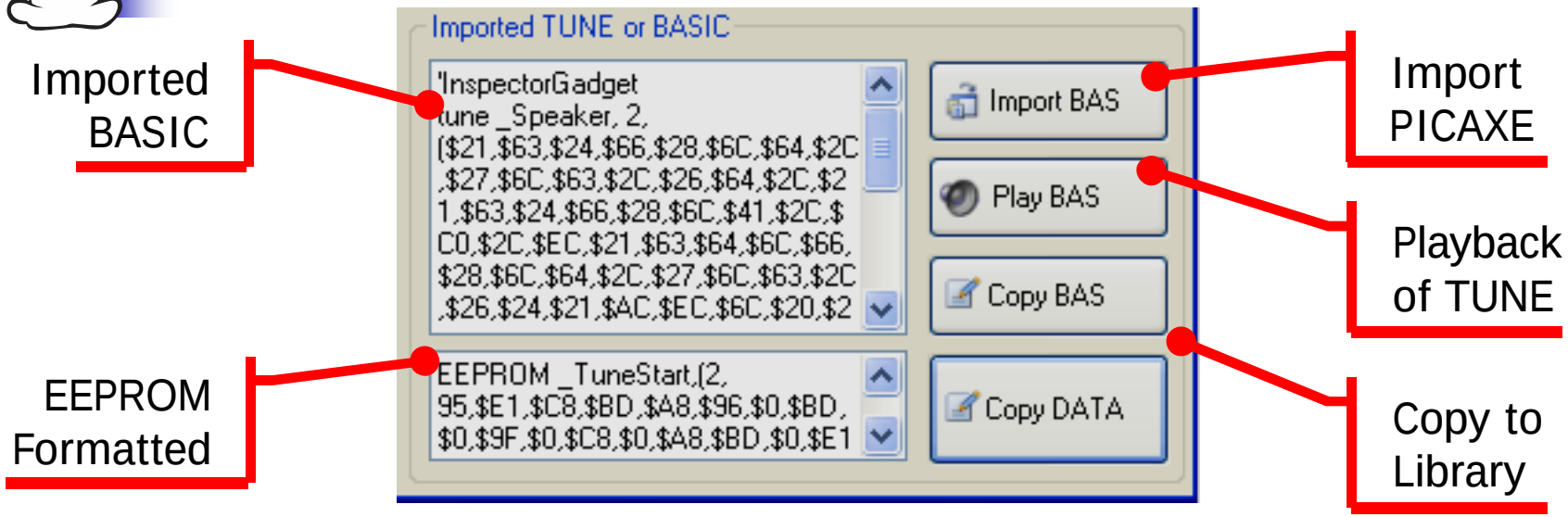
SFX – Keyboard Synthesizer



- Some PICAXE support the TUNE command
  - TUNES are played in the foreground, so the PICAXE pauses whilst the notes are played
- KodeKLIX introduces new ways to play TUNEs in the background by translating the routines to EEPROM stored codes
  - Background TUNEs still pause for each note played
  - Background PWM tunes do not pause for each note played (note: some limitations on tune complexity apply)

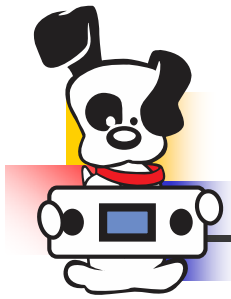


SFX – TUNE Importing



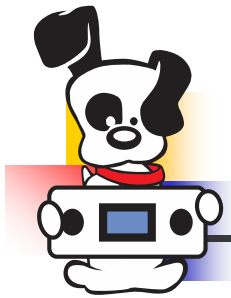
- Import pre-existing TUNEs from the PICAXE suite
  - Add to the KodeKLIX library or convert to EEPROM format
- Built-in playback and convert feature
- Copy either BASIC code or just DATA values to the library

Note: Keyboard Synthesizer output is also written to this window



Adding Sounds and Music

- Sounds and notes can be hardcoded by simply using the numeric values for notes and durations – this is PICAXE BASIC
- With KodeKLIX you can also specify a sound or tune from your SFX library using the SFX$xx label where xx is the ID number, for example SFX$03
  - SFX$xx could be a code or tune snippet
- Your KLX project file saves the name of the SFX library used during creation

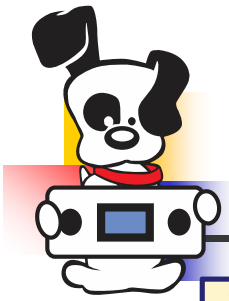


Example Code – controls

```
'====================================
' Multiplexed Button B
'====================================
{  ‘ play foreground sound
if _btnADC > _MuxB and _btnADC < _MuxC then
          sound _Speaker, (64,5)
          endif
}
```

```
'====================================
' Multiplexed Button C
'====================================
{  ' suspend background playing
if _btnADC > _MuxC and _btnADC < _MuxD then
          suspend 1
          endif
}
```

```
'====================================
' Multiplexed Button D
'====================================
{  ' resume background playing
if _btnADC > _MuxD and _btnADC < _MuxTR then
          resume 1
          endif
}
```

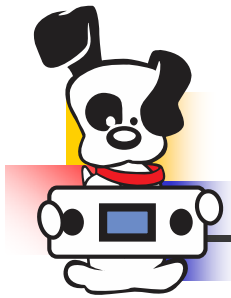


Example Code – background

```
' ========================================
' Background Music Player using PWM method
' Use of EEPROM based data storage allows
' tunes to be loaded from other devices.
' ========================================
' either use EEPROM, or simply the #SFXxx macro
EEPROM _TuneStart,(…tune goes here…)
' PWMDIV16 codes, 1st byte tempo (bpm) index, 2nd sets note count
read _TunePos, _TuneNote

_TuneDuty=_TuneNote +1
_TuneDuty=_TuneDuty *2 max 255
PWMOUT PWMDIV16, _SpeakerPWM, _TuneNote, _TuneDuty
' convert BPM to a pause duration,
' PWM (note) keeps going during pause!
' index to BPM table * 74ms gives pause duration
read _TuneBPM, _TuneNote
_TunePause=_TuneNote *74 - 20 ' -20 corresponds to delay in software loop
pause _TunePause

inc _TunePos
read _TuneEnd, _TuneEndPos
if _TunePos > _TuneEndPos then
          _TunePos = _TuneStart +1
          endif
```



Tutorial: 3.7

- Open tutorial 3.7
- Study code snippets for:
  - Button B, Button C, and Button D
  - Task 1
- Connect PUP and Download program
- What happens when you press?
  - A _____
  - B _____
  - C or D _____