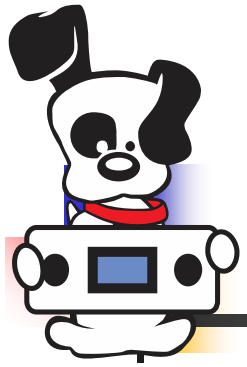
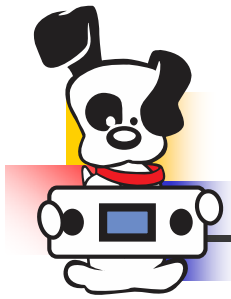


# KodeKLIX for PUP

## Advanced LCD
## Graphics and Animation

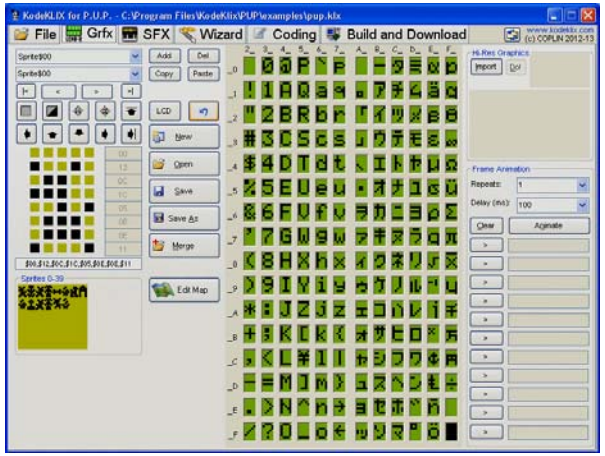


# LCD Graphic and Animation

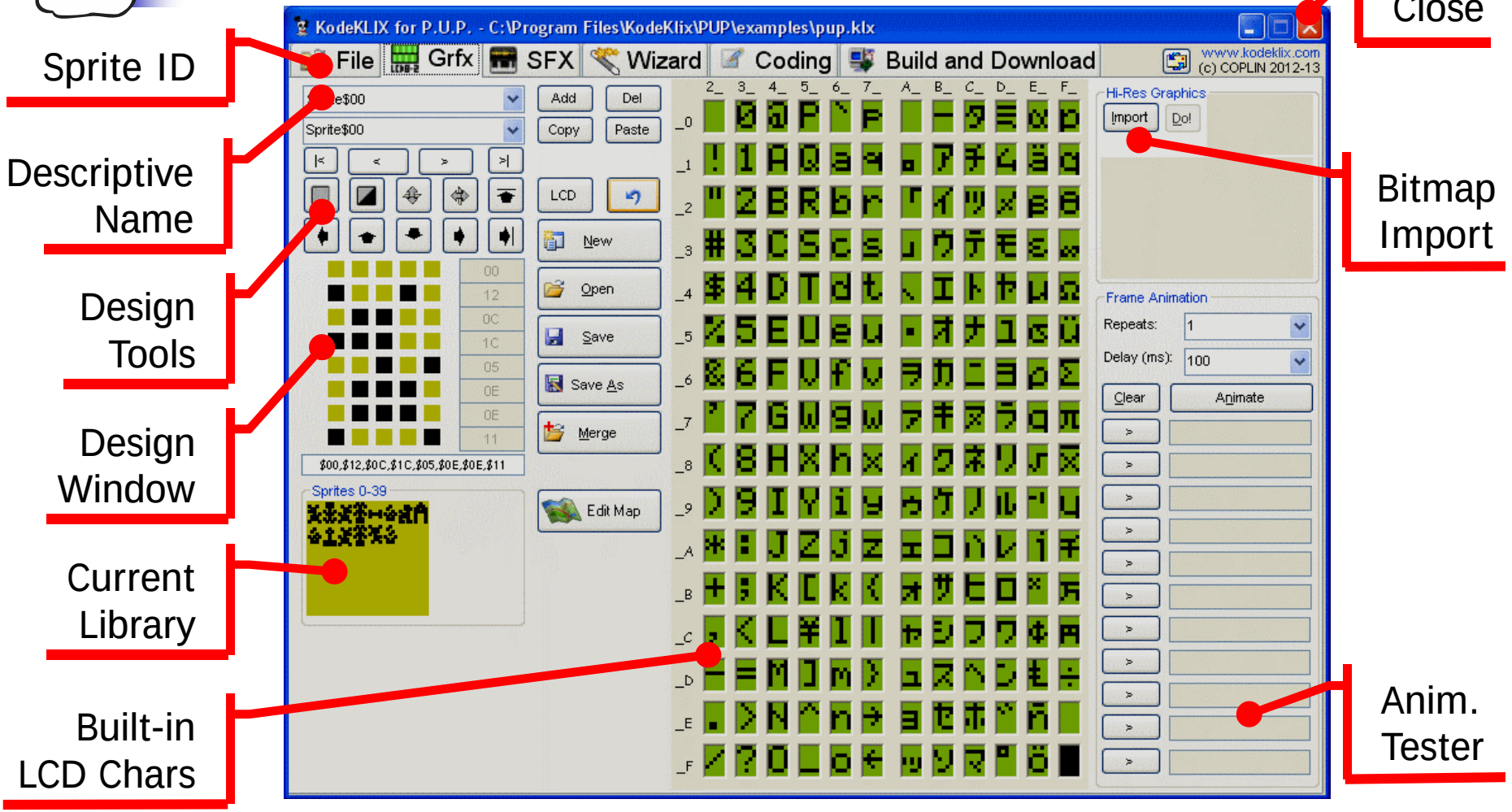
- LCD Design Module
- Animation and custom characters
- Tile based hi-resolution graphics
- Importing hi-resolution images
- PUP™ *gfx* font definitions

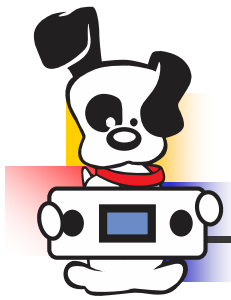
# LCD / CGRAM Design Module

- Design new LCD character definitions
  - Equivalent to “sprites” in gaming speak
  - CGRAM = Custom Graphics RAM
- Import / convert small BMP (bitmap) images to the LCD graphics format
- Trial animation sequences
- Manage custom character libraries
  - Share these with other KodeKLIX users

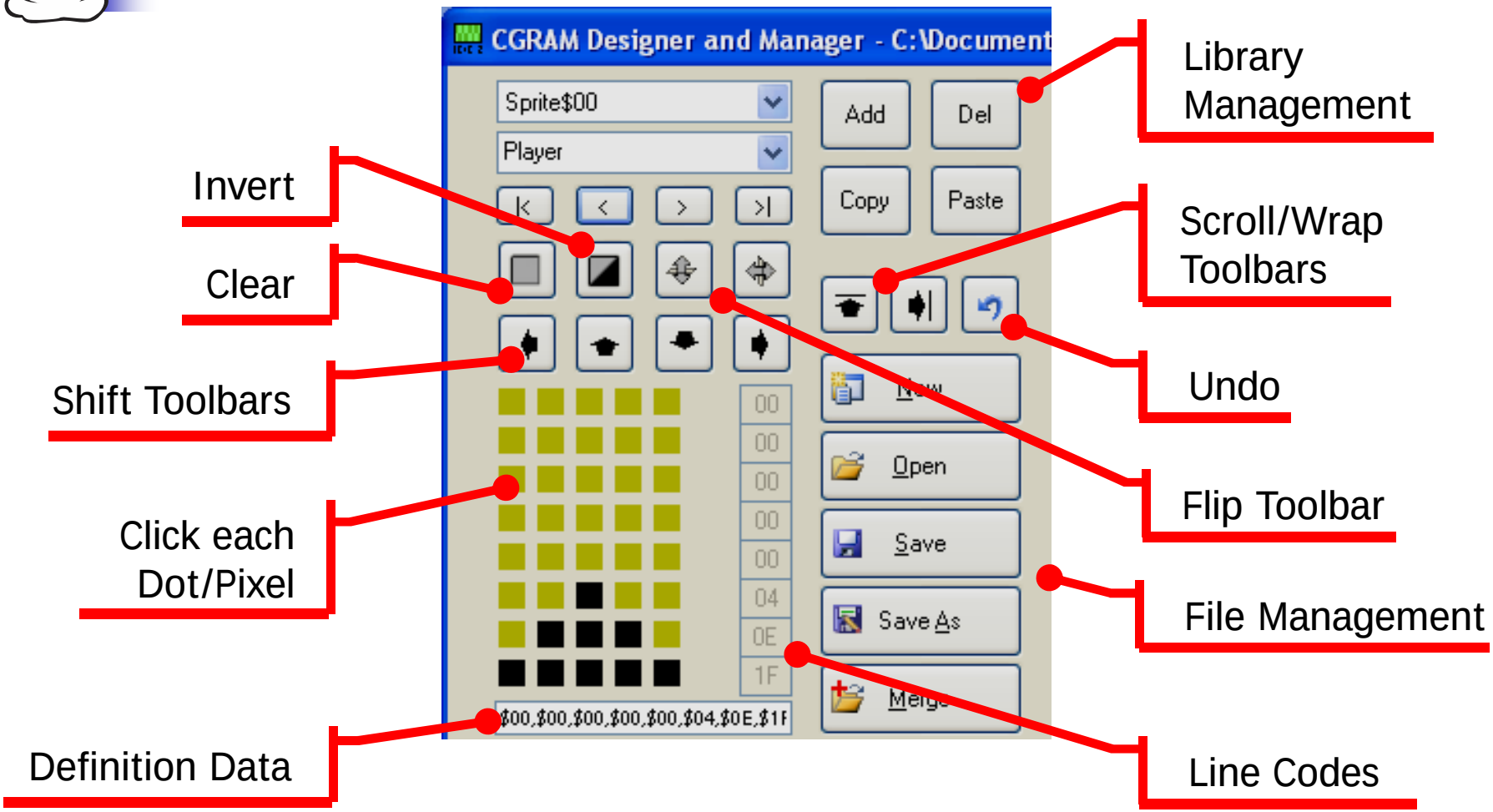


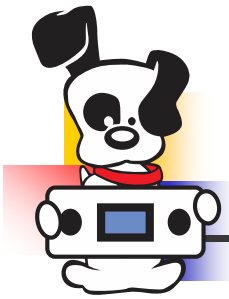
# LCD / CGRAM – CloseUP Guide





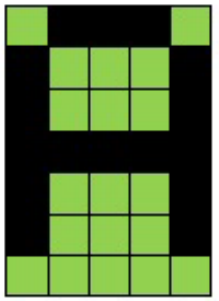
# LCD / CGRAM – Designer





# LCD / CGRAM – Bit Codes

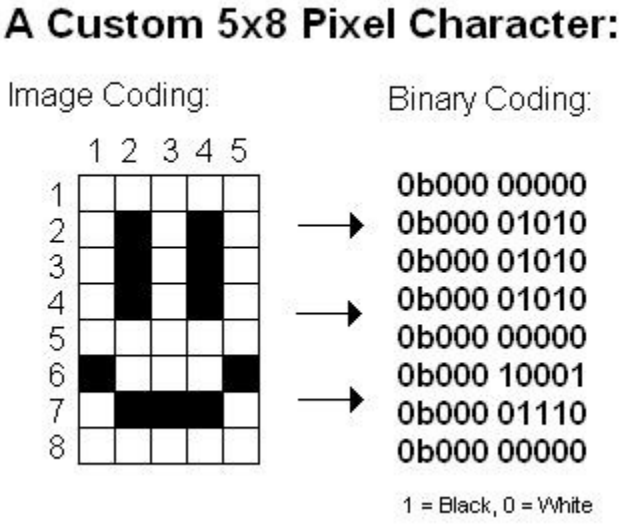
- Built in LCD Chars only define lines rows 1 to 7



Bit: 43210 -- Hex
ROW1: 01110 -- 0x0E
ROW2: 10001 -- 0x11
ROW3: 10001 -- 0x11
ROW4: 11111 -- 0x1F
ROW5: 10001 -- 0x11
ROW6: 10001 -- 0x11
ROW7: 00000 -- 0x00

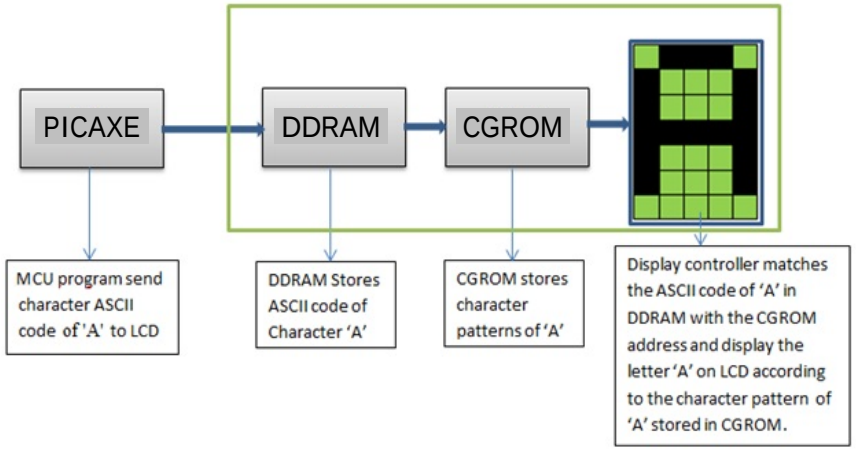
Uppercase format of Letter 'A'

- Custom LCD Chars consist of 8 row definitions, lowest 5bits per row define the design

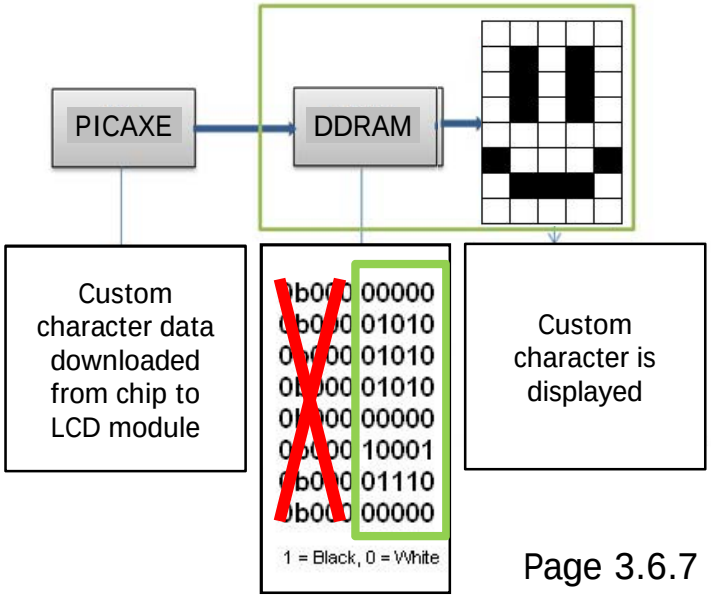


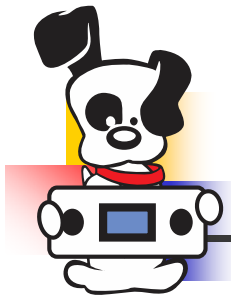
# LCD / CGRAM – Bit Codes

- Built in LCD Chars only define lines rows 1 to 7




- Custom LCD Chars consist of 8 row definitions, lowest 5bits per row define the design





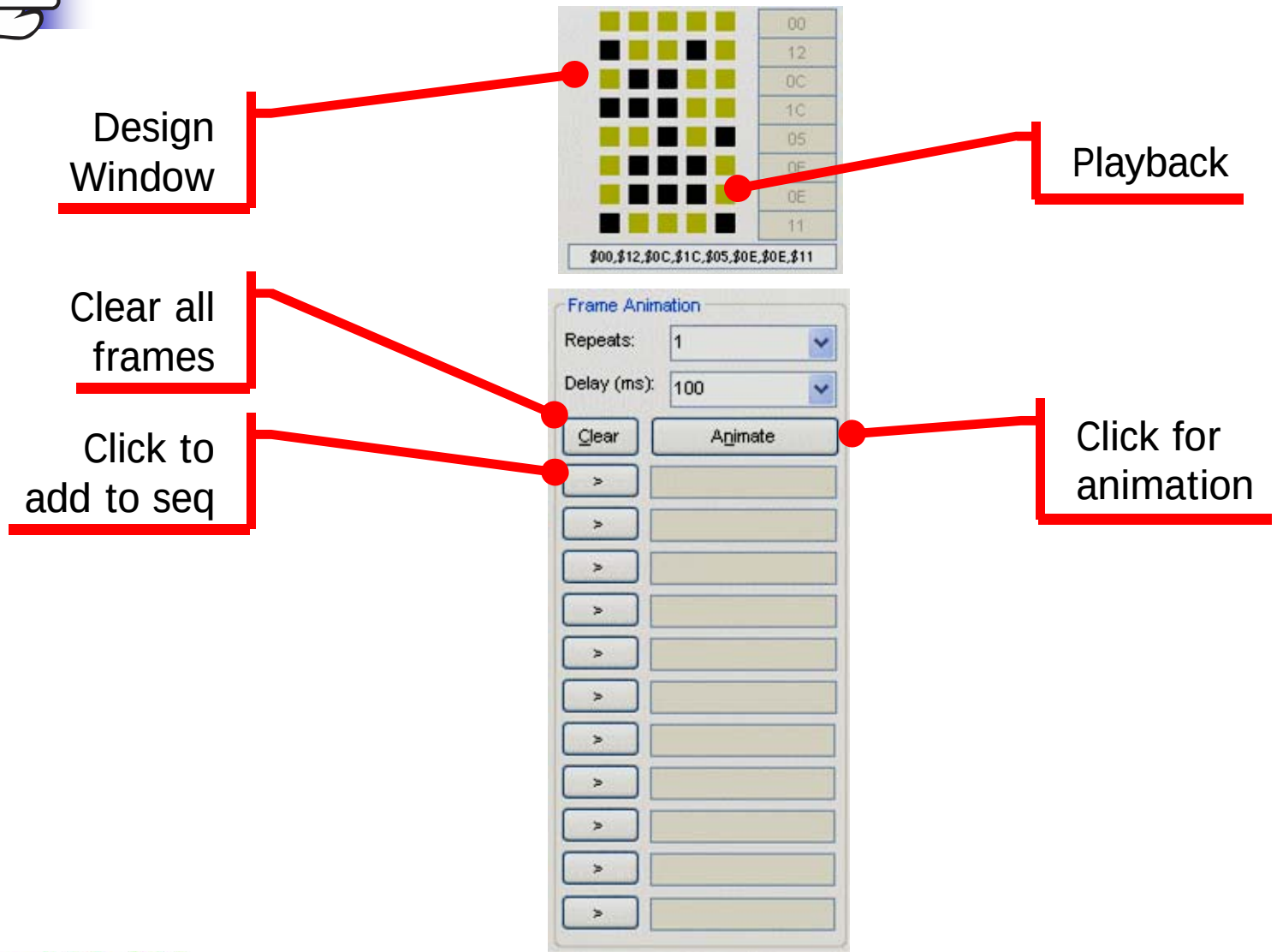
# LCD / CGRAM – Memory

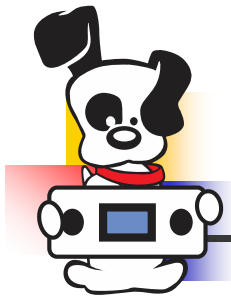
- CGRAM is memory inside the LCD control chip
- Each custom definition is stored consecutively
- Maximum space for a standard customised definitions

For 5 × 8 dot character patterns

| Character Codes (DDRAM data) | | CGRAM Address | | Character Patterns (CGRAM data) | | |
|---|---|---|---|---|---|---|
| 7 6 5 4 3 2 1 0 | | 5 4 3 | 2 1 0 | 7 6 5 | 4 3 2 1 0 | |
| High Low | | High | Low | High | Low | |
| 0 0 0 0 * 0 0 0 | | 0 0 0 | 0 0 0 | * * * | 1 1 1 1 0 | Character pattern (1) |
| | | | 0 0 1 | | 1 0 0 0 1 | |
| | | | 0 1 0 | | 1 0 0 0 1 | |
| | | | 0 1 1 | | 1 1 1 1 0 | |
| | | | 1 0 0 | | 1 0 1 0 0 | |
| | | | 1 0 1 | | 1 0 0 1 0 | |
| | | | 1 1 0 | | 1 0 0 0 1 | |
| | | | 1 1 1 | * * * | 0 0 0 0 0 | Cursor position |
| 0 0 0 0 * 0 0 1 | | 0 0 1 | 0 0 0 | * * * | 1 0 0 0 1 | Character pattern (2) |
| | | | 0 0 1 | | 0 1 0 1 0 | |
| | | | 0 1 0 | | 1 1 1 1 1 | |
| | | | 0 1 1 | | 0 0 1 0 0 | |
| | | | 1 0 0 | | 1 1 1 1 1 | |
| | | | 1 0 1 | | 0 0 1 0 0 | |
| | | | 1 1 0 | | 0 0 1 0 0 | |
| | | | 1 1 1 | * * * | 0 0 0 0 0 | Cursor position |
| | | | 0 0 0 | * * * | | |
| | | | 0 0 1 | | | |
| 0 0 0 0 * 1 1 1 | | 1 1 1 | 1 0 0 | * * * | | |
| | | | 1 0 1 | | | |
| | | | 1 1 0 | | | |
| | | | 1 1 1 | | | |

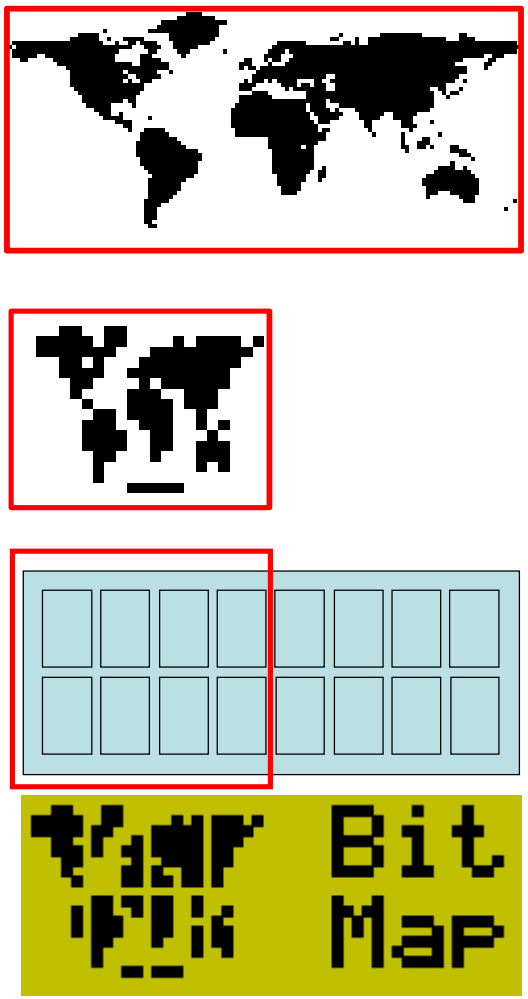
# LCD / CGRAM – Animation

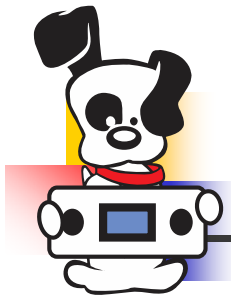




# Tile Based Graphics – 8x2LCD

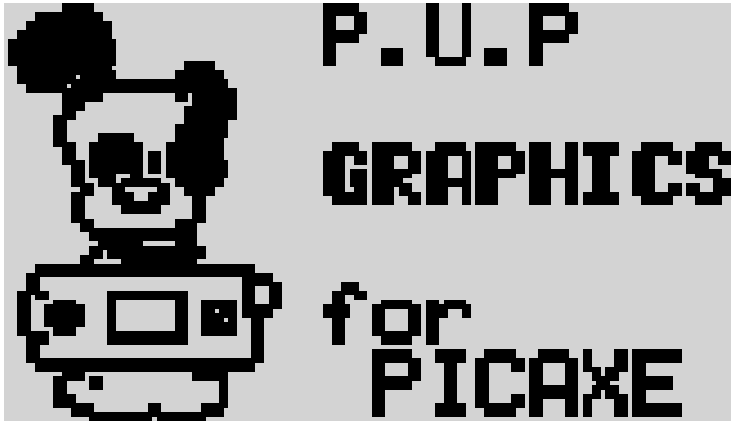
- The 8 custom characters can be drawn as “tiles” that make up a bigger picture
- The import Hi-Res graphics function lets you convert a picture into a set of tiles
- With the text LCD display there is a 1 pixel gap between display tiles





# Tile Based Graphics – *gfx* LCD

- The *gfx* display can be filled with up to 84 custom characters drawn as “tiles” that make up a full screen picture
- The import Hi-Res graphics function lets you convert a picture into a set of tiles
- With the *gfx* display there is no gap between display tiles



# LCD / CGRAM – Hi-Res Grfx

STEP 1

Import
20x16 BMP

STEP 2

Create 8x
custom chars

STEP 3


Actual Size
Viewer

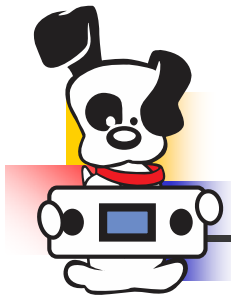
Zoom &
Progress


Sprite
Library

New chars
added

# PUP™ *gfx* – Font Def. Tables

- The *gfx* display version of PUP does not have build-in fonts
  - Fonts downloaded to PICAXE TABLE or EEPROM memory
    (table memory is read-only)
  - API automatically adjusts char codes for the definition table so that users can print as text
- The PUP *gfx* display can also be directly over-written combine text with graphics



# Tutorial: 3.6