# **CedarGrove\_Clock\_Builder**

A collection of CircuitPython classes for supporting clock and calendar display functionality. The classes support the following features:

* Operates on Adafruit PyBadger, FeatherM4Express, and ItsyBitsyM4Express host platforms,
* Compatible with CircuitPython 5.0.0 and associated library distribution,
* Numeric and text year, month, day-of-month (date), hour, minute time representation,
* 12 and 24-hour display modes with AM/PM indicator (where permitted by the display),
* Host platform battery monitoring (where permitted by the host platform and display),
* Selectable automatic Daylight Savings Time adjustment,
* Message text display,
* Alert text display and sound,
* Time setting functionality via integral host platform buttons, USB-based REPL, or rotary encoder,
* Selectable clock “tick” sound and display indicator, and
* Display brightness control.

Clock\_Builder is a collection of classes that can be used for standalone or imbedded clock and calendar timekeeping functionality. The classes accept and produce Python structured time objects. Clock parameters can be read or set as values.

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## Implementation Notes

### Hardware:

* Adafruit PyBadge, EdgeBadge
  + Time Setting: integral controls; REPL
  + Sound: integral speaker; REPL notification
* Adafruit Feather M4 Express
  + Time Setting: rotary encoder connected to GPIO pins D5, D6, and D9; REPL
  + Sound: piezo connected to GPIO pin D13; REPL notification
* Adafruit ItsyBitsy M4 Express (only tested for REPL function)
  + Time Setting: REPL
  + Sound: none; REPL notification

### Software and Dependencies:

* Adafruit CircuitPython libraries:
  + simpleio
  + adafruit\_ht16k33 (for LED displays)
  + adafruit\_display\_text.label (for PyBadge display)
  + adafruit\_bitmap\_font (for PyBadge display)
  + adafruit\_imageload (for PyBadge display)
  + adafruit\_pybadger (for PyBadge features)
* Fonts, graphics, and sound files:
  + OpenSans-9.bdf (for PyBadge display)
  + Helvetica-Bold-36.bdf (for PyBadge display)
  + batt\_sprite\_sheet.bmp (for PyBadge display)
  + tick\_soft.wav (for PyBadge sound output)
* Adafruit CircuitPython firmware for the supported boards: <https://github.com/adafruit/circuitpython/releases>

## Clock\_Builder Classes:

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| *class* bigled\_7x4\_display. BigLed7x4Display(*\**, *timezone=”Pacific”, hour\_24=False, auto\_dst=True,*  *sound=False, brightness=15, debug=False*) |

Class representing the cedargrove\_clock\_builder.bigled\_7x4\_display. Tested with the Adafruit Feather M4 Express host platform and 1.2-inch 7-Segment Display (PID #1265).

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| *class* led\_7x4\_display.LED7x4Display(*\**, *timezone=”Pacific”, hour\_24=False, auto\_dst=True,*  *sound=False, brightness=15, debug=False*) |

Class representing the cedargrove\_clock\_builder.led\_7x4\_display. Untested.

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| *class* led\_7x14\_display.LED7x14Display(*\**, *timezone=”Pacific”, hour\_24=False, auto\_dst=True,*  *sound=False, brightness=15, debug=False*) |

Class representing the cedargrove\_clock\_builder.led\_7x14\_display. Tested with the Adafruit Feather M4 Express host platform and Quad 0.54-inch AlphaNum FeatherWing (PID #3127).

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| *class* pybadge\_display.PyBadgeDisplay(*\**, *timezone=”Pacific”, hour\_24=False, auto\_dst=True,*  *sound=False, brightness=1.0, debug=False*) |

Class representing the cedargrove\_clock\_builder.pybadge\_display. Compatible with the Adafruit PyBadge and EdgeBadge host platforms.

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| *class* repl\_display.REPLDisplay(*\**, *timezone=”Pacific”, hour\_24=False, auto\_dst=True,*  *sound=False, brightness=1.0, debug=False*) |

Class representing the cedargrove\_clock\_builder.repl\_display. Compatible with the Adafruit PyBadge, EdgeBadge, ItsyBitsy M4 Express, and Feather M4 Express host platforms.

### Shared Class Parameters:

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| **Parameters:** | * **timezone** – The clock’s time zone. Can by any text string; only the first character is used to display time zone. Defaults to *Pacific*. * **hour\_24** – A logical switch to indicate hour display mode. *True* for 24-hour display mode; *False* for 12-hour with AM/PM display. Defaults to 12-hour display mode (*False)*. * **auto\_dst** – A logical switch to enable automatic Daylight Saving Time (DST) adjustment, passed through to the primary clock method. Defaults to automatic DST enabled (*True*). * **sound** – A logical switch to enable sound output (host platform dependent). Only disables ticking or alarm sounds; setup menu helper sounds remain enabled regardless of setting. Defaults to sound disabled (*False*). * **brightness** – The display brightness setting. The input range for the PyBadge/EdgeBadge display is 0.0 to 1.0 (1.0 is full brightness); LED brightness ranges from 0 to 15 (15 is full brightness). Can be any positive value within the specified range. Defaults to full brightness. * **debug** – A logical switch to enable debug printout on REPL display. Defaults to debug printout disabled (*False*). |

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|  | **Platform** | | |
| **Function** | **PyBadge** | **Feather M4** | **ItsyBitsy M4** |
| **show()** | Integral Display | LED Display | REPL |
| **set\_datetime()** | Integral Controls | Rotary Encoder | REPL |
| **tick()** | Integral Speaker and REPL | Piezo Speaker and REPL | REPL |
| **alert()** | Integral Display and Speaker | LED Display and Speaker | REPL |

### Shared Class Functions:

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| show(*datetime*) |

The primary function of each Clock\_Builder class. Displays the date, time, and clock settings (host platform and class dependent).

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| **Parameters:** | **datetime** – The Python structured time input value to display. No default value. |

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| set\_datetime(*xst\_datetime*) |

Host platform dependent method for manual input of time and clock operational parameters.

using the PyBadge buttons and display. Accepts only Python structured Standard Time (xST) value and returns an adjusted Daylight Saving Time (xDT) structured time value, sound flag, and “something was changed” status flag.

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| **Parameters:** | **xst\_datetime** – The Python structured time input value express as Standard Time (xST). No default value. |

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| tick() |

Play tick sound (if supported on the host platform).

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| **Parameters:** | *none* |

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| alert(*text=””*) |

Place alert message in clock message area or scroll across display (host platform dependent). Defaults to the previous message.

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| **Parameters:** | **text** – The input range maximum. Can be any positive or negative value, smaller or larger than the input range minimum. Input range minimum and maximum values cannot be equal. Defaults to 65535. |

## Shared Class Attributes:

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| message(*text=””*) |

Update clock message text. Default is a blank message.

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| **Parameters:** | **text** – The index output minimum. Can be any positive or negative value, smaller or larger than the output index maximum. Output index minimum and maximum values cannot be equal. Defaults to 0. |

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| zone(*timezone=”Pacific”65535*) |

Changes the clock's time zone. Default is Pacific.

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| **Parameters:** | **timezone** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |

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| hour\_24(*hour\_24=False*) |

Changes the display for 24-hour or 12-hour AM/PM formatting. Default is 12-hour (False).

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| **Parameters:** | **hour\_24** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |

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| dst(*dst=False*) |

Time is US DST. Default is Standard Time (False).Changes the default output index maximum to a new value.

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| **Parameters:** | **dst** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |

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| auto\_dst(*auto\_dst=True*) |

Changes the default output index maximum to a new value.

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| **Parameters:** | **auto\_dst** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |

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| sound(*sound=False*) |

Changes the default output index maximum to a new value.

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| **Parameters:** | **sound** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |

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| brightness(*brightness=1.0*) |

Changes the default output index maximum to a new value.

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| **Parameters:** | **brightness** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |

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| colon(*colon=True)* |

Changes the default output index maximum to a new value.

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| **Parameters:** | **colon** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |

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| battery(*volts=0*) |

Display the battery icon proportional to the battery level. Default is zero volts (0)

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| **Parameters:** | **volts** – The output index maximum. Can be any positive or negative value, smaller or larger than the output index minimum. Output index minimum and maximum values cannot be equal. Defaults to 65535. |