

The encoder button has various uses:

- Single click
- Long push
- Double click
- Single click followed by a long push

Single click:

Press encoder button down and then quickly release it

Long push:

Press and hold down encoder button for a second or two

Double click:

Press encoder button, quickly release it, then immediately press and release it again

Click + longpush:

Press encoder button, quickly release it, then press it again and hold down for 1 or 2 seconds

During normal operation the LCD shows a status-icon in the top-left corner, depicting the current power setting (Off, Normal, Limit, Boost) and a „still alive“ animation in the bottom row of the icon. Next to the icon is the bargraph showing the current output power. In the bottom line the current power-manager state is shown, or alternatively the currently active power manager configuration name. Toggle between the two by double-clicking the encoder button.

Status Icons:



Power Output Off



Normal Power Output



Limited Power Output



Boosted Power Output

When in automatic mode, i.e. with the power manager enabled, the following actions are possible:

- Single click used to turn on/off
- When turned on, Click-Longpush to enter sleep mode when
- When in sleep mode, rotate the encoder to force wake up
- Longpush to enter the main menu

When in manual mode, i.e. with the power manager disabled, the following actions are possible:

- Single click to turn on/off, memorizes last power level for on
- Turn encoder left/right to change output power mode (Off, Normal, Limit, Boost)
- Longpush to enter main menu

## Main Menu

From the default info-display after power-up, the main can be entered by a longpush on the encoder button. Push & hold the button until the main menu is displayed. Once in the main menu, rotate the encoder to select the desired option. These are:

- Main Setup: Global system configuration
- Edit Config: Edit the power-manager configuration
- Save Config: Save the edited power manager configuration
- Load Config: Load and activate one of the stored power manager configurations
- Show Version: Display the firmware name and version
- Reset: Reboot the firmware

To select a menu item, simply click the encoder button once.

To exit the main menu, simply do a longpush on the encoder button again until you are back to the main info display.

## Main Setup

This configures the basic, global parameters of the system. Changes made here are immediately active. Rotate the encoder to cycle through the available options. These are:

- Language: Select the language used for display and serial output. Currently English and German are implemented.
- Baudrate: Set the baudrate of the serial interface. Only the baudrate can be selected, the other parameters for the serial port are always 8,N,1. Note: When realtime logging is used, a low baudrate will cause a very slow response of the system, so select a suitably high baudrate in this case.
- Logger: What info messages to log through the serial port, realtime parameter logging
- Startup PM Conf.: Select which power-manager configuration to automatically load at system power-up from the configuration storage.

When selection an option, the currently active one is displayed by default. To change the option, simply rotate the encoder to select the desired one, and then do a single click which does the actual selection and in turn brings you back to the options overview. The Logger options are different since these are multiple-choice. A \* in front of the selected option shows that it is active. Do a single click to toggle between active and non-active. Rotate the encoder to select a different sub-option. Do a longpush to get back to the options overview. The Startup PM Conf. option will show you the textual name of the selected config-set from memory.

When exiting the Main Setup options the selected settings will automatically be saved to the internal EEPROM.

## Edit Config

This allows to edit the runtime parameters of the power-manager. Selecting this option will first bring up which parameterset to edit. The choices are:

- Current Config: The currently active configuration
- From Default Cfg: Start with a configuration filled with default parameters
- One of the eight stored configurations. The name of that config will be shown in the bottom line of the LCD, while the memory slot it used is displayed in the upper-right corner of the LCD, from #0 to #7

A single click will select the configuration and starts the editor, a longpush will exit and go back to the main menu. The options are grouped into sub-items as follows:

- Startup Mode:
  - Auto, On – Auto, Off – Manual, On – Manual, Off
- Heatup Mode
  - Normal Power – Power Limit – Power Boost
- Heatup End Cond.
  - Timed – Pwr Lvl Thresh.
- Heatup End Param
  - HeatupLim, Time – HeatupLim, PwrTh – HeatupBst, Time – HeatupBst, PwrTh
- Idle Parameters
  - Idle Threshold – Enter Sleep Time
- Sleep Options
  - Sleep Mode - Auto-Powerdown
- Sleep Mode Param
  - Light Sleep Time – Light Slp Thresh – Sleep Threshold – Auto-Off Time
- Wakeup Mode
  - Normal Power – Power Bosst
- Wakeup End Cond.
  - Timed – Pwr Lvl Thresh.
- Wakeup End Param
  - WakeupBst, Time – WakeupBst, PwrTh
- Normal Backlight
  - Constant – Pulsing - Flashing
- Sleep Backlight
  - Constant – Pulsing - Flashing
- Auto Off Backl.
  - Constant – Pulsing - Flashing
- Const. BL Param.
  - Const. BL. Level
- Pulse BL Param.
  - Pulse Level Low – Pulse Level High – Pulse Speed
- Flash BL Param
  - Flash Level Low – Flash Level High – Flash On-Time – Flash Off-Time
- Config Name
  - Actual name of the currently edited parameter set

To select a group, click the selection. Then select which parameter to change and click again. Adjust the parameter as wanted and click or longpush. This will bring you back to the parameter selection of that group. To go back to the group selection then, do a longpush. To exit the editor, do another longpush.

The name editor is slightly different. When starting to edit the name, the current name will be shown in the top line on the LCD. In the bottom line a – is shown. Rotate the encoder to move that marker under the character that is to be changed. Then click the encoder button. The marker will change to a ^ and thus indicate that the character is to be changed. Rotate the encoder to change it. Click to get back to the – marker to select another character. The name-editing can be aborted by a longpush. To save the edited name, use a clickpush instead.

In case of multi-option (i.e. The Sleep Options), a single click will enable/disable the option, a longpush will go back to the option selection menu.

The option-groups and their parameters have the following purposes/meanings:

- Startup Mode: Select in which mode to start-up the unit after power-on/reset
  - Auto, On: Automatic power management is enabled, turned on after power-up
  - Auto, Off: Automatic power management is enabled, turned off after power-up
  - Manual, On: Manual control mode, turned on after power-up
  - Manual, Off: Manual control mode, turned off after power-up
- Heatup Mode: Select what power level to use for initial heatup
  - Normal Power: Use normal power output during heatup
  - Power Limit: Use limited power output during heatup
  - Power Boost: Use boosted power output during heatup
- Heatup End Cond.: Select the condition to end initial heatup, only for boost/limit heatup modes
  - Timed: End heatup phase after a given number of seconds
  - Pwr Lvl Thresh.: End heatup phase when power output fall below a given threshold
- Heatup End Param: Times (in seconds) and power levels for the limit/boost heatup modes
  - HeatupLim, Time: Time after which to end the limited power heatup phase
  - HeatupLim, PwrTh: Power level below which to end the limited power heatup phase
  - HeatupBst, Time: Time after which to end the boosted power heatup phase
  - HeatupBst, PwrTh: Power level below which to end the boosted power heatup phase
- Idle Parameters: Defines threshold between idle/heating mode, and a time after which to enter sleep mode
  - Idle Threshold: Rise in output power after which to go from idle to heating mode
  - Enter Sleep Time: Time in seconds of idling after which to go to sleep mode, if enabled
- Sleep Options: Enable/disable the sleep-mode and automatic power-down
  - Sleep Mode: Enable/disable the entering of the sleep mode when idling too long
  - Auto-Powerdown: Enable/disable the auto-powerdown mode when sleeping too long
- Sleep Mode Param: Define times and thresholds for the sleep mode
  - Light Sleep Time: Time spent in inital sleep mode, to accomodate power level change from idle mode
  - Light Slp Thresh: Rise threshold in output power when in inital sleep mode, wakes up when exceeded
  - Sleep Threshold: Rise threshold in output power for normal sleep mode, wakes up when exceeded
  - Auto-Off Time: Time spent sleeping after which to automatically power down
- Wakeup Mode: Power output setting when waking up from sleep mode
  - Normal Power: Wake up using normal power output
  - Power Boost: Wake up with boosted output power (quicker thermal recovery)
- Wakeup End Cond.: Condition to end boosted output power wakeup, when enabled
  - Timed: End boosted power wakeup after given time in seconds
  - Pwr Lvl Thresh.: End boosted output power wakeup when power consumption falls below a given threshold
- Wakeup End Param: Time (in seconds) and power level for the boost wakeup modes
  - WakeupBst, Time: Time after which to end the boosted power wakeup phase
  - WakeupBst, PwrTh: Power level below which to end the boosted power wakeup phase

- Normal Backlight: Which LCD Backlight mode to use to signal normal operation (heatup, idle, etc.)
  - Constant: Fixed brightness level
  - Pulsing: Fade brightness level up/down continuously
  - Flashing: Flash brightness level
- Sleep Backlight: Which LCD Backlight mode to use to signal sleep mode
  - Constant: Fixed brightness level
  - Pulsing: Fade brightness level up/down continuously
  - Flashing: Flash brightness level
- Auto Off Backl.: Which LCD Backlight mode to use to signal automatic power down mode
  - Constant: Fixed brightness level
  - Pulsing: Fade brightness level up/down continuously
  - Flashing: Flash brightness level
- Const. BL Param.: Brightness level used for constant backlight
  - Const. BL. Level
- Pulse BL Param.: Brightness levels and time/speed for pulsating backlight
  - Pulse Level Low: Minimum brightness to fade from/to
  - Pulse Level High: Maximum brightness to fade from/to
  - Pulse Speed: Speed to fade between low/high brightness, bigger=slower and smaller=faster
- Flash BL Param: Brightness levels and times/speeds for flashing backlight
  - Flash Level Low: Minimum brightness to quickly fade to
  - Flash Level High: Maximum brightness to flash to
  - Flash On-Time: Time spent for high-brightness flash-fade
  - Flash Off-Time: Time spent to wait for next flash
- Config Name
  - Actual name of the currently edited parameter set

#### Save Config

This allows to save the edited runtime parameters of the power-manager. Selecting this option will first bring up which parameterset to load. The choices are:

- Make Active: Activate the currently edited configuration, i.e. use it. No actual saving is done.
- One of the eight stored configurations. The name of the config currently present in the selected slot will be shown in the bottom line of the LCD, while the memory slot it used is displayed in the upper-right corner of the LCD, from #0 to #7. Click to select that slot and overwrite it with the edited config.

#### Load Config

This allows to load and activate the runtime parameters of the power-manager. Selecting this option will first bring up which parameterset to load. The choices are:

- From Edit Config: The currently edited configuration
- One of the eight stored configurations. The name of that config will be shown in the bottom line of the LCD, while the memory slot it used is displayed in the upper-right corner of the LCD, from #0 to #7

#### Show Version

This will show the firmware name and version. Simply rotate the encoder to exit from that display.

#### Reset

Do a reboot of the firmware, same result as if power-cycling the unit.

The config editor always allows to edit all options, no matter if they depend on another config option or not. For example, the Heatup End Cond and Heatup End Param are only used when either the limited power or the boosted power heatup mode is selected, but never used when the normal heatup mode is chosen.

When editing a config, it is just that: an edited config. It does not become active unless it is either saved to EEPROM and then loaded, or when explicitly chosen to activate it.

EEPROM storage uses CRC checksums to verify that all is OK. When an invalid CRC is encountered, the config or parameter set will be replaced with a default one. This applies to both, the main config as well as any of the power manager configurations. When flashing the firmware into the  $\mu$ C it will create default configurations at the first power up. This is also shown in the output on the serial interface. Default serial port speed is 115200 Baud.

The encoder handling has a very crude „dynamic“ in it. The faster it is turned, the bigger the steps in which it changes. This allows to adjust a large value range without needing to rotate it for ages. However, it is just that: crude. So don't expect too much from it.

Button handling is not perfect either. Sometimes it just misses something. Especially when extensive realtime logging is enabled on the serial port. That extensive logging then also affects the rotary encoder.

The menu handling and config editor „run“ in the background, depending on which one is active. That means that the power manager is always running. So you can happily edit something or stay in the menu without affecting the automatic power management.

Multi-language support in the firmware is implemented by using a big array of pointers to strings, one for each language. The active array is the selected by the language manager, depending on the chosen language. To access a string, a simple `tr()` macro is defined which takes the string-index and returns the pointer to that string in program memory.

The actual strings are defined in `strings_EN` for English, and `strings_DE` for German. In `language_strings.h` is a long list of defined string names that represent the index to a string. The order of these `#defines` must be the same as the strings in the actual `strings_*` files. In the same include files the number of languages etc. are defined at the top.

To add a new language simply create a new `strings_*` file, use the `strings_EN` as a template here. Replace all the strings to whatever language you want. Change the `NUM_LANGUAGES` accordingly, and add a new „`#define LANG_*`“ to `languages_strings.h`. Then extend the `language_entries[]` struct in `languages_strings.c`, and add the „`#include strings_*`“ for the new language to it. That should be all....

All the menu and config option stuff is defined in their own structs, so that the main handlers stay the same while allowing to easily add new menus, sub-menus, options, etc.

Not much documentation in the source code yet. After all, this is just V00.01, that is, the first somewhat usable revision.

There are quite some leftovers in the files from the development. Stuff has changed, but some code not deleted or `#defines` removed. In short: it's quite a mess right now. Also, some names used for functions, variables and defines are not that good and should change.

Have fun!