

ckb-next  
beta-v0.2.8 at branch testing

Generated by Doxygen 1.8.6

Sun Jun 18 2017 18:21:35



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# Chapter 1

## README

ckb-next: RGB Driver for Linux and OS X

**ckb-next** is an open-source driver for Corsair keyboards and mice. It aims to bring the features of their proprietary CUE software to the Linux and Mac operating systems. This project is currently a work in progress, but it already supports much of the same functionality, including full RGB animations. More features are coming soon. Testing and bug reports are appreciated!

**Disclaimer:** ckb-next is not an official Corsair product. It is licensed under the GNU General Public License (version 2) in the hope that it will be useful, but with NO WARRANTY of any kind.

### What happened to the original **ckb**?

We don't know. The author of **ckb** [ccMSC](#) suddenly disappeared and hasn't showed up since July 2016. So the community around ckb decided to take the project over and continue its development. That's how **ckb-next** was created. Currently it's not rock solid and very easy to set up on newer systems but we are actively working on this. Nevertheless the project already incorporates a notable amount of fixes and patches in comparison to the original ckb.

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See also:

- <https://github.com/mattanger/ckb-next/blob/master/DAEMON.md> "Manual for the driver daemon"
- [ckb testing repository](#) (updated more frequently, but may be unstable)

## Device Support

### Keyboards:

- K65 RGB
- K70
- K70 RGB
- K70 LUX RGB
- K95\*
- K95 RGB
- Strafe
- Strafe RGB
- = hardware playback not supported. Settings will be saved to software only.

### Mice:

- M65 RGB
- M65 PRO RGB
- Sabre RGB
- Scimitar RGB

## Linux Installation

### Pre-made packages:

#### **ckb-next** packages:

- Fedora 24/25, CentOS/RHEL 7 (maintained by ):
  - `'johanh/ckb'` - based on `master` branch

#### **ckb** packages (deprecated):

- Arch Linux (maintained by ):
  - `'aur/ckb-git'` - based on `master` branch (more stable)
  - `'aur/ckb-git-latest'` - based on `testing` branch (less stable but fresher)
- Gentoo (maintained by ): `emerge -av app-misc/ckb`

If you are a package maintainer or want to discuss something with package maintainers let us know in the issues, so we can have an accountable and centralized communication about this. *If you would like to maintain a package for your favorite distro/OS, please let us know as well.*



**Preparation:**

ckb-next requires Qt5 (Qt 5.6 recommended for OS X), libudev, zlib, gcc, g++, and glibc.

- **Ubuntu:** `sudo apt-get install build-essential libudev-dev qt5-default zlib1g-dev libappindicator-dev`
- **Fedora:** `sudo dnf install zlib-devel qt5-qtbase-devel libgudev-devel libappindicator-devel systemd-devel gcc-c++`
- **Arch:** `sudo pacman -S base-devel qt5-base zlib`
- **Other distros:** Look for `qt5` or `libqt5*-devel`

**Note:** If you build your own kernels, ckb-next requires the `uinput` flag to be enabled. It is located in `Device Drivers -> Input Device Support -> Miscellaneous devices -> User level driver support`. If you don't know what this means, you can ignore this.

**Installing:**

You can download ckb-next using the "Download zip" option on the right. Extract it and open the `ckb-master` directory. The easiest way to install ckb is to double-click the `quickinstall` script and run it in a Terminal. It will attempt to build ckb and then ask if you'd like to install/run the application. If the build doesn't succeed, or if you'd like to compile ckb manually, see <https://github.com/ccMSC/ckb/blob/master/BUILD.md> "BUILD.md" for instructions.

**Upgrading:**

To install a new version of ckb, or to reinstall the same version, first delete the `ckb-master` directory and the zip file from your previous download. Then download the source code again and re-run `quickinstall`. The script will automatically replace the previous installation. You may need to reboot afterward.

**Uninstalling:**

First, stop the `ckb-daemon` service and remove the service file.

- If you have `systemd` (Ubuntu versions starting with 15.04): `sudo systemctl stop ckb-daemon sudo rm -f /usr/lib/systemd/system/ckb-daemon.service`
- If you have `Upstart` (Ubuntu versions earlier than 15.04): `sudo service ckb-daemon stop sudo rm -f /etc/init/ckb-daemon.conf`
- If you have `OpenRC`: `sudo rc-service ckb-daemon stop sudo rc-update del ckb-daemon default sudo rm -f /etc/init.d/ckb-daemon`
- If you're not sure, re-run the `quickinstall` script and proceed to the service installation. The script will say `System service: Upstart detected` or `System service: systemd detected`. Please be aware that `OpenRC` is currently not detected automatically.

Afterward, remove the applications and related files: `sudo rm -f /usr/bin/ckb /usr/bin/ckb-daemon /usr/share/applications/ckb.desktop /usr/share/icons/hicolor/512x512/apps/ckb.png sudo rm -rf /usr/lib/ckb-animations`

Before <https://github.com/mattanger/ckb-next/commit/f347e60df211c60452f95084b6c46dc4ec5f42> animations were located elsewhere, try removing them as well: `sudo rm -rf /usr/bin/ckb-animations`

**OS X/macOS Installation****Binary download:**

The latest OS X/macOS binary can be downloaded here: <https://github.com/mattanger/ckb-next/releases/latest>

Click on `ckb.pkg` under the Downloads section. This is an automated installer which will set up the driver for you. After it's finished, open `ckb.app` (it will be installed to your Applications directory) to get started.

### Building from source:

Install the latest version of Xcode from the App Store. Open Xcode, accept the license agreement, and wait for it to install any additional components (if necessary). When you see the "Welcome to Xcode" screen, the setup is finished and you can close the app. Then install Xcode Command Line Tools package issuing `xcode-select --install` in a Terminal app. Afterwards install Qt5 from here: <http://www.qt.io/download-open-source/>

The easiest way to build the driver is with the `quickinstall` script, which is present in the `ckb-master` folder. Double-click on `quickinstall` and it will compile the app for you, then ask if you'd like to install it system-wide. If the build fails for any reason, or if you'd like to compile manually, see <https://github.com/ccMSC/ckb/blob/master/BUILD.md> "BUILD.md".

### Upgrading (binary):

Download the latest `ckb.pkg`, run the installer, and reboot. The newly-installed driver will replace the old one.

### Upgrading (source):

Remove the existing `ckb-master` directory and zip file. Re-download the source code and run the `quickinstall` script again. The script will automatically replace the previous installation. You may need to reboot afterward.

### Uninstalling:

Drag `ckb.app` into the trash. If the system service file isn't cleaned up automatically, you can find it and remove it here: `/Library/LaunchDaemons/com.ckb.daemon.plist`.

## Usage

The user interface is still a work in progress.

### Major features:

- Control multiple devices independently
- United States and European keyboard layouts
- Customizable key bindings
- Per-key lighting and animation
- Reactive lighting
- Multiple profiles/modes with hardware save function
- Adjustable mouse DPI with ability to change DPI on button press
- Key macros (G-Keys also); Have a look at [https://youtu.be/qhrKP03\\_NrM](https://youtu.be/qhrKP03_NrM) for a short video tutorial
- Key macro delays: Handle delays between keystrokes when playing a macro

Closing `ckb` will actually minimize it to the system tray. Use the Quit option from the tray icon or the settings screen to exit the application.

### Roadmap (roughly in order)

- **v0.3 release:**
  - Ability to store profiles separately from devices, import/export them
  - More functions for the Win Lock key
- **v0.4 release:**

- Ability to import CUE profiles
- Ability to tie profiles to which application has focus
- **v0.5 release:**
  - Key combos
  - Timers?
- **v1.0 release:**
  - OSD? (Not sure if this can actually be done)
  - Extra settings?
  - ????

## Troubleshooting

### Linux

If you have problems connecting the device to your system (device doesn't respond, ckb-daemon doesn't recognize or can't connect it) and/or you experience long boot times when using the keyboard, try adding the following to your kernel's `cmdline`:

- K65 RGB: `usbhid.quirks=0x1B1C:0x1B17:0x20000408`
- K70: `usbhid.quirks=0x1B1C:0x1B09:0x0x20000408`
- K70 RGB: `usbhid.quirks=0x1B1C:0x1B13:0x20000408`
- K95: `usbhid.quirks=0x1B1C:0x1B08:0x20000408`
- K95 RGB: `usbhid.quirks=0x1B1C:0x1B11:0x20000408`
- Strafe: `usbhid.quirks=0x1B1C:0x1B15:0x20000408`
- Strafe RGB: `usbhid.quirks=0x1B1C:0x1B20:0x20000408`
- M65 RGB: `usbhid.quirks=0x1B1C:0x1B12:0x20000408`
- Sabre RGB Optical: `usbhid.quirks=0x1B1C:0x1B14:0x20000408`
- Sabre RGB Laser: `usbhid.quirks=0x1B1C:0x1B19:0x20000408`
- Scimitar RGB: `usbhid.quirks=0x1B1C:0x1B1E:0x20000408`

For instructions on adding `cmdline` parameters in Ubuntu, see <https://wiki.ubuntu.com/Kernel/-KernelBootParameters>

If you have multiple devices, combine them with commas, starting after the `=`. For instance, for K70 RGB + M65 RGB: `usbhid.quirks=0x1B1C:0x1B13:0x20000408,0x1B1C:0x1B12:0x20000408`

If it still doesn't work, try replacing `0x20000408` with `0x4`. Note that this will cause the kernel driver to ignore the device(s) completely, so you need to ensure `ckb-daemon` is running at boot or else you'll have no input. This will not work if you are using full-disk encryption.

If you see **GLib** critical errors like 'GLib-GObject-CRITICAL \*\*: g\_type\_add\_interface\_static: assertion 'G\_TYPE\_IS\_INSTANTIATABLE (instance\_type)' failed' and you are using:

- Qt 5.8 and newer, remove your Qt configuration files and restart the ckb GUI. Also watch out for different style overrides in dotfiles under `~/` generated by Qt automatically, remove them as well.
- Qt 5.7 and lower, install `qt5ct` package on Arch Linux (find a similar one for your distribution). That's all. This is a known Qt bug. It happened because Qt did not ship required GTK files.

If you're using **Unity** and the tray icon doesn't appear correctly, run `sudo apt-get install libappindicator-dev`. Then reinstall ckb.

## OS X/macOS

- **\*\*“ckb.pkg” can’t be opened because it is from an unidentified developer\*\*** Open System Preferences > Security & Privacy > General and click Open Anyway.
- **Modifier keys (Shift, Ctrl, etc.) are not rebound correctly** ckb does not recognize modifier keys rebound from System Preferences. You can rebound them again within the application.
- **\*\*~ key prints \$±\*\*** Check your keyboard layout on ckb’s Settings screen. Choose the layout that matches your physical keyboard.
- **Compile problems** Can usually be resolved by rebooting your computer and/or reinstalling Qt. Make sure that Xcode works on its own. If a compile fails, delete the `ckb-master` directory as well as any automatically generated `build-ckb` folders and try again from a new download.
- **Scroll wheel does not scroll** As of #c3474d2 it’s now possible to **disable scroll acceleration** from the GUI. You can access it under "OSX tweaks" in the "More settings" screen. Once disabled, the scroll wheel should behave consistently.

## General

**Please ensure your keyboard firmware is up to date. If you’ve just bought the keyboard, connect it to a Windows computer first and update the firmware from Corsair’s official utility.**

**Before reporting an issue, connect your keyboard to a Windows computer and see if the problem still occurs. If it does, contact Corsair.** Additionally, please check the Corsair user forums to see if your issue has been reported by other users. If so, try their solutions first.

Common issues:

- **Problem:** ckb says "No devices connected" or "Driver inactive"
- **Solution:** Try rebooting the computer and/or reinstalling ckb. Try removing the keyboard and plugging it back in. If the error doesn’t go away, try the following:
- **Problem:** Keyboard doesn’t work in BIOS, doesn’t work at boot
- **Solution:** Some BIOSes have trouble communicating with the keyboard. They may prevent the keyboard from working correctly in the operating system as well. First, try booting the OS *without* the keyboard attached, and plug the keyboard in after logging in. If the keyboard works after the computer is running but does not work at boot, you may need to use the keyboard’s BIOS mode option.
- BIOS mode can be activated using the poll rate switch at the back of the keyboard. Slide it all the way to the position marked "BIOS". You should see the scroll lock light blinking to indicate that it is on. (Note: Unfortunately, this has its own problems - see Known Issues. You may need to activate BIOS mode when booting the computer and deactivate it after logging in).
- **Problem:** Keyboard isn’t detected when plugged in, even if driver is already running
- **Solution:** Try moving to a different USB port. Be sure to follow [Corsair’s USB connection requirements](#). Note that the keyboard does not work with some USB3 controllers - if you have problems with USB3 ports, try USB2 instead. If you have any USB hubs on hand, try those as well. You may also have success sliding the poll switch back and forth a few times.

## Reporting issues

If you have a problem that you can’t solve (and it isn’t mentioned in the Known Issues section below), you can report it on [the GitHub issue tracker](#). Before opening a new issue, please check to see if someone else has reported your problem already - if so, feel free to leave a comment there.

## Known issues

- Using the keyboard in BIOS mode prevents the media keys (including mute and volume wheel), as well as the K95's G-keys from working. This is a hardware limitation.
- The tray icon doesn't appear in some desktop environments. This is a known Qt bug. If you can't see the icon, reopen ckb to bring the window back.
- When starting the driver manually, the Terminal window sometimes gets spammed with enter keys. You can stop it by unplugging and replugging the keyboard or by moving the poll rate switch.
- When stopping the driver manually, the keyboard sometimes stops working completely. You can reconnect it by moving the poll rate switch.

## Contributing

You can contribute to the project by [opening a pull request](#). It's best if you base your changes off of the `testing` branch as opposed to the `master`, because the pull request will be merged there first. If you'd like to contribute but don't know what you can do, take a look at [the issue tracker](#) and see if any features/problems are still unresolved. Feel free to ask if you'd like some ideas.



## Chapter 2

# Building ckb

### Linux

You can build the project by running `./qmake-auto && make` in a Terminal inside the `ckb-master` directory. The binaries will be placed in a new `bin` directory assuming they compile successfully. If you get a `No suitable qmake found` error, make sure Qt5 is installed and up to date. You may have to invoke `qmake` manually, then run `make` on its own. If you have Qt Creator installed, you can open `ckb.pro` (when asked to configure the project, make sure "Desktop" is checked) and use `Build > Build Project "ckb"` (Ctrl+B) to build the application instead.

#### Running as a service:

First copy the binary and the service files to their system directories:

- **Upstart (Ubuntu, prior to 15.04):** `sudo cp -R bin/* /usr/bin && sudo cp service/upstart/ckb-daemon.conf /etc/init`
- **Systemd (Ubuntu 15.04 and later):** `sudo cp -R bin/* /usr/bin && sudo cp service/systemd/ckb-daemon.service /usr/lib/systemd/system`
- **OpenRC:** `sudo cp -R bin/* /usr/bin && sudo cp service/openrc/ckb-daemon /etc/init.d/`

To launch the driver and enable it at start-up:

- **Upstart:** `sudo service ckb-daemon start`
- **Systemd:** `sudo systemctl start ckb-daemon && sudo systemctl enable ckb-daemon`
- **OpenRC:** `sudo rc-service ckb-daemon start && sudo rc-update add ckb-daemon default`

Open the `bin` directory and double-click on `ckb` to launch the user interface. If you want to run it at login, add `ckb --background` to your Startup Applications.

#### Running manually:

Open the `bin` directory in a Terminal and run `sudo ./ckb-daemon` to start the driver. To start the user interface, run `./ckb`. Running the driver manually may be useful for testing/debugging purposes, but you must leave the terminal window open and you'll have to re-run it at every reboot, so installing it as a service is the best long-term solution.

## OSX

Open `ckb.pro` in Qt Creator. You should be prompted to configure the project (make sure the "Desktop" configuration is selected and not iOS). Once it's finished loading, press `Cmd+B` or select `Build > Build Project "ckb"` from the menu bar. When it's done, you should see a newly-created `ckb.app` in the project directory. Exit Qt Creator.

Alternatively, open a Terminal in the `ckb-master` directory and run `./qmake-auto && make`. It will detect Qt automatically if you installed it to one of the standard locations. You should see a newly created `ckb.app` if the build is successful.

### Running as a service:

Copy `ckb.app` to your Applications folder. Copy the file `'service/launchd/com.ckb.daemon.plist'` to your computer's `/Library/LaunchDaemons` folder (you can get to it by pressing `Cmd+Shift+G` in Finder and typing the location). Then open a Terminal and run the following commands to launch the driver:

```
"" sudo chown root:wheel /Library/LaunchDaemons/com.ckb.daemon.plist sudo chmod 0700 /Library/LaunchDaemons/com.ckb.daemon.plist sudo launchctl load /Library/LaunchDaemons/com.ckb.daemon.plist ""
```

After you're done, open `ckb.app` to launch the user interface.

### Running manually:

Open a Terminal in the `ckb` directory and run `sudo ckb.app/Contents/Resources/ckb-daemon` to start the driver. Open `ckb.app` to start the user interface. Note that you must leave the terminal window open and must re-launch the driver at every boot if you choose this; installing as a service is the better long term solution.



## Chapter 3

# cbk Improvements Roadmap

### Short term plan

- merge existing PR submitted to original ckb repo
- Contact other developers interested in collaboration on a new and improved version of ckb
- Figure out the issues relating to MacOS Sierra and other version
- Device support:
  - Determine which will need support other than just USB id additions
- Address existing bugs. Not help requests.



## Chapter 4

# DAEMON

The daemon provides devices at `/dev/input/ckb*`, where `*` is the device number, starting at 1. Up to 9 devices may be connected at once and controlled independently. The daemon additionally provides `/dev/input/ckb0`, which stores driver information.

**Mac note:** The devices on OSX are located at `/var/run/ckb*` and not `/dev/input/ckb*`. So wherever you see `/dev/input` in this document, replace it with `/var/run`.

`/dev/input/ckb0` contains the following files:

- `connected`: A list of all connected devices, one per line. Each line contains a device path followed by the device's serial number and its description.
- `pid`: The process identifier of the daemon.
- `version`: The daemon version.

Other `ckb*` devices contain the following:

- `cmd`: Keyboard controller.
- `notify0`: Keyboard- or mouse notifications.
- `notify1`: Keyboard- or mouse notifications, used for macro recording.
- `features`: Device features.
- `fwversion`: Device firmware version (not present on all devices).
- `model`: Device description/model.
- `pollrate`: Poll rate in milliseconds (not present on all devices).
- `productid`: Contains the USB productID of the hardware
- `serial`: Device serial number. `model` and `serial` will match the info found in `ckb0/connected`

## Commands

The `/dev/input/ckb*/cmd` nodes accept input in the form of text commands. They are normally accessible to all users on the system (see Security section). Commands should be given in the following format: `[mode <n>] command1 [parameter1] [command2] [parameter2] [command3] [parameter3] ...`

In a terminal shell, you can do this like `echo mycommand > /dev/input/ckb1/cmd`. Programmatically, you can open and write them as regular files. When programming, you must append a newline character and flush the output before your command(s) will actually be read.

The `mode` parameter is used to group settings. Most (but not all) settings are mode-specific; that is, changing mode 1 will not affect mode 2. By default, all commands affect the current mode. Use `mode <n> switch` to change the current mode.

When plugged in, all devices start in hardware-controlled mode (also known as idle mode) and will not respond to commands. Before issuing any other commands, write `active` to the command node, like `echo active > /dev/input/ckbl/cmd`. To put the device back into hardware mode, issue the `idle` command.

## Features

The `features` node describes features supported by the device, which may not be present on all devices. The first two words in the `features` node are always `<vendor> <model>`, like `corsair k70`. After that, any of the following features may appear:

- `adjrate`: Device supports adjustable poll rate.
- `bind`: Device supports key rebinding.
- `fwupdate`: Device supports firmware updates.
- `fwversion`: Device has a detectable firmware version (stored in the `fwversion` node).
- `notify`: Device supports key notifications.
- `pollrate`: Device has a detectable poll rate (stored in the `pollrate` node).
- `rgb`: Device supports RGB lighting.

## Keyboard layout

The driver has no concept of keyboard layouts; all keys are referred to by their English names regardless of the underlying hardware. This means that, for instance, in an AZERTY layout the `q` key in `ckb-daemon` corresponds to `A` on the physical keyboard. Note that on UK/european (ISO) layouts, the backslash key (beside left shift) is called `bslash_iso`, while `bslash` refers to the backslash on the US keyboard. The key next to Enter on the ISO keyboard is known as `hash`. See <src/ckb-daemon/keymap.c> for the full table of supported keys.

For technical reasons, the OSX driver may swap the `bslash_iso` and `grave` keys if the keyboard layout is not set correctly. To compensate for this, write `layout iso` or `layout ansi` to the command node.

## Poll rate

A device's current poll rate can be read from its `pollrate` node, assuming it has one. Keyboards have a hardware switch to control poll rate and cannot be adjusted via software. However, mice have a software-controlled poll rate. You can change it by issuing `pollrate <interval>` to the command node, where `interval` is the time in milliseconds. Valid poll rates are 1, 2, 4, and 8.

## Profiles and modes

Each mode has its own independent binding and lighting setup. When the daemon starts or a keyboard is plugged in, the profile will be loaded from the hardware. By default, all commands will update the currently selected mode. The `mode <n>` command may be used to change the settings for a different mode. Up to 6 modes are available. Each keyboard has one profile, which may be given a name. Mode 1 may be saved to the device hardware, or modes 1-3 in the case of the K95. Modes 4 through 6 are software-only. Profile management commands are as follows:

- `profilename <name>` sets the profile's name. The name must be written without spaces; to add a space, use `%20`.

- `name <name>` sets the current mode's name. Use `mode <n> name <name>` to set a different mode's name.
- `profileid <guid> [<modification>]` sets a profile's ID. The GUID must be written in registry format, like `{12345678-ABCD-EF01-2345-6789ABCDEF01}`. The optional modification number must be written with 8 hex digits, like `ABCDEF01`.
- `id <guid> [<modification>]` sets a mode's ID.
- `mode <n> switch` switches the keyboard to mode N. If the mode does not exist, it will be created with a blank ID, black lighting, and default bindings.
- `hwload` loads the RGB profile from the hardware. Key bindings and non-hardware RGB modes are unaffected.
- `hwsave` saves the RGB profile to the hardware.
- `erase` erases the current mode, resetting its lighting and bindings. Use `mode <n> erase` to erase a different mode.
- `eraseprofile` erases the entire profile, deleting its name, ID, and all of its modes.

#### Examples:

- `profilename My%20Profile mode 1 name Mode%201 mode 2 name Mode%202 mode 3 name Mode%203` will name the profile "My Profile" and name modes 1-3 "Mode 1", "Mode 2", and "Mode 3".
- `eraseprofile hwload` resets the entire profile to its hardware settings.

## LED commands

The backlighting is controlled by the `rgb` commands.

- `rgb <RRGGBB>` sets the entire keyboard to the color specified by the hex constant `RRGGBB`.
- `rgb <key>:<RRGGBB>` sets the specified key to the specified hex color.

#### Examples:

- `rgb ffffffff` makes the whole keyboard white.
- `rgb 000000` makes the whole keyboard black.
- `rgb esc:ff0000` sets the Esc key red but leaves the rest of the keyboard unchanged.

Multiple keys may be changed to one color when separated with commas, for instance:

- `rgb w,a,s,d:0000ff` sets the WASD keys to blue.

Additionally, multiple commands may be combined into one, for instance:

- `rgb ffffffff esc:ff0000 w,a,s,d:0000ff` sets the Esc key red, the WASD keys blue, and the rest of the keyboard white (note the lack of a key name before `fffffff`, implying the whole keyboard is to be set).

By default, the controller runs at 30 FPS, meaning that attempts to animate the LEDs faster than that will be ignored. If you wish to change it, send the command `fps <n>`. The maximum frame rate is 60.

For devices running in 512-color mode, color dithering can be enabled by sending the command `dither 1`. The command `dither 0` disables dithering.

## Indicators

The indicator LEDs (Num Lock, Caps Lock, Scroll Lock) are controlled with the `i` commands.

- `ioff <led>` turns an indicator off permanently. Valid LED names are `num`, `caps`, and `scroll`.
- `ion <led>` turns an indicator on permanently.
- `iauto <led>` turns an indicator off or on automatically (default behavior).

## Binding keys

Keys may be rebound through use of the `bind` commands. Binding is a 1-to-1 operation that translates one keypress to a different keypress regardless of circumstance.

- `bind <key1>:<key2>` remaps `key1` to `key2`.
- `unbind <key>` unbinds a key, causing it to lose all function.
- `rebind <key>` resets a key, returning it to its default binding.

### Examples:

- `bind g1:esc` makes G1 become an alternate Esc key (the actual Esc key is not changed).
- `bind caps:tab tab:caps` switches the functions of the Tab and Caps Lock keys.
- `unbind lwin rwin` disables both Windows keys, even without using the keyboard's Windows Lock function.
- `rebind all` resets the whole keyboard to its default bindings.

## Key macros

Macros are a more advanced form of key binding, controlled with the `macro` command.

- `macro <keys>:<command>` binds a key combination to a command, where the command is a series of key presses. To combine keys, separate them with `+`; for instance, `lctrl+a` binds a macro to (left) Ctrl+A. In the command field, enter `+``<key>` to trigger a key down or `-<key>` to trigger a key up. To simulate a key press, use `+``<key>`, `-<key>`.
- `macro <keys>:clear` clears commands associated with a key combination. Only one macro may be assigned per combination; assigning a second one will overwrite the first.
- `macro clear` clears all macros.

### Examples:

- `macro g1:+lctrl,+a,-a,-lctrl` triggers a Ctrl+A when G1 is pressed.
- `macro g2+g3:+lalt,+f4,-f4,-lalt` triggers an Alt+F4 when G2 and G3 are pressed simultaneously.

Assigning a macro to a key will cause its binding to be ignored; for instance, `macro a:+b,-b` will cause A to generate a B character regardless of its binding. However, `macro lctrl+a:+b,-b` will cause A to generate a B only when Ctrl is also held down.

## Macro playback delay

There are two types of playback delay that can be set with macros; global and local. Setting a *global delay* value introduces a time delay between events during macro execution or playback. *Local delay* allows setting the delay after an individual event, overriding the global delay value for that event. Thus global delay can be used to set the overall playback speed of macros and local delays can be used to tune individual events within a macro.

All delay values are specified in microseconds (us) and are positive values from 0 to `UINT_MAX - 1`. This means delays range from 0 to just over 1 hour (4,294,967,294us, 4,294 seconds, 71 minutes, or 1.19 hours). A value of zero (0) represents no delay between actions.

### Global macro delay (default delay)

Global delay allows macro playback speed to be changed. It sets the time between (actually after) each recorded macro event. If global delay is set to 1 microsecond then a 1 ms delay will follow each individual macro event when the macro is triggered.

The *global delay* is set with the `ckb-daemon`'s existing (in testing branch) `delay` command followed by an unsigned integer representing the number of microseconds to wait after each macro action and before the next.

Global delay can also be set to `on` which maintains backwards compatibility with the current development of `ckb-daemon` for long macro playback. That is, setting the global delay to `on` introduces a 30us and a 100us delay based on the macro's length during playback.

**NOTE:** This setting also introduces a delay after the last macro action. This functionality exists in the current testing branch and was left as-is. It is still to be determined if this is a bug or a feature.

### Examples:

- `delay 1000` sets a 1,000us delay between action playback.
- `delay on` sets long macro delay; 30us for actions between 20 and 200, 100us for actions > 200.
- `delay off` sets no delay (same as 0).
- `delay 0` sets no delay (same as off).
- `delay spearmint-potato` is invalid input, sets no delay (same as off).

### Local macro delay (keystroke delay)

Local Delay allows each macro action to have a post-action delay associated with it. This allows a macro to vary it's playback speed for each event. If no local delay is specified for a macro action, then the `global delay` (above) is used. All delay values are in microsecons (us) as with the global delay setting.

### \*\*\*Examples:\*\*\*

- `macro g5:+d,-d,+e=5000,-e,+l,-l=10000,+a,-a,+y,-y=1000000,+enter,-enter` define a macro for `g5` with a 5,000us delay between the `e` down and `e` up actions. A 1,000us delay between `l` up and a down, a delay of one second (1,000,000us) after `y` up and before `enter`, and the global delay for all other actions.
- `macro g5:+d,-d=0` use default delay between `d` down and `d` up and no delay (0us) after `d` up. This removes the noted feature/bug (above) where the last action has a trailing delay associated with it.

## DPI and mouse settings

DPI settings are stored in a bank. They are controlled with the `dpi` command.

- `dpi <stage>:<x>,<y>` sets the DPI for a given `stage` to `x` by `y`. Valid stages are 0 through 5. In hardware, 1 is the first (lowest) stage and 5 is the highest. Stage 0 is used for Sniper mode.
- `dpi <stage>:<xy>` sets both X and Y.

- `dpi <stage>:off` disables a DPI stage.
- `dpisel <stage>` sets the current stage selection.

In order to change the mouse's current DPI, first update one of the stages with the value you want, then select that stage. For instance:

- `dpi 1:1000 dpisel 1` sets the current DPI to 1000x1000.

Additional mouse settings:

- `lift <height>` sets the lift height, from 1 (lowest) to 5 (highest)
- `snap <on|off>` enables or disables Angle Snap.

## Notifications

The keyboard can be configured to generate user-readable notifications on keypress events. These are controlled with the `notify` commands. In order to see events, read from `/dev/input/ckb*/notify0`. In a terminal, you can do this like `cat /dev/input/ckb1/notify0`. Programmatically, you can open it for reading like a regular file.

Note that the file can only reliably be read by one application: if you try to open it in two different programs, they may both fail to get data. Data will be buffered as long as no programs are reading, so you will receive all unread notifications as soon as you open the file. If you'd like to read notifications from two separate applications, send the command `notifyon <n>` to the keyboard you wish to receive notifications from, where N is a number between 1 and 9. If `/dev/input/ckb*/notify<n>` does not already exist, it will be created, and you can read notifications from there without disrupting any other program. To close a notification node, send `notifyoff <n>`.

`notify0` is always open and will not be affected by `notifyon/notifyoff` commands. By default, all notifications are printed to `notify0`. To print output to a different node, prefix your command with `@<node>`.

Notifications are printed with one notification per line. Commands are as follows:

- `notify <key>:on` or simply `notify <key>` enables notifications for a key. Each key will generate two notifications: `key +<key>` when the key is pressed, and `key -<key>` when it is released.
- `notify <key>:off` turns notifications off for a key.

## Examples:

- `notify w a s d` sends notifications whenever W, A, S, or D is pressed.
- `notify g1 g2 g3 g4 g5 g6 g7 g8 g9 g10 g11 g12 g13 g14 g15 g16 g17 g18 mr m1 m2 m3 light lock` prints a notification whenever a non-standard key is pressed.
- `notify all:off` turns all key notifications off.
- `@5 notify esc` prints Esc key notifications to `notify5`.

**Note:** Key notifications are *not* affected by bindings. For instance, if you run `echo bind a:b notify a > /dev/input/ckb1/cmd` and then press the A key, the notifications will read `key +a key -a`, despite the fact that the character printed on screen will be `b`. Likewise, unbinding a key or assigning a macro to a key does not affect the notifications.



## Indicator notifications

You can also choose to receive notifications for the indicator LEDs by using the `inotify` command. For instance, `inotify caps:on` or simply `inotify caps` will print notifications whenever the Caps Lock LED is toggled. The notifications will read `i +caps` when the light is turned on and `i -caps` when it is turned off. It is also possible to toggle all indicators at once using `inotify all` or `inotify all:off`.

Like key notifications, indicator notifications are not affected by bindings, nor by the `ion`, `ioff`, or `iauto` commands. The notifications will reflect the state of the LEDs as seen by the event device.

## Getting parameters

Parameters can be retrieved using the `get` command. The data will be sent out as a notification. Generally, the syntax to get the data associated with a command is `get :<command>` (note the colon), and the associated data will be returned in the form of `<command> <data>`. The following data may be gotten:

- `get :mode` returns the current mode in the form of a `switch` command. (Note: Do not use this in a line containing a `mode` command or it will return the mode that you selected, rather than the keyboard's current mode.)
- `get :name` returns the current mode's name in the form of `mode <n> name <name>`. To see the name of another mode, use `mode <n> get :name`. The name is URL-encoded; spaces are written as `%20`. The name may be truncated, so `name <some long string> get :name` may return something shorter than what was entered.
- `get :profilename` returns the profile's name, in the form of `profilename <name>`. As above, it is URL-encoded and may be truncated.
- `get :hwname` and `get :hwprofilename` return the same thing except taken from the current hardware profile instead of the in-memory profile. The output is identical but will read `hwname` instead of `name` and `hwprofilename` instead of `profilename`.
- `get :id` returns the current mode's ID and modification number in the form of `mode <n> id <guid> <modification>`.
- `get :profileid` returns the current profile's ID and modification number in the form of `profileid <guid> <modification>`.
- `get :hwid` and `get :hwprofileid` return the same thing except from the current hardware profile/mode. As before, the output will be the same but with `hwid` and `hwprofileid` instead of `id` and `profileid`.
- `get :rgb` returns an `rgb` command equivalent to the current RGB state.
- `get :hwrngb` does the same thing, but retrieves the colors currently stored in the hardware profile. The output will say `hwrngb` instead of `rgb`.
- `get :dpi` returns a `dpi` command equivalent to the current DPI bank.
- `get :dpisel` returns a `dpisel` command for the currently-selected DPI stage.
- `get :lift` returns a `lift` command for the current lift height.
- `get :snap` returns the current angle snap status.
- `get :hwdpi`, `get :hwdpisel`, `get :hwlift`, and `get :hwsnap` return the same properties, but for the current hardware profile.
- `get :keys` and `get :i` return the current keypress status and indicator status, respectively. They will indicate all currently pressed keys and all currently active indicators, like `key +enter` and `i +num`.

Like `notify`, you must prefix your command with `@<node>` to get data printed to a node other than `notify0`.

## Firmware updates

**WARNING:** Improper use of `fwupdate` may brick your device; use this command *at your own risk*. I accept no responsibility for broken keyboards.

The latest firmware versions and their URLs can be found in the `FIRMWARE` document. To update your keyboard's firmware, first extract the contents of the zip file and then issue the command `fwupdate /path/to/fw/file.bin` to the keyboard you wish to update. The path name must be absolute and must not include spaces. If it succeeded, you should see `fwupdate <path> ok` logged to the keyboard's notification node and then the device will disconnect and reconnect. If you see `fwupdate <path> invalid` it means that the firmware file was not valid for the device; more info may be available in the daemon's `stdout`. If you see `fwupdate <path> fail` it means that the file was valid but the update failed at a hardware level. The keyboard may disconnect/reconnect anyway or it may remain in operation.

When the device reconnects you should see the new firmware version in its `fwversion` node; if you see `0000` instead it means that the keyboard did not update successfully and will need another `fwupdate` command in order to function again. If the update fails repeatedly, try connecting the keyboard to a Windows PC and using the official firmware update in CUE.

## Restart

Because sometimes the communication between the daemon and the keyboard is corrupted after resuming from standby or suspend, a restart function is implemented. It first calls the `quit()` function, then it calls `main()` again with the original parameter list.

There are two ways to restart the daemon:

- send the string "restart some-description-as-one-word" to the `cmd-pipe` (normally `/dev/input/ckb1/cmd` or `/dev/input/ckb2/cmd`, depending on what device gets which ID).
- send `SIGUSR1` to the daemon process (as root).

Later on, there may be a user interface in the client for the first method.

## Security

By default, all of the `ckb*` nodes may be accessed by any user. For most single-user systems this should not present any security issues, since only one person will have access to the computer anyway. However, if you'd like to restrict the users that can write to the `cmd` nodes or read from the `notify` nodes, you can specify the `--gid=<group>` option at start up. For instance, on most systems you could run `ckb-daemon --gid=1000` to make them accessible only by the system's primary user. `ckb-daemon` must still be run as root, regardless of which `gid` you specify. The `gid` option may be set only at startup and cannot be changed while the daemon is running.

The daemon additionally supports a `--nonotify` option to disable key notifications, to prevent unauthorized programs from logging key input. Note that this will interfere with some of `ckb`'s abilities. It is also highly unlikely to increase security unless you are using the program in a stripped down terminal environment without Xorg. For most use cases there are many other (more likely) ways that a keylogger program could compromise your system. Nevertheless, the option is provided for the sake of paranoia. If you'd like to disable key rebinding as well, launch the daemon with `--nobind`. `--nobind` implies `--nonotify`, so notifications will also be disabled. As with `--gid`, these options must be set at startup and cannot be changed while the daemon is running.

## Chapter 5

# Todo List

### Global `_usbsend` (usbdevice \*kb, const uchar \*messages, int count, const char \*file, int line)

A lot of different conditions are combined in this code. Don't think, it is good in every combination...

Check whether this is the same in the macOS variant. It is not dramatic, but if errors occur, it can certainly irritate the devices completely if they receive incomplete data streams. Do we have errors with the messages "Wrote YY bytes (expected 64)" in the system logs? If not, we do not need to look any further.

### Global `closeusb` (usbdevice \*kb)

What is not yet comprehensible is the call to `updateconnected()` BEFORE `os_closeusb()`. Should that be in the other sequence? Or is `updateconnected()` not displaying the connected usb devices, but the representation which uinput devices are loaded? Questions about questions ...

### Global `devmain` (usbdevice \*kb)

Hope to find the need for dmux usage later.

Should this function be declared as `pthread_t*` function, because of the definition of `pthread-create`? But `void*` works also...

`readcmd()` gets a **line**, not **lines**. Have a look on that later.

Is the condition `IS_CONNECTED` valid? What functions change the condition for the macro?

### Global `get_vtable` (short vendor, short product)

Is the last point really a good decision and always correct?

### Global `inputupdate_keys` (usbdevice \*kb)

If we want to get all keys typed while a macro is played, add the code for it here.

### Global `macro_pt_enqueue` ()

find a better exit strategy if no more mem available.

### Global `os_inputmain` (void \*context)

This function is a collection of many tasks. It should be divided into several sub-functions for the sake of greater convenience:

### Global `os_resetusb` (usbdevice \*kb, const char \*file, int line)

it seems that no one wants to try the reset again. But I've seen it somewhere...

### Global `os_setupusb` (usbdevice \*kb)

in these modules a pullrequest is outstanding

### Global `os_usbend` (usbdevice \*kb, const uchar \*out\_msg, int is\_rcv, const char \*file, int line)

Since the handling of endpoints has already led to problems elsewhere, this implementation is extremely hardware-dependent and critical!

Eg. the new keyboard K95PLATINUMRGB has a version number significantly less than 2.0 - will it run with this implementation?

**Global `product_str` (short product)**

There are macros defined in `usb.h` to detect all the combinations below. the only difference is the parameter: The macros need the `kb*`, `product_str()` needs the *product ID*

**Global `revertusb` (usbdevice \*kb)**

Why is this useful? Are there problems seen with deactivating a device with older fw-version??? Why isn't this an error indicating reason and we return success (0)?

The return value of `nk95cmd()` is ignored (but sending the ioctl may produce an error and `_nk95_cmd` will indicate this), instead `revertusb()` returns success in any case.

**Global `udevthread`**

These two thread variables seem to be unused: `usbthread`, `udevthread`

**Global `udevthread`**

These two thread variables seem to be unused: `usbthread`, `udevthread`

**Global `usb_add_device` (struct udev\_device \*dev)**

So why the hell not a transformation between the string and the short presentation? Lets check if the string representation is used elsewhere.

**Global `usb_tryreset` (usbdevice \*kb)**

Why does `usb_tryreset()` hide the information returned from `resetusb()`? Isn't it needed by the callers?

**Global `usbmain` ()**

Why isn't missing of uinput a fatal error?

lae. here the work has to go on...

**Global `usbmutex`**

We should have a look why this mutex is never used.

## Chapter 6

# Data Structure Index

### 6.1 Data Structures

Here are the data structures with brief descriptions:

<a href="#">devcmd.__unnamed__</a> . . . . .	27
--	----



## Chapter 7

# File Index

### 7.1 File List

Here is a list of all files with brief descriptions:

src/ckb-daemon/command.c	31
src/ckb-daemon/command.h	36
src/ckb-daemon/device.c	45
src/ckb-daemon/device.h	49
src/ckb-daemon/device_keyboard.c	59
src/ckb-daemon/device_mouse.c	63
src/ckb-daemon/device_vtable.c	66
src/ckb-daemon/devnode.c	68
src/ckb-daemon/devnode.h	82
src/ckb-daemon/dpi.c	90
src/ckb-daemon/dpi.h	95
src/ckb-daemon/extra_mac.c	100
src/ckb-daemon/firmware.c	100
src/ckb-daemon/firmware.h	105
src/ckb-daemon/includes.h	107
src/ckb-daemon/input.c	111
src/ckb-daemon/input.h	125
src/ckb-daemon/input_linux.c	136
src/ckb-daemon/input_mac.c	143
src/ckb-daemon/input_mac_mouse.c	143
src/ckb-daemon/keymap.c	143
src/ckb-daemon/keymap.h	148
src/ckb-daemon/keymap_mac.h	156
src/ckb-daemon/led.c	157
src/ckb-daemon/led.h	163
src/ckb-daemon/led_keyboard.c	174
src/ckb-daemon/led_mouse.c	207
src/ckb-daemon/main.c	210
src/ckb-daemon/notify.c	219
src/ckb-daemon/notify.h	228
src/ckb-daemon/os.h	232
src/ckb-daemon/profile.c	234
src/ckb-daemon/profile.h	250
src/ckb-daemon/profile_keyboard.c	265
src/ckb-daemon/profile_mouse.c	268
src/ckb-daemon/structures.h	270
src/ckb-daemon/usb.c	289

src/ckb-daemon/ <a href="#">usb.h</a>	
Definitions for using USB interface . . . . .	307
src/ckb-daemon/ <a href="#">usb_linux.c</a> . . . . .	346
src/ckb-daemon/ <a href="#">usb_mac.c</a> . . . . .	371



## Chapter 8

# Data Structure Documentation

### 8.1 devcmd.\_\_unnamed\_\_ Struct Reference

Collaboration diagram for devcmd.\_\_unnamed\_\_:

devcmd.__unnamed__
<div><div>+ hwload</div><div>+ hwsave</div><div>+ fwupdate</div><div>+ pollrate</div><div>+ active</div><div>+ idle</div><div>+ erase</div><div>+ eraseprofile</div><div>+ name</div><div>+ profilename</div><div>and 26 more...</div></div>

#### Data Fields

- [cmdhandler\\_io hwload](#)
- [cmdhandler\\_io hwsave](#)
- [cmdhandler\\_io fwupdate](#)
- [cmdhandler\\_io pollrate](#)
- [cmdhandler\\_io active](#)
- [cmdhandler\\_io idle](#)
- [cmdhandler erase](#)
- [cmdhandler eraseprofile](#)
- [cmdhandler name](#)
- [cmdhandler profilename](#)
- [cmdhandler id](#)

- [cmdhandler profileid](#)
- [cmdhandler rgb](#)
- [cmdhandler ioff](#)
- [cmdhandler ion](#)
- [cmdhandler iauto](#)
- [cmdhandler bind](#)
- [cmdhandler unbind](#)
- [cmdhandler rebind](#)
- [cmdhandler\\_mac macro](#)
- [cmdhandler\\_mac dpi](#)
- [cmdhandler dpisel](#)
- [cmdhandler lift](#)
- [cmdhandler snap](#)
- [cmdhandler notify](#)
- [cmdhandler inotify](#)
- [cmdhandler get](#)
- [cmdhandler restart](#)
- [int\(\\* start \)\(usbdevice \\*kb, int makeactive\)](#)
- [void\(\\* setmodeindex \)\(usbdevice \\*kb, int index\)](#)
- [void\(\\* allocprofile \)\(usbdevice \\*kb\)](#)
- [int\(\\* loadprofile \)\(usbdevice \\*kb\)](#)
- [void\(\\* freeprofile \)\(usbdevice \\*kb\)](#)
- [int\(\\* updatergb \)\(usbdevice \\*kb, int force\)](#)
- [void\(\\* updateindicators \)\(usbdevice \\*kb, int force\)](#)
- [int\(\\* updatedpi \)\(usbdevice \\*kb, int force\)](#)

### 8.1.1 Detailed Description

Definition at line 78 of file command.h.

### 8.1.2 Field Documentation

8.1.2.1

8.1.2.2

8.1.2.3

8.1.2.4

8.1.2.5

8.1.2.6

8.1.2.7

8.1.2.8

8.1.2.9

8.1.2.10

8.1.2.11

8.1.2.12

8.1.2.13

8.1.2.14

8.1.2.15

8.1.2.16

8.1.2.17

8.1.2.18

8.1.2.19

8.1.2.20

8.1.2.21

8.1.2.22

8.1.2.23

8.1.2.24

8.1.2.25

8.1.2.26

8.1.2.27

8.1.2.28

8.1.2.29

8.1.2.30

8.1.2.31

8.1.2.32

8.1.2.33

8.1.2.34

8.1.2.35

8.1.2.36

The documentation for this struct was generated from the following files:



## Chapter 9

# File Documentation

### 9.1 BUILD.md File Reference

### 9.2 DAEMON.md File Reference

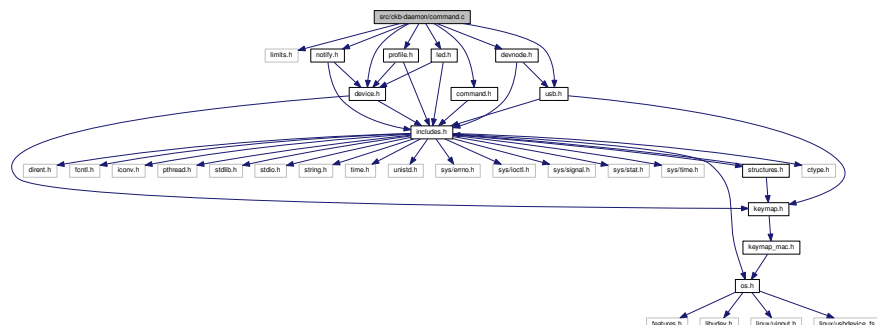
### 9.3 README.md File Reference

### 9.4 ROADMAP.md File Reference

### 9.5 src/ckb-daemon/command.c File Reference

```
#include <limits.h>
#include "command.h"
#include "device.h"
#include "devnode.h"
#include "led.h"
#include "notify.h"
#include "profile.h"
#include "usb.h"
```

Include dependency graph for command.c:



## Macros

- `#define TRY_WITH_RESET(action)`

## Functions

- int `readcmd` (`usbdevice *kb`, const char \*`line`)

## Variables

- static const char \*const `cmd_strings` [(`CMD_LAST-CMD_FIRST+2`)-1]

### 9.5.1 Macro Definition Documentation

#### 9.5.1.1 #define TRY\_WITH\_RESET( *action* )

##### Value:

```
while(action){
    if(usb_tryreset(kb)){
        free(word);
        return 1;
    }
}
```

Definition at line 59 of file `command.c`.

Referenced by `readcmd()`.

### 9.5.2 Function Documentation

#### 9.5.2.1 int readcmd ( `usbdevice * kb`, const char \* *line* )

< Because length of word is length of line + 1, there should be no problem with buffer overflow.

Definition at line 68 of file `command.c`.

References ACCEL, ACTIVE, `usbdevice::active`, BIND, CMD\_COUNT, CMD\_FIRST, `cmd_strings`, `usbprofile::currentmode`, DELAY, `usbdevice::delay`, DITHER, `usbdevice::dither`, `devcmd::do_cmd`, `devcmd::do_io`, `devcmd::do_macro`, DPI, DPISEL, ERASE, ERASEPROFILE, FEAT\_ANSI, FEAT\_BIND, FEAT\_ISO, FEAT\_LMASK, FEAT\_MOUSEACCEL, FEAT\_NOTIFY, `usbdevice::features`, `lighting::forceupdate`, FPS, FWUPDATE, GET, HAS\_FEATURES, HWLOAD, HWSAVE, IAUTO, ID, IDLE, INDEX\_OF, INOTIFY, IOFF, ION, IS\_FULLRANGE, IS\_MOUSE\_DEV, keymap, LAYOUT, LIFT, `usbmode::light`, MACRO, `mknotifynode()`, MODE, `usbprofile::mode`, MODE\_COUNT, N\_KEYS\_EXTENDED, NAME, NEEDS\_FW\_UPDATE, NONE, NOTIFY, NOTIFYOFF, NOTIFYON, OUTFIFO\_MAX, POLLRATE, `usbdevice::profile`, PROFILEID, PROFILENAME, REBIND, RESTART, RGB, `rmnotifynode()`, SCROLL\_ACCELERATED, SCROLL\_MAX, SCROLL\_MIN, SCROLLSPEED, SNAP, SWITCH, TRY\_WITH\_RESET, UNBIND, `usbdevice::usbdelay`, and `usbdevice::vtable`.

Referenced by `devmain()`.

```
68
69     char* word = malloc(strlen(line) + 1);
70     int wordlen;
71     const char* newline = 0;
72     const devcmd* vt = kb->vtable;
73     usbprofile* profile = kb->profile;
74     usbmode* mode = 0;
75     int notifynumber = 0;
76     // Read words from the input
77     cmd command = NONE;
78     while(sscanf(line, "%s%n", word, &wordlen) == 1){
79         line += wordlen;
80         // If we passed a newline, reset the context
81         if(line > newline){
82             mode = profile->currentmode;
83             command = NONE;
84             notifynumber = 0;
85             newline = strchr(line, '\n');
86             if(!newline)
87                 newline = line + strlen(line);
```

```

88     }
89     // Check for a command word
90     for(int i = 0; i < CMD_COUNT - 1; i++){
91         if(!strcmp(word, cmd_strings[i])){
92             command = i + CMD_FIRST;
93 #ifndef OS_MAC
94         // Layout and mouse acceleration aren't used on Linux; ignore
95         if(command == LAYOUT || command == ACCEL || command ==
SCROLLSPEED)
96             command = NONE;
97 #endif
98         // Most commands require parameters, but a few are actions in and of themselves
99         if(command != SWITCH
100             && command != HWLOAD && command != HWSAVE
101             && command != ACTIVE && command != IDLE
102             && command != ERASE && command != ERASEPROFILE
103             && command != RESTART)
104             goto next_loop;
105         break;
106     }
107 }
108
109 // Set current notification node when given @number
110 int newnotify;
111 if(sscanf(word, "%u", &newnotify) == 1 && newnotify < OUTFIFO_MAX){
112     notifynumber = newnotify;
113     continue;
114 }
115
116 // Reject unrecognized commands. Reject bind or notify related commands if the keyboard doesn't
have the feature enabled.
117 if(command == NONE
118     || ((!HAS_FEATURES(kb, FEAT_BIND) && (command ==
BIND || command == UNBIND || command == REBIND || command ==
MACRO || command == DELAY))
119     || (!HAS_FEATURES(kb, FEAT_NOTIFY) && command ==
NOTIFY))){
120     next_loop:
121     continue;
122 }
123 // Reject anything not related to fwupdate if device has a bricked FW
124 if(NEEDS_FW_UPDATE(kb) && command != FWUPDATE && command !=
NOTIFYON && command != NOTIFYOFF)
125     continue;
126
127 // Specially handled commands - these are available even when keyboard is IDLE
128 switch(command){
129 case NOTIFYON: {
130     // Notification node on
131     int notify;
132     if(sscanf(word, "%u", &notify) == 1)
133         mknotifynode(kb, notify);
134     continue;
135 } case NOTIFYOFF: {
136     // Notification node off
137     int notify;
138     if(sscanf(word, "%u", &notify) == 1 && notify != 0) // notify0 can't be removed
139         rmnotifynode(kb, notify);
140     continue;
141 } case GET:
142     // Output data to notification node
143     vt->get(kb, mode, notifynumber, 0, word);
144     continue;
145 case LAYOUT:
146     // OSX: switch ANSI/ISO keyboard layout
147     if(!strcmp(word, "ansi"))
148         kb->features = (kb->features & ~FEAT_LMASK) |
FEAT_ANSI;
149     else if(!strcmp(word, "iso"))
150         kb->features = (kb->features & ~FEAT_LMASK) |
FEAT_ISO;
151     continue;
152 #ifdef OS_MAC
153 case ACCEL:
154     // OSX mouse acceleration on/off
155     if(!strcmp(word, "on"))
156         kb->features |= FEAT_MOUSEACCEL;
157     else if(!strcmp(word, "off"))
158         kb->features &= ~FEAT_MOUSEACCEL;
159     continue;
160 case SCROLLSPEED:
161     int newscroll;
162     if(sscanf(word, "%d", &newscroll) != 1)
163         break;
164     if(newscroll < SCROLL_MIN)
165         newscroll = SCROLL_ACCELERATED;
166     if(newscroll > SCROLL_MAX)

```

```

167         newscroll = SCROLL_MAX;
168         kb->scroll_rate = newscroll;
169         continue;
170     }
171 #endif
172     case MODE: {
173         // Select a mode number (1 - 6)
174         int newmode;
175         if(sscanf(word, "%u", &newmode) == 1 && newmode > 0 && newmode <=
MODE_COUNT)
176             mode = profile->mode + newmode - 1;
177         continue;
178     }
179     case FPS: {
180         // USB command delay (2 - 10ms)
181         uint framerate;
182         if(sscanf(word, "%u", &framerate) == 1 && framerate > 0){
183             // Not all devices require the same number of messages per frame; select delay
appropriately
184             uint per_frame = IS_MOUSE_DEV(kb) ? 2 : IS_FULLRANGE(kb) ? 14 : 5;
185             uint delay = 1000 / framerate / per_frame;
186             if(delay < 2)
187                 delay = 2;
188             else if(delay > 10)
189                 delay = 10;
190             kb->usbdelay = delay;
191         }
192         continue;
193     }
194     case DITHER: {
195         // 0: No dither, 1: Ordered dither.
196         uint dither;
197         if(sscanf(word, "%u", &dither) == 1 && dither <= 1){
198             kb->dither = dither;
199             profile->currentmode->light.forceupdate = 1;
200             mode->light.forceupdate = 1;
201         }
202         continue;
203     }
204     case DELAY: {
205         long int delay;
206         if(sscanf(word, "%ld", &delay) == 1 && 0 <= delay && delay < UINT_MAX) {
207             // Add delay of 'newdelay' microseconds to macro playback
208             kb->delay = (unsigned int)delay;
209         } else if(strcmp(word, "on") == 0) {
210             // allow previous syntax, 'delay on' means use old 'long macro delay'
211             kb->delay = UINT_MAX;
212         } else {
213             // bad parameter to handle false commands like "delay off"
214             kb->delay = 0; // No delay.
215         }
216         continue;
217     }
218     case RESTART: {
219         char mybuffer[] = "no reason specified";
220         if (sscanf(line, "%[^\\n]", word) == -1) {
221             word = mybuffer;
222         }
223         vt->do_cmd[command](kb, mode, notifiynumber, 0, word);
224         continue;
225     }
226     default:;
227 }
228
229 // If a keyboard is inactive, it must be activated before receiving any other commands
230 if(!kb->active){
231     if(command == ACTIVE)
232         TRY_WITH_RESET(vt->active(kb, mode, notifiynumber, 0, 0));
233     continue;
234 }
235 // Specially handled commands only available when keyboard is ACTIVE
236 switch(command){
237     case IDLE:
238         TRY_WITH_RESET(vt->idle(kb, mode, notifiynumber, 0, 0));
239         continue;
240     case SWITCH:
241         if(profile->currentmode != mode){
242             profile->currentmode = mode;
243             // Set mode light for non-RGB K95
244             int index = INDEX_OF(mode, profile->mode);
245             vt->setmodeindex(kb, index);
246         }
247         continue;
248     case HWLOAD: case HWSAVE:{
249         char delay = kb->usbdelay;
250         // Ensure delay of at least 10ms as the device can get overwhelmed otherwise
251         if(delay < 10)

```



```

252         kb->usbdelay = 10;
253         // Try to load/save the hardware profile. Reset on failure, disconnect if reset fails.
254         TRY_WITH_RESET(vt->do_io[command](kb, mode, notifynumber, 1, 0));
255         // Re-send the current RGB state as it sometimes gets scrambled
256         TRY_WITH_RESET(vt->updatergb(kb, 1));
257         kb->usbdelay = delay;
258         continue;
259     }
260     case FWUPDATE:
261         // FW update parses a whole word. Unlike hload/hwsave, there's no try again on failure.
262         if(vt->fwupdate(kb, mode, notifynumber, 0, word)){
263             free(word);
264             return 1;
265         }
266         continue;
267     case POLLRATE: {
268         uint rate;
269         if(sscanf(word, "%u", &rate) == 1 && (rate == 1 || rate == 2 || rate == 4 || rate == 8))
270             TRY_WITH_RESET(vt->pollrate(kb, mode, notifynumber, rate, 0));
271         continue;
272     }
273     case ERASEPROFILE:
274         // Erase the current profile
275         vt->eraseprofile(kb, mode, notifynumber, 0, 0);
276         // Update profile/mode pointers
277         profile = kb->profile;
278         mode = profile->currentmode;
279         continue;
280     case ERASE: case NAME: case IOFF: case ION: case IAUTO: case
INOTIFY: case PROFILENAME: case ID: case PROFILEID: case
DPISEL: case LIFT: case SNAP:
281         // All of the above just parse the whole word
282         vt->do_cmd[command](kb, mode, notifynumber, 0, word);
283         continue;
284     case RGB: {
285         // RGB command has a special response for a single hex constant
286         int r, g, b;
287         if(sscanf(word, "%02x%02x%02x", &r, &g, &b) == 3){
288             // Set all keys
289             for(int i = 0; i < N_KEYS_EXTENDED; i++)
290                 vt->rgb(kb, mode, notifynumber, i, word);
291             continue;
292         }
293         break;
294     }
295     case MACRO:
296         if(!strcmp(word, "clear")){
297             // Macro has a special clear command
298             vt->macro(kb, mode, notifynumber, 0, 0);
299             continue;
300         }
301         break;
302     default:;
303     }
304     // For anything else, split the parameter at the colon
305     int left = -1;
306     sscanf(word, "%*[^:]\n", &left);
307     if(left <= 0)
308         continue;
309     const char* right = word + left;
310     if(right[0] == ':')
311         right++;
312     // Macros and DPI have a separate left-side handler
313     if(command == MACRO || command == DPI){
314         word[left] = 0;
315         vt->do_macro[command](kb, mode, notifynumber, word, right);
316         continue;
317     }
318     // Scan the left side for key names and run the requested command
319     int position = 0, field = 0;
320     char keyname[11];
321     while(position < left && sscanf(word + position, "%10[^:]\n", keyname, &field) == 1){
322         int keycode;
323         if(!strcmp(keyname, "all")){
324             // Set all keys
325             for(int i = 0; i < N_KEYS_EXTENDED; i++)
326                 vt->do_cmd[command](kb, mode, notifynumber, i, right);
327         } else if((sscanf(keyname, "%d", &keycode) && keycode >= 0 && keycode <
N_KEYS_EXTENDED)
328 || (sscanf(keyname, "%x", &keycode) && keycode >= 0 && keycode <
N_KEYS_EXTENDED)){
329             // Set a key numerically
330             vt->do_cmd[command](kb, mode, notifynumber, keycode, right);
331         } else {
332             // Find this key in the keymap
333             for(unsigned i = 0; i < N_KEYS_EXTENDED; i++){
334                 if(keymap[i].name && !strcmp(keyname, keymap[i].name)){

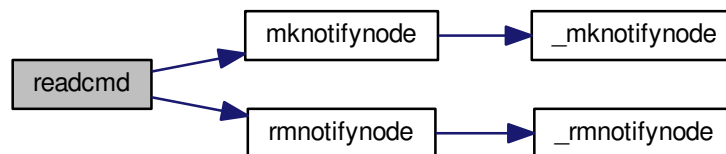
```

```

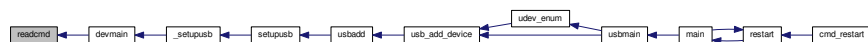
335             vt->do_cmd[command](kb, mode, notifynumber, i, right);
336             break;
337         }
338     }
339 }
340 if(word[position += field] == ',')
341     position++;
342 }
343 }
344
345 // Finish up
346 if(!NEEDS_FW_UPDATE(kb)){
347     TRY_WITH_RESET(vt->updatergb(kb, 0));
348     TRY_WITH_RESET(vt->updatedpi(kb, 0));
349 }
350 free(word);
351 return 0;
352 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



## 9.5.3 Variable Documentation

### 9.5.3.1 `const char* const cmd_strings[(CMD_LAST-CMD_FIRST+2)-1]` [static]

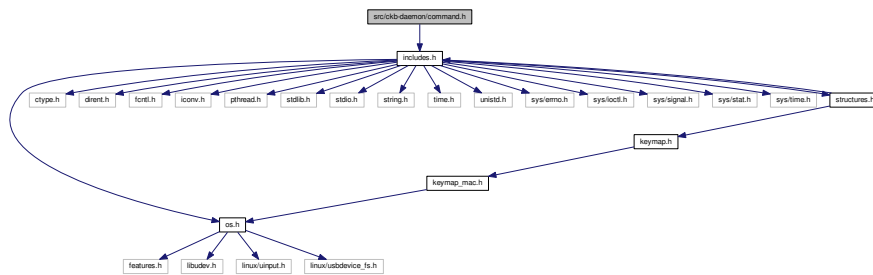
Definition at line 10 of file `command.c`.

Referenced by `readcmd()`.

## 9.6 `src/ckb-daemon/command.h` File Reference

```
#include "includes.h"
```

Include dependency graph for command.h:



This graph shows which files directly or indirectly include this file:



## Data Structures

- union [devcmd](#)
- struct [devcmd.\\_\\_unnamed\\_\\_](#)

## Macros

- #define [CMD\\_COUNT](#) (CMD\_LAST - CMD\_FIRST + 2)
- #define [CMD\\_DEV\\_COUNT](#) (CMD\_LAST - CMD\_VT\_FIRST + 1)

## Typedefs

- typedef void(\* [cmdhandler](#) )(usbdevice \*kb, usbmode \*modeidx, int notifyidx, int keyindex, const char \*parameter)
- typedef int(\* [cmdhandler\\_io](#) )(usbdevice \*kb, usbmode \*modeidx, int notifyidx, int keyindex, const char \*parameter)
- typedef void(\* [cmdhandler\\_mac](#) )(usbdevice \*kb, usbmode \*modeidx, int notifyidx, const char \*keys, const char \*assignment)
- typedef union [devcmd](#) devcmd

## Enumerations

- enum [cmd](#) {  
[NONE](#) = -11, [DELAY](#) = -10, [CMD\\_FIRST](#) = DELAY, [MODE](#) = -9,  
[SWITCH](#) = -8, [LAYOUT](#) = -7, [ACCEL](#) = -6, [SCROLLSPEED](#) = -5,  
[NOTIFYON](#) = -4, [NOTIFYOFF](#) = -3, [FPS](#) = -2, [DITHER](#) = -1,  
[HWLOAD](#) = 0, [CMD\\_VT\\_FIRST](#) = 0, [HWSAVE](#), [FWUPDATE](#),  
[POLLRATE](#), [ACTIVE](#), [IDLE](#), [ERASE](#),  
[ERASEPROFILE](#), [NAME](#), [PROFILENAME](#), [ID](#),  
[PROFILEID](#), [RGB](#), [IOFF](#), [ION](#),  
[IAUTO](#), [BIND](#), [UNBIND](#), [REBIND](#),  
[MACRO](#), [DPI](#), [DPISEL](#), [LIFT](#),  
[SNAP](#), [NOTIFY](#), [INOTIFY](#), [GET](#),  
[RESTART](#), [CMD\\_LAST](#) = RESTART }



#### 9.6.2.2 `#define CMD_DEV_COUNT (CMD_LAST - CMD_VT_FIRST + 1)`

Definition at line 66 of file command.h.

### 9.6.3 Typedef Documentation

#### 9.6.3.1 `typedef void(* cmdhandler)(usbdevice *kb, usbmode *modeidx, int notifyidx, int keyindex, const char *parameter)`

Definition at line 70 of file command.h.

#### 9.6.3.2 `typedef int(* cmdhandler_io)(usbdevice *kb, usbmode *modeidx, int notifyidx, int keyindex, const char *parameter)`

Definition at line 71 of file command.h.

#### 9.6.3.3 `typedef void(* cmdhandler_mac)(usbdevice *kb, usbmode *modeidx, int notifyidx, const char *keys, const char *assignment)`

Definition at line 72 of file command.h.

#### 9.6.3.4 `typedef union devcmd devcmd`

### 9.6.4 Enumeration Type Documentation

#### 9.6.4.1 `enum cmd`

Enumerator

***NONE***  
***DELAY***  
***CMD\_FIRST***  
***MODE***  
***SWITCH***  
***LAYOUT***  
***ACCEL***  
***SCROLLSPEED***  
***NOTIFYON***  
***NOTIFYOFF***  
***FPS***  
***DITHER***  
***HWLOAD***  
***CMD\_VT\_FIRST***  
***HWSAVE***  
***FWUPDATE***  
***POLLRATE***  
***ACTIVE***  
***IDLE***  
***ERASE***

**ERASEPROFILE****NAME****PROFILENAME****ID****PROFILEID****RGB****IOFF****ION****IAUTO****BIND****UNBIND****REBIND****MACRO****DPI****DPISEL****LIFT****SNAP****NOTIFY****INOTIFY****GET****RESTART****CMD\_LAST**

Definition at line 7 of file command.h.

```

7      {
8      // Special - handled by readcmd, no device functions
9      NONE      = -11,
10     DELAY      = -10,    CMD_FIRST = DELAY,
11     MODE       = -9,
12     SWITCH     = -8,
13     LAYOUT     = -7,
14     ACCEL      = -6,
15     SCROLLSPEED = -5,
16     NOTIFYON   = -4,
17     NOTIFYOFF  = -3,
18     FPS        = -2,
19     DITHER     = -1,
20
21     // Hardware data
22     HWLOAD      = 0,    CMD_VT_FIRST = 0,
23     HWSAVE,
24     FWUPDATE,
25     POLLRATE,
26
27     // Software control on/off
28     ACTIVE,
29     IDLE,
30
31     // Profile/mode metadata
32     ERASE,
33     ERASEPROFILE,
34     NAME,
35     PROFILENAME,
36     ID,
37     PROFILEID,
38
39     // LED control
40     RGB,
41     IOFF,
42     ION,
43     IAUTO,
44
45     // Key binding control
46     BIND,

```

```

47     UNBIND,
48     REBIND,
49     MACRO,
50
51     // DPI control
52     DPI,
53     DPISEL,
54     LIFT,
55     SNAP,
56
57     // Notifications and output
58     NOTIFY,
59     INOTIFY,
60     GET,
61     RESTART,
62
63     CMD_LAST = RESTART
64 } cmd;

```

## 9.6.5 Function Documentation

### 9.6.5.1 int readcmd ( usbdevice \* kb, const char \* line )

< Because length of word is length of line + 1, there should be no problem with buffer overflow.

Definition at line 68 of file command.c.

References ACCEL, ACTIVE, usbdevice::active, BIND, CMD\_COUNT, CMD\_FIRST, cmd\_strings, usbprofile::currentmode, DELAY, usbdevice::delay, DITHER, usbdevice::dither, devcmd::do\_cmd, devcmd::do\_io, devcmd::do\_macro, DPI, DPISEL, ERASE, ERASEPROFILE, FEAT\_ANSI, FEAT\_BIND, FEAT\_ISO, FEAT\_LMASK, FEAT\_MOUSEACCEL, FEAT\_NOTIFY, usbdevice::features, lighting::forceupdate, FPS, FWUPDATE, GET, HAS\_FEATURES, HWLOAD, HWSAVE, IAUTO, ID, IDLE, INDEX\_OF, INOTIFY, IOFF, ION, IS\_FULLRANGE, IS\_MOUSE\_DEV, keymap, LAYOUT, LIFT, usbmode::light, MACRO, mknotifynode(), MODE, usbprofile::mode, MODE\_COUNT, N\_KEYS\_EXTENDED, NAME, NEEDS\_FW\_UPDATE, NONE, NOTIFY, NOTIFYOFF, NOTIFYON, OUTFIFO\_MAX, POLLRATE, usbdevice::profile, PROFILEID, PROFILENAME, REBIND, RESTART, RGB, rmnotifynode(), SCROLL\_ACCELERATED, SCROLL\_MAX, SCROLL\_MIN, SCROLLSPEED, SNAP, SWITCH, TRY\_WITH\_RESET, UNBIND, usbdevice::usbdelay, and usbdevice::vtable.

Referenced by devmain().

```

68     {
69         char* word = malloc(strlen(line) + 1);
70         int wordlen;
71         const char* newline = 0;
72         const devcmd* vt = kb->vtable;
73         usbprofile* profile = kb->profile;
74         usbmode* mode = 0;
75         int notifynumber = 0;
76         // Read words from the input
77         cmd command = NONE;
78         while(sscanf(line, "%s%n", word, &wordlen) == 1){
79             line += wordlen;
80             // If we passed a newline, reset the context
81             if(line > newline){
82                 mode = profile->currentmode;
83                 command = NONE;
84                 notifynumber = 0;
85                 newline = strchr(line, '\n');
86                 if(!newline)
87                     newline = line + strlen(line);
88             }
89             // Check for a command word
90             for(int i = 0; i < CMD_COUNT - 1; i++){
91                 if(!strcmp(word, cmd_strings[i])){
92                     command = i + CMD_FIRST;
93 #ifndef OS_MAC
94                     // Layout and mouse acceleration aren't used on Linux; ignore
95                     if(command == LAYOUT || command == ACCEL || command ==
SCROLLSPEED)
96                         command = NONE;
97 #endif
98                     // Most commands require parameters, but a few are actions in and of themselves
99                     if(command != SWITCH
100                        && command != HWLOAD && command != HWSAVE
101                        && command != ACTIVE && command != IDLE
102                        && command != ERASE && command != ERASEPROFILE
103                        && command != RESTART)

```

```

104         goto next_loop;
105         break;
106     }
107 }
108
109 // Set current notification node when given @number
110 int newnotify;
111 if(sscanf(word, "%u", &newnotify) == 1 && newnotify < OUTFIFO_MAX){
112     notifynumber = newnotify;
113     continue;
114 }
115
116 // Reject unrecognized commands. Reject bind or notify related commands if the keyboard doesn't
117 // have the feature enabled.
118 if(command == NONE
119    || ((!HAS_FEATURES(kb, FEAT_BIND) && (command ==
120 BIND || command == UNBIND || command == REBIND || command ==
121 MACRO || command == DELAY))
122    || (!HAS_FEATURES(kb, FEAT_NOTIFY) && command ==
123 NOTIFY))) {
124     next_loop:
125     continue;
126 }
127 // Reject anything not related to fwupdate if device has a bricked FW
128 if(NEEDS_FW_UPDATE(kb) && command != FWUPDATE && command !=
129 NOTIFYON && command != NOTIFYOFF)
130     continue;
131
132 // Specially handled commands - these are available even when keyboard is IDLE
133 switch(command){
134 case NOTIFYON: {
135     // Notification node on
136     int notify;
137     if(sscanf(word, "%u", &notify) == 1)
138         mknotifynode(kb, notify);
139     continue;
140 } case NOTIFYOFF: {
141     // Notification node off
142     int notify;
143     if(sscanf(word, "%u", &notify) == 1 && notify != 0) // notify0 can't be removed
144         rmnotifynode(kb, notify);
145     continue;
146 } case GET:
147     // Output data to notification node
148     vt->get(kb, mode, notifynumber, 0, word);
149     continue;
150 case LAYOUT:
151     // OSX: switch ANSI/ISO keyboard layout
152     if(!strcmp(word, "ansi"))
153         kb->features = (kb->features & ~FEAT_LMASK) |
154 FEAT_ANSI;
155     else if(!strcmp(word, "iso"))
156         kb->features = (kb->features & ~FEAT_LMASK) |
157 FEAT_ISO;
158     continue;
159 #ifdef OS_MAC
160 case ACCEL:
161     // OSX mouse acceleration on/off
162     if(!strcmp(word, "on"))
163         kb->features |= FEAT_MOUSEACCEL;
164     else if(!strcmp(word, "off"))
165         kb->features &= ~FEAT_MOUSEACCEL;
166     continue;
167 case SCROLLSPEED: {
168     int newscroll;
169     if(sscanf(word, "%d", &newscroll) != 1)
170         break;
171     if(newscroll < SCROLL_MIN)
172         newscroll = SCROLL_ACCELERATED;
173     if(newscroll > SCROLL_MAX)
174         newscroll = SCROLL_MAX;
175     kb->scroll_rate = newscroll;
176     continue;
177 }
178 #endif
179 case MODE: {
180     // Select a mode number (1 - 6)
181     int newmode;
182     if(sscanf(word, "%u", &newmode) == 1 && newmode > 0 && newmode <=
183 MODE_COUNT)
184         mode = profile->mode + newmode - 1;
185     continue;
186 }
187 case FPS: {
188     // USB command delay (2 - 10ms)
189     uint framerate;
190     if(sscanf(word, "%u", &framerate) == 1 && framerate > 0){

```



```

183         // Not all devices require the same number of messages per frame; select delay
appropriately
184         uint per_frame = IS_MOUSE_DEV(kb) ? 2 : IS_FULLLRANGE(kb) ? 14 : 5;
185         uint delay = 1000 / framerate / per_frame;
186         if(delay < 2)
187             delay = 2;
188         else if(delay > 10)
189             delay = 10;
190         kb->usbdelay = delay;
191     }
192     continue;
193 }
194 case DITHER: {
195     // 0: No dither, 1: Ordered dither.
196     uint dither;
197     if(sscanf(word, "%u", &dither) == 1 && dither <= 1){
198         kb->dither = dither;
199         profile->currentmode->light.forceupdate = 1;
200         mode->light.forceupdate = 1;
201     }
202     continue;
203 }
204 case DELAY: {
205     long int delay;
206     if(sscanf(word, "%ld", &delay) == 1 && 0 <= delay && delay < UINT_MAX) {
207         // Add delay of 'newdelay' microseconds to macro playback
208         kb->delay = (unsigned int)delay;
209     } else if(strcmp(word, "on") == 0) {
210         // allow previous syntax, 'delay on' means use old 'long macro delay'
211         kb->delay = UINT_MAX;
212     } else {
213         // bad parameter to handle false commands like "delay off"
214         kb->delay = 0; // No delay.
215     }
216     continue;
217 }
218 case RESTART: {
219     char mybuffer[] = "no reason specified";
220     if (sscanf(line, "%[^\n]", word) == -1) {
221         word = mybuffer;
222     }
223     vt->do_cmd[command](kb, mode, notifiynumber, 0, word);
224     continue;
225 }
226 default;;
227 }
228
229 // If a keyboard is inactive, it must be activated before receiving any other commands
230 if(!kb->active){
231     if(command == ACTIVE)
232         TRY_WITH_RESET(vt->active(kb, mode, notifiynumber, 0, 0));
233     continue;
234 }
235 // Specially handled commands only available when keyboard is ACTIVE
236 switch(command){
237 case IDLE:
238     TRY_WITH_RESET(vt->idle(kb, mode, notifiynumber, 0, 0));
239     continue;
240 case SWITCH:
241     if(profile->currentmode != mode){
242         profile->currentmode = mode;
243         // Set mode light for non-RGB K95
244         int index = INDEX_OF(mode, profile->mode);
245         vt->setmodeindex(kb, index);
246     }
247     continue;
248 case HWLOAD: case HWSAVE:{
249     char delay = kb->usbdelay;
250     // Ensure delay of at least 10ms as the device can get overwhelmed otherwise
251     if(delay < 10)
252         kb->usbdelay = 10;
253     // Try to load/save the hardware profile. Reset on failure, disconnect if reset fails.
254     TRY_WITH_RESET(vt->do_io[command](kb, mode, notifiynumber, 1, 0));
255     // Re-send the current RGB state as it sometimes gets scrambled
256     TRY_WITH_RESET(vt->updatergb(kb, 1));
257     kb->usbdelay = delay;
258     continue;
259 }
260 case FWUPDATE:
261     // FW update parses a whole word. Unlike hwload/hwsave, there's no try again on failure.
262     if(vt->fwupdate(kb, mode, notifiynumber, 0, word)){
263         free(word);
264         return 1;
265     }
266     continue;
267 case POLLRATE: {
268     uint rate;

```

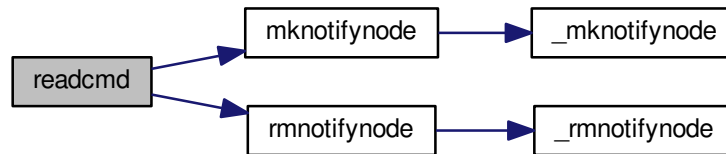
```

269         if(sscanf(word, "%u", &rate) == 1 && (rate == 1 || rate == 2 || rate == 4 || rate == 8))
270             TRY_WITH_RESET(vt->pollrate(kb, mode, notifynumber, rate, 0));
271         continue;
272     }
273     case ERASEPROFILE:
274         // Erase the current profile
275         vt->eraseprofile(kb, mode, notifynumber, 0, 0);
276         // Update profile/mode pointers
277         profile = kb->profile;
278         mode = profile->currentmode;
279         continue;
280     case ERASE: case NAME: case IOFF: case ION: case IAUTO: case
INOTIFY: case PROFILENAME: case ID: case PROFILEID: case
DPISL: case LIFT: case SNAP:
281         // All of the above just parse the whole word
282         vt->do_cmd[command](kb, mode, notifynumber, 0, word);
283         continue;
284     case RGB: {
285         // RGB command has a special response for a single hex constant
286         int r, g, b;
287         if(sscanf(word, "%02x%02x%02x", &r, &g, &b) == 3){
288             // Set all keys
289             for(int i = 0; i < N_KEYS_EXTENDED; i++)
290                 vt->rgb(kb, mode, notifynumber, i, word);
291             continue;
292         }
293         break;
294     }
295     case MACRO:
296         if(!strcmp(word, "clear")){
297             // Macro has a special clear command
298             vt->macro(kb, mode, notifynumber, 0, 0);
299             continue;
300         }
301         break;
302     default:;
303     }
304     // For anything else, split the parameter at the colon
305     int left = -1;
306     sscanf(word, "%*[^:]%n", &left);
307     if(left <= 0)
308         continue;
309     const char* right = word + left;
310     if(right[0] == ':')
311         right++;
312     // Macros and DPI have a separate left-side handler
313     if(command == MACRO || command == DPI){
314         word[left] = 0;
315         vt->do_macro[command](kb, mode, notifynumber, word, right);
316         continue;
317     }
318     // Scan the left side for key names and run the requested command
319     int position = 0, field = 0;
320     char keyname[11];
321     while(position < left && sscanf(word + position, "%10[^:,%n", keyname, &field) == 1){
322         int keycode;
323         if(!strcmp(keyname, "all")){
324             // Set all keys
325             for(int i = 0; i < N_KEYS_EXTENDED; i++)
326                 vt->do_cmd[command](kb, mode, notifynumber, i, right);
327         } else if((sscanf(keyname, "%d", &keycode) && keycode >= 0 && keycode <
N_KEYS_EXTENDED)
328             || (sscanf(keyname, "%x%x", &keycode) && keycode >= 0 && keycode <
N_KEYS_EXTENDED)){
329             // Set a key numerically
330             vt->do_cmd[command](kb, mode, notifynumber, keycode, right);
331         } else {
332             // Find this key in the keymap
333             for(unsigned i = 0; i < N_KEYS_EXTENDED; i++){
334                 if(keymap[i].name && !strcmp(keyname, keymap[i].name)){
335                     vt->do_cmd[command](kb, mode, notifynumber, i, right);
336                     break;
337                 }
338             }
339         }
340         if(word[position += field] == ',')
341             position++;
342     }
343 }
344
345 // Finish up
346 if(!NEEDS_FW_UPDATE(kb)){
347     TRY_WITH_RESET(vt->updatergb(kb, 0));
348     TRY_WITH_RESET(vt->updatedpi(kb, 0));
349 }
350 free(word);
351 return 0;

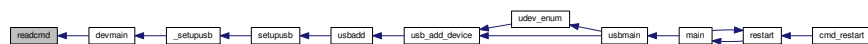
```

352 }

Here is the call graph for this function:



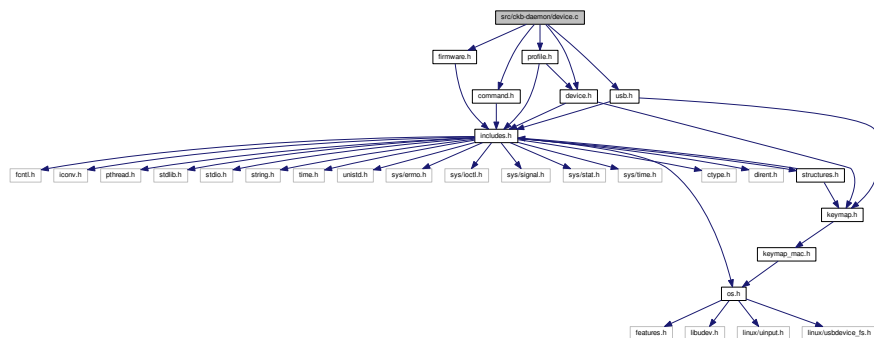
Here is the caller graph for this function:



## 9.7 src/ckb-daemon/device.c File Reference

```
#include "command.h"
#include "device.h"
#include "firmware.h"
#include "profile.h"
#include "usb.h"
```

Include dependency graph for device.c:



## Functions

- int [\\_start\\_dev](#) (usbdevice \*kb, int makeactive)
- int [start\\_dev](#) (usbdevice \*kb, int makeactive)

## Variables

- int [hwload\\_mode](#) = 1

- hwload\_mode = 1 means read hardware once. should be enough*
- [usbdevice keyboard](#) [9]
  - remember all usb devices. Needed for [closeusb\(\)](#).*
- `pthread_mutex_t devlistmutex = PTHREAD_MUTEX_INITIALIZER`
- `pthread_mutex_t devmutex [9] = { [0 ... 9 -1] = PTHREAD_MUTEX_INITIALIZER }`
  - Mutex for handling the usbdevice structure.*
- `pthread_mutex_t inputmutex [9] = { [0 ... 9 -1] = PTHREAD_MUTEX_INITIALIZER }`
  - Mutex for dealing with usb input frames.*
- `pthread_mutex_t macromutex [9] = { [0 ... 9 -1] = PTHREAD_MUTEX_INITIALIZER }`
  - Protecting macros against lightning: Both use [usb\\_send](#).*
- `pthread_mutex_t macromutex2 [9] = { [0 ... 9 -1] = PTHREAD_MUTEX_INITIALIZER }`
  - Protecting the single link list of threads and the macrovar.*
- `pthread_cond_t macrovar [9] = { [0 ... 9 -1] = PTHREAD_COND_INITIALIZER }`
  - This variable is used to stop and wakeup all macro threads which have to wait.*

## 9.7.1 Function Documentation

### 9.7.1.1 `int _start_dev ( usbdevice * kb, int makeactive )`

`_start_dev` get fw-info and pollrate; if available, install new firmware; get all hardware profiles.

#### Parameters

<i>kb</i>	the normal kb pointer to the usbdevice. Is also valid for mice.
<i>makeactive</i>	if set to 1, activate the device via <a href="#">setactive()</a>

#### Returns

0 if success, other else

- This hacker code is tricky in mutiple aspects. What it means is:
  - if `hwload_mode == 0`: just set pollrate to 0 and clear features in the bottom lines of the if-block.
  - if `hwload_mode == 1`: if the device has FEAT\_HWLOAD active, call [getfwversion\(\)](#). If it returns true, there was an error while detecting fw-version. Put error message, reset FEAT\_HWLOAD and finalize as above.
  - if `hwload_mode == 2`: if the device has FEAT\_HWLOAD active, call [getfwversion\(\)](#). If it returns true, there was an error while detecting fw-version. Put error message and return directly from function with error.

Why do not you just write it down?
- Now check if device needs a firmware update. If so, set it up and leave the function without error.
- Device needs a firmware update. Finish setting up but don't do anything.
- Load profile from device if the hw-pointer is not set yet and hw-loading is possible and allowed.
  - return error if `mode == 2` (load always) and loading got an error. Else reset HWLOAD feature, because hwload must be 1.

That is real Horror code.

Definition at line 25 of file `device.c`.

References `usbdevice::active`, `ckb_info`, `ckb_warn`, `FEAT_ADJRATE`, `FEAT_FWUPDATE`, `FEAT_FWVERSION`, `FEAT_HWLOAD`, `FEAT_POLLRATE`, `FEAT_RGB`, `usbdevice::features`, `usbdevice::fwversion`, [getfwversion\(\)](#), `HA-S_FEATURES`, `usbdevice::hw`, `hwload_mode`, `hwloadprofile`, `NEEDS_FW_UPDATE`, `usbdevice::pollrate`, and [setactive](#).

Referenced by `start_dev()`.

```

25     {
26     // Get the firmware version from the device
27     if (kb->pollrate == 0) {
35         if (!hwload_mode || (HAS_FEATURES(kb, FEAT_HWLOAD) &&
getfwversion(kb))) {
36             if (hwload_mode == 2)
37                 // hwload=always. Report setup failure.
38                 return -1;
39             else if (hwload_mode) {
40                 // hwload=once. Log failure, prevent trying again, and continue.
41                 ckb_warn("Unable to load firmware version/poll rate\n");
42                 kb->features &= ~FEAT_HWLOAD;
43             }
44             kb->pollrate = 0;
45             kb->features &= ~(FEAT_POLLRATE | FEAT_ADJRATE);
46             if (kb->fwversion == 0)
47                 kb->features &= ~(FEAT_FWVERSION |
FEAT_FWUPDATE);
48         }
49     }
54     if (NEEDS_FW_UPDATE(kb)) {
56         ckb_info("Device needs a firmware update. Please issue a fwupdate command.\n");
57         kb->features = FEAT_RGB | FEAT_FWVERSION |
FEAT_FWUPDATE;
58         kb->active = 1;
59         return 0;
60     }
66     if (!kb->hw && hwload_mode && HAS_FEATURES(kb,
FEAT_HWLOAD)) {
67         if (hwloadprofile(kb, 1)) {
68             if (hwload_mode == 2)
69                 return -1;
70             ckb_warn("Unable to load hardware profile\n");
71             kb->features &= ~FEAT_HWLOAD;
72         }
73     }
74     // Active software mode if requested
75     if (makeactive)
76         return setactive(kb, 1);
77     return 0;
78 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.7.1.2 int start\_dev ( usbdevice \* kb, int makeactive )

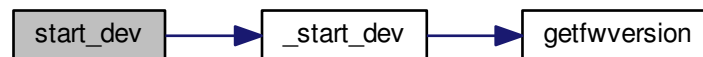
Definition at line 80 of file device.c.

References `_start_dev()`, `USB_DELAY_DEFAULT`, and `usbdevice::usbdelay`.

```

80                                     {
81     // Force USB interval to 10ms during initial setup phase; return to nominal 5ms after setup completes.
82     kb->usbdelay = 10;
83     int res = _start_dev(kb, makeactive);
84     kb->usbdelay = USB_DELAY_DEFAULT;
85     return res;
86 }
```

Here is the call graph for this function:



## 9.7.2 Variable Documentation

### 9.7.2.1 `pthread_mutex_t devlistmutex = PTHREAD_MUTEX_INITIALIZER`

Definition at line 11 of file `device.c`.

### 9.7.2.2 `pthread_mutex_t devmutex[9] = { [0 ... 9 -1] = PTHREAD_MUTEX_INITIALIZER }`

Definition at line 12 of file `device.c`.

Referenced by `_updateconnected()`, `quitWithLock()`, and `usb_rm_device()`.

### 9.7.2.3 `int hwload_mode = 1`

`hwload_mode` is defined in [device.c](#)

Definition at line 7 of file `device.c`.

Referenced by `_start_dev()`, `_usbrecv()`, `_usbsend()`, and `main()`.

### 9.7.2.4 `pthread_mutex_t inputmutex[9] = { [0 ... 9 -1] = PTHREAD_MUTEX_INITIALIZER }`

Definition at line 13 of file `device.c`.

### 9.7.2.5 `usbdevice keyboard[9]`

Definition at line 10 of file `device.c`.

Referenced by `_mkdevpath()`, `_mknotifynode()`, `_rmnotifynode()`, `_setupusb()`, `_updateconnected()`, `closeusb()`, `main()`, `mkfwnode()`, `os_closeusb()`, `os_inputmain()`, `os_inputopen()`, `os_setupusb()`, `quitWithLock()`, `rmdevpath()`, `usb_rm_device()`, and `usbadd()`.

### 9.7.2.6 `pthread_mutex_t macromutex[9] = { [0 ... 9 -1] = PTHREAD_MUTEX_INITIALIZER }`

Definition at line 14 of file `device.c`.

### 9.7.2.7 pthread\_mutex\_t macromutex2[9] = { [0 ... 9 -1] = PTHREAD\_MUTEX\_INITIALIZER }

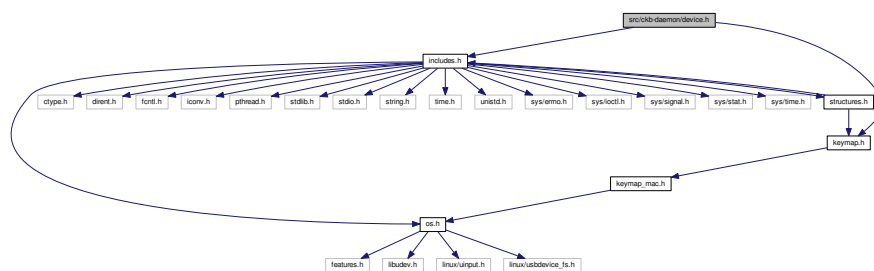
Definition at line 15 of file device.c.

### 9.7.2.8 pthread\_cond\_t macrovar[9] = { [0 ... 9 -1] = PTHREAD\_COND\_INITIALIZER }

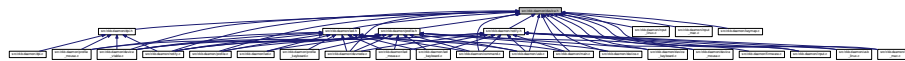
Definition at line 16 of file device.c.

## 9.8 src/ckb-daemon/device.h File Reference

```
#include "includes.h"
#include "keymap.h"
Include dependency graph for device.h:
```



This graph shows which files directly or indirectly include this file:



## Macros

- `#define DEV_MAX 9`
- `#define IS_CONNECTED(kb) ((kb) && (kb)->handle && (kb)->uinput_kb && (kb)->uinput_mouse)`
- `#define dmutex(kb) (devmutex + INDEX_OF(kb, keyboard))`
- `#define imutex(kb) (inputmutex + INDEX_OF(kb, keyboard))`
- `#define mmutex(kb) (macromutex + INDEX_OF(kb, keyboard))`
- `#define mmutex2(kb) (macromutex2 + INDEX_OF(kb, keyboard))`
- `#define mvar(kb) (macrovar + INDEX_OF(kb, keyboard))`
- `#define setactive(kb, makeactive) ((makeactive) ? (kb)->vtable->active((kb), 0, 0, 0, 0) : (kb)->vtable->idle((kb), 0, 0, 0, 0))`  
*setactive()* calls via the corresponding *kb->vtable* either the *active()* or the *idle()* function.  
*active()* is called if the parameter *makeactive* is true, *idle* if it is false.  
 What function is called effectively is device dependent. Have a look at [device\\_vtable.c](#) for more information.
- `#define IN_HID 0x80`
- `#define IN_CORSAIR 0x40`
- `#define ACT_LIGHT 1`
- `#define ACT_NEXT 3`
- `#define ACT_NEXT_NOWRAP 5`
- `#define ACT_LOCK 8`
- `#define ACT_MR_RING 9`

- `#define ACT_M1 10`
- `#define ACT_M2 11`
- `#define ACT_M3 12`

## Functions

- `int start_dev (usbdevice *kb, int makeactive)`
- `int start_kb_nrgb (usbdevice *kb, int makeactive)`
- `int setactive_kb (usbdevice *kb, int active)`
- `int setactive_mouse (usbdevice *kb, int active)`
- `int cmd_active_kb (usbdevice *kb, usbmode *dummy1, int dummy2, int dummy3, const char *dummy4)`
- `int cmd_active_mouse (usbdevice *kb, usbmode *dummy1, int dummy2, int dummy3, const char *dummy4)`
- `int cmd_idle_kb (usbdevice *kb, usbmode *dummy1, int dummy2, int dummy3, const char *dummy4)`
- `int cmd_idle_mouse (usbdevice *kb, usbmode *dummy1, int dummy2, int dummy3, const char *dummy4)`
- `int cmd_pollrate (usbdevice *kb, usbmode *dummy1, int dummy2, int rate, const char *dummy3)`
- `void setmodeindex_nrgb (usbdevice *kb, int index)`

## Variables

- `usbdevice keyboard` [9]  
*remember all usb devices. Needed for `closeusb()`.*
- `pthread_mutex_t devmutex` [9]  
*Mutex for handling the usbdevice structure.*
- `pthread_mutex_t inputmutex` [9]  
*Mutex for dealing with usb input frames.*
- `pthread_mutex_t macromutex` [9]  
*Protecting macros against lightning: Both use `usb_send`.*
- `pthread_mutex_t macromutex2` [9]  
*Protecting the single link list of threads and the macrovar.*
- `pthread_cond_t macrovar` [9]  
*This variable is used to stop and wakeup all macro threads which have to wait.*

### 9.8.1 Macro Definition Documentation

#### 9.8.1.1 `#define ACT_LIGHT 1`

Definition at line 68 of file `device.h`.

Referenced by `setactive_kb()`.

#### 9.8.1.2 `#define ACT_LOCK 8`

Definition at line 71 of file `device.h`.

Referenced by `setactive_kb()`.

#### 9.8.1.3 `#define ACT_M1 10`

Definition at line 73 of file `device.h`.

Referenced by `setactive_kb()`.



#### 9.8.1.4 `#define ACT_M2 11`

Definition at line 74 of file device.h.

Referenced by `setactive_kb()`.

#### 9.8.1.5 `#define ACT_M3 12`

Definition at line 75 of file device.h.

Referenced by `setactive_kb()`.

#### 9.8.1.6 `#define ACT_MR_RING 9`

Definition at line 72 of file device.h.

Referenced by `setactive_kb()`.

#### 9.8.1.7 `#define ACT_NEXT 3`

Definition at line 69 of file device.h.

#### 9.8.1.8 `#define ACT_NEXT_NOWRAP 5`

Definition at line 70 of file device.h.

#### 9.8.1.9 `#define DEV_MAX 9`

Definition at line 8 of file device.h.

Referenced by `_updateconnected()`, `quitWithLock()`, `usb_rm_device()`, and `usbadd()`.

#### 9.8.1.10 `#define dmutex( kb ) (devmutex + INDEX_OF(kb, keyboard))`

Definition at line 18 of file device.h.

Referenced by `_ledthread()`, `_setupusb()`, `closeusb()`, `devmain()`, and `usbadd()`.

#### 9.8.1.11 `#define imutex( kb ) (inputmutex + INDEX_OF(kb, keyboard))`

Definition at line 22 of file device.h.

Referenced by `_setupusb()`, `closeusb()`, `cmd_bind()`, `cmd_erase()`, `cmd_eraseprofile()`, `cmd_get()`, `cmd_macro()`, `cmd_notify()`, `cmd_rebind()`, `cmd_unbind()`, `os_inputmain()`, `setactive_kb()`, `setactive_mouse()`, and `setupusb()`.

#### 9.8.1.12 `#define IN_CORSAIR 0x40`

Definition at line 65 of file device.h.

Referenced by `setactive_kb()`, and `setactive_mouse()`.

#### 9.8.1.13 `#define IN_HID 0x80`

Definition at line 64 of file device.h.

Referenced by `setactive_kb()`, and `setactive_mouse()`.

9.8.1.14 `#define IS_CONNECTED( kb ) ((kb) && (kb)->handle && (kb)->uinput_kb && (kb)->uinput_mouse)`

Definition at line 12 of file device.h.

Referenced by `_updateconnected()`, `devmain()`, `quitWithLock()`, and `usbadd()`.

9.8.1.15 `#define mmutex( kb ) (macromutex + INDEX_OF(kb, keyboard))`

Definition at line 26 of file device.h.

Referenced by `_usbrecv()`, `_usbseend()`, and `play_macro()`.

9.8.1.16 `#define mmutex2( kb ) (macromutex2 + INDEX_OF(kb, keyboard))`

Definition at line 28 of file device.h.

Referenced by `play_macro()`.

9.8.1.17 `#define mvar( kb ) (macrovar + INDEX_OF(kb, keyboard))`

Definition at line 30 of file device.h.

Referenced by `play_macro()`.

9.8.1.18 `#define setactive( kb, makeactive ) ((makeactive) ? (kb)->vtable->active((kb), 0, 0, 0, 0) : (kb)->vtable->idle((kb), 0, 0, 0, 0))`

Definition at line 44 of file device.h.

Referenced by `_start_dev()`, and `revertusb()`.

## 9.8.2 Function Documentation

9.8.2.1 `int cmd_active_kb ( usbdevice * kb, usbmode * dummy1, int dummy2, int dummy3, const char * dummy4 )`

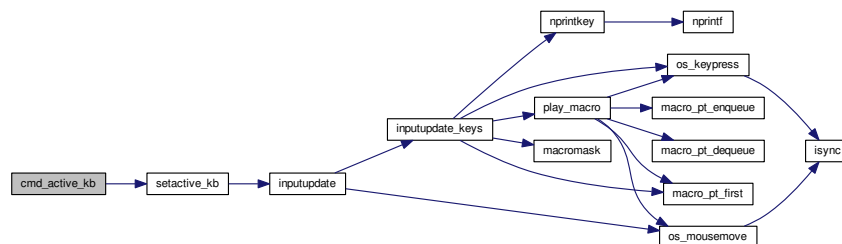
Definition at line 112 of file device\_keyboard.c.

References `setactive_kb()`.

```

112
113     return setactive_kb(kb, 1);
114 }
```

Here is the call graph for this function:



### 9.8.2.2 int cmd\_active\_mouse ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

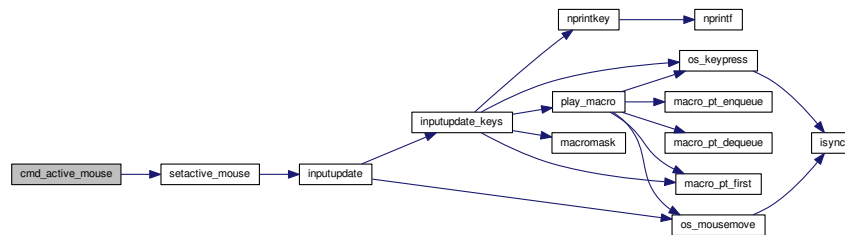
Definition at line 44 of file device\_mouse.c.

References `setactive_mouse()`.

```

44                                     {
45     return setactive_mouse(kb, 1);
46 }
```

Here is the call graph for this function:



### 9.8.2.3 int cmd\_idle\_kb ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

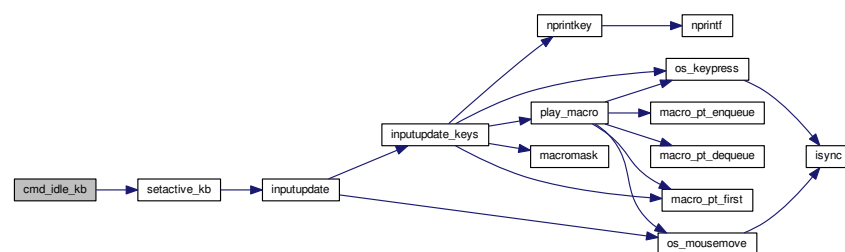
Definition at line 116 of file device\_keyboard.c.

References `setactive_kb()`.

```

116                                     {
117     return setactive_kb(kb, 0);
118 }
```

Here is the call graph for this function:



### 9.8.2.4 int cmd\_idle\_mouse ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

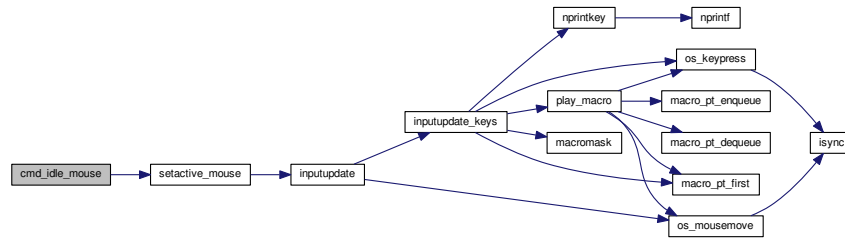
Definition at line 48 of file device\_mouse.c.

References `setactive_mouse()`.

```

48                                     {
49     return setactive_mouse(kb, 0);
50 }
```

Here is the call graph for this function:



#### 9.8.2.5 int cmd\_pollrate( usbdevice \* kb, usbmode \* dummy1, int dummy2, int rate, const char \* dummy3 )

Definition at line 52 of file device\_mouse.c.

References MSG\_SIZE, usbdevice::pollrate, and usbsend.

```

52                                     {
53     uchar msg[MSG_SIZE] = {
54         0x07, 0x0a, 0, 0, (uchar)rate
55     };
56     if(!usbsend(kb, msg, 1))
57         return -1;
58     // Device should disconnect+reconnect, but update the poll rate field in case it doesn't
59     kb->pollrate = rate;
60     return 0;
61 }

```

#### 9.8.2.6 int setactive\_kb( usbdevice \* kb, int active )

Definition at line 18 of file device\_keyboard.c.

References ACT\_LIGHT, ACT\_LOCK, ACT\_M1, ACT\_M2, ACT\_M3, ACT\_MR\_RING, usbdevice::active, DELAY\_MEDIUM, lighting::forceupdate, imutex, IN\_CORSAIR, IN\_HID, usbdevice::input, inputupdate(), keymap, usbinput::keys, usbprofile::lastlight, MSG\_SIZE, N\_KEYS\_HW, NEEDS\_FW\_UPDATE, usbdevice::profile, usbsend, and usbdevice::vtable.

Referenced by cmd\_active\_kb(), and cmd\_idle\_kb().

```

18                                     {
19     if (NEEDS_FW_UPDATE(kb))
20         return 0;
21
22     pthread_mutex_lock(imutex(kb));
23     kb->active = !active;
24     kb->profile->lastlight.forceupdate = 1;
25     // Clear input
26     memset(&kb->input.keys, 0, sizeof(kb->input.keys));
27     inputupdate(kb);
28     pthread_mutex_unlock(imutex(kb));
29
30     uchar msg[3][MSG_SIZE] = {
31         { 0x07, 0x04, 0 }, // Disables or enables HW control for top row
32         { 0x07, 0x40, 0 }, // Selects key input
33         { 0x07, 0x05, 2, 0, 0x03, 0x00 } // Commits key input selection
34     };
35     if(active){
36         // Put the M-keys (K95) as well as the Brightness/Lock keys into software-controlled mode.
37         msg[0][2] = 2;
38         if(!usbsend(kb, msg[0], 1))
39             return -1;
40         DELAY_MEDIUM(kb);
41         // Set input mode on the keys. They must be grouped into packets of 60 bytes (+ 4 bytes header)
42         // Keys are referenced in byte pairs, with the first byte representing the key and the second byte
         representing the mode.

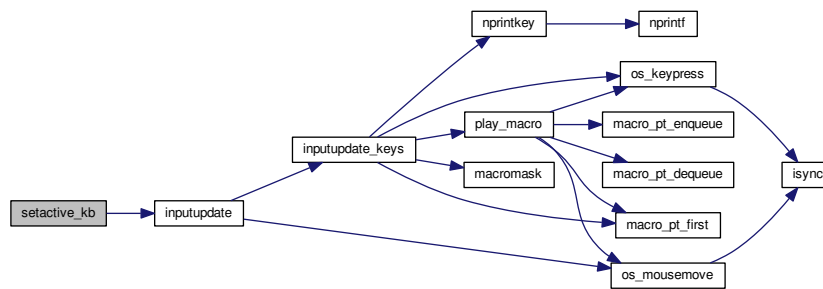
```

```

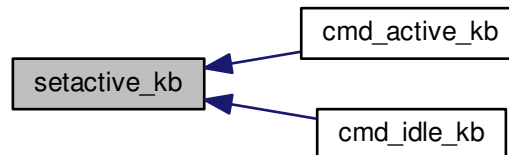
43     for(int key = 0; key < N_KEYS_HW; ){
44         int pair;
45         for(pair = 0; pair < 30 && key < N_KEYS_HW; pair++, key++){
46             // Select both standard and Corsair input. The standard input will be ignored except in
47             BIOS mode.
48             uchar action = IN_HID | IN_CORSAIR;
49             // Additionally, make MR activate the MR ring (this is disabled for now, may be back later)
50             //if(keymap[key].name && !strcmp(keymap[key].name, "mr"))
51             //    action |= ACT_MR_RING;
52             msg[1][4 + pair * 2] = key;
53             msg[1][5 + pair * 2] = action;
54         }
55         // Byte 2 = pair count (usually 30, less on final message)
56         msg[1][2] = pair;
57         if(!usbSend(kb, msg[1], 1))
58             return -1;
59     }
60     // Commit new input settings
61     if(!usbSend(kb, msg[2], 1))
62         return -1;
63     DELAY_MEDIUM(kb);
64 } else {
65     // Set the M-keys back into hardware mode, restore hardware RGB profile. It has to be sent twice
66     for some reason.
67     msg[0][2] = 1;
68     if(!usbSend(kb, msg[0], 1))
69         return -1;
70     DELAY_MEDIUM(kb);
71     if(!usbSend(kb, msg[0], 1))
72         return -1;
73     DELAY_MEDIUM(kb);
74 }
75 #ifdef OS_LINUX
76     // On OSX the default key mappings are fine. On Linux, the G keys will freeze the keyboard. Set the
77     keyboard entirely to HID input.
78     for(int key = 0; key < N_KEYS_HW; ){
79         int pair;
80         for(pair = 0; pair < 30 && key < N_KEYS_HW; pair++, key++){
81             uchar action = IN_HID;
82             // Enable hardware actions
83             if(keymap[key].name){
84                 if(!strcmp(keymap[key].name, "mr"))
85                     action = ACT_MR_RING;
86                 else if(!strcmp(keymap[key].name, "m1"))
87                     action = ACT_M1;
88                 else if(!strcmp(keymap[key].name, "m2"))
89                     action = ACT_M2;
90                 else if(!strcmp(keymap[key].name, "m3"))
91                     action = ACT_M3;
92                 else if(!strcmp(keymap[key].name, "light"))
93                     action = ACT_LIGHT;
94                 else if(!strcmp(keymap[key].name, "lock"))
95                     action = ACT_LOCK;
96             }
97             msg[1][4 + pair * 2] = key;
98             msg[1][5 + pair * 2] = action;
99         }
100         // Byte 2 = pair count (usually 30, less on final message)
101         msg[1][2] = pair;
102         if(!usbSend(kb, msg[1], 1))
103             return -1;
104     }
105     // Commit new input settings
106     if(!usbSend(kb, msg[2], 1))
107         return -1;
108     DELAY_MEDIUM(kb);
109 #endif
110 }
111 // Update indicator LEDs if the profile contains settings for them
112 kb->vtable->updateIndicators(kb, 0);
113 return 0;
114 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.8.2.7 int setactive\_mouse ( usbdevice \* kb, int active )

Definition at line 9 of file device\_mouse.c.

References `usbdevice::active`, `lighting::forceupdate`, `imutex`, `IN_CORSAIR`, `IN_HID`, `usbdevice::input`, `inputupdate()`, `usbinput::keys`, `usbprofile::lastlight`, `MSG_SIZE`, `NEEDS_FW_UPDATE`, `usbdevice::profile`, and `usbsend`.

Referenced by `cmd_active_mouse()`, and `cmd_idle_mouse()`.

```

9
10     if(NEEDS_FW_UPDATE(kb))
11         return 0;
12     const int keycount = 20;
13     uchar msg[2][MSG_SIZE] = {
14         { 0x07, 0x04, 0 },
15         { 0x07, 0x40, keycount, 0 },
16     };
17     if(active)
18         // Put the mouse into SW mode
19         msg[0][2] = 2;
20     else
21         // Restore HW mode
22         msg[0][2] = 1;
23     pthread_mutex_lock(&imutex(kb));
24     kb->active = !active;
25     kb->profile->lastlight.forceupdate = 1;
26     // Clear input
27     memset(&kb->input.keys, 0, sizeof(kb->input.keys));
28     inputupdate(kb);
29     pthread_mutex_unlock(&imutex(kb));
30     if(!usbsend(kb, msg[0], 1))
31         return -1;
32     if(active){

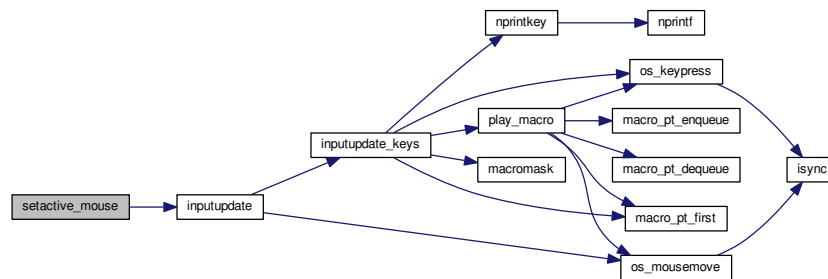
```

```

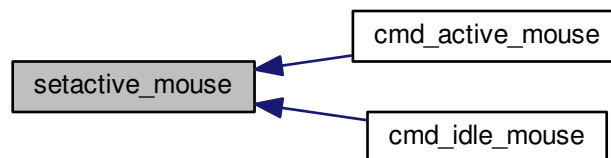
33     // Set up key input
34     if(!usb send(kb, msg[1], 1))
35         return -1;
36     for(int i = 0; i < keycount; i++){
37         msg[1][i * 2 + 4] = i + 1;
38         msg[1][i * 2 + 5] = (i < 6 ? IN_HID : IN_CORSAIR);
39     }
40 }
41 return 0;
42 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.8.2.8 void setmodeindex\_nrgb ( usbdevice \* kb, int index )

Definition at line 120 of file device\_keyboard.c.

References NK95\_M1, NK95\_M2, NK95\_M3, and nk95cmd.

```

120     {
121     switch(index % 3){
122     case 0:
123         nk95cmd(kb, NK95_M1);
124         break;
125     case 1:
126         nk95cmd(kb, NK95_M2);
127         break;
128     case 2:
129         nk95cmd(kb, NK95_M3);
130         break;
131     }
132 }

```

### 9.8.2.9 `int start_dev ( usbdevice * kb, int makeactive )`

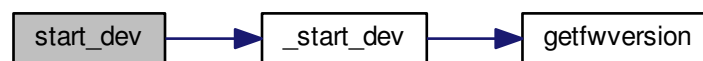
Definition at line 80 of file device.c.

References `_start_dev()`, `USB_DELAY_DEFAULT`, and `usbdevice::usbdelay`.

```

80                                     {
81     // Force USB interval to 10ms during initial setup phase; return to nominal 5ms after setup completes.
82     kb->usbdelay = 10;
83     int res = _start_dev(kb, makeactive);
84     kb->usbdelay = USB_DELAY_DEFAULT;
85     return res;
86 }
```

Here is the call graph for this function:



### 9.8.2.10 `int start_kb_nrgb ( usbdevice * kb, int makeactive )`

Definition at line 9 of file device\_keyboard.c.

References `usbdevice::active`, `NK95_HWOFF`, `nk95cmd`, and `usbdevice::pollrate`.

```

9                                     {
10    // Put the non-RGB K95 into software mode. Nothing else needs to be done hardware wise
11    nk95cmd(kb, NK95_HWOFF);
12    // Fill out RGB features for consistency, even though the keyboard doesn't have them
13    kb->active = 1;
14    kb->pollrate = -1;
15    return 0;
16 }
```

## 9.8.3 Variable Documentation

### 9.8.3.1 `pthread_mutex_t devmutex[9]`

Definition at line 12 of file device.c.

Referenced by `_updateconnected()`, `quitWithLock()`, and `usb_rm_device()`.

### 9.8.3.2 `pthread_mutex_t inputmutex[9]`

Definition at line 13 of file device.c.

### 9.8.3.3 `usbdevice keyboard[9]`

Definition at line 10 of file device.c.

Referenced by `_mkdevpath()`, `_mknotifynode()`, `_rmnotifynode()`, `_setupusb()`, `_updateconnected()`, `closeusb()`, `main()`, `mkfwnode()`, `os_closeusb()`, `os_inputmain()`, `os_inputopen()`, `os_setupusb()`, `quitWithLock()`, `rmdevpath()`, `usb_rm_device()`, and `usbadd()`.



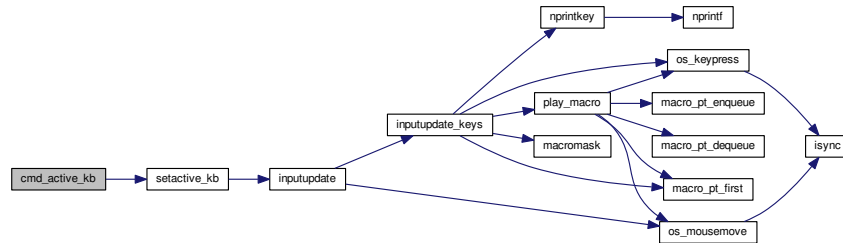


```

112
113     return setactive_kb(kb, 1);
114 }

```

Here is the call graph for this function:



### 9.9.1.2 int cmd\_idle\_kb ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

Definition at line 116 of file device\_keyboard.c.

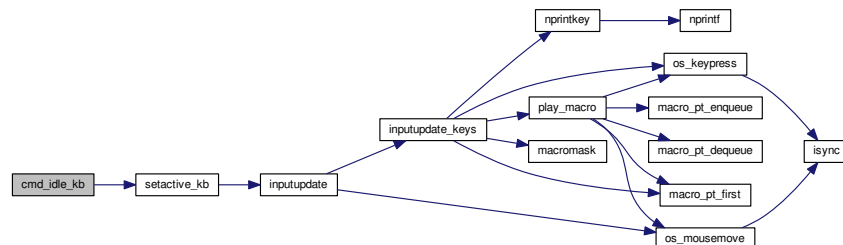
References setactive\_kb().

```

116
117     return setactive_kb(kb, 0);
118 }

```

Here is the call graph for this function:



### 9.9.1.3 int setactive\_kb ( usbdevice \* kb, int active )

Definition at line 18 of file device\_keyboard.c.

References ACT\_LIGHT, ACT\_LOCK, ACT\_M1, ACT\_M2, ACT\_M3, ACT\_MR\_RING, usbdevice::active, DELAY\_MEDIUM, lighting::forceupdate, imutex, IN\_CORSAIR, IN\_HID, usbdevice::input, inputupdate(), keymap, usbinput::keys, usbprofile::lastlight, MSG\_SIZE, N\_KEYS\_HW, NEEDS\_FW\_UPDATE, usbdevice::profile, usbdevice::send, and usbdevice::vtable.

Referenced by cmd\_active\_kb(), and cmd\_idle\_kb().

```

18
19     if (NEEDS_FW_UPDATE(kb))
20         return 0;
21
22     pthread_mutex_lock(imutex(kb));

```

```

23     kb->active = !!active;
24     kb->profile->lastlight.forceupdate = 1;
25     // Clear input
26     memset(&kb->input.keys, 0, sizeof(kb->input.keys));
27     inputupdate(kb);
28     pthread_mutex_unlock(&mutex(kb));
29
30     uchar msg[3][MSG_SIZE] = {
31         { 0x07, 0x04, 0 }, // Disables or enables HW control for top row
32         { 0x07, 0x40, 0 }, // Selects key input
33         { 0x07, 0x05, 2, 0, 0x03, 0x00 } // Commits key input selection
34     };
35     if(active){
36         // Put the M-keys (K95) as well as the Brightness/Lock keys into software-controlled mode.
37         msg[0][2] = 2;
38         if(!usbSend(kb, msg[0], 1))
39             return -1;
40         DELAY_MEDIUM(kb);
41         // Set input mode on the keys. They must be grouped into packets of 60 bytes (+ 4 bytes header)
42         // Keys are referenced in byte pairs, with the first byte representing the key and the second byte
43         // representing the mode.
44         for(int key = 0; key < N_KEYS_HW; ){
45             int pair;
46             for(pair = 0; pair < 30 && key < N_KEYS_HW; pair++, key++){
47                 // Select both standard and Corsair input. The standard input will be ignored except in
48                 // BIOS mode.
49                 uchar action = IN_HID | IN_CORSAIR;
50                 // Additionally, make MR activate the MR ring (this is disabled for now, may be back later)
51                 //if(keymap[key].name && !strcmp(keymap[key].name, "mr"))
52                 //    action |= ACT_MR_RING;
53                 msg[1][4 + pair * 2] = key;
54                 msg[1][5 + pair * 2] = action;
55             }
56             // Byte 2 = pair count (usually 30, less on final message)
57             msg[1][2] = pair;
58             if(!usbSend(kb, msg[1], 1))
59                 return -1;
60         }
61         // Commit new input settings
62         if(!usbSend(kb, msg[2], 1))
63             return -1;
64         DELAY_MEDIUM(kb);
65     } else {
66         // Set the M-keys back into hardware mode, restore hardware RGB profile. It has to be sent twice
67         // for some reason.
68         msg[0][2] = 1;
69         if(!usbSend(kb, msg[0], 1))
70             return -1;
71         DELAY_MEDIUM(kb);
72         if(!usbSend(kb, msg[0], 1))
73             return -1;
74         DELAY_MEDIUM(kb);
75     }
76 #ifdef OS_LINUX
77     // On OSX the default key mappings are fine. On Linux, the G keys will freeze the keyboard. Set the
78     // keyboard entirely to HID input.
79     for(int key = 0; key < N_KEYS_HW; ){
80         int pair;
81         for(pair = 0; pair < 30 && key < N_KEYS_HW; pair++, key++){
82             uchar action = IN_HID;
83             // Enable hardware actions
84             if(keymap[key].name){
85                 if(!strcmp(keymap[key].name, "mr"))
86                     action = ACT_MR_RING;
87                 else if(!strcmp(keymap[key].name, "m1"))
88                     action = ACT_M1;
89                 else if(!strcmp(keymap[key].name, "m2"))
90                     action = ACT_M2;
91                 else if(!strcmp(keymap[key].name, "m3"))
92                     action = ACT_M3;
93                 else if(!strcmp(keymap[key].name, "light"))
94                     action = ACT_LIGHT;
95                 else if(!strcmp(keymap[key].name, "lock"))
96                     action = ACT_LOCK;
97             }
98             msg[1][4 + pair * 2] = key;
99             msg[1][5 + pair * 2] = action;
100         }
101         // Byte 2 = pair count (usually 30, less on final message)
102         msg[1][2] = pair;
103         if(!usbSend(kb, msg[1], 1))
104             return -1;
105     }
106     // Commit new input settings
107     if(!usbSend(kb, msg[2], 1))
108         return -1;
109     DELAY_MEDIUM(kb);
110 #endif

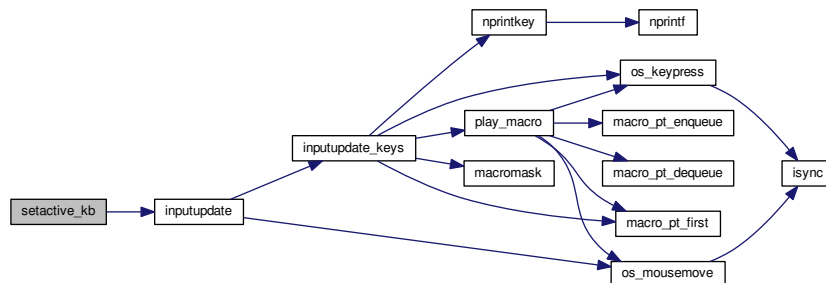
```

```

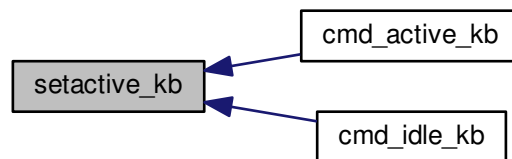
106     }
107     // Update indicator LEDs if the profile contains settings for them
108     kb->vtable->updateindicators(kb, 0);
109     return 0;
110 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.9.1.4 void setmodeindex\_nrgb ( usbdevice \* kb, int index )

Definition at line 120 of file device\_keyboard.c.

References NK95\_M1, NK95\_M2, NK95\_M3, and nk95cmd.

```

120     {
121     switch(index % 3){
122     case 0:
123         nk95cmd(kb, NK95_M1);
124         break;
125     case 1:
126         nk95cmd(kb, NK95_M2);
127         break;
128     case 2:
129         nk95cmd(kb, NK95_M3);
130         break;
131     }
132 }

```

#### 9.9.1.5 int start\_kb\_nrgb ( usbdevice \* kb, int makeactive )

Definition at line 9 of file device\_keyboard.c.

References `usbdevice::active`, `NK95_HWOFF`, `nk95cmd`, and `usbdevice::pollrate`.

```

9          {
10         // Put the non-RGB K95 into software mode. Nothing else needs to be done hardware wise
11         nk95cmd(kb, NK95_HWOFF);
12         // Fill out RGB features for consistency, even though the keyboard doesn't have them
13         kb->active = 1;
14         kb->pollrate = -1;
15         return 0;
16     }

```

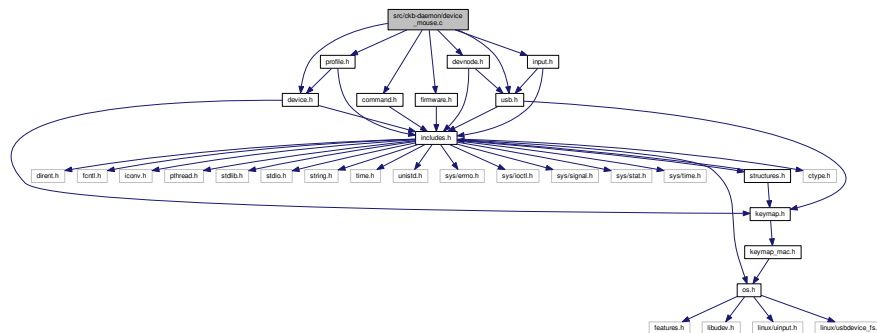
## 9.10 src/ckb-daemon/device\_mouse.c File Reference

```

#include "command.h"
#include "device.h"
#include "devnode.h"
#include "firmware.h"
#include "input.h"
#include "profile.h"
#include "usb.h"

```

Include dependency graph for `device_mouse.c`:



## Functions

- `int setactive_mouse (usbdevice *kb, int active)`
- `int cmd_active_mouse (usbdevice *kb, usbmode *dummy1, int dummy2, int dummy3, const char *dummy4)`
- `int cmd_idle_mouse (usbdevice *kb, usbmode *dummy1, int dummy2, int dummy3, const char *dummy4)`
- `int cmd_pollrate (usbdevice *kb, usbmode *dummy1, int dummy2, int rate, const char *dummy3)`

### 9.10.1 Function Documentation

#### 9.10.1.1 `int cmd_active_mouse ( usbdevice * kb, usbmode * dummy1, int dummy2, int dummy3, const char * dummy4 )`

Definition at line 44 of file `device_mouse.c`.

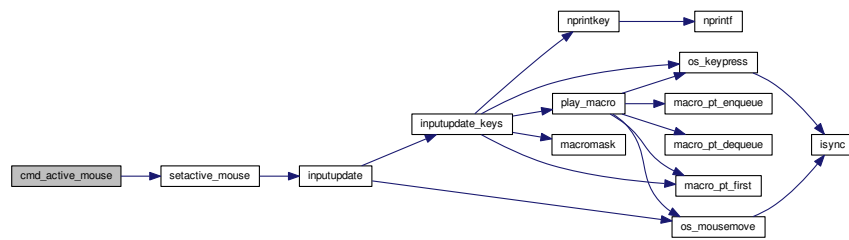
References `setactive_mouse()`.

```

44
45     return setactive_mouse(kb, 1);
46 }

```

Here is the call graph for this function:



#### 9.10.1.2 int cmd\_idle\_mouse ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

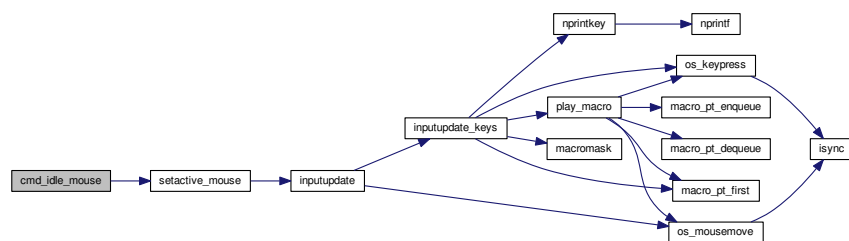
Definition at line 48 of file device\_mouse.c.

References setactive\_mouse().

```

48                                     {
49     return setactive_mouse(kb, 0);
50 }
  
```

Here is the call graph for this function:



#### 9.10.1.3 int cmd\_pollrate ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int rate, const char \* dummy3 )

Definition at line 52 of file device\_mouse.c.

References MSG\_SIZE, usbdevice::pollrate, and usbsend.

```

52                                     {
53     uchar msg[MSG_SIZE] = {
54         0x07, 0x0a, 0, 0, (uchar)rate
55     };
56     if(!usbsend(kb, msg, 1))
57         return -1;
58     // Device should disconnect+reconnect, but update the poll rate field in case it doesn't
59     kb->pollrate = rate;
60     return 0;
61 }
  
```

#### 9.10.1.4 int setactive\_mouse ( usbdevice \* kb, int active )

Definition at line 9 of file device\_mouse.c.

References usbdevice::active, lighting::forceupdate, imutex, IN\_CORSAIR, IN\_HID, usbdevice::input, inputupdate(), usbinput::keys, usbprofile::lastlight, MSG\_SIZE, NEEDS\_FW\_UPDATE, usbdevice::profile, and usbsend.

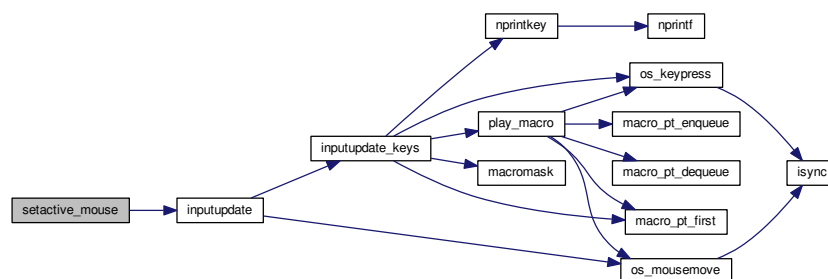
Referenced by cmd\_active\_mouse(), and cmd\_idle\_mouse().

```

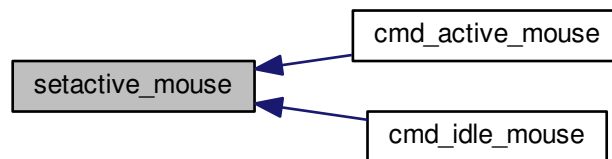
9                                     {
10     if (NEEDS_FW_UPDATE(kb))
11         return 0;
12     const int keycount = 20;
13     uchar msg[2][MSG_SIZE] = {
14         { 0x07, 0x04, 0 },
15         { 0x07, 0x40, keycount, 0 },
16     };
17     if (active)
18         // Put the mouse into SW mode
19         msg[0][2] = 2;
20     else
21         // Restore HW mode
22         msg[0][2] = 1;
23     pthread_mutex_lock(&imutex(kb));
24     kb->active = !active;
25     kb->profile->lastlight.forceupdate = 1;
26     // Clear input
27     memset(&kb->input.keys, 0, sizeof(kb->input.keys));
28     inputupdate(kb);
29     pthread_mutex_unlock(&imutex(kb));
30     if (!usbsend(kb, msg[0], 1))
31         return -1;
32     if (active) {
33         // Set up key input
34         if (!usbsend(kb, msg[1], 1))
35             return -1;
36         for (int i = 0; i < keycount; i++) {
37             msg[1][i * 2 + 4] = i + 1;
38             msg[1][i * 2 + 5] = (i < 6 ? IN_HID : IN_CORSAIR);
39         }
40     }
41     return 0;
42 }

```

Here is the call graph for this function:



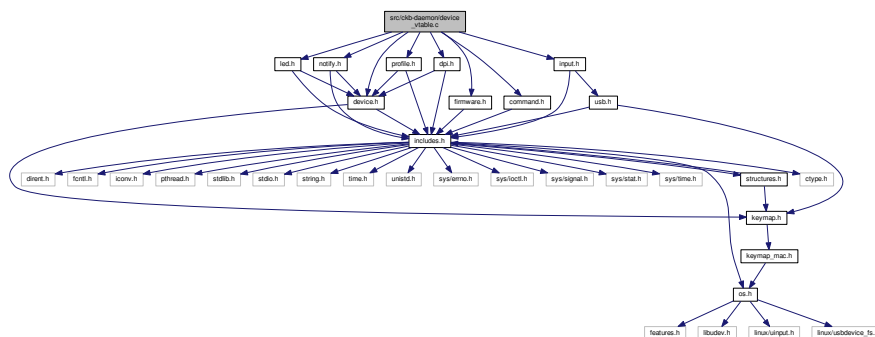
Here is the caller graph for this function:



## 9.11 src/ckb-daemon/device\_vtable.c File Reference

```
#include "command.h"
#include "device.h"
#include "dpi.h"
#include "firmware.h"
#include "input.h"
#include "led.h"
#include "notify.h"
#include "profile.h"
```

Include dependency graph for device\_vtable.c:



## Functions

- static void `cmd_none` (`usbdevice` \*kb, `usbmode` \*dummy1, int dummy2, int dummy3, const char \*dummy4)
- static int `cmd_io_none` (`usbdevice` \*kb, `usbmode` \*dummy1, int dummy2, int dummy3, const char \*dummy4)
- static void `cmd_macro_none` (`usbdevice` \*kb, `usbmode` \*dummy1, int dummy2, const char \*dummy3, const char \*dummy4)
- static int `loadprofile_none` (`usbdevice` \*kb)
- static void `int1_void_none` (`usbdevice` \*kb, int dummy)
- static int `int1_int_none` (`usbdevice` \*kb, int dummy)

## Variables

- const `devcmd vtable_keyboard`



*RGB keyboard vtable holds functions for each device type.*

- const [devcmd vtable\\_keyboard\\_norrgb](#)
- const [devcmd vtable\\_mouse](#)

## 9.11.1 Function Documentation

**9.11.1.1** `static int cmd_io_none ( usbdevice * kb, usbmode * dummy1, int dummy2, int dummy3, const char * dummy4 )`  
[static]

Definition at line 13 of file device\_vtable.c.

```
13                                     {
14     return 0;
15 }
```

**9.11.1.2** `static void cmd_macro_none ( usbdevice * kb, usbmode * dummy1, int dummy2, const char * dummy3, const char * dummy4 )` [static]

Definition at line 16 of file device\_vtable.c.

```
16     {
17 }
```

**9.11.1.3** `static void cmd_none ( usbdevice * kb, usbmode * dummy1, int dummy2, int dummy3, const char * dummy4 )`  
[static]

Definition at line 11 of file device\_vtable.c.

```
11                                     {
12 }
```

**9.11.1.4** `static int int1_int_none ( usbdevice * kb, int dummy )` [static]

Definition at line 23 of file device\_vtable.c.

```
23                                     {
24     return 0;
25 }
```

**9.11.1.5** `static void int1_void_none ( usbdevice * kb, int dummy )` [static]

Definition at line 21 of file device\_vtable.c.

```
21                                     {
22 }
```

**9.11.1.6** `static int loadprofile_none ( usbdevice * kb )` [static]

Definition at line 18 of file device\_vtable.c.

```
18                                     {
19     return 0;
20 }
```



## Functions

- int [rm\\_recursive](#) (const char \*path)
- void [\\_updateconnected](#) ()  
*\_updateconnected Update the list of connected devices.*
- void [updateconnected](#) ()  
*Update the list of connected devices.*
- int [\\_mknotifynode](#) (usbdevice \*kb, int notify)
- int [mknotifynode](#) (usbdevice \*kb, int notify)  
*Creates a notification node for the specified keyboard.*
- int [\\_rmnotifynode](#) (usbdevice \*kb, int notify)
- int [rmnotifynode](#) (usbdevice \*kb, int notify)  
*Removes a notification node for the specified keyboard.*
- static int [\\_mkdevpath](#) (usbdevice \*kb)
- int [mkdevpath](#) (usbdevice \*kb)  
*Create a dev path for the keyboard at index. Returns 0 on success.*
- int [rmdevpath](#) (usbdevice \*kb)  
*Remove the dev path for the keyboard at index. Returns 0 on success.*
- int [mkfwnode](#) (usbdevice \*kb)  
*Writes a keyboard's firmware version and poll rate to its device node.*
- void [readlines\\_ctx\\_init](#) (readlines\_ctx \*ctx)
- void [readlines\\_ctx\\_free](#) (readlines\_ctx ctx)
- unsigned [readlines](#) (int fd, readlines\_ctx ctx, const char \*\*input)

## Variables

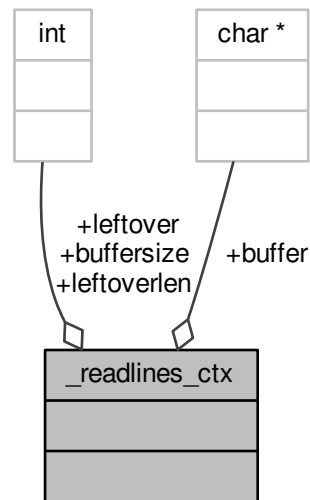
- const char \*const [devpath](#) = "/dev/input/ckb"
- long [gid](#) = -1  
*Group ID for the control nodes. -1 to give read/write access to everybody.*

### 9.12.1 Data Structure Documentation

#### 9.12.1.1 struct \_readlines\_ctx

Definition at line 335 of file devnode.c.

Collaboration diagram for `_readlines_ctx`:



#### Data Fields

char *	buffer	
int	buffer size	
int	leftover	
int	leftover len	

## 9.12.2 Macro Definition Documentation

### 9.12.2.1 `#define MAX_BUFFER (1024 * 1024 - 1)`

Definition at line 334 of file `devnode.c`.

Referenced by `readlines()`.

### 9.12.2.2 `#define S_GID_READ (gid >= 0 ? S_CUSTOM_R : S_READ)`

Definition at line 17 of file `devnode.c`.

Referenced by `_mkdevpath()`, `_mknotifynode()`, `_updateconnected()`, and `mkfwnode()`.

## 9.12.3 Function Documentation

### 9.12.3.1 `static int _mkdevpath ( usbdevice * kb ) [static]`

Definition at line 136 of file `devnode.c`.

References `_mknotifynode()`, `_updateconnected()`, `ckb_err`, `ckb_warn`, `devpath`, `FEAT_ADJRATE`, `FEAT_BIND`, `FEAT_FWUPDATE`, `FEAT_FWVERSION`, `FEAT_MONOCHROME`, `FEAT_NOTIFY`, `FEAT_POLLRATE`, `FEAT_RGB`, `gid`, `HAS_FEATURES`, `INDEX_OF`, `usbdevice::infifo`, `keyboard`, `mkfwnode()`, `usbdevice::name`, `usbdevice-`

::product, product\_str(), rm\_recursive(), S\_CUSTOM, S\_GID\_READ, S\_READ, S\_READDIR, S\_READWRITE, usbdevice::serial, usbdevice::vendor, and vendor\_str().

Referenced by mkdevpath().

```

136         {
137     int index = INDEX_OF(kb, keyboard);
138     // Create the control path
139     char path[strlen(devpath) + 2];
140     snprintf(path, sizeof(path), "%s%d", devpath, index);
141     if(rm_recursive(path) != 0 && errno != ENOENT){
142         ckb_err("Unable to delete %s: %s\n", path, strerror(errno));
143         return -1;
144     }
145     if(mkdir(path, S_READDIR) != 0){
146         ckb_err("Unable to create %s: %s\n", path, strerror(errno));
147         rm_recursive(path);
148         return -1;
149     }
150     if(gid >= 0)
151         chown(path, 0, gid);
152
153     if(kb == keyboard + 0){
154         // Root keyboard: write a list of devices
155         _updateconnected();
156         // Write version number
157         char vpath[sizeof(path) + 8];
158         snprintf(vpath, sizeof(vpath), "%s/version", path);
159         FILE* vfile = fopen(vpath, "w");
160         if(vfile){
161             fprintf(vfile, "%s\n", CKB_VERSION_STR);
162             fclose(vfile);
163             chmod(vpath, S_GID_READ);
164             if(gid >= 0)
165                 chown(vpath, 0, gid);
166         } else {
167             ckb_warn("Unable to create %s: %s\n", vpath, strerror(errno));
168             remove(vpath);
169         }
170         // Write PID
171         char ppath[sizeof(path) + 4];
172         snprintf(ppath, sizeof(ppath), "%s/pid", path);
173         FILE* pfile = fopen(ppath, "w");
174         if(pfile){
175             fprintf(pfile, "%u\n", getpid());
176             fclose(pfile);
177             chmod(ppath, S_READ);
178             if(gid >= 0)
179                 chown(vpath, 0, gid);
180         } else {
181             ckb_warn("Unable to create %s: %s\n", ppath, strerror(errno));
182             remove(ppath);
183         }
184     } else {
185         // Create command FIFO
186         char inpath[sizeof(path) + 4];
187         snprintf(inpath, sizeof(inpath), "%s/cmd", path);
188         if(mkfifo(inpath, gid >= 0 ? S_CUSTOM : S_READWRITE) != 0
189             // Open the node in RDWR mode because RDONLY will lock the thread
190             || (kb->ininfo = open(inpath, O_RDWR) + 1) == 0){
191             // Add one to the FD because 0 is a valid descriptor, but ckb uses 0 for uninitialized devices
192             ckb_err("Unable to create %s: %s\n", inpath, strerror(errno));
193             rm_recursive(path);
194             kb->ininfo = 0;
195             return -1;
196         }
197         if(gid >= 0)
198             fchown(kb->ininfo - 1, 0, gid);
199
200         // Create notification FIFO
201         _mknotifynode(kb, 0);
202
203         // Write the model and serial to files
204         char mpath[sizeof(path) + 6], spath[sizeof(path) + 7];
205         snprintf(mpath, sizeof(mpath), "%s/model", path);
206         snprintf(spath, sizeof(spath), "%s/serial", path);
207         FILE* mfile = fopen(mpath, "w");
208         if(mfile){
209             fputs(kb->name, mfile);
210             fputc('\n', mfile);
211             fclose(mfile);
212             chmod(mpath, S_GID_READ);
213             if(gid >= 0)
214                 chown(mpath, 0, gid);
215         } else {
216             ckb_warn("Unable to create %s: %s\n", mpath, strerror(errno));

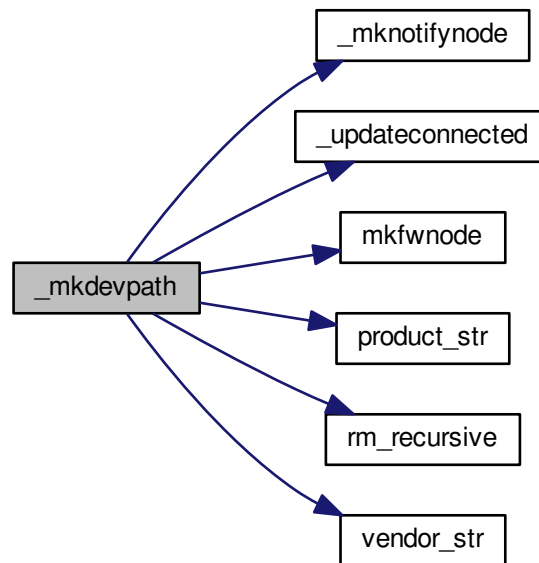
```

```

217         remove(mpath);
218     }
219     FILE* sfile = fopen(spath, "w");
220     if(sfile){
221         fputs(kb->serial, sfile);
222         fputc('\n', sfile);
223         fclose(sfile);
224         chmod(spath, S_GID_READ);
225         if(gid >= 0)
226             chown(spath, 0, gid);
227     } else {
228         ckb_warn("Unable to create %s: %s\n", spath, strerror(errno));
229         remove(spath);
230     }
231     // Write the keyboard's features
232     char fpath[sizeof(path) + 9];
233     snprintf(fpath, sizeof(fpath), "%s/features", path);
234     FILE* ffile = fopen(fpath, "w");
235     if(ffile){
236         fprintf(ffile, "%s %s", vendor_str(kb->vendor),
product_str(kb->product));
237         if(HAS_FEATURES(kb, FEAT_MONOCHROME))
238             fputs(" monochrome", ffile);
239         if(HAS_FEATURES(kb, FEAT_RGB))
240             fputs(" rgb", ffile);
241         if(HAS_FEATURES(kb, FEAT_POLLRATE))
242             fputs(" pollrate", ffile);
243         if(HAS_FEATURES(kb, FEAT_ADJRATE))
244             fputs(" adjrate", ffile);
245         if(HAS_FEATURES(kb, FEAT_BIND))
246             fputs(" bind", ffile);
247         if(HAS_FEATURES(kb, FEAT_NOTIFY))
248             fputs(" notify", ffile);
249         if(HAS_FEATURES(kb, FEAT_FWVERSION))
250             fputs(" fwversion", ffile);
251         if(HAS_FEATURES(kb, FEAT_FWUPDATE))
252             fputs(" fwupdate", ffile);
253         fputc('\n', ffile);
254         fclose(ffile);
255         chmod(fpath, S_GID_READ);
256         if(gid >= 0)
257             chown(fpath, 0, gid);
258     } else {
259         ckb_warn("Unable to create %s: %s\n", fpath, strerror(errno));
260         remove(fpath);
261     }
262     // Write firmware version and poll rate
263     mkfwnode(kb);
264 }
265 return 0;
266 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.12.3.2 int \_mknotifynode ( usbdevice \* kb, int notify )

Definition at line 87 of file devnode.c.

References `ckb_warn`, `devpath`, `gid`, `INDEX_OF`, `keyboard`, `usbdevice::outfifo`, `OUTFIFO_MAX`, and `S_GID_READ`.

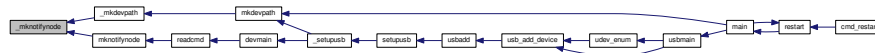
Referenced by `_mkdevpath()`, and `mknotifynode()`.

```

87  {
88      if(notify < 0 || notify >= OUTFIFO_MAX)
89          return -1;
90      if(kb->outfifo[notify] != 0)
91          return 0;
92      // Create the notification node
93      int index = INDEX_OF(kb, keyboard);
94      char outpath[strlen(devpath) + 10];
95      snprintf(outpath, sizeof(outpath), "%s%d/notify%d", devpath, index, notify);
96      if(mkfifo(outpath, S_GID_READ) != 0 || (kb->outfifo[notify] = open(outpath, O_RDWR |
O_NONBLOCK) + 1) == 0){
97          // Add one to the FD because 0 is a valid descriptor, but ckb uses 0 for uninitialized devices
98          ckb_warn("Unable to create %s: %s\n", outpath, strerror(errno));
99          kb->outfifo[notify] = 0;
100          remove(outpath);
101          return -1;
102      }
103      if(gid >= 0)
104          fchown(kb->outfifo[notify] - 1, 0, gid);
105      return 0;
106 }

```

Here is the caller graph for this function:



### 9.12.3.3 int\_rmnotifynode ( usbdevice \* kb, int notify )

Definition at line 115 of file devnode.c.

References devpath, INDEX\_OF, keyboard, usbdevice::outfifo, and UTFIFO\_MAX.

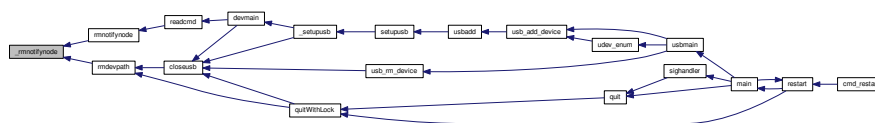
Referenced by rmdevpath(), and rmnotifynode().

```

115 {
116     if(notify < 0 || notify >= UTFIFO_MAX || !kb->outfifo[notify])
117         return -1;
118     int index = INDEX_OF(kb, keyboard);
119     char outpath[strlen(devpath) + 10];
120     snprintf(outpath, sizeof(outpath), "%s%d/notify%d", devpath, index, notify);
121     // Close FIFO
122     close(kb->outfifo[notify] - 1);
123     kb->outfifo[notify] = 0;
124     // Delete node
125     int res = remove(outpath);
126     return res;
127 }

```

Here is the caller graph for this function:



### 9.12.3.4 void\_updateconnected ( )

<devicepath> normally is /dev/input/ckb or /input/ckb.

Open the normal file under <devicepath>0/connected for writing. For each device connected, print its devicepath+number, the serial number of the usb device and the usb name of the device connected to that usb interface.

eg:

```
/dev/input/ckb1 0F022014ABABABABABABABABABA999 Corsair K95 RGB Gaming Keyboard
```

```
/dev/input/ckb2 0D02303DBACBACBACBACBACBACBAC998 Corsair M65 RGB Gaming Mouse
```

Set the file ownership to root. If the glob var gid is explicitly set to something different from -1 (the initial value), set file permission to 640, else to 644. This is used if you start the daemon with -gid=<GID> Parameter.

Because several independent threads may call [updateconnected\(\)](#), protect that procedure with locking/unlocking of **devmutex**.

Definition at line 55 of file devnode.c.

References ckb\_warn, DEV\_MAX, devmutex, devpath, gid, IS\_CONNECTED, keyboard, and S\_GID\_READ.

Referenced by \_mkdevpath(), and updateconnected().

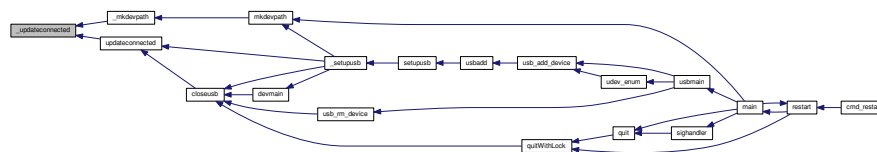


```

56 pthread_mutex_lock(&devmutex);
57 char cpath[strlen(&devpath) + 12];
58 snprintf(cpath, sizeof(cpath), "%s0/connected", &devpath);
59 FILE* cfile = fopen(cpath, "w");
60 if(!cfile){
61     ckb_warn("Unable to update %s: %s\n", cpath, strerror(errno));
62     pthread_mutex_unlock(&devmutex);
63     return;
64 }
65 int written = 0;
66 for(int i = 1; i < DEV_MAX; i++){
67     if(IS_CONNECTED(keyboard + i)){
68         written = 1;
69         fprintf(cfile, "%s%d %s %s\n", &devpath, i, &keyboard[i].serial,
keyboard[i].name);
70     }
71 }
72 if(!written)
73     fputc('\n', cfile);
74 fclose(cfile);
75 chmod(cpath, S_GID_READ);
76 if(gid >= 0)
77     chown(cpath, 0, gid);
78 pthread_mutex_unlock(&devmutex);
79 }

```

Here is the caller graph for this function:



### 9.12.3.5 int mkdevpath ( usbdevice \* kb )

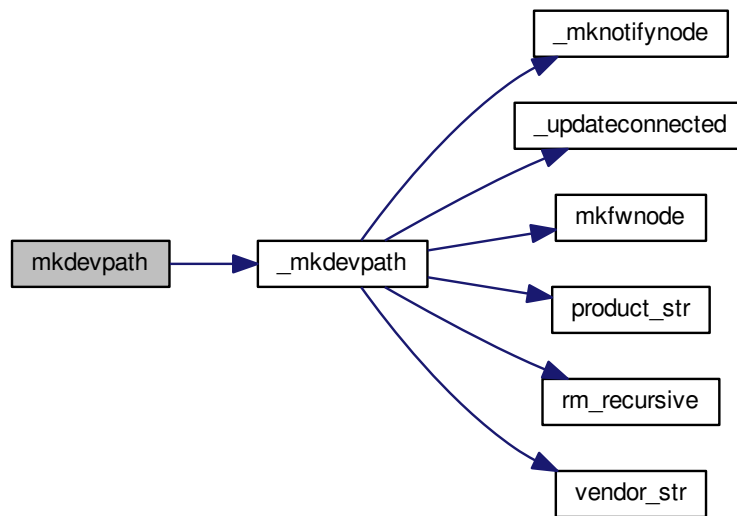
Definition at line 268 of file devnode.c.

References `_mkdevpath()`, `euid_guard_start`, and `euid_guard_stop`.

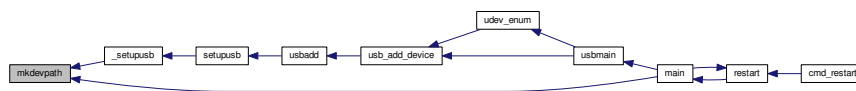
Referenced by `_setupusb()`, and `main()`.

```
268                                     {
269     euuid_guard_start;
270     int res = _mkdevpath(kb);
271     euuid_guard_stop;
272     return res;
273 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.12.3.6 int mkfwnode ( usbdevice \* kb )

Definition at line 299 of file devnode.c.

References `ckb_warn`, `devpath`, `usbdevice::fwversion`, `gid`, `INDEX_OF`, `keyboard`, `usbdevice::pollrate`, and `S_GID_READ`.

Referenced by `_mkdevpath()`, and `fwupdate()`.

```

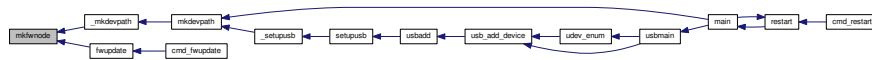
299     {
300         int index = INDEX_OF(kb, keyboard);
301         char fwpath[strlen(devpath) + 12];
302         snprintf(fwpath, sizeof(fwpath), "%s%d/fwversion", devpath, index);
303         FILE* fwfile = fopen(fwpath, "w");
304         if(fwfile){
305             fprintf(fwfile, "%04x", kb->fwversion);
306             fputc('\n', fwfile);
307             fclose(fwfile);
308             chmod(fwpath, S_GID_READ);
309             if(gid >= 0)
310                 chown(fwpath, 0, gid);
311         } else {
312             ckb_warn("Unable to create %s: %s\n", fwpath, strerror(errno));
313             remove(fwpath);
314             return -1;
315         }
316         char ppath[strlen(devpath) + 11];
317         snprintf(ppath, sizeof(ppath), "%s%d/pollrate", devpath, index);
318         FILE* pfile = fopen(ppath, "w");
  
```

```

319     if(pfile){
320         fprintf(pfile, "%d ms", kb->pollrate);
321         fputc('\n', pfile);
322         fclose(pfile);
323         chmod(ppath, S_GID_READ);
324         if(gid >= 0)
325             chown(ppath, 0, gid);
326     } else {
327         ckb_warn("Unable to create %s: %s\n", fwpath, strerror(errno));
328         remove(ppath);
329         return -2;
330     }
331     return 0;
332 }

```

Here is the caller graph for this function:



### 9.12.3.7 int mknotifynode ( usbdevice \* kb, int notify )

Definition at line 108 of file devnode.c.

References `_mknotifynode()`, `euid_guard_start`, and `euid_guard_stop`.

Referenced by `readcmd()`.

```

108     {
109         euid_guard_start;
110         int res = _mknotifynode(kb, notify);
111         euid_guard_stop;
112         return res;
113     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.12.3.8 unsigned readlines ( int fd, readlines\_ctx ctx, const char \*\* input )

Definition at line 353 of file devnode.c.

References `_readlines_ctx::buffer`, `_readlines_ctx::buffersize`, `ckb_warn`, `_readlines_ctx::leftover`, `_readlines_ctx::leftoverlen`, and `MAX_BUFFER`.

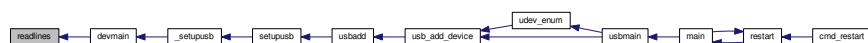
Referenced by `devmain()`.

```

353                                     {
354     // Move any data left over from a previous read to the start of the buffer
355     char* buffer = ctx->buffer;
356     int buffersize = ctx->buffersize;
357     int leftover = ctx->leftover, leftoverlen = ctx->leftoverlen;
358     memcpy(buffer, buffer + leftover, leftoverlen);
359     // Read data from the file
360     ssize_t length = read(fd, buffer + leftoverlen, buffersize - leftoverlen);
361     length = (length < 0 ? 0 : length) + leftoverlen;
362     leftover = ctx->leftover = leftoverlen = ctx->leftoverlen = 0;
363     if(length <= 0){
364         *input = 0;
365         return 0;
366     }
367     // Continue buffering until all available input is read or there's no room left
368     while(length == buffersize){
369         if(buffersize == MAX_BUFFER)
370             break;
371         int oldsize = buffersize;
372         buffersize += 4096;
373         ctx->buffersize = buffersize;
374         buffer = ctx->buffer = realloc(buffer, buffersize + 1);
375         ssize_t length2 = read(fd, buffer + oldsize, buffersize - oldsize);
376         if(length2 <= 0)
377             break;
378         length += length2;
379     }
380     buffer[length] = 0;
381     // Input should be issued one line at a time and should end with a newline.
382     char* lastline = memchr(buffer, '\n', length);
383     if(lastline == buffer + length - 1){
384         // If the buffer ends in a newline, process the whole string
385         *input = buffer;
386         return length;
387     } else if(lastline){
388         // Otherwise, chop off the last line but process everything else
389         *lastline = 0;
390         leftover = ctx->leftover = lastline + 1 - buffer;
391         leftoverlen = ctx->leftoverlen = length - leftover;
392         *input = buffer;
393         return leftover - 1;
394     } else {
395         // If a newline wasn't found at all, process the whole buffer next time
396         *input = 0;
397         if(length == MAX_BUFFER){
398             // Unless the buffer is completely full, in which case discard it
399             ckb_warn("Too much input (1MB). Dropping.\n");
400             return 0;
401         }
402         leftoverlen = ctx->leftoverlen = length;
403         return 0;
404     }
405 }

```

Here is the caller graph for this function:



### 9.12.3.9 void readlines\_ctx\_free ( readlines\_ctx ctx )

Definition at line 348 of file `devnode.c`.

References `_readlines_ctx::buffer`.

Referenced by `devmain()`.

348

{

```
349     free(ctx->buffer);
350     free(ctx);
351 }
```

Here is the caller graph for this function:



**9.12.3.10** `void readlines_ctx_init ( readlines_ctx * ctx )`

Definition at line 341 of file devnode.c.

Referenced by devmain().

```

341                                     {
342                                     // Allocate buffers to store data
343                                     *ctx = calloc(1, sizeof(struct _readlines_ctx));
344                                     int buffersize = (*ctx)->buffersize = 4095;
345                                     (*ctx)->buffer = malloc(buffersize + 1);
346                                     }

```

Here is the caller graph for this function:



### 9.12.3.11 int rm\_recursive ( const char \* *path* )

Definition at line 19 of file devnode.c.

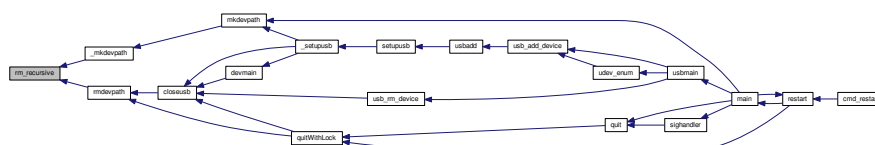
Referenced by `_mkdevpath()`, and `rmdevpath()`.

```

19                                     {
20     DIR* dir = opendir(path);
21     if(!dir)
22         return remove(path);
23     struct dirent* file;
24     while((file = readdir(dir)))
25     {
26         if(!strcmp(file->d_name, ".") || !strcmp(file->d_name, ".."))
27             continue;
28         char path2[FILENAME_MAX];
29         sprintf(path2, FILENAME_MAX, "%s/%s", path, file->d_name);
30         int stat = rm_recursive(path2);
31         if(stat != 0)
32             return stat;
33     }
34     closedir(dir);
35     return remove(path);
36 }

```

Here is the caller graph for this function:



### 9.12.3.12 int rmdevpath ( usbdevice \* kb )

Definition at line 275 of file devnode.c.

References `_rmnotifynode()`, `ckb_info`, `ckb_warn`, `devpath`, `euid_guard_start`, `euid_guard_stop`, `INDEX_OF`, `usbdevice::infifo`, `keyboard`, `OUTFIFO_MAX`, and `rm_recursive()`.

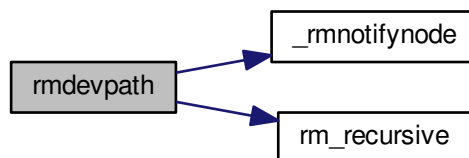
Referenced by `closeusb()`, and `quitWithLock()`.

```

275     {
276         euid_guard_start;
277         int index = INDEX_OF(kb, keyboard);
278         if(kb->infifo != 0) {
279             #ifdef OS_LINUX
280                 write(kb->infifo - 1, "\n", 1); // hack to prevent the FIFO thread from perma-blocking
281             #endif
282             close(kb->infifo - 1);
283             kb->infifo = 0;
284         }
285         for(int i = 0; i < OUTFIFO_MAX; i++)
286             _rmnotifynode(kb, i);
287         char path[strlen(devpath) + 2];
288         snprintf(path, sizeof(path), "%s%d", devpath, index);
289         if(rm_recursive(path) != 0 && errno != ENOENT) {
290             ckb_warn("Unable to delete %s: %s\n", path, strerror(errno));
291             euid_guard_stop;
292             return -1;
293         }
294         ckb_info("Removed device path %s\n", path);
295         euid_guard_stop;
296         return 0;
297     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.12.3.13 int rmnotifynode ( usbdevice \* kb, int notify )

Definition at line 129 of file devnode.c.

References `_rmnotifynode()`, `euid_guard_start`, and `euid_guard_stop`.

Referenced by `readcmd()`.

```

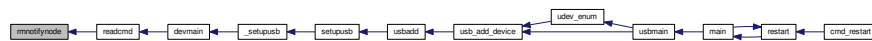
129                                     {
130     euid_guard_start;
131     int res = _rmnotifynode(kb, notify);
132     euid_guard_stop;
133     return res;
134 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.12.3.14 void updateconnected ( )

Definition at line 81 of file devnode.c.

References `_updateconnected()`, `euid_guard_start`, and `euid_guard_stop`.

Referenced by `_setupusb()`, and `closeusb()`.

```

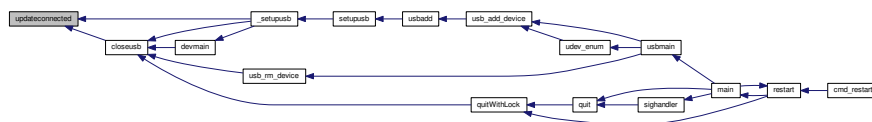
81     {
82     euid_guard_start;
83     _updateconnected();
84     euid_guard_stop;
85 }

```

Here is the call graph for this function:



Here is the caller graph for this function:







## Functions

- void `updateconnected` ()  
*Update the list of connected devices.*
- int `mkdevpath` (usbdevice \*kb)  
*Create a dev path for the keyboard at index. Returns 0 on success.*
- int `rmdevpath` (usbdevice \*kb)  
*Remove the dev path for the keyboard at index. Returns 0 on success.*
- int `mknotifynode` (usbdevice \*kb, int notify)  
*Creates a notification node for the specified keyboard.*
- int `rmnotifynode` (usbdevice \*kb, int notify)  
*Removes a notification node for the specified keyboard.*
- int `mkfwnode` (usbdevice \*kb)  
*Writes a keyboard's firmware version and poll rate to its device node.*
- void `readlines_ctx_init` (readlines\_ctx \*ctx)
- void `readlines_ctx_free` (readlines\_ctx ctx)
- unsigned `readlines` (int fd, readlines\_ctx ctx, const char \*\*input)

## Variables

- const char \*const `devpath`  
*Device path base ("/dev/input/ckb" or "/var/run/ckb")*
- long `gid`  
*Group ID for the control nodes. -1 to give read/write access to everybody.*

### 9.13.1 Macro Definition Documentation

#### 9.13.1.1 #define S\_CUSTOM (S\_IRUSR | S\_IWUSR | S\_IRGRP | S\_IWGRP)

Definition at line 17 of file devnode.h.

Referenced by `_mkdevpath()`.

#### 9.13.1.2 #define S\_CUSTOM\_R (S\_IRUSR | S\_IWUSR | S\_IRGRP)

Definition at line 18 of file devnode.h.

#### 9.13.1.3 #define S\_READ (S\_IRUSR | S\_IRGRP | S\_IROTH | S\_IWUSR)

Definition at line 15 of file devnode.h.

Referenced by `_mkdevpath()`.

#### 9.13.1.4 #define S\_READDIR (S\_IRWXU | S\_IRGRP | S\_IROTH | S\_IXGRP | S\_IXOTH)

Definition at line 14 of file devnode.h.

Referenced by `_mkdevpath()`.

#### 9.13.1.5 #define S\_READWRITE (S\_IRUSR | S\_IRGRP | S\_IROTH | S\_IWUSR | S\_IWGRP | S\_IWOTH)

Definition at line 16 of file devnode.h.

Referenced by `_mkdevpath()`.

## 9.13.2 Typedef Documentation

### 9.13.2.1 typedef struct \_readlines\_ctx\* readlines\_ctx

Definition at line 39 of file devnode.h.

## 9.13.3 Function Documentation

### 9.13.3.1 int mkdevpath ( usbdevice \* kb )

Definition at line 268 of file devnode.c.

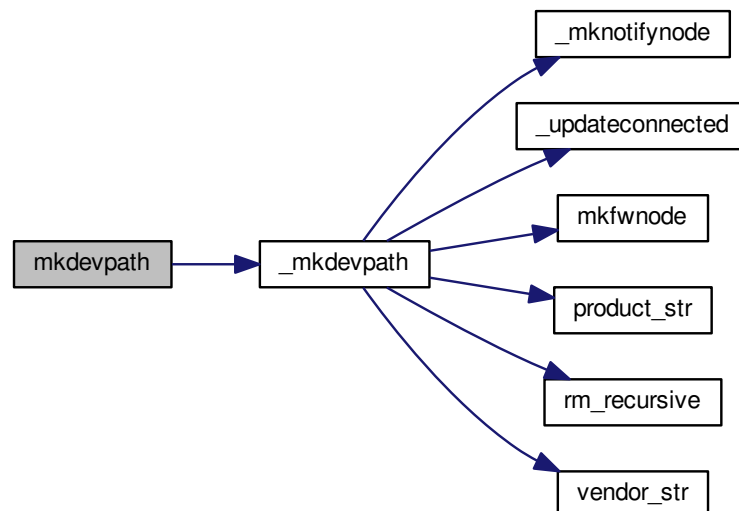
References `_mkdevpath()`, `euid_guard_start`, and `euid_guard_stop`.

Referenced by `_setupusb()`, and `main()`.

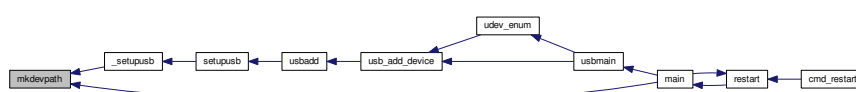
```

268                                     {
269     euid_guard_start;
270     int res = _mkdevpath(kb);
271     euid_guard_stop;
272     return res;
273 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.13.3.2 int mkfwnode ( usbdevice \* kb )

Definition at line 299 of file devnode.c.

References ckb\_warn, devpath, usbdevice::fwversion, gid, INDEX\_OF, keyboard, usbdevice::pollrate, and S\_GID\_READ.

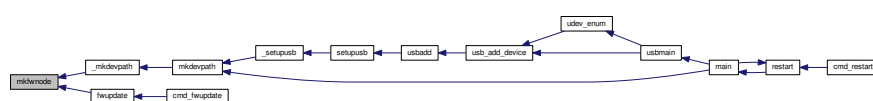
Referenced by `_mkdevpath()`, and `fwupdate()`.

```

299     {
300     int index = INDEX_OF(kb, keyboard);
301     char fwpath[strlen(devpath) + 12];
302     snprintf(fwpath, sizeof(fwpath), "%s%d/fwversion", devpath, index);
303     FILE* fwfile = fopen(fwpath, "w");
304     if(fwfile){
305         fprintf(fwfile, "%04x", kb->fwversion);
306         fputc('\n', fwfile);
307         fclose(fwfile);
308         chmod(fwpath, S_GID_READ);
309         if(gid >= 0)
310             chown(fwpath, 0, gid);
311     } else {
312         ckb_warn("Unable to create %s: %s\n", fwpath, strerror(errno));
313         remove(fwpath);
314         return -1;
315     }
316     char ppath[strlen(devpath) + 11];
317     snprintf(ppath, sizeof(ppath), "%s%d/pollrate", devpath, index);
318     FILE* pfile = fopen(ppath, "w");
319     if(pfile){
320         fprintf(pfile, "%d ms", kb->pollrate);
321         fputc('\n', pfile);
322         fclose(pfile);
323         chmod(ppath, S_GID_READ);
324         if(gid >= 0)
325             chown(ppath, 0, gid);
326     } else {
327         ckb_warn("Unable to create %s: %s\n", ppath, strerror(errno));
328         remove(ppath);
329         return -2;
330     }
331     return 0;
332 }

```

Here is the caller graph for this function:



### 9.13.3.3 int mknotifynode ( usbdevice \* kb, int notify )

Definition at line 108 of file devnode.c.

References `mknotifynode()`, `euid guard start`, and `euid guard stop`.

Referenced by readcmd().

```
108         {
109             euid_guard_start;
110             int res = _mknotifynode(kb, notify);
111             euid_guard_stop;
112             return res;
113     }
```

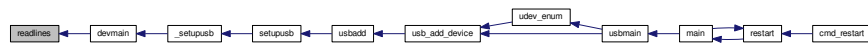


```

396     *input = 0;
397     if(length == MAX_BUFFER){
398         // Unless the buffer is completely full, in which case discard it
399         ckb_warn("Too much input (1MB). Dropping.\n");
400         return 0;
401     }
402     leftoverlen = ctx->leftoverlen = length;
403     return 0;
404 }
405 }

```

Here is the caller graph for this function:



#### 9.13.3.5 void readlines\_ctx\_free ( readlines\_ctx ctx )

Definition at line 348 of file devnode.c.

References `_readlines_ctx::buffer`.

Referenced by `devmain()`.

```

348                                     {
349     free(ctx->buffer);
350     free(ctx);
351 }

```

Here is the caller graph for this function:



#### 9.13.3.6 void readlines\_ctx\_init ( readlines\_ctx \* ctx )

Definition at line 341 of file devnode.c.

Referenced by `devmain()`.

```

341                                     {
342     // Allocate buffers to store data
343     *ctx = calloc(1, sizeof(struct _readlines_ctx));
344     int buffersize = (*ctx)->buffersize = 4095;
345     (*ctx)->buffer = malloc(buffersize + 1);
346 }

```

Here is the caller graph for this function:



### 9.13.3.7 int rmdevpath ( usbdevice \* kb )

Definition at line 275 of file devnode.c.

References `_rmnotifynode()`, `ckb_info`, `ckb_warn`, `devpath`, `euid_guard_start`, `euid_guard_stop`, `INDEX_OF`, `usbdevice::infifo`, `keyboard`, `OUTFIFO_MAX`, and `rm_recursive()`.

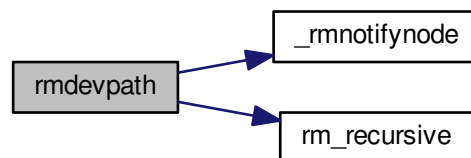
Referenced by `closeusb()`, and `quitWithLock()`.

```

275     {
276         euid_guard_start;
277         int index = INDEX_OF(kb, keyboard);
278         if(kb->infifo != 0) {
279             #ifdef OS_LINUX
280                 write(kb->infifo - 1, "\n", 1); // hack to prevent the FIFO thread from perma-blocking
281             #endif
282             close(kb->infifo - 1);
283             kb->infifo = 0;
284         }
285         for(int i = 0; i < OUTFIFO_MAX; i++)
286             _rmnotifynode(kb, i);
287         char path[strlen(devpath) + 2];
288         snprintf(path, sizeof(path), "%s%d", devpath, index);
289         if(rm_recursive(path) != 0 && errno != ENOENT) {
290             ckb_warn("Unable to delete %s: %s\n", path, strerror(errno));
291             euid_guard_stop;
292             return -1;
293         }
294         ckb_info("Removed device path %s\n", path);
295         euid_guard_stop;
296         return 0;
297     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.13.3.8 int rmnotifynode ( usbdevice \* kb, int notify )

Definition at line 129 of file devnode.c.

References `_rmnotifynode()`, `euid_guard_start`, and `euid_guard_stop`.

Referenced by `readcmd()`.

```

129                                     {
130     euid_guard_start;
131     int res = _rmnotifynode(kb, notify);
132     euid_guard_stop;
133     return res;
134 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.13.3.9 void updateconnected ( )

Definition at line 81 of file `devnode.c`.

References `_updateconnected()`, `euid_guard_start`, and `euid_guard_stop`.

Referenced by `_setupusb()`, and `closeusb()`.

```

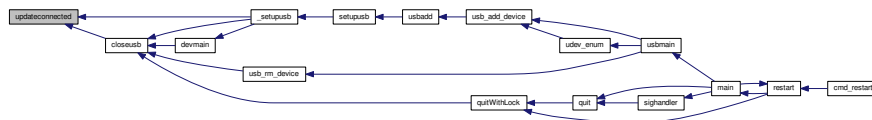
81     {
82     euid_guard_start;
83     _updateconnected();
84     euid_guard_stop;
85 }

```

Here is the call graph for this function:



Here is the caller graph for this function:







```

9      // If that doesn't work, scan single number
10     if(sscanf(values, "%hu", &x) == 1)
11         y = x;
12     else if(!strcmp(values, "off", 3))
13         // If the right side says "off", disable the level(s)
14         disable = 1;
15     else
16         // Otherwise, quit
17         return;
18 }
19 if((x == 0 || y == 0) && !disable)
20     return;
21 // Scan the left side for stage numbers (comma-separated)
22 int left = strlen(stages);
23 int position = 0, field = 0;
24 char stagename[3];
25 while(position < left && sscanf(stages + position, "%2[^,]\n", stagename, &field) == 1){
26     uchar stagenum;
27     if(sscanf(stagename, "%hhu", &stagenum) && stagenum < DPI_COUNT){
28         // Set DPI for this stage
29         if(disable){
30             mode->dpi.enabled &= ~(1 << stagenum);
31             mode->dpi.x[stagenum] = 0;
32             mode->dpi.y[stagenum] = 0;
33         } else {
34             mode->dpi.enabled |= 1 << stagenum;
35             mode->dpi.x[stagenum] = x;
36             mode->dpi.y[stagenum] = y;
37         }
38     }
39     if(stages[position += field] == ',')
40         position++;
41 }
42 }

```

#### 9.14.1.2 void cmd\_dpiset ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* stage )

Definition at line 44 of file dpi.c.

References `dpiset::current`, `usbmode::dpi`, and `DPI_COUNT`.

```

44                                     {
45     uchar stagenum;
46     if(sscanf(stage, "%hhu", &stagenum) != 1)
47         return;
48     if(stagenum > DPI_COUNT)
49         return;
50     mode->dpi.current = stagenum;
51 }

```

#### 9.14.1.3 void cmd\_lift ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* height )

Definition at line 53 of file dpi.c.

References `usbmode::dpi`, `dpiset::lift`, `LIFT_MAX`, and `LIFT_MIN`.

```

53                                     {
54     uchar heightnum;
55     if(sscanf(height, "%hhu", &heightnum) != 1)
56         return;
57     if(heightnum > LIFT_MAX || heightnum < LIFT_MIN)
58         return;
59     mode->dpi.lift = heightnum;
60 }

```

#### 9.14.1.4 void cmd\_snap ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* enable )

Definition at line 62 of file dpi.c.

References `usbmode::dpi`, and `dpiset::snap`.

```

62                                     {
63     if(!strcmp(enable, "on"))
64         mode->dpi.snap = 1;
65     if(!strcmp(enable, "off"))
66         mode->dpi.snap = 0;
67 }

```

#### 9.14.1.5 int loaddpi ( usbdevice \* kb, dpiset \* dpi, lighting \* light )

Definition at line 152 of file dpi.c.

References `lighting::b`, `ckb_err`, `dpiset::current`, `DPI_COUNT`, `dpiset::enabled`, `lighting::g`, `LED_MOUSE`, `dpiset::lift`, `LIFT_MAX`, `LIFT_MIN`, `MSG_SIZE`, `N_MOUSE_ZONES`, `lighting::r`, `dpiset::snap`, `usbrecv`, `dpiset::x`, and `dpiset::y`.

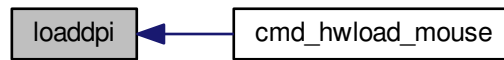
Referenced by `cmd_hwload_mouse()`.

```

152                                     {
153     // Ask for settings
154     uchar data_pkt[4][MSG_SIZE] = {
155         { 0x0e, 0x13, 0x05, 1, },
156         { 0x0e, 0x13, 0x02, 1, },
157         { 0x0e, 0x13, 0x03, 1, },
158         { 0x0e, 0x13, 0x04, 1, }
159     };
160     uchar in_pkt[4][MSG_SIZE];
161     for(int i = 0; i < 4; i++){
162         if(!usbrecv(kb, data_pkt[i], in_pkt[i]))
163             return -2;
164         if(memcmp(in_pkt[i], data_pkt[i], 4)){
165             ckb_err("Bad input header\n");
166             return -3;
167         }
168     }
169     // Copy data from device
170     dpi->enabled = in_pkt[0][4];
171     dpi->enabled &= (1 << DPI_COUNT) - 1;
172     dpi->current = in_pkt[1][4];
173     if(dpi->current >= DPI_COUNT)
174         dpi->current = 0;
175     dpi->lift = in_pkt[2][4];
176     if(dpi->lift < LIFT_MIN || dpi->lift > LIFT_MAX)
177         dpi->lift = LIFT_MIN;
178     dpi->snap = !!in_pkt[3][4];
179
180     // Get X/Y DPIs
181     for(int i = 0; i < DPI_COUNT; i++){
182         uchar data_pkt[MSG_SIZE] = { 0x0e, 0x13, 0xd0, 1 };
183         uchar in_pkt[MSG_SIZE];
184         data_pkt[2] |= i;
185         if(!usbrecv(kb, data_pkt, in_pkt))
186             return -2;
187         if(memcmp(in_pkt, data_pkt, 4)){
188             ckb_err("Bad input header\n");
189             return -3;
190         }
191         // Copy to profile
192         dpi->x[i] = *(ushort*)(in_pkt + 5);
193         dpi->y[i] = *(ushort*)(in_pkt + 7);
194         light->r[LED_MOUSE + N_MOUSE_ZONES + i] = in_pkt[9];
195         light->g[LED_MOUSE + N_MOUSE_ZONES + i] = in_pkt[10];
196         light->b[LED_MOUSE + N_MOUSE_ZONES + i] = in_pkt[11];
197     }
198     // Finished. Set SW DPI light to the current hardware level
199     light->r[LED_MOUSE + 2] = light->r[LED_MOUSE +
200     N_MOUSE_ZONES + dpi->current];
201     light->g[LED_MOUSE + 2] = light->g[LED_MOUSE +
202     N_MOUSE_ZONES + dpi->current];
203     light->b[LED_MOUSE + 2] = light->b[LED_MOUSE +
204     N_MOUSE_ZONES + dpi->current];
205     return 0;
206 }

```

Here is the caller graph for this function:



#### 9.14.1.6 `char* printdpi ( const dpiset * dpi, const usbdevice * kb )`

Definition at line 69 of file dpi.c.

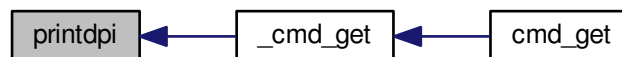
References `_readlines_ctx::buffer`, `DPI_COUNT`, `dpiset::enabled`, `dpiset::x`, and `dpiset::y`.

Referenced by `_cmd_get()`.

```

69                                     {
70     // Print all DPI settings
71     const int BUFFER_LEN = 100;
72     char* buffer = malloc(BUFFER_LEN);
73     int length = 0;
74     for(int i = 0; i < DPI_COUNT; i++){
75         // Print the stage number
76         int newlen = 0;
77         snprintf(buffer + length, BUFFER_LEN - length, length == 0 ? "%d\n" : " %d\n", i, &newlen);
78         length += newlen;
79         // Print the DPI settings
80         if(!(dpi->enabled & (1 << i)))
81             snprintf(buffer + length, BUFFER_LEN - length, ":off\n", &newlen);
82         else
83             snprintf(buffer + length, BUFFER_LEN - length, ":%u,%u\n", dpi->x[i], dpi->
84 y[i], &newlen);
85         length += newlen;
86     }
87     return buffer;
88 }
  
```

Here is the caller graph for this function:



#### 9.14.1.7 `int savedpi ( usbdevice * kb, dpiset * dpi, lighting * light )`

Definition at line 124 of file dpi.c.

References `lighting::b`, `dpiset::current`, `DPI_COUNT`, `dpiset::enabled`, `lighting::g`, `LED_MOUSE`, `dpiset::lift`, `MSG_SIZE`, `N_MOUSE_ZONES`, `lighting::r`, `dpiset::snap`, `usbsend`, `dpiset::x`, and `dpiset::y`.

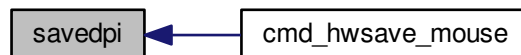
Referenced by `cmd_hwsave_mouse()`.

```

124                                     {
125     // Send X/Y DPIs
126     for(int i = 0; i < DPI_COUNT; i++){
127         uchar data_pkt[MSG_SIZE] = { 0x07, 0x13, 0xd0, 1 };
128         data_pkt[2] |= i;
129         *(ushort*)(data_pkt + 5) = dpi->x[i];
130         *(ushort*)(data_pkt + 7) = dpi->y[i];
131         // Save the RGB value for this setting too
132         data_pkt[9] = light->r[LED_MOUSE + N_MOUSE_ZONES + i];
133         data_pkt[10] = light->g[LED_MOUSE + N_MOUSE_ZONES + i];
134         data_pkt[11] = light->b[LED_MOUSE + N_MOUSE_ZONES + i];
135         if(!usbSend(kb, data_pkt, 1))
136             return -1;
137     }
138
139     // Send settings
140     uchar data_pkt[4][MSG_SIZE] = {
141         { 0x07, 0x13, 0x05, 1, dpi->enabled },
142         { 0x07, 0x13, 0x02, 1, dpi->current },
143         { 0x07, 0x13, 0x03, 1, dpi->lift },
144         { 0x07, 0x13, 0x04, 1, dpi->snap, 0x05 }
145     };
146     if(!usbSend(kb, data_pkt[0], 4))
147         return -2;
148     // Finished
149     return 0;
150 }

```

Here is the caller graph for this function:



#### 9.14.1.8 int updatedpi ( usbdevice \* kb, int force )

Definition at line 89 of file dpi.c.

References `usbdevice::active`, `dpiset::current`, `usbprofile::currentmode`, `usbmode::dpi`, `DPI_COUNT`, `dpiset::enabled`, `dpiset::forceupdate`, `usbprofile::lastdpi`, `dpiset::lift`, `MSG_SIZE`, `usbdevice::profile`, `dpiset::snap`, `usbSend`, `dpiset::x`, and `dpiset::y`.

```

89                                     {
90     if(!kb->active)
91         return 0;
92     dpiset* lastdpi = &kb->profile->lastdpi;
93     dpiset* newdpi = &kb->profile->currentmode->dpi;
94     // Don't do anything if the settings haven't changed
95     if(!force && !lastdpi->forceupdate && !newdpi->forceupdate
96         && !memcmp(lastdpi, newdpi, sizeof(dpi)))
97         return 0;
98     lastdpi->forceupdate = newdpi->forceupdate = 0;
99
100     // Send X/Y DPIs
101     for(int i = 0; i < DPI_COUNT; i++){
102         uchar data_pkt[MSG_SIZE] = { 0x07, 0x13, 0xd0, 0 };
103         data_pkt[2] |= i;
104         *(ushort*)(data_pkt + 5) = newdpi->x[i];
105         *(ushort*)(data_pkt + 7) = newdpi->y[i];
106         if(!usbSend(kb, data_pkt, 1))
107             return -1;
108     }
109
110     // Send settings
111     uchar data_pkt[4][MSG_SIZE] = {
112         { 0x07, 0x13, 0x05, 0, newdpi->enabled },
113         { 0x07, 0x13, 0x02, 0, newdpi->current },
114         { 0x07, 0x13, 0x03, 0, newdpi->lift },

```

```

115     { 0x07, 0x13, 0x04, 0, newdpi->snap, 0x05 }
116 };
117 if(!usbSend(kb, data_pkt[0], 4))
118     return -2;
119 // Finished
120 memcpy(lastdpi, newdpi, sizeof(dpiset));
121 return 0;
122 }

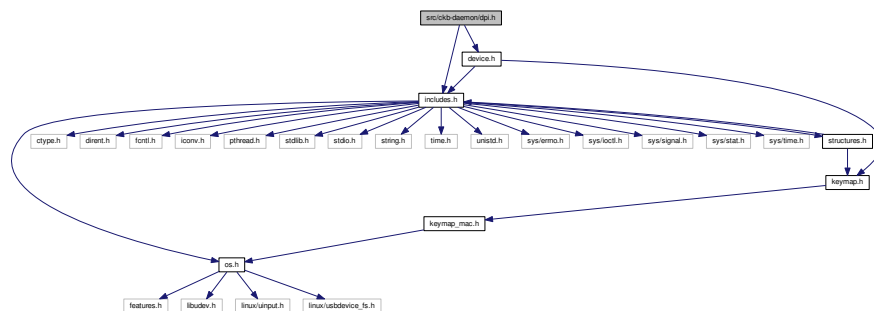
```

## 9.15 src/ckb-daemon/dpi.h File Reference

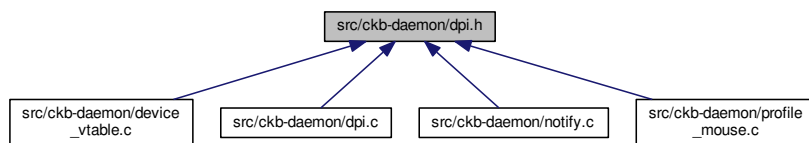
```
#include "includes.h"
```

```
#include "device.h"
```

Include dependency graph for dpi.h:



This graph shows which files directly or indirectly include this file:



## Functions

- int [updatedpi](#) (usbdevice \*kb, int force)
- int [savedpi](#) (usbdevice \*kb, dpiset \*dpi, lighting \*light)
- int [loaddpi](#) (usbdevice \*kb, dpiset \*dpi, lighting \*light)
- char \* [printdpi](#) (const dpiset \*dpi, const usbdevice \*kb)
- void [cmd\\_dpi](#) (usbdevice \*kb, usbmode \*mode, int dummy, const char \*stages, const char \*values)
- void [cmd\\_dpiset](#) (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*stage)
- void [cmd\\_lift](#) (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*height)
- void [cmd\\_snap](#) (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*enable)

### 9.15.1 Function Documentation

9.15.1.1 void [cmd\\_dpi](#) ( usbdevice \* kb, usbmode \* mode, int dummy, const char \* stages, const char \* values )

Definition at line 4 of file dpi.c.

References `usbmode::dpi`, `DPI_COUNT`, `dpiset::enabled`, `dpiset::x`, and `dpiset::y`.

```

4                                     {
5     int disable = 0;
6     ushort x, y;
7     // Try to scan X,Y values
8     if(sscanf(values, "%hu,%hu", &x, &y) != 2){
9         // If that doesn't work, scan single number
10        if(sscanf(values, "%hu", &x) == 1)
11            y = x;
12        else if(!strcmp(values, "off", 3))
13            // If the right side says "off", disable the level(s)
14            disable = 1;
15        else
16            // Otherwise, quit
17            return;
18    }
19    if((x == 0 || y == 0) && !disable)
20        return;
21    // Scan the left side for stage numbers (comma-separated)
22    int left = strlen(stages);
23    int position = 0, field = 0;
24    char stagename[3];
25    while(position < left && sscanf(stages + position, "%2[^,]\n", stagename, &field) == 1){
26        uchar stagenum;
27        if(sscanf(stagename, "%hhu", &stagenum) && stagenum < DPI_COUNT){
28            // Set DPI for this stage
29            if(disable){
30                mode->dpi.enabled &= ~(1 << stagenum);
31                mode->dpi.x[stagenum] = 0;
32                mode->dpi.y[stagenum] = 0;
33            } else {
34                mode->dpi.enabled |= 1 << stagenum;
35                mode->dpi.x[stagenum] = x;
36                mode->dpi.y[stagenum] = y;
37            }
38        }
39        if(stages[position += field] == ',')
40            position++;
41    }
42 }
```

#### 9.15.1.2 void cmd\_dpisel ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* stage )

Definition at line 44 of file dpi.c.

References `dpiset::current`, `usbmode::dpi`, and `DPI_COUNT`.

```

44                                     {
45     uchar stagenum;
46     if(sscanf(stage, "%hhu", &stagenum) != 1)
47         return;
48     if(stagenum > DPI_COUNT)
49         return;
50     mode->dpi.current = stagenum;
51 }
```

#### 9.15.1.3 void cmd\_lift ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* height )

Definition at line 53 of file dpi.c.

References `usbmode::dpi`, `dpiset::lift`, `LIFT_MAX`, and `LIFT_MIN`.

```

53                                     {
54     uchar heightnum;
55     if(sscanf(height, "%hhu", &heightnum) != 1)
56         return;
57     if(heightnum > LIFT_MAX || heightnum < LIFT_MIN)
58         return;
59     mode->dpi.lift = heightnum;
60 }
```

#### 9.15.1.4 void cmd\_snap ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* enable )

Definition at line 62 of file dpi.c.

References `usbmode::dpi`, and `dpiset::snap`.

```

62                                     {
63     if (!strcmp(enable, "on"))
64         mode->dpi.snap = 1;
65     if (!strcmp(enable, "off"))
66         mode->dpi.snap = 0;
67 }
```

#### 9.15.1.5 int loaddpi ( usbdevice \* kb, dpiset \* dpi, lighting \* light )

Definition at line 152 of file dpi.c.

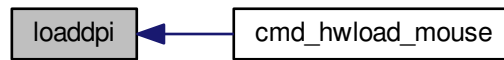
References `lighting::b`, `ckb_err`, `dpiset::current`, `DPI_COUNT`, `dpiset::enabled`, `lighting::g`, `LED_MOUSE`, `dpiset::lift`, `LIFT_MAX`, `LIFT_MIN`, `MSG_SIZE`, `N_MOUSE_ZONES`, `lighting::r`, `dpiset::snap`, `usbrecv`, `dpiset::x`, and `dpiset::y`.

Referenced by `cmd_hload_mouse()`.

```

152                                     {
153     // Ask for settings
154     uchar data_pkt[4][MSG_SIZE] = {
155         { 0x0e, 0x13, 0x05, 1, },
156         { 0x0e, 0x13, 0x02, 1, },
157         { 0x0e, 0x13, 0x03, 1, },
158         { 0x0e, 0x13, 0x04, 1, }
159     };
160     uchar in_pkt[4][MSG_SIZE];
161     for(int i = 0; i < 4; i++){
162         if(!usbrecv(kb, data_pkt[i], in_pkt[i]))
163             return -2;
164         if(memcmp(in_pkt[i], data_pkt[i], 4)){
165             ckb_err("Bad input header\n");
166             return -3;
167         }
168     }
169     // Copy data from device
170     dpi->enabled = in_pkt[0][4];
171     dpi->enabled &= (1 << DPI_COUNT) - 1;
172     dpi->current = in_pkt[1][4];
173     if(dpi->current >= DPI_COUNT)
174         dpi->current = 0;
175     dpi->lift = in_pkt[2][4];
176     if(dpi->lift < LIFT_MIN || dpi->lift > LIFT_MAX)
177         dpi->lift = LIFT_MIN;
178     dpi->snap = !!in_pkt[3][4];
179
180     // Get X/Y DPIs
181     for(int i = 0; i < DPI_COUNT; i++){
182         uchar data_pkt[MSG_SIZE] = { 0x0e, 0x13, 0xd0, 1 };
183         uchar in_pkt[MSG_SIZE];
184         data_pkt[2][4] = i;
185         if(!usbrecv(kb, data_pkt, in_pkt))
186             return -2;
187         if(memcmp(in_pkt, data_pkt, 4)){
188             ckb_err("Bad input header\n");
189             return -3;
190         }
191         // Copy to profile
192         dpi->x[i] = *(ushort*)(in_pkt + 5);
193         dpi->y[i] = *(ushort*)(in_pkt + 7);
194         light->r[LED_MOUSE + N_MOUSE_ZONES + i] = in_pkt[9];
195         light->g[LED_MOUSE + N_MOUSE_ZONES + i] = in_pkt[10];
196         light->b[LED_MOUSE + N_MOUSE_ZONES + i] = in_pkt[11];
197     }
198     // Finished. Set SW DPI light to the current hardware level
199     light->r[LED_MOUSE + 2] = light->r[LED_MOUSE +
200     N_MOUSE_ZONES + dpi->current];
201     light->g[LED_MOUSE + 2] = light->g[LED_MOUSE +
202     N_MOUSE_ZONES + dpi->current];
203     light->b[LED_MOUSE + 2] = light->b[LED_MOUSE +
204     N_MOUSE_ZONES + dpi->current];
205     return 0;
206 }
```

Here is the caller graph for this function:



#### 9.15.1.6 `char* printdpi ( const dpiset * dpi, const usbdevice * kb )`

Definition at line 69 of file `dpi.c`.

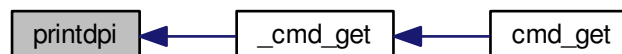
References `_readlines_ctx::buffer`, `DPI_COUNT`, `dpiset::enabled`, `dpiset::x`, and `dpiset::y`.

Referenced by `_cmd_get()`.

```

69                                     {
70     // Print all DPI settings
71     const int BUFFER_LEN = 100;
72     char* buffer = malloc(BUFFER_LEN);
73     int length = 0;
74     for(int i = 0; i < DPI_COUNT; i++){
75         // Print the stage number
76         int newlen = 0;
77         snprintf(buffer + length, BUFFER_LEN - length, length == 0 ? "%d\n" : " %d\n", i, &newlen);
78         length += newlen;
79         // Print the DPI settings
80         if(!(dpi->enabled & (1 << i)))
81             snprintf(buffer + length, BUFFER_LEN - length, ":off\n", &newlen);
82         else
83             snprintf(buffer + length, BUFFER_LEN - length, ":%u,%u\n", dpi->x[i], dpi->
y[i], &newlen);
84         length += newlen;
85     }
86     return buffer;
87 }
  
```

Here is the caller graph for this function:



#### 9.15.1.7 `int savedpi ( usbdevice * kb, dpiset * dpi, lighting * light )`

Definition at line 124 of file `dpi.c`.

References `lighting::b`, `dpiset::current`, `DPI_COUNT`, `dpiset::enabled`, `lighting::g`, `LED_MOUSE`, `dpiset::lift`, `MSG_SIZE`, `N_MOUSE_ZONES`, `lighting::r`, `dpiset::snap`, `usbsend`, `dpiset::x`, and `dpiset::y`.

Referenced by `cmd_hwsave_mouse()`.

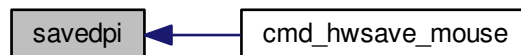


```

124                                     {
125     // Send X/Y DPIs
126     for(int i = 0; i < DPI_COUNT; i++){
127         uchar data_pkt[MSG_SIZE] = { 0x07, 0x13, 0xd0, 1 };
128         data_pkt[2] |= i;
129         *(ushort*)(data_pkt + 5) = dpi->x[i];
130         *(ushort*)(data_pkt + 7) = dpi->y[i];
131         // Save the RGB value for this setting too
132         data_pkt[9] = light->r[LED_MOUSE + N_MOUSE_ZONES + i];
133         data_pkt[10] = light->g[LED_MOUSE + N_MOUSE_ZONES + i];
134         data_pkt[11] = light->b[LED_MOUSE + N_MOUSE_ZONES + i];
135         if(!usbsend(kb, data_pkt, 1))
136             return -1;
137     }
138
139     // Send settings
140     uchar data_pkt[4][MSG_SIZE] = {
141         { 0x07, 0x13, 0x05, 1, dpi->enabled },
142         { 0x07, 0x13, 0x02, 1, dpi->current },
143         { 0x07, 0x13, 0x03, 1, dpi->lift },
144         { 0x07, 0x13, 0x04, 1, dpi->snap, 0x05 }
145     };
146     if(!usbsend(kb, data_pkt[0], 4))
147         return -2;
148     // Finished
149     return 0;
150 }

```

Here is the caller graph for this function:



#### 9.15.1.8 int updatedpi ( usbdevice \* kb, int force )

Definition at line 89 of file dpi.c.

References `usbdevice::active`, `dpiset::current`, `usbprofile::currentmode`, `usbmode::dpi`, `DPI_COUNT`, `dpiset::enabled`, `dpiset::forceupdate`, `usbprofile::lastdpi`, `dpiset::lift`, `MSG_SIZE`, `usbdevice::profile`, `dpiset::snap`, `usbsend`, `dpiset::x`, and `dpiset::y`.

```

89                                     {
90     if(!kb->active)
91         return 0;
92     dpiset* lastdpi = &kb->profile->lastdpi;
93     dpiset* newdpi = &kb->profile->currentmode->dpi;
94     // Don't do anything if the settings haven't changed
95     if(!force && !lastdpi->forceupdate && !newdpi->forceupdate
96         && !memcmp(lastdpi, newdpi, sizeof(dpi)))
97         return 0;
98     lastdpi->forceupdate = newdpi->forceupdate = 0;
99
100     // Send X/Y DPIs
101     for(int i = 0; i < DPI_COUNT; i++){
102         uchar data_pkt[MSG_SIZE] = { 0x07, 0x13, 0xd0, 0 };
103         data_pkt[2] |= i;
104         *(ushort*)(data_pkt + 5) = newdpi->x[i];
105         *(ushort*)(data_pkt + 7) = newdpi->y[i];
106         if(!usbsend(kb, data_pkt, 1))
107             return -1;
108     }
109
110     // Send settings
111     uchar data_pkt[4][MSG_SIZE] = {
112         { 0x07, 0x13, 0x05, 0, newdpi->enabled },
113         { 0x07, 0x13, 0x02, 0, newdpi->current },
114         { 0x07, 0x13, 0x03, 0, newdpi->lift },

```

```

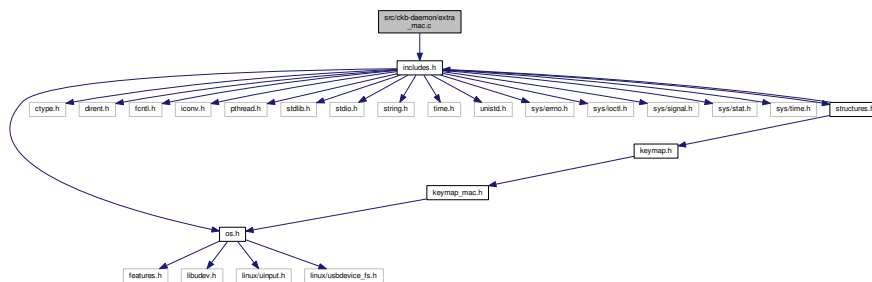
115     { 0x07, 0x13, 0x04, 0, newdpi->snap, 0x05 }
116 };
117 if(!usb_send(kb, data_pkt[0], 4))
118     return -2;
119 // Finished
120 memcpy(lastdpi, newdpi, sizeof(dpiset));
121 return 0;
122 }

```

## 9.16 src/ckb-daemon/extra\_mac.c File Reference

```
#include "includes.h"
```

Include dependency graph for extra\_mac.c:



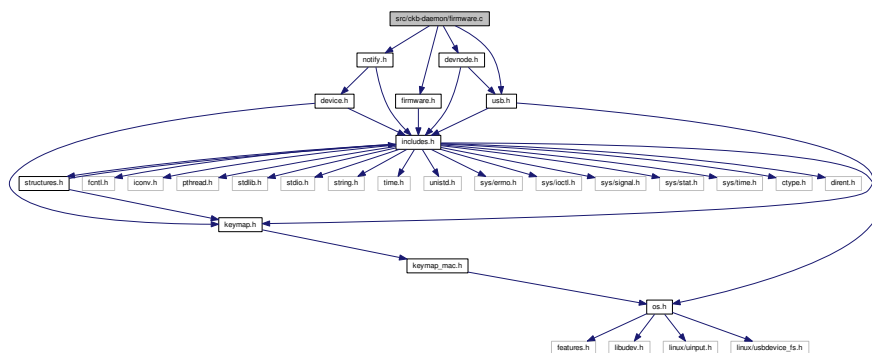
## 9.17 src/ckb-daemon/firmware.c File Reference

```

#include "devnode.h"
#include "firmware.h"
#include "notify.h"
#include "usb.h"

```

Include dependency graph for firmware.c:



## Macros

- #define FW\_OK 0
- #define FW\_NOFILE -1
- #define FW\_WRONGDEV -2
- #define FW\_USBFAIL -3
- #define FW\_MAXSIZE (255 \* 256)

## Functions

- int [getfwversion](#) ([usbdevice](#) \*kb)
- int [fwupdate](#) ([usbdevice](#) \*kb, const char \*path, int nnumber)
- int [cmd\\_fwupdate](#) ([usbdevice](#) \*kb, [usbmode](#) \*dummy1, int nnumber, int dummy2, const char \*path)

### 9.17.1 Macro Definition Documentation

#### 9.17.1.1 #define FW\_MAXSIZE (255 \* 256)

Definition at line 51 of file firmware.c.

Referenced by [fwupdate\(\)](#).

#### 9.17.1.2 #define FW\_NOFILE -1

Definition at line 7 of file firmware.c.

Referenced by [cmd\\_fwupdate\(\)](#), and [fwupdate\(\)](#).

#### 9.17.1.3 #define FW\_OK 0

Definition at line 6 of file firmware.c.

Referenced by [cmd\\_fwupdate\(\)](#), and [fwupdate\(\)](#).

#### 9.17.1.4 #define FW\_USBFAIL -3

Definition at line 9 of file firmware.c.

Referenced by [cmd\\_fwupdate\(\)](#), and [fwupdate\(\)](#).

#### 9.17.1.5 #define FW\_WRONGDEV -2

Definition at line 8 of file firmware.c.

Referenced by [cmd\\_fwupdate\(\)](#), and [fwupdate\(\)](#).

### 9.17.2 Function Documentation

#### 9.17.2.1 int cmd\_fwupdate ( [usbdevice](#) \* kb, [usbmode](#) \* dummy1, int nnumber, int dummy2, const char \* path )

Definition at line 154 of file firmware.c.

References [FEAT\\_FWUPDATE](#), [FW\\_NOFILE](#), [FW\\_OK](#), [FW\\_USBFAIL](#), [FW\\_WRONGDEV](#), [fwupdate\(\)](#), [HAS\\_FEATURES](#), [nprintf\(\)](#), and [usb\\_tryreset\(\)](#).

```

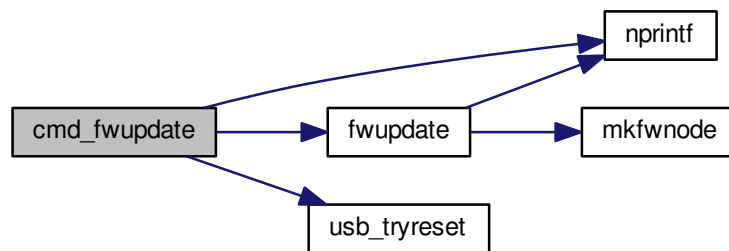
154
155     if(!HAS_FEATURES(kb, FEAT_FWUPDATE))
156         return 0;
157     // Update the firmware
158     int ret = fwupdate(kb, path, nnumber);
159     while(ret == FW_USBFAIL){
160         // Try to reset the device if it fails
161         if(usb_tryreset(kb))
162             break;
163         ret = fwupdate(kb, path, nnumber);
164     }
165     switch(ret){
166     case FW_OK:
167         nprintf(kb, nnumber, 0, "fwupdate %s ok\n", path);
168     }
```

```

168         break;
169     case FW_NOFILE:
170     case FW_WRONGDEV:
171         nprintf(kb, nnumber, 0, "fwupdate %s invalid\n", path);
172         break;
173     case FW_USBFAIL:
174         nprintf(kb, nnumber, 0, "fwupdate %s fail\n", path);
175         return -1;
176     }
177     return 0;
178 }

```

Here is the call graph for this function:



#### 9.17.2.2 int fwupdate ( usbdevice \* kb, const char \* path, int nnumber )

Definition at line 55 of file firmware.c.

References ckb\_err, ckb\_info, FW\_MAXSIZE, FW\_NOFILE, FW\_OK, FW\_USBFAIL, FW\_WRONGDEV, usbdevice::fwversion, mkfwnode(), MSG\_SIZE, nprintf(), usbdevice::product, usbdevice::usbdelay, usbdevice::usbdevice::vendor.

Referenced by cmd\_fwupdate().

```

55     {
56         // Read the firmware from the given path
57         char* fwdata = calloc(1, FW_MAXSIZE + 256);
58         int fd = open(path, O_RDONLY);
59         if(fd == -1){
60             ckb_err("Failed to open firmware file %s: %s\n", path, strerror(errno));
61             return FW_NOFILE;
62         }
63         ssize_t length = read(fd, fwdata, FW_MAXSIZE + 1);
64         if(length <= 0x108 || length > FW_MAXSIZE){
65             ckb_err("Failed to read firmware file %s: %s\n", path, length <= 0 ? strerror(errno) : "
Wrong size");
66             close(fd);
67             return FW_NOFILE;
68         }
69         close(fd);
70
71         short vendor, product, version;
72         // Copy the vendor ID, product ID, and version from the firmware file
73         memcpy(&vendor, fwdata + 0x102, 2);
74         memcpy(&product, fwdata + 0x104, 2);
75         memcpy(&version, fwdata + 0x106, 2);
76         // Check against the actual device
77         if(vendor != kb->vendor || product != kb->product){
78             ckb_err("Firmware file %s doesn't match device (V: %04x P: %04x)\n", path, vendor, product);
79             return FW_WRONGDEV;
80         }
81         ckb_info("Loading firmware version %04x from %s\n", version, path);
82         nprintf(kb, nnumber, 0, "fwupdate %s 0/%d\n", path, (int)length);
83         // Force the device to 10ms delay (we need to deliver packets very slowly to make sure it doesn't get
overwhelmed)

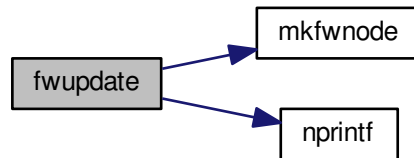
```

```

84     kb->usbdelay = 10;
85     // Send the firmware messages (256 bytes at a time)
86     uchar data_pkt[7][MSG_SIZE] = {
87         { 0x07, 0x0c, 0xf0, 0x01, 0 },
88         { 0x07, 0x0d, 0xf0, 0 },
89         { 0x7f, 0x01, 0x3c, 0 },
90         { 0x7f, 0x02, 0x3c, 0 },
91         { 0x7f, 0x03, 0x3c, 0 },
92         { 0x7f, 0x04, 0x3c, 0 },
93         { 0x7f, 0x05, 0x10, 0 }
94     };
95     int output = 0, last = 0;
96     int index = 0;
97     while(output < length){
98         int npackets = 1;
99         // Packet 1: data position
100        data_pkt[1][6] = index++;
101        while(output < length){
102            npackets++;
103            if(npackets != 6){
104                // Packets 2-5: 60 bytes of data
105                memcpy(data_pkt[npackets] + 4, fwdata + output, 60);
106                last = output;
107                output += 60;
108            } else {
109                // Packet 6: 16 bytes
110                memcpy(data_pkt[npackets] + 4, fwdata + output, 16);
111                last = output;
112                output += 16;
113                break;
114            }
115        }
116        if(index == 1){
117            if(!usb_send(kb, data_pkt[0], 1)){
118                ckb_err("Firmware update failed\n");
119                return FW_USBFAIL;
120            }
121            // The above packet can take a lot longer to process, so wait for a while
122            sleep(3);
123            if(!usb_send(kb, data_pkt[2], npackets - 1)){
124                ckb_err("Firmware update failed\n");
125                return FW_USBFAIL;
126            }
127        } else {
128            // If the output ends here, set the length byte appropriately
129            if(output >= length)
130                data_pkt[npackets][2] = length - last;
131            if(!usb_send(kb, data_pkt[1], npackets)){
132                ckb_err("Firmware update failed\n");
133                return FW_USBFAIL;
134            }
135        }
136        nprintf(kb, nnumber, 0, "fwupdate %s %d/%d\n", path, output, (int)length);
137    }
138    // Send the final pair of messages
139    uchar data_pkt2[2][MSG_SIZE] = {
140        { 0x07, 0x0d, 0xf0, 0x00, 0x00, 0x00, index },
141        { 0x07, 0x02, 0xf0, 0 }
142    };
143    if(!usb_send(kb, data_pkt2[0], 2)){
144        ckb_err("Firmware update failed\n");
145        return FW_USBFAIL;
146    }
147    // Updated successfully
148    kb->fwversion = version;
149    mkfwnode(kb);
150    ckb_info("Firmware update complete\n");
151    return FW_OK;
152 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.17.2.3 int getfwversion ( usbdevice \* kb )

Definition at line 11 of file firmware.c.

References `ckb_err`, `ckb_warn`, `FEAT_POLLRATE`, `usbdevice::features`, `usbdevice::fwversion`, `MSG_SIZE`, `usbdevice::pollrate`, `usbdevice::product`, `usbrecv`, and `usbdevice::vendor`.

Referenced by `_start_dev()`.

```

11      {
12      // Ask board for firmware info
13      uchar data_pkt[MSG_SIZE] = { 0x0e, 0x01, 0 };
14      uchar in_pkt[MSG_SIZE];
15      if(!usbrecv(kb, data_pkt, in_pkt))
16          return -1;
17      if(in_pkt[0] != 0x0e || in_pkt[1] != 0x01){
18          ckb_err("Bad input header\n");
19          return -1;
20      }
21      short vendor, product, version, bootloader;
22      // Copy the vendor ID, product ID, version, and poll rate from the firmware data
23      memcpy(&version, in_pkt + 8, 2);
24      memcpy(&bootloader, in_pkt + 10, 2);
25      memcpy(&vendor, in_pkt + 12, 2);
26      memcpy(&product, in_pkt + 14, 2);
27      char poll = in_pkt[16];
28      if(poll <= 0){
29          poll = -1;
30          kb->features &= ~FEAT_POLLRATE;
31      }
32      // Print a warning if the message didn't match the expected data
33      if(vendor != kb->vendor)
34          ckb_warn("Got vendor ID %04x (expected %04x)\n", vendor, kb->
vendor);
35      if(product != kb->product)
36          ckb_warn("Got product ID %04x (expected %04x)\n", product, kb->
product);
37      // Set firmware version and poll rate
38      if(version == 0 || bootloader == 0){

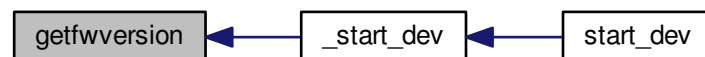
```

```

39     // Needs firmware update
40     kb->fwversion = 0;
41     kb->pollrate = -1;
42 } else {
43     if (version != kb->fwversion && kb->fwversion != 0)
44         ckb_warn("Got firmware version %04x (expected %04x)\n", version, kb->
fwversion);
45     kb->fwversion = version;
46     kb->pollrate = poll;
47 }
48 return 0;
49 }

```

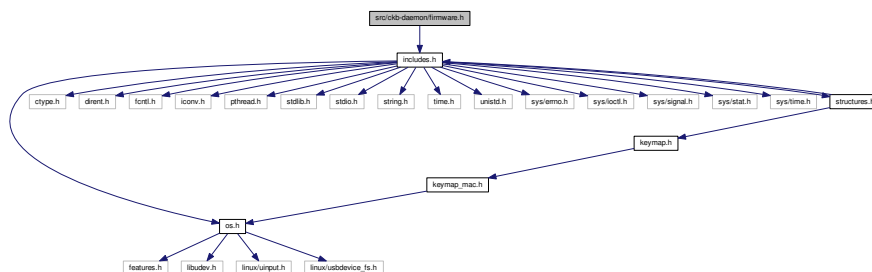
Here is the caller graph for this function:



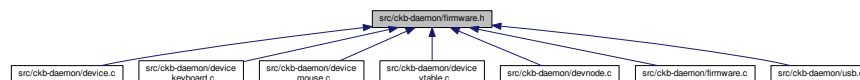
## 9.18 src/ckb-daemon/firmware.h File Reference

```
#include "includes.h"
```

Include dependency graph for firmware.h:



This graph shows which files directly or indirectly include this file:



## Functions

- `int getfwversion (usbdevice *kb)`
- `int cmd_fwupdate (usbdevice *kb, usbmode *dummy1, int nnumber, int dummy2, const char *path)`

### 9.18.1 Function Documentation

### 9.18.1.1 `int cmd_fwupdate ( usbdevice * kb, usbmode * dummy1, int nnumber, int dummy2, const char * path )`

Definition at line 154 of file firmware.c.

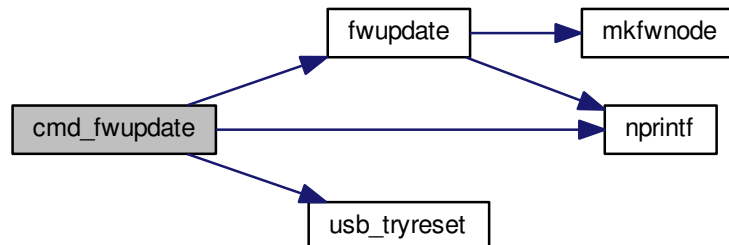
References `FEAT_FWUPDATE`, `FW_NOFILE`, `FW_OK`, `FW_USBFAIL`, `FW_WRONGDEV`, `fwupdate()`, `HAS_FEATURES`, `nprintf()`, and `usb_tryreset()`.

```

154
155     if(!HAS_FEATURES(kb, FEAT_FWUPDATE))
156         return 0;
157     // Update the firmware
158     int ret = fwupdate(kb, path, nnumber);
159     while(ret == FW_USBFAIL){
160         // Try to reset the device if it fails
161         if(usb_tryreset(kb))
162             break;
163         ret = fwupdate(kb, path, nnumber);
164     }
165     switch(ret){
166     case FW_OK:
167         nprintf(kb, nnumber, 0, "fwupdate %s ok\n", path);
168         break;
169     case FW_NOFILE:
170     case FW_WRONGDEV:
171         nprintf(kb, nnumber, 0, "fwupdate %s invalid\n", path);
172         break;
173     case FW_USBFAIL:
174         nprintf(kb, nnumber, 0, "fwupdate %s fail\n", path);
175         return -1;
176     }
177     return 0;
178 }

```

Here is the call graph for this function:



### 9.18.1.2 `int getfwversion ( usbdevice * kb )`

Definition at line 11 of file firmware.c.

References `ckb_err`, `ckb_warn`, `FEAT_POLLRATE`, `usbdevice::features`, `usbdevice::fwversion`, `MSG_SIZE`, `usbdevice::pollrate`, `usbdevice::product`, `usbrecv`, and `usbdevice::vendor`.

Referenced by `_start_dev()`.

```

11
12     // Ask board for firmware info
13     uchar data_pkt[MSG_SIZE] = { 0x0e, 0x01, 0 };
14     uchar in_pkt[MSG_SIZE];
15     if(!usbrecv(kb, data_pkt, in_pkt))
16         return -1;
17     if(in_pkt[0] != 0x0e || in_pkt[1] != 0x01){
18         ckb_err("Bad input header\n");
19         return -1;

```

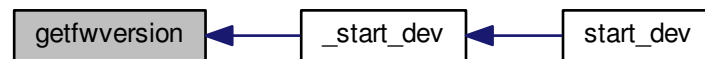


```

20     }
21     short vendor, product, version, bootloader;
22     // Copy the vendor ID, product ID, version, and poll rate from the firmware data
23     memcpy(&version, in_pkt + 8, 2);
24     memcpy(&bootloader, in_pkt + 10, 2);
25     memcpy(&vendor, in_pkt + 12, 2);
26     memcpy(&product, in_pkt + 14, 2);
27     char poll = in_pkt[16];
28     if(poll <= 0){
29         poll = -1;
30         kb->features &= ~FEAT_POLLRATE;
31     }
32     // Print a warning if the message didn't match the expected data
33     if(vendor != kb->vendor)
34         ckb_warn("Got vendor ID %04x (expected %04x)\n", vendor, kb->
vendor);
35     if(product != kb->product)
36         ckb_warn("Got product ID %04x (expected %04x)\n", product, kb->
product);
37     // Set firmware version and poll rate
38     if(version == 0 || bootloader == 0){
39         // Needs firmware update
40         kb->fwversion = 0;
41         kb->pollrate = -1;
42     } else {
43         if(version != kb->fwversion && kb->fwversion != 0)
44             ckb_warn("Got firmware version %04x (expected %04x)\n", version, kb->
fwversion);
45         kb->fwversion = version;
46         kb->pollrate = poll;
47     }
48     return 0;
49 }

```

Here is the caller graph for this function:



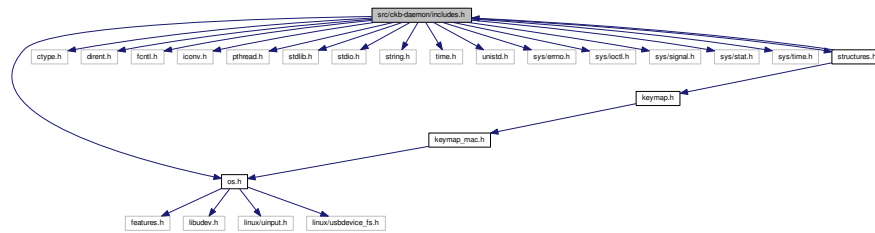
## 9.19 src/ckb-daemon/includes.h File Reference

```

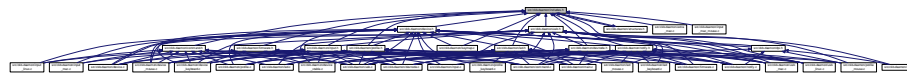
#include "os.h"
#include <ctype.h>
#include <dirent.h>
#include <fcntl.h>
#include <iconv.h>
#include <pthread.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <time.h>
#include <unistd.h>
#include <sys/errno.h>
#include <sys/ioctl.h>
#include <sys/signal.h>
#include <sys/stat.h>
#include <sys/time.h>
#include "structures.h"

```

Include dependency graph for includes.h:



This graph shows which files directly or indirectly include this file:



## Macros

- `#define INDEX_OF(entry, array) (int)(entry - array)`
- `#define ckb_s_out stdout`
- `#define ckb_s_err stdout`
- `#define __FILE_NOPATH__ (strchr(__FILE__, '/') ? strchr(__FILE__, '/') + 1 : __FILE__)`
- `#define ckb_fatal_nofile(fmt, args...) fprintf(ckb_s_err, "[F] " fmt, ## args)`
- `#define ckb_fatal_fn(fmt, file, line, args...) fprintf(ckb_s_err, "[F] %s (via %s:%d): " fmt, __func__, file, line, ## args)`
- `#define ckb_fatal(fmt, args...) fprintf(ckb_s_err, "[F] %s (%s:%d): " fmt, __func__, __FILE_NOPATH__, __LINE__, ## args)`
- `#define ckb_err_nofile(fmt, args...) fprintf(ckb_s_err, "[E] " fmt, ## args)`
- `#define ckb_err_fn(fmt, file, line, args...) fprintf(ckb_s_err, "[E] %s (via %s:%d): " fmt, __func__, file, line, ## args)`
- `#define ckb_err(fmt, args...) fprintf(ckb_s_err, "[E] %s (%s:%d): " fmt, __func__, __FILE_NOPATH__, __LINE__, ## args)`
- `#define ckb_warn_nofile(fmt, args...) fprintf(ckb_s_out, "[W] " fmt, ## args)`
- `#define ckb_warn_fn(fmt, file, line, args...) fprintf(ckb_s_out, "[W] %s (via %s:%d): " fmt, __func__, file, line, ## args)`
- `#define ckb_warn(fmt, args...) fprintf(ckb_s_out, "[W] %s (%s:%d): " fmt, __func__, __FILE_NOPATH__, __LINE__, ## args)`
- `#define ckb_info_nofile(fmt, args...) fprintf(ckb_s_out, "[I] " fmt, ## args)`
- `#define ckb_info_fn(fmt, file, line, args...) fprintf(ckb_s_out, "[I] " fmt, ## args)`
- `#define ckb_info(fmt, args...) fprintf(ckb_s_out, "[I] " fmt, ## args)`
- `#define timespec_gt(left, right) ((left).tv_sec > (right).tv_sec || ((left).tv_sec == (right).tv_sec && (left).tv_nsec > (right).tv_nsec))`
- `#define timespec_eq(left, right) ((left).tv_sec == (right).tv_sec && (left).tv_nsec == (right).tv_nsec)`
- `#define timespec_ge(left, right) ((left).tv_sec > (right).tv_sec || ((left).tv_sec == (right).tv_sec && (left).tv_nsec >= (right).tv_nsec))`
- `#define timespec_lt(left, right) (!timespec_ge(left, right))`
- `#define timespec_le(left, right) (!timespec_gt(left, right))`

## Typedefs

- `typedef unsigned char uchar`
- `typedef unsigned short ushort`

## Functions

- void [timespec\\_add](#) (struct timespec \*timespec, long nanoseconds)

### 9.19.1 Macro Definition Documentation

9.19.1.1 `#define __FILE_NOPATH__ (strchr(__FILE__, '/') ? strchr(__FILE__, '/') + 1 : __FILE__)`

Definition at line 40 of file includes.h.

9.19.1.2 `#define ckb_err( fmt, args... ) fprintf(ckb_s_err, "[E] %s (%s:%d): " fmt, __func__, __FILE_NOPATH__, __LINE__, ## args)`

Definition at line 49 of file includes.h.

Referenced by `_mkdevpath()`, `fwupdate()`, `getfwversion()`, `loaddpi()`, `loadrgb_kb()`, `loadrgb_mouse()`, `macro_pt_dequeue()`, `os_inputmain()`, `os_sendindicators()`, `os_setupusb()`, `restart()`, `setupusb()`, `uinputopen()`, `usb_tryreset()`, `usbadd()`, and `usbclaim()`.

9.19.1.3 `#define ckb_err_fn( fmt, file, line, args... ) fprintf(ckb_s_err, "[E] %s (via %s:%d): " fmt, __func__, file, line, ## args)`

Definition at line 48 of file includes.h.

Referenced by `_nk95cmd()`, `_usbrecv()`, `os_usbrecv()`, and `os_usbsend()`.

9.19.1.4 `#define ckb_err_nofile( fmt, args... ) fprintf(ckb_s_err, "[E] " fmt, ## args)`

Definition at line 47 of file includes.h.

9.19.1.5 `#define ckb_fatal( fmt, args... ) fprintf(ckb_s_err, "[F] %s (%s:%d): " fmt, __func__, __FILE_NOPATH__, __LINE__, ## args)`

Definition at line 46 of file includes.h.

Referenced by `usbmain()`.

9.19.1.6 `#define ckb_fatal_fn( fmt, file, line, args... ) fprintf(ckb_s_err, "[F] %s (via %s:%d): " fmt, __func__, file, line, ## args)`

Definition at line 45 of file includes.h.

9.19.1.7 `#define ckb_fatal_nofile( fmt, args... ) fprintf(ckb_s_err, "[F] " fmt, ## args)`

Definition at line 44 of file includes.h.

Referenced by `main()`.

9.19.1.8 `#define ckb_info( fmt, args... ) fprintf(ckb_s_out, "[I] " fmt, ## args)`

Definition at line 55 of file includes.h.

Referenced by `_setupusb()`, `_start_dev()`, `closeusb()`, `cmd_restart()`, `fwupdate()`, `main()`, `os_inputmain()`, `os_setupusb()`, `quitWithLock()`, `rmdevpath()`, `usb_tryreset()`, `usbadd()`, and `usbclaim()`.

9.19.1.9 `#define ckb_info_fn( fmt, file, line, args... ) fprintf(ckb_s_out, "[I] " fmt, ## args)`

Definition at line 54 of file includes.h.

9.19.1.10 `#define ckb_info_nofile( fmt, args... ) fprintf(ckb_s_out, "[I] " fmt, ## args)`

Definition at line 53 of file includes.h.

Referenced by main().

9.19.1.11 `#define ckb_s_err stdout`

Definition at line 36 of file includes.h.

9.19.1.12 `#define ckb_s_out stdout`

Definition at line 35 of file includes.h.

9.19.1.13 `#define ckb_warn( fmt, args... ) fprintf(ckb_s_out, "[W] %s (%s:%d): " fmt, __func__, __FILE__ __LINE__, ## args)`

Definition at line 52 of file includes.h.

Referenced by `_mkdevpath()`, `_mknotifynode()`, `_start_dev()`, `_updateconnected()`, `getfwversion()`, `hid_kb_translate()`, `isync()`, `mkfwnode()`, `os_inputclose()`, `os_keypress()`, `os_mousemove()`, `readlines()`, `rmdevpath()`, `uinputopen()`, and `usbmain()`.

9.19.1.14 `#define ckb_warn_fn( fmt, file, line, args... ) fprintf(ckb_s_out, "[W] %s (via %s:%d): " fmt, __func__, file, line, ## args)`

Definition at line 51 of file includes.h.

Referenced by `os_usbrecv()`, and `os_usbsend()`.

9.19.1.15 `#define ckb_warn_nofile( fmt, args... ) fprintf(ckb_s_out, "[W] " fmt, ## args)`

Definition at line 50 of file includes.h.

Referenced by main().

9.19.1.16 `#define INDEX_OF( entry, array ) (int)(entry - array)`

Definition at line 27 of file includes.h.

Referenced by `_mkdevpath()`, `_mknotifynode()`, `_rmnotifynode()`, `_setupusb()`, `closeusb()`, `mkfwnode()`, `nprintf()`, `os_closeusb()`, `os_inputmain()`, `os_inputopen()`, `os_setupusb()`, `readcmd()`, and `rmdevpath()`.

9.19.1.17 `#define timespec_eq( left, right ) ((left).tv_sec == (right).tv_sec && (left).tv_nsec == (right).tv_nsec)`

Definition at line 60 of file includes.h.

9.19.1.18 `#define timespec_ge( left, right ) ((left).tv_sec > (right).tv_sec || ((left).tv_sec == (right).tv_sec && (left).tv_nsec >= (right).tv_nsec))`

Definition at line 61 of file includes.h.

9.19.1.19 `#define timespec_gt( left, right ) ((left).tv_sec > (right).tv_sec || ((left).tv_sec == (right).tv_sec && (left).tv_nsec > (right).tv_nsec))`

Definition at line 59 of file includes.h.

9.19.1.20 `#define timespec_le( left, right ) (!timespec_gt(left, right))`

Definition at line 63 of file includes.h.

9.19.1.21 `#define timespec_lt( left, right ) (!timespec_ge(left, right))`

Definition at line 62 of file includes.h.

## 9.19.2 Typedef Documentation

9.19.2.1 `typedef unsigned char uchar`

Definition at line 24 of file includes.h.

9.19.2.2 `typedef unsigned short ushort`

Definition at line 25 of file includes.h.

## 9.19.3 Function Documentation

9.19.3.1 `void timespec_add ( struct timespec * timespec, long nanoseconds )`

Definition at line 19 of file main.c.

```

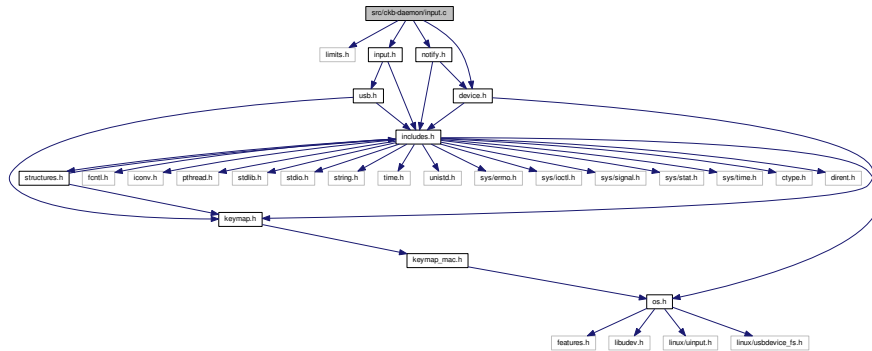
19                                     {
20     nanoseconds += timespec->tv_nsec;
21     timespec->tv_sec += nanoseconds / 1000000000;
22     timespec->tv_nsec = nanoseconds % 1000000000;
23 }
```

## 9.20 src/ckb-daemon/input.c File Reference

```

#include <limits.h>
#include "device.h"
#include "input.h"
#include "notify.h"
```

Include dependency graph for input.c:



## Macros

- `#define IS_WHEEL(scan, kb) (((scan) == KEY_VOLUMEUP || (scan) == KEY_VOLUMEDOWN || (scan) == BTN_WHEELUP || (scan) == BTN_WHEELDOWN) && !IS_K65(kb))`

## Functions

- `int macromask (const uchar *key1, const uchar *key2)`
- `static void macro_pt_enqueue ()`  
*macro\_pt\_enqueue Save the new thread in the single linked list (FIFO).*
- `static pthread_t macro_pt_dequeue ()`  
*macro\_pt\_dequeue gets the first thread id of the list and returns the thread\_id stored in it.*
- `static pthread_t macro_pt_first ()`  
*macro\_pt\_first returns the first pthread\_id but does not remove the first entry.*
- `static void * play_macro (void *param)`  
*play\_macro is the code for all threads started to play a macro.*
- `static void inputupdate_keys (usbdevice *kb)`  
*inputupdate\_keys Handle input from Keyboard or mouse; start Macro if detected.*
- `void inputupdate (usbdevice *kb)`
- `void updateindicators_kb (usbdevice *kb, int force)`
- `void initbind (binding *bind)`
- `void freebind (binding *bind)`
- `void cmd_bind (usbdevice *kb, usbmode *mode, int dummy, int keyindex, const char *to)`
- `void cmd_unbind (usbdevice *kb, usbmode *mode, int dummy, int keyindex, const char *to)`
- `void cmd_rebind (usbdevice *kb, usbmode *mode, int dummy, int keyindex, const char *to)`
- `static void _cmd_macro (usbmode *mode, const char *keys, const char *assignment)`
- `void cmd_macro (usbdevice *kb, usbmode *mode, const int notifynumber, const char *keys, const char *assignment)`

## Variables

- `static ptlist_t * pt_head = 0`  
*pt\_head is the head pointer for the single linked thread list managed by macro\_pt\_en/dequeue().*
- `static ptlist_t * pt_tail = 0`  
*pt\_tail is the tail pointer for the single linked thread list managed by macro\_pt\_en/dequeue().*

## 9.20.1 Macro Definition Documentation

9.20.1.1 `#define IS_WHEEL( scan, kb ) (((scan) == KEY_VOLUMEUP || (scan) == KEY_VOLUMEDOWN || (scan) == BTN_WHEELUP || (scan) == BTN_WHEELDOWN) && !IS_K65(kb))`

Referenced by `inputupdate_keys()`.

## 9.20.2 Function Documentation

9.20.2.1 `static void _cmd_macro ( usbmode * mode, const char * keys, const char * assignment ) [static]`

Definition at line 345 of file `input.c`.

References `keymacro::actioncount`, `keymacro::actions`, `usbmode::bind`, `keymacro::combo`, `macroaction::delay`, `macroaction::down`, `keymap`, `MACRO_MAX`, `binding::macrocap`, `binding::macrocount`, `binding::macros`, `N_KEYBYTES_INPUT`, `N_KEYS_INPUT`, `macroaction::scan`, `key::scan`, and `SET_KEYBIT`.

Referenced by `cmd_macro()`.

```

345                                     {
346     binding* bind = &mode->bind;
347     if(!keys && !assignment){
348         // Null strings = "macro clear" -> erase the whole thing
349         for(int i = 0; i < bind->macrocount; i++)
350             free(bind->macros[i].actions);
351         bind->macrocount = 0;
352         return;
353     }
354     if(bind->macrocount >= MACRO_MAX)
355         return;
356     // Create a key macro
357     keymacro macro;
358     memset(&macro, 0, sizeof(macro));
359     // Scan the left side for key names, separated by +
360     int empty = 1;
361     int left = strlen(keys), right = strlen(assignment);
362     int position = 0, field = 0;
363     char keyname[24];
364     while(position < left && sscanf(keys + position, "%10[^\n]", keyname, &field) == 1){
365         int keycode;
366         if((sscanf(keyname, "%d", &keycode) && keycode >= 0 && keycode <
N_KEYS_INPUT)
367             || (sscanf(keyname, "%x", &keycode) && keycode >= 0 && keycode <
N_KEYS_INPUT)){
368             // Set a key numerically
369             SET_KEYBIT(macro.combo, keycode);
370             empty = 0;
371         } else {
372             // Find this key in the keymap
373             for(unsigned i = 0; i < N_KEYS_INPUT; i++){
374                 if(keymap[i].name && !strcmp(keyname, keymap[i].name)){
375                     macro.combo[i / 8] |= 1 << (i % 8);
376                     empty = 0;
377                     break;
378                 }
379             }
380         }
381         if(keys[position += field] == '+')
382             position++;
383     }
384     if(empty)
385         return;
386     // Count the number of actions (comma separated)
387     int count = 1;
388     for(const char* c = assignment; *c != 0; c++){
389         if(*c == ',')
390             count++;
391     }
392     // Allocate a buffer for them
393     macro.actions = calloc(count, sizeof(macroaction));
394     macro.actioncount = 0;
395     // Scan the actions
396     position = 0;
397     field = 0;
398     // max action = old 11 chars plus 12 chars which is the max 32-bit int 4294967295 size
399     while(position < right && sscanf(assignment + position, "%23[^\n]", keyname, &field) == 1){
400         if(!strcmp(keyname, "clear"))
401             break;

```

```

402
403 // Check for local key delay of the form '[+<key>=<delay>'
404 long int long_delay; // scanned delay value, used to keep delay in range.
405 unsigned int delay = UINT_MAX; // computed delay value. UINT_MAX means use global delay value.
406 char real_keyname[12]; // temp to hold the left side (key) of the <key>=<delay>
407 int scan_matches = sscanf(keyname, "%11[^]=%ld", real_keyname, &long_delay);
408 if (scan_matches == 2) {
409     if (0 <= long_delay && long_delay < UINT_MAX) {
410         delay = (unsigned int)long_delay;
411         strcpy(keyname, real_keyname); // keyname[24], real_keyname[12]
412     }
413 }
414
415 int down = (keyname[0] == '+');
416 if(down || keyname[0] == '-') {
417     int keycode;
418     if(sscanf(keyname + 1, "%d", &keycode) && keycode >= 0 && keycode < N_KEYS_INPUT)
419         || (sscanf(keyname + 1, "%x", &keycode) && keycode >= 0 && keycode <
N_KEYS_INPUT)) {
420         // Set a key numerically
421         macro.actions[macro.actioncount].scan =
keymap[keycode].scan;
422         macro.actions[macro.actioncount].down = down;
423         macro.actions[macro.actioncount].delay = delay;
424         macro.actioncount++;
425     } else {
426         // Find this key in the keymap
427         for(unsigned i = 0; i < N_KEYS_INPUT; i++){
428             if(keymap[i].name && !strcmp(keyname + 1, keymap[i].name)){
429                 macro.actions[macro.actioncount].scan =
keymap[i].scan;
430                 macro.actions[macro.actioncount].down = down;
431                 macro.actions[macro.actioncount].delay = delay;
432                 macro.actioncount++;
433                 break;
434             }
435         }
436     }
437 }
438 if(assignment[position += field] == ',')
439     position++;
440 }
441
442 // See if there's already a macro with this trigger
443 keymacro* macros = bind->macros;
444 for(int i = 0; i < bind->macrocount; i++){
445     if(!memcmp(macros[i].combo, macro.combo, N_KEYBYTES_INPUT)){
446         free(macros[i].actions);
447         // If the new macro has no actions, erase the existing one
448         if(!macro.actioncount){
449             for(int j = i + 1; j < bind->macrocount; j++)
450                 memcpy(macros + j - 1, macros + j, sizeof(keymacro));
451             bind->macrocount--;
452         } else
453             // If there are actions, replace the existing with the new
454             memcpy(macros + i, &macro, sizeof(keymacro));
455         return;
456     }
457 }
458
459 // Add the macro to the device settings if not empty
460 if(macro.actioncount < 1)
461     return;
462 memcpy(bind->macros + (bind->macrocount++), &macro, sizeof(
keymacro));
463 if(bind->macrocount >= bind->macrocap)
464     bind->macros = realloc(bind->macros, (bind->macrocap += 16) * sizeof(
keymacro));
465 }

```

Here is the caller graph for this function:





### 9.20.2.2 void cmd\_bind ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* to )

Definition at line 307 of file input.c.

References `binding::base`, `usbmode::bind`, `imutex`, `keymap`, `N_KEYS_INPUT`, and `key::scan`.

```

307                                     {
308     if(keyindex >= N_KEYS_INPUT)
309         return;
310     // Find the key to bind to
311     int tocode = 0;
312     if(sscanf(to, "%x%ux", &tocode) != 1 && sscanf(to, "%#u", &tocode) == 1 && tocode <
N_KEYS_INPUT){
313         pthread_mutex_lock(&imutex(kb));
314         mode->bind.base[keyindex] = tocode;
315         pthread_mutex_unlock(&imutex(kb));
316         return;
317     }
318     // If not numeric, look it up
319     for(int i = 0; i < N_KEYS_INPUT; i++){
320         if(keymap[i].name && !strcmp(to, keymap[i].name)){
321             pthread_mutex_lock(&imutex(kb));
322             mode->bind.base[keyindex] = keymap[i].scan;
323             pthread_mutex_unlock(&imutex(kb));
324             return;
325         }
326     }
327 }
```

### 9.20.2.3 void cmd\_macro ( usbdevice \* kb, usbmode \* mode, const int notifynumber, const char \* keys, const char \* assignment )

Definition at line 467 of file input.c.

References `_cmd_macro()`, and `imutex`.

```

467     {
468     pthread_mutex_lock(&imutex(kb));
469     _cmd_macro(mode, keys, assignment);
470     pthread_mutex_unlock(&imutex(kb));
471 }
```

Here is the call graph for this function:



### 9.20.2.4 void cmd\_rebind ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* to )

Definition at line 337 of file input.c.

References `binding::base`, `usbmode::bind`, `imutex`, `keymap`, `N_KEYS_INPUT`, and `key::scan`.

```

337                                     {
338     if(keyindex >= N_KEYS_INPUT)
339         return;
340     pthread_mutex_lock(&imutex(kb));
341     mode->bind.base[keyindex] = keymap[keyindex].scan;
342     pthread_mutex_unlock(&imutex(kb));
343 }
```

### 9.20.2.5 void cmd\_unbind ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* to )

Definition at line 329 of file input.c.

References binding::base, usbmode::bind, imutex, KEY\_UNBOUND, and N\_KEYS\_INPUT.

```

329                                     {
330     if(keyindex >= N_KEYS_INPUT)
331         return;
332     pthread_mutex_lock(imutex(kb));
333     mode->bind.base[keyindex] = KEY_UNBOUND;
334     pthread_mutex_unlock(imutex(kb));
335 }
```

### 9.20.2.6 void freebind ( binding \* bind )

Definition at line 300 of file input.c.

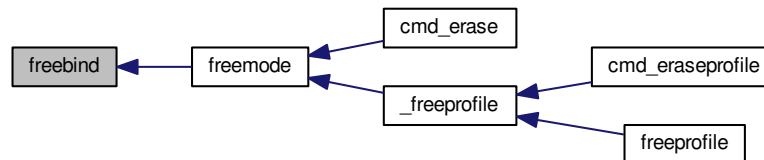
References keymacro::actions, binding::macrocount, and binding::macros.

Referenced by freemode().

```

300                                     {
301     for(int i = 0; i < bind->macrocount; i++)
302         free(bind->macros[i].actions);
303     free(bind->macros);
304     memset(bind, 0, sizeof(*bind));
305 }
```

Here is the caller graph for this function:



### 9.20.2.7 void initbind ( binding \* bind )

Definition at line 292 of file input.c.

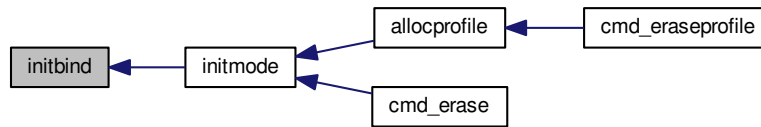
References binding::base, keymap, binding::macrocap, binding::macrocount, binding::macros, N\_KEYS\_INPUT, and key::scan.

Referenced by initmode().

```

292                                     {
293     for(int i = 0; i < N_KEYS_INPUT; i++)
294         bind->base[i] = keymap[i].scan;
295     bind->macros = calloc(32, sizeof(keymacro));
296     bind->macrocap = 32;
297     bind->macrocount = 0;
298 }
```

Here is the caller graph for this function:



#### 9.20.2.8 void inputupdate ( usbdevice \* kb )

Definition at line 241 of file input.c.

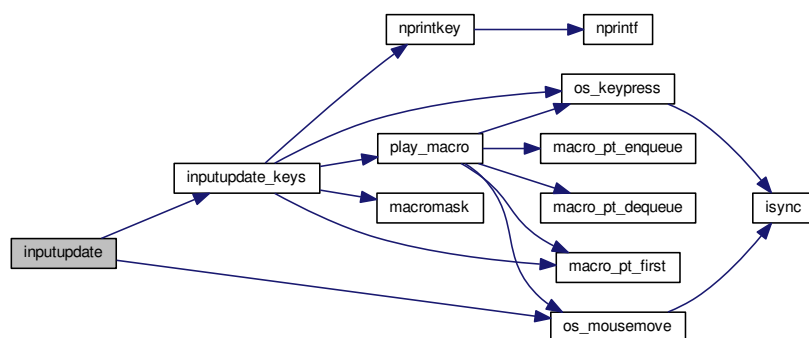
References `usbdevice::input`, `inputupdate_keys()`, `os_mousemove()`, `usbdevice::profile`, `usbinput::rel_x`, `usbinput::rel_y`, `usbdevice::uinput_kb`, and `usbdevice::uinput_mouse`.

Referenced by `os_inputmain()`, `setactive_kb()`, and `setactive_mouse()`.

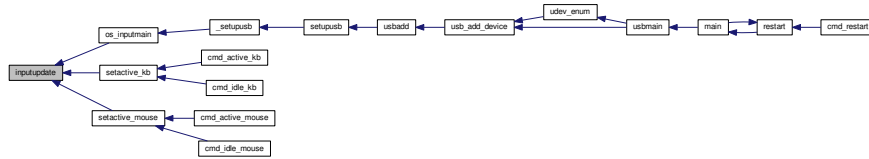
```

241                                     {
242 #ifdef OS_LINUX
243     if ((!kb->uinput_kb || !kb->uinput_mouse)
244 #else
245     if (!kb->event
246 #endif
247         || !kb->profile)
248         return;
249     // Process key/button input
250     inputupdate_keys(kb);
251     // Process mouse movement
252     usbinput* input = &kb->input;
253     if(input->rel_x != 0 || input->rel_y != 0){
254         os_mousemove(kb, input->rel_x, input->rel_y);
255         input->rel_x = input->rel_y = 0;
256     }
257     // Finish up
258     memcpy(input->prevkeys, input->keys, N_KEYBYTES_INPUT);
259 }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.20.2.9 static void inputupdate\_keys ( usbdevice \* kb ) [static]

#### Parameters

<i>kb</i>	
-----------	--

Process all queued keypresses if no macro is running yet.

**Todo** If we want to get all keys typed while a macro is played, add the code for it here.

Definition at line 134 of file input.c.

References `usbdevice::active`, `binding::base`, `usbmode::bind`, `keymacro::combo`, `usbprofile::currentmode`, `usbdevice::input`, `IS_MOD`, `IS_WHEEL`, `parameter::kb`, `keymap`, `usbinput::keys`, `parameter::macro`, `macro_pt_first()`, `binding::macrocount`, `macromask()`, `binding::macros`, `N_KEYBYTES_INPUT`, `N_KEYS_INPUT`, `usbmode::notify`, `nprintkey()`, `os_keypress()`, `OUTFIFO_MAX`, `play_macro()`, `usbinput::prevkeys`, `usbdevice::profile`, `key::scan`, `SCAN_SILENT`, and `keymacro::triggered`.

Referenced by `inputupdate()`.

```

134                                     {
135     usbmode* mode = kb->profile->currentmode;
136     binding* bind = &mode->bind;
137     usbinput* input = &kb->input;
138
139     // Don't do anything if the state hasn't changed
140     if(!memcmp(input->prevkeys, input->keys, N_KEYBYTES_INPUT))
141         return;
142     // Look for macros matching the current state
143     if (kb->active) {
144         for (int i = 0; i < bind->macrocount; i++) {
145             keymacro* macro = &bind->macros[i];
146             if (macromask(input->keys, macro->combo)) {
147                 if (!macro->triggered) {
148                     parameter_t* params = malloc(sizeof(parameter_t));
149                     if (params == 0) {
150                         perror("inputupdate_keys got no more mem.");
151                     } else {
152                         pthread_t thread = 0;
153                         params->kb = kb;
154                         params->macro = macro;
155                         int retval = pthread_create(&thread, 0, play_macro, (void*)params);
156                         if (retval) {
157                             perror("inputupdate_keys: Creating thread returned not null");
158                         } else {
159                             macro->triggered = 1;
160                         }
161                     }
162                 }
163             } else macro->triggered = 0;
164         }
165     }
166     // Make a list of keycodes to send. Rearrange them so that modifier keydowns always come first
167     // and modifier keyups always come last. This ensures that shortcut keys will register properly
168     // even if both keydown events happen at once.
169     // N_KEYS + 4 is used because the volume wheel generates keydowns and keyups at the same time
170     // (it's currently impossible to press all four at once, but safety first)
171     int events[N_KEYS_INPUT + 4];
172     int modcount = 0, keycount = 0, rmodcount = 0;
173     for(int byte = 0; byte < N_KEYBYTES_INPUT; byte++){
174         char oldb = input->prevkeys[byte], newb = input->keys[byte];
175         if(oldb == newb)

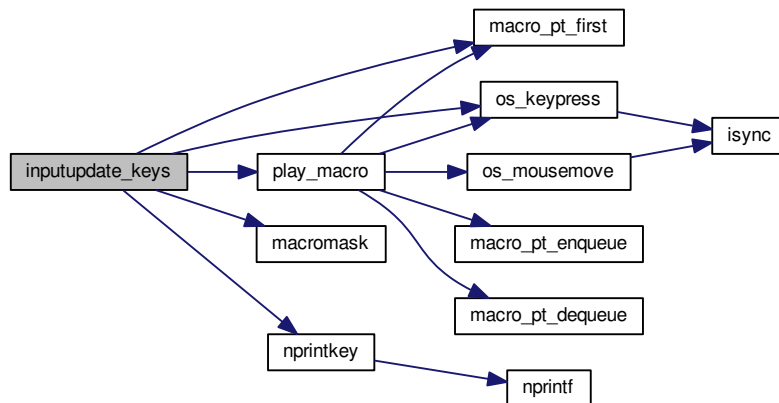
```

```

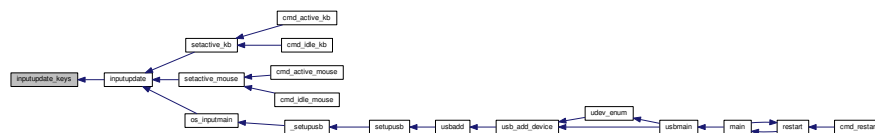
176         continue;
177     for(int bit = 0; bit < 8; bit++){
178         int keyindex = byte * 8 + bit;
179         if(keyindex >= N_KEYS_INPUT)
180             break;
181         const key* map = keymap + keyindex;
182         int scancode = (kb->active) ? bind->base[keyindex] : map->
scan;
183         char mask = 1 << bit;
184         char old = oldb & mask, new = newb & mask;
185         // If the key state changed, send it to the input device
186         if(old != new){
187             // Don't echo a key press if there's no scancode associated
188             if(!(scancode & SCAN_SILENT)){
189                 if(IS_MOD(scancode)){
190                     if(new){
191                         // Modifier down: Add to the end of modifier keys
192                         for(int i = keycount + rmodcount; i > 0; i--){
193                             events[modcount + i] = events[modcount + i - 1];
194                             // Add 1 to the scancode because A is zero on OSX
195                             // Positive code = keydown, negative code = keyup
196                             events[modcount++] = scancode + 1;
197                         } else {
198                             // Modifier up: Add to the end of everything
199                             events[modcount + keycount + rmodcount++] = -(scancode + 1);
200                         }
201                     } else {
202                         // Regular keypress: add to the end of regular keys
203                         for(int i = rmodcount; i > 0; i--){
204                             events[modcount + keycount + i] = events[modcount + keycount + i - 1];
205                             events[modcount + keycount++] = new ? (scancode + 1) : -(scancode + 1);
206                             // The volume wheel and the mouse wheel don't generate keyups, so create them
207                             automatically
208                             #define IS_WHEEL(scan, kb) (((scan) == KEY_VOLUMEUP || (scan) == KEY_VOLUMEDOWN || (scan) == BTN_WHEELUP
|| (scan) == BTN_WHEELDOWN) && !IS_K65(kb))
209                             if(new && IS_WHEEL(map->scan, kb)){
210                                 for(int i = rmodcount; i > 0; i--){
211                                     events[modcount + keycount + i] = events[modcount + keycount + i - 1];
212                                     events[modcount + keycount++] = -(scancode + 1);
213                                     input->keys[byte] &= ~mask;
214                                 }
215                             }
216                             // Print notifications if desired
217                             if(kb->active){
218                                 for(int notify = 0; notify < OUTFIFO_MAX; notify++){
219                                     if(mode->notify[notify][byte] & mask){
220                                         nprintkey(kb, notify, keyindex, new);
221                                         // Wheels doesn't generate keyups
222                                         if(new && IS_WHEEL(map->scan, kb))
223                                             nprintkey(kb, notify, keyindex, 0);
224                                     }
225                                 }
226                             }
227                         }
228                     }
229                 }
230             }
231         }
232         if (!macro_pt_first()) {
233             int totalkeys = modcount + keycount + rmodcount;
234             for(int i = 0; i < totalkeys; i++){
235                 int scancode = events[i];
236                 os_keypress(kb, (scancode < 0 ? -scancode : scancode) - 1, scancode > 0);
237             }
238         }
239     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.20.2.10 static pthread\_t macro\_pt\_dequeue ( ) [static]

##### Returns

the `pthread_id` of the first element. If list is empty, return 0.

##### Attention

Because multiple threads may use this function in parallel, save the critical section with a mutex.

< why are we called?

< Was last element in the list, so clear tail.

< save the return value before deleting element

Definition at line 49 of file `input.c`.

References `ckb_err`, `ptlist::next`, `pt_head`, and `ptlist::thread_id`.

Referenced by `play_macro()`.

```

49      {
50      pthread_t retval = 0;
51      ptlist_t* elem = 0;
52      if (pt_head == 0 && pt_tail == 0) {
53          ckb_err("macro_pt_dequeue: called on empty list.\n");
54          return 0;
55      }
56      elem = pt_head;
57      pt_head = pt_head->next;
  
```

```
58     if (pt_head == 0) pt_tail = 0;
59     retval = elem->thread_id;
60     free(elem);
61     return retval;
62 }
```

Here is the caller graph for this function:



**9.20.2.11** `static void macro_pt_enqueue ( ) [static]`

## Attention

Because multiple threads may use this function in parallel, save the critical section with a mutex.

```
< exit on critical situation;
```

**Todo** find a better exit strategy if no more mem available.

< The element knows its ID by itself

< new list, first element

< existing list, append on last element (FIFO)

Definition at line 27 of file input.c.

References `ptlist::next`, and `ptlist::thread_id`.

Referenced by `play_macro()`.

```

27         {
28     ptlist_t* new_elem = malloc(sizeof(ptlist_t));
29     if (!new_elem) {
30         perror("macro_pt_enqueue: ");
31         exit (-1);
32     }
33     new_elem->next = 0;
34     new_elem->thread_id = pthread_self();
35     if (pt_head == 0) {
36         pt_head = pt_tail = new_elem;
37     } else {
38         pt_tail->next = new_elem;
39         pt_tail = new_elem;
40     }
41 }

```

Here is the caller graph for this function:



**9.20.2.12** `static pthread_t macro_pt_first ( ) [static]`





## Parameters

<i>param</i>	<i>parameter_t</i> to store Kb-ptr and macro-ptr (thread may get only one user-parameter)
--------------	---

## Returns

0 on success, -1 else (no one is interested in it except the kernel...)

First have a look if we are the first and only macro-thread to run. If not, wait. So enqueue our thread first, so it is remembered for us and can be seen by all others.

< If the first thread in the list is not our, another one is running

< Give all new threads the chance to enter the block.

Send events for each keypress in the macro

< Synchronization between macro output and color information

< use this unlock / relock for enabling the parallel running colorization

< local delay set

< use default global delay

< use delays depending on macro length

< protect the linked list and the mvar

< Wake up all waiting threads

< for the linked list and the mvar

< Sync keyboard input/output and colorization

Definition at line 79 of file input.c.

References keymacro::actioncount, keymacro::actions, macroaction::delay, usbdevice::delay, macroaction::down, parameter::kb, parameter::macro, macro\_pt\_dequeue(), macro\_pt\_enqueue(), macro\_pt\_first(), mmutex, mmutex2, mvar, os\_keypress(), os\_mousemove(), macroaction::rel\_x, macroaction::rel\_y, and macroaction::scan.

Referenced by inputupdate\_keys().

```

79
80     parameter_t* ptr = (parameter_t*) param;
81     usbdevice* kb = ptr->kb;
82     keymacro* macro = ptr->macro;
83
84     pthread_mutex_lock(mmutex2(kb));
85     macro_pt_enqueue();
86     // ckb_info("Entering critical section with 0x%x. Queue head is 0x%x\n", (unsigned long
87     int)pthread_self(), (unsigned long int)macro_pt_first());
88     while (macro_pt_first() != pthread_self()) {
89         // ckb_info("Now waiting with 0x%x because of 0x%x\n", (unsigned long int)pthread_self(),
90         (unsigned long int)macro_pt_first());
91         pthread_cond_wait(mvar(kb), mmutex2(kb));
92         // ckb_info("Waking up with 0x%x\n", (unsigned long int)pthread_self());
93     }
94     pthread_mutex_unlock(mmutex2(kb));
95
96     pthread_mutex_lock(mmutex(kb));
97     for (int a = 0; a < macro->actioncount; a++) {
98         macroaction* action = macro->actions + a;
99         if (action->rel_x != 0 || action->rel_y != 0)
100             os_mousemove(kb, action->rel_x, action->rel_y);
101         else {
102             os_keypress(kb, action->scan, action->down);
103             pthread_mutex_unlock(mmutex(kb));
104             if (action->delay != UINT_MAX && action->delay) {
105                 usleep(action->delay);
106             } else if (kb->delay != UINT_MAX && kb->delay) {
107                 usleep(kb->delay);
108             } else if (a < (macro->actioncount - 1)) {
109                 if (a > 200) {
110                     usleep(100);
111                 } else if (a > 20) {
112                     usleep(30);
113                 }
114             }

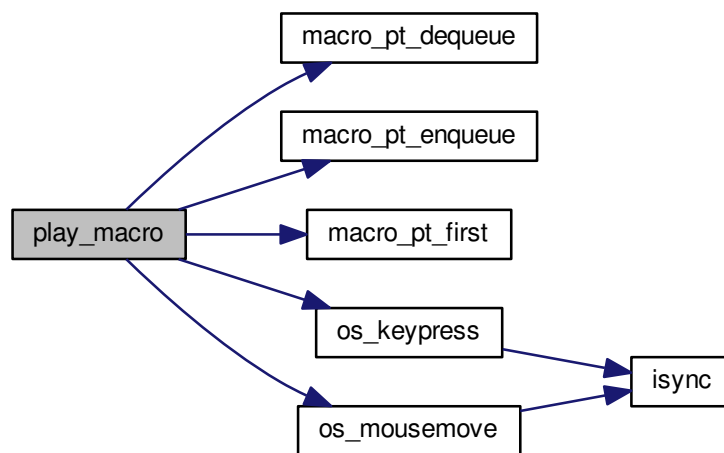
```

```

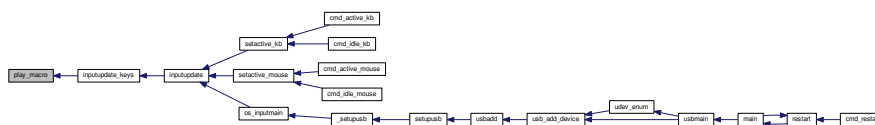
115         }
116         pthread_mutex_lock(&mmutex(kb));
117     }
118 }
119
120 pthread_mutex_lock(&mmutex2(kb));
121 // ckb_info("Now leaving 0x%lx and waking up all others\n", (unsigned long int)pthread_self());
122 macro_pt_dequeue();
123 pthread_cond_broadcast(&mvar(kb));
124 pthread_mutex_unlock(&mmutex2(kb));
125
126 pthread_mutex_unlock(&mmutex(kb));
127 return 0;
128 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.20.2.15 void updateindicators\_kb ( usbdevice \* kb, int force )

Definition at line 261 of file input.c.

References `usbdevice::active`, `usbprofile::currentmode`, `DELAY_SHORT`, `usbdevice::hw_ileds`, `usbdevice::hw_ileds_old`, `I_CAPS`, `I_NUM`, `I_SCROLL`, `usbdevice::ileds`, `usbmode::inotify`, `usbmode::ioff`, `usbmode::ion`, `nprintind()`, `os_sendindicators()`, `OUTFIFO_MAX`, and `usbdevice::profile`.

```

261 {
262     // Read current hardware indicator state (set externally)
263     uchar old = kb->ileds, hw_old = kb->hw_ileds_old;
264     uchar new = kb->hw_ileds, hw_new = new;
265     // Update them if needed
266     if (kb->active) {

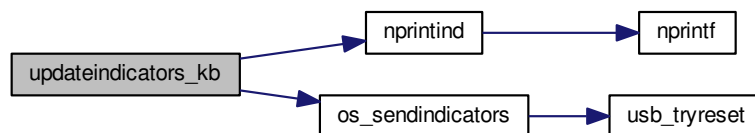
```

```

267     usbmode* mode = kb->profile->currentmode;
268     new = (new & ~mode->ioff) | mode->ion;
269 }
270 kb->iLEDs = new;
271 kb->hw_iLEDs_old = hw_new;
272 if(old != new || force){
273     DELAY_SHORT(kb);
274     os_sendindicators(kb);
275 }
276 // Print notifications if desired
277 if(!kb->active)
278     return;
279 usbmode* mode = kb->profile->currentmode;
280 uchar indicators[] = { I_NUM, I_CAPS, I_SCROLL };
281 for(unsigned i = 0; i < sizeof(indicators) / sizeof(uchar); i++){
282     uchar mask = indicators[i];
283     if((hw_old & mask) == (hw_new & mask))
284         continue;
285     for(int notify = 0; notify < OUTFIFO_MAX; notify++){
286         if(mode->inotify[notify] & mask)
287             nprintind(kb, notify, mask, hw_new & mask);
288     }
289 }
290 }

```

Here is the call graph for this function:



## 9.20.3 Variable Documentation

### 9.20.3.1 `ptlist_t* pt_head = 0` [static]

Definition at line 18 of file `input.c`.

Referenced by macro `pt_dequeue()`.

### 9.20.3.2 `ptlist_t* pt_tail = 0` [static]

Definition at line 20 of file `input.c`.

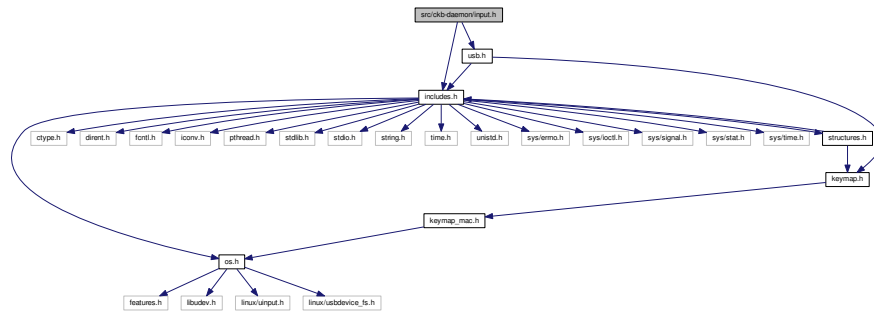
## 9.21 src/ckb-daemon/input.h File Reference

```

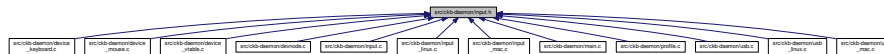
#include "includes.h"
#include "usb.h"

```

Include dependency graph for input.h:



This graph shows which files directly or indirectly include this file:



## Data Structures

- struct [parameter](#)  
*struct parameter contains the values for a fresh started macro\_play thread. parameter\_t is the typedef for it. [More...](#)*
- struct [ptlist](#)  
*struct ptlist is one element in the single linked list to store macro\_play threads waiting for their execution ptlist\_t is the typedef for it. [More...](#)*

## Macros

- `#define IS_MOD(s) ((s) == KEY_CAPSLOCK || (s) == KEY_NUMLOCK || (s) == KEY_SCROLLLOCK || (s) == KEY_LEFTSHIFT || (s) == KEY_RIGHTSHIFT || (s) == KEY_LEFTCTRL || (s) == KEY_RIGHTCTRL || (s) == KEY_LEFTMETA || (s) == KEY_RIGHTMETA || (s) == KEY_LEFTALT || (s) == KEY_RIGHTALT || (s) == KEY_FN)`

## Typedefs

- typedef struct [parameter](#) [parameter\\_t](#)  
*struct parameter contains the values for a fresh started macro\_play thread. parameter\_t is the typedef for it.*
- typedef struct [ptlist](#) [ptlist\\_t](#)  
*struct ptlist is one element in the single linked list to store macro\_play threads waiting for their execution ptlist\_t is the typedef for it.*

## Functions

- int [os\\_inputopen](#) ([usbdevice](#) \*kb)  
*os\_inputopen*
- void [os\\_inputclose](#) ([usbdevice](#) \*kb)
- void [inputupdate](#) ([usbdevice](#) \*kb)
- void [updateindicators\\_kb](#) ([usbdevice](#) \*kb, int force)
- void [initbind](#) ([binding](#) \*bind)

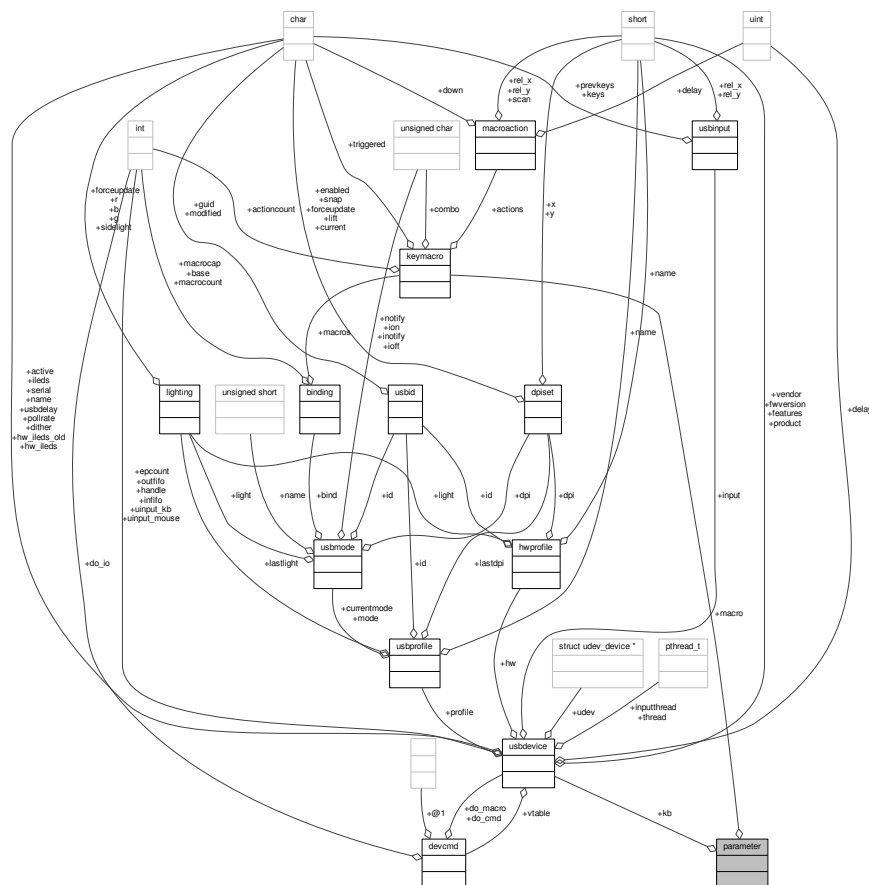
- void [freebind](#) ([binding](#) \*bind)
- void [cmd\\_bind](#) ([usbdevice](#) \*kb, [usbmode](#) \*mode, int dummy, int keyindex, const char \*to)
- void [cmd\\_unbind](#) ([usbdevice](#) \*kb, [usbmode](#) \*mode, int dummy, int keyindex, const char \*ignored)
- void [cmd\\_rebind](#) ([usbdevice](#) \*kb, [usbmode](#) \*mode, int dummy, int keyindex, const char \*ignored)
- void [cmd\\_macro](#) ([usbdevice](#) \*kb, [usbmode](#) \*mode, const int notifynumber, const char \*keys, const char \*assignment)
- void [os\\_keypress](#) ([usbdevice](#) \*kb, int scancode, int down)
- void [os\\_mousemove](#) ([usbdevice](#) \*kb, int x, int y)
- int [os\\_setupindicators](#) ([usbdevice](#) \*kb)

## 9.21.1 Data Structure Documentation

### 9.21.1.1 struct parameter

Definition at line 54 of file input.h.

Collaboration diagram for parameter:



### Data Fields

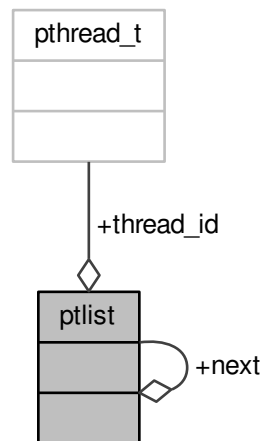
<a href="#">usbdevice</a> *	kb
-----------------------------	----

<a href="#">keymacro</a> *	macro	
----------------------------	-------	--

### 9.21.1.2 struct ptlist

Definition at line 62 of file input.h.

Collaboration diagram for ptlist:



#### Data Fields

struct <a href="#">ptlist</a> *	next	
pthread_t	thread_id	

## 9.21.2 Macro Definition Documentation

9.21.2.1 `#define IS_MOD( s ) ((s) == KEY_CAPSLOCK || (s) == KEY_NUMLOCK || (s) == KEY_SCROLLLOCK || (s) == KEY_LEFTSHIFT || (s) == KEY_RIGHTSHIFT || (s) == KEY_LEFTCTRL || (s) == KEY_RIGHTCTRL || (s) == KEY_LEFTMETA || (s) == KEY_RIGHTMETA || (s) == KEY_LEFTALT || (s) == KEY_RIGHTALT || (s) == KEY_FN)`

Definition at line 34 of file input.h.

Referenced by `inputupdate_keys()`.

## 9.21.3 Typedef Documentation

9.21.3.1 `typedef struct parameter parameter_t`

9.21.3.2 `typedef struct ptlist ptlist_t`

## 9.21.4 Function Documentation

#### 9.21.4.1 void cmd\_bind ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* to )

Definition at line 307 of file input.c.

References `binding::base`, `usbmode::bind`, `imutex`, `keymap`, `N_KEYS_INPUT`, and `key::scan`.

```

307                                     {
308     if(keyindex >= N_KEYS_INPUT)
309         return;
310     // Find the key to bind to
311     int tocode = 0;
312     if(sscanf(to, "%x%ux", &tocode) != 1 && sscanf(to, "%#u", &tocode) == 1 && tocode <
N_KEYS_INPUT){
313         pthread_mutex_lock(&imutex(kb));
314         mode->bind.base[keyindex] = tocode;
315         pthread_mutex_unlock(&imutex(kb));
316         return;
317     }
318     // If not numeric, look it up
319     for(int i = 0; i < N_KEYS_INPUT; i++){
320         if(keymap[i].name && !strcmp(to, keymap[i].name)){
321             pthread_mutex_lock(&imutex(kb));
322             mode->bind.base[keyindex] = keymap[i].scan;
323             pthread_mutex_unlock(&imutex(kb));
324             return;
325         }
326     }
327 }
```

#### 9.21.4.2 void cmd\_macro ( usbdevice \* kb, usbmode \* mode, const int notifynumber, const char \* keys, const char \* assignment )

Definition at line 467 of file input.c.

References `_cmd_macro()`, and `imutex`.

```

467     {
468     pthread_mutex_lock(&imutex(kb));
469     _cmd_macro(mode, keys, assignment);
470     pthread_mutex_unlock(&imutex(kb));
471 }
```

Here is the call graph for this function:



#### 9.21.4.3 void cmd\_rebind ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* ignored )

Definition at line 337 of file input.c.

References `binding::base`, `usbmode::bind`, `imutex`, `keymap`, `N_KEYS_INPUT`, and `key::scan`.

```

337                                     {
338     if(keyindex >= N_KEYS_INPUT)
339         return;
340     pthread_mutex_lock(&imutex(kb));
341     mode->bind.base[keyindex] = keymap[keyindex].scan;
342     pthread_mutex_unlock(&imutex(kb));
343 }
```

#### 9.21.4.4 void cmd\_unbind ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* ignored )

Definition at line 329 of file input.c.

References binding::base, usbmode::bind, imutex, KEY\_UNBOUND, and N\_KEYS\_INPUT.

```

329                                     {
330     if(keyindex >= N_KEYS_INPUT)
331         return;
332     pthread_mutex_lock(imutex(kb));
333     mode->bind.base[keyindex] = KEY_UNBOUND;
334     pthread_mutex_unlock(imutex(kb));
335 }
```

#### 9.21.4.5 void freebind ( binding \* bind )

Definition at line 300 of file input.c.

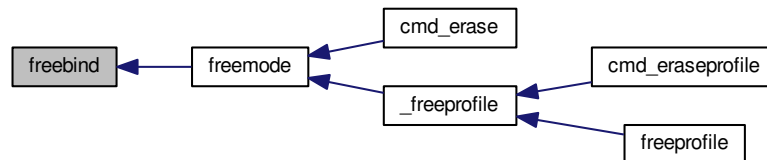
References keymacro::actions, binding::macrocount, and binding::macros.

Referenced by freemode().

```

300                                     {
301     for(int i = 0; i < bind->macrocount; i++)
302         free(bind->macros[i].actions);
303     free(bind->macros);
304     memset(bind, 0, sizeof(*bind));
305 }
```

Here is the caller graph for this function:



#### 9.21.4.6 void initbind ( binding \* bind )

Definition at line 292 of file input.c.

References binding::base, keymap, binding::macrocap, binding::macrocount, binding::macros, N\_KEYS\_INPUT, and key::scan.

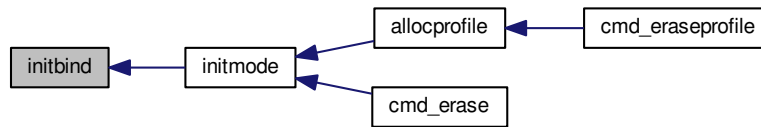
Referenced by initmode().

```

292                                     {
293     for(int i = 0; i < N_KEYS_INPUT; i++)
294         bind->base[i] = keymap[i].scan;
295     bind->macros = calloc(32, sizeof(keymacro));
296     bind->macrocap = 32;
297     bind->macrocount = 0;
298 }
```



Here is the caller graph for this function:



#### 9.21.4.7 void inputupdate ( usbdevice \* kb )

Definition at line 241 of file input.c.

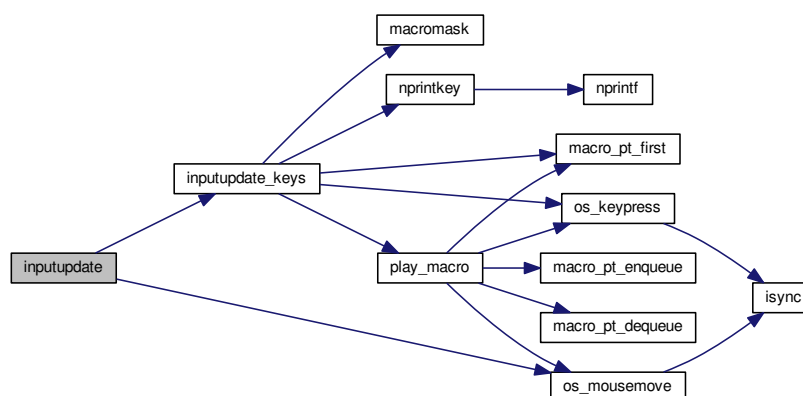
References `usbdevice::input`, `inputupdate_keys()`, `os_mousemove()`, `usbdevice::profile`, `usbinput::rel_x`, `usbinput::rel_y`, `usbdevice::uinput_kb`, and `usbdevice::uinput_mouse`.

Referenced by `os_inputmain()`, `setactive_kb()`, and `setactive_mouse()`.

```

241                                     {
242 #ifdef OS_LINUX
243     if ((!kb->uinput_kb || !kb->uinput_mouse)
244 #else
245     if (!kb->event
246 #endif
247         || !kb->profile)
248         return;
249     // Process key/button input
250     inputupdate_keys(kb);
251     // Process mouse movement
252     usbinput* input = &kb->input;
253     if(input->rel_x != 0 || input->rel_y != 0){
254         os_mousemove(kb, input->rel_x, input->rel_y);
255         input->rel_x = input->rel_y = 0;
256     }
257     // Finish up
258     memcpy(input->prevkeys, input->keys, N_KEYBYTES_INPUT);
259 }
  
```

Here is the call graph for this function:





## Parameters

<i>kb</i>	
-----------	--

## Returns

Some tips on using `uinput_user_dev` in

Definition at line 55 of file `input_linux.c`.

References `usbdevice::fwversion`, `INDEX_OF`, `keyboard`, `usbdevice::name`, `usbdevice::product`, `usbdevice::uinput_kb`, `usbdevice::uinput_mouse`, `uinputopen()`, and `usbdevice::vendor`.

Referenced by `_setupusb()`.

```

55         {
56     // Create the new input device
57     int index = INDEX_OF(kb, keyboard);
58     struct uinput_user_dev indev;
59     memset(&indev, 0, sizeof(indev));
60     snprintf(indev.name, UINPUT_MAX_NAME_SIZE, "ckb%d: %s", index, kb->name);
61     indev.id.bustype = BUS_USB;
62     indev.id.vendor = kb->vendor;
63     indev.id.product = kb->product;
64     indev.id.version = kb->fwversion;
65     // Open keyboard
66     int fd = uinputopen(&indev, 0);
67     kb->uinput_kb = fd;
68     if (fd <= 0)
69         return 0;
70     // Open mouse
71     fd = uinputopen(&indev, 1);
72     kb->uinput_mouse = fd;
73     return fd <= 0;
74 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.21.4.10 void os\_keypress ( usbdevice \* kb, int scancode, int down )

Definition at line 118 of file `input_linux.c`.

References `BTN_WHEELDOWN`, `BTN_WHEELUP`, `ckb_warn`, `isync()`, `SCAN_MOUSE`, `usbdevice::uinput_kb`, and `usbdevice::uinput_mouse`.

Referenced by `inputupdate_keys()`, and `play_macro()`.

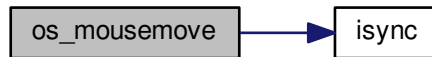


```

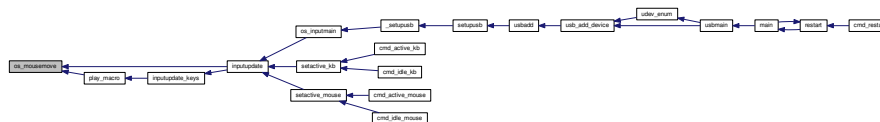
156         event.code = REL_Y;
157         event.value = y;
158         if(write(kb->uinput_mouse - 1, &event, sizeof(event)) <= 0)
159             ckb_warn("uinput write failed: %s\n", strerror(errno));
160         else
161             isync(kb);
162     }
163 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.21.4.12 int os\_setupindicators ( usbdevice \* kb )

Definition at line 189 of file input\_linux.c.

References `_ledthread()`, `usbdevice::hw_ileds`, `usbdevice::hw_ileds_old`, and `usbdevice::ileds`.

Referenced by `_setupusb()`.

```

189                                     {
190     // Initialize LEDs to all off
191     kb->hw_ileds = kb->hw_ileds_old = kb->ileds = 0;
192     // Create and detach thread to read LED events
193     pthread_t thread;
194     int err = pthread_create(&thread, 0, __ledthread, kb);
195     if(err != 0)
196         return err;
197     pthread_detach(thread);
198     return 0;
199 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.21.4.13 void updateindicators\_kb ( usbdevice \* kb, int force )

Definition at line 261 of file input.c.

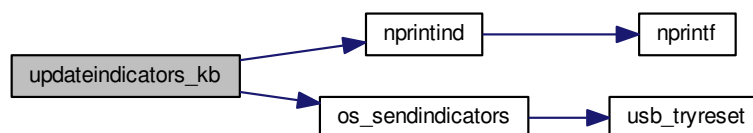
References `usbdevice::active`, `usbprofile::currentmode`, `DELAY_SHORT`, `usbdevice::hw_ileds`, `usbdevice::hw_ileds_old`, `I_CAPS`, `I_NUM`, `I_SCROLL`, `usbdevice::ileds`, `usbmode::inotify`, `usbmode::ioff`, `usbmode::ion`, `nprintind()`, `os_sendindicators()`, `OUTFIFO_MAX`, and `usbdevice::profile`.

```

261     {
262         // Read current hardware indicator state (set externally)
263         uchar old = kb->ileds, hw_old = kb->hw_ileds_old;
264         uchar new = kb->hw_ileds, hw_new = new;
265         // Update them if needed
266         if(kb->active){
267             usbmode* mode = kb->profile->currentmode;
268             new = (new & ~mode->ioff) | mode->ion;
269         }
270         kb->ileds = new;
271         kb->hw_ileds_old = hw_new;
272         if(old != new || force){
273             DELAY_SHORT(kb);
274             os_sendindicators(kb);
275         }
276         // Print notifications if desired
277         if(!kb->active)
278             return;
279         usbmode* mode = kb->profile->currentmode;
280         uchar indicators[] = { I_NUM, I_CAPS, I_SCROLL };
281         for(unsigned i = 0; i < sizeof(indicators) / sizeof(uchar); i++){
282             uchar mask = indicators[i];
283             if((hw_old & mask) == (hw_new & mask))
284                 continue;
285             for(int notify = 0; notify < OUTFIFO_MAX; notify++){
286                 if(mode->inotify[notify] & mask)
287                     nprintind(kb, notify, mask, hw_new & mask);
288             }
289         }
290     }

```

Here is the call graph for this function:



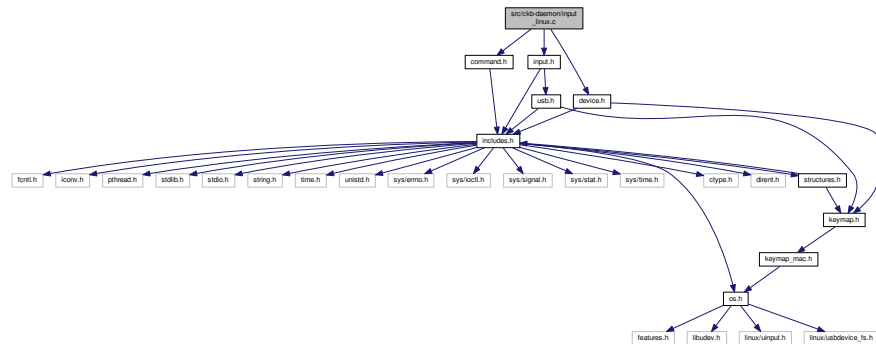
## 9.22 src/ckb-daemon/input\_linux.c File Reference

```

#include "command.h"
#include "device.h"
#include "input.h"

```

Include dependency graph for input\_linux.c:



## Functions

- int [uinputopen](#) (struct uinput\_user\_dev \*indev, int mouse)
- int [os\\_inputopen](#) (usbdevice \*kb)
  - os\_inputopen*
- void [os\\_inputclose](#) (usbdevice \*kb)
- static void [isync](#) (usbdevice \*kb)
- void [os\\_keypress](#) (usbdevice \*kb, int scancode, int down)
- void [os\\_mousemove](#) (usbdevice \*kb, int x, int y)
- void \* [\\_ledthread](#) (void \*ctx)
- int [os\\_setupindicators](#) (usbdevice \*kb)

### 9.22.1 Function Documentation

#### 9.22.1.1 void\* \_ledthread ( void \* ctx )

Definition at line 165 of file input\_linux.c.

References [dmutex](#), [usbdevice::hw\\_ileds](#), [usbdevice::uinput\\_kb](#), and [usbdevice::vtable](#).

Referenced by [os\\_setupindicators\(\)](#).

```

165                                     {
166     usbdevice* kb = ctx;
167     uchar ileds = 0;
168     // Read LED events from the uinput device
169     struct input_event;
170     while (read(kb->uinput_kb - 1, &event, sizeof(event)) > 0) {
171         if (event.type == EV_LED && event.code < 8){
172             char which = 1 << event.code;
173             if(event.value)
174                 ileds |= which;
175             else
176                 ileds &= ~which;
177         }
178         // Update them if needed
179         pthread_mutex_lock(&dmutex(kb));
180         if(kb->hw_ileds != ileds){
181             kb->hw_ileds = ileds;
182             kb->vtable->updateindicators(kb, 0);
183         }
184         pthread_mutex_unlock(&dmutex(kb));
185     }
186     return 0;
187 }
```

Here is the caller graph for this function:



### 9.22.1.2 static void isync ( usbdevice \* kb ) [static]

Definition at line 107 of file input\_linux.c.

References ckb\_warn, usbdevice::uinput\_kb, and usbdevice::uinput\_mouse.

Referenced by os\_keypress(), and os\_mousemove().

```

107     {
108         struct input_event event;
109         memset(&event, 0, sizeof(event));
110         event.type = EV_SYN;
111         event.code = SYN_REPORT;
112         if(write(kb->uinput_kb - 1, &event, sizeof(event)) <= 0)
113             ckb_warn("uinput write failed: %s\n", strerror(errno));
114         if(write(kb->uinput_mouse - 1, &event, sizeof(event)) <= 0)
115             ckb_warn("uinput write failed: %s\n", strerror(errno));
116     }

```

Here is the caller graph for this function:



### 9.22.1.3 void os\_inputclose ( usbdevice \* kb )

Definition at line 76 of file input\_linux.c.

References ckb\_warn, usbdevice::uinput\_kb, and usbdevice::uinput\_mouse.

Referenced by closeusb().

```

76     {
77         if(kb->uinput_kb <= 0 || kb->uinput_mouse <= 0)
78             return;
79         // Set all keys released
80         struct input_event event;
81         memset(&event, 0, sizeof(event));
82         event.type = EV_KEY;
83         for(int key = 0; key < KEY_CNT; key++){
84             event.code = key;
85             if(write(kb->uinput_kb - 1, &event, sizeof(event)) <= 0)
86                 ckb_warn("uinput write failed: %s\n", strerror(errno));
87             if(write(kb->uinput_mouse - 1, &event, sizeof(event)) <= 0)
88                 ckb_warn("uinput write failed: %s\n", strerror(errno));
89         }
90         event.type = EV_SYN;
91         event.code = SYN_REPORT;
92         if(write(kb->uinput_kb - 1, &event, sizeof(event)) <= 0)
93             ckb_warn("uinput write failed: %s\n", strerror(errno));
94         if(write(kb->uinput_mouse - 1, &event, sizeof(event)) <= 0)
95             ckb_warn("uinput write failed: %s\n", strerror(errno));
96         // Close the keyboard
97         ioctl(kb->uinput_kb - 1, UI_DEV_DESTROY);
98         close(kb->uinput_kb - 1);
99         kb->uinput_kb = 0;
100        // Close the mouse

```

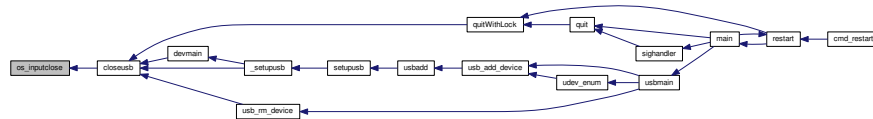


```

101     ioctl(kb->uinput_mouse - 1, UI_DEV_DESTROY);
102     close(kb->uinput_mouse - 1);
103     kb->uinput_mouse = 0;
104 }

```

Here is the caller graph for this function:



#### 9.22.1.4 int os\_inputopen ( usbdevice \* kb )

##### Parameters

<i>kb</i>	
-----------	--

##### Returns

Some tips on using `uinput_user_dev` in

Definition at line 55 of file input\_linux.c.

References `usbdevice::fwversion`, `INDEX_OF`, `keyboard`, `usbdevice::name`, `usbdevice::product`, `usbdevice::uinput_kb`, `usbdevice::uinput_mouse`, `uinputopen()`, and `usbdevice::vendor`.

Referenced by `_setupusb()`.

```

55     {
56         // Create the new input device
57         int index = INDEX_OF(kb, keyboard);
58         struct uinput_user_dev indev;
59         memset(&indev, 0, sizeof(indev));
60         snprintf(indev.name, UINPUT_MAX_NAME_SIZE, "ckb%d: %s", index, kb->name);
61         indev.id.bustype = BUS_USB;
62         indev.id.vendor = kb->vendor;
63         indev.id.product = kb->product;
64         indev.id.version = kb->fwversion;
65         // Open keyboard
66         int fd = uinputopen(&indev, 0);
67         kb->uinput_kb = fd;
68         if (fd <= 0)
69             return 0;
70         // Open mouse
71         fd = uinputopen(&indev, 1);
72         kb->uinput_mouse = fd;
73         return fd <= 0;
74     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.22.1.5 void os\_keypress ( usbdevice \* kb, int scancode, int down )

Definition at line 118 of file input\_linux.c.

References `BTN_WHEELDOWN`, `BTN_WHEELUP`, `ckb_warn`, `isync()`, `SCAN_MOUSE`, `usbdevice::uinput_kb`, and `usbdevice::uinput_mouse`.

Referenced by `inputupdate_keys()`, and `play_macro()`.

```

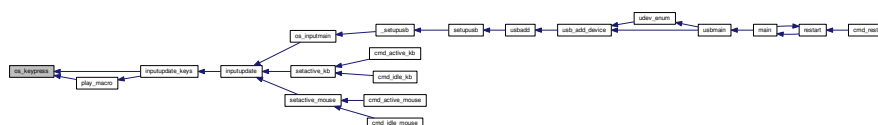
118                                     {
119     struct input_event event;
120     memset(&event, 0, sizeof(event));
121     int is_mouse = 0;
122     if(scancode == BTN_WHEELUP || scancode == BTN_WHEELDOWN) {
123         // The mouse wheel is a relative axis
124         if(!down)
125             return;
126         event.type = EV_REL;
127         event.code = REL_WHEEL;
128         event.value = (scancode == BTN_WHEELUP ? 1 : -1);
129         is_mouse = 1;
130     } else {
131         // Mouse buttons and key events are both EV_KEY. The scancodes are already correct, just remove the
132         ckb bit
133         event.type = EV_KEY;
134         event.code = scancode & ~SCAN_MOUSE;
135         event.value = down;
136         is_mouse = !(scancode & SCAN_MOUSE);
137     }
138     if(write((is_mouse ? kb->uinput_mouse : kb->uinput_kb) - 1, &event, sizeof(event))
139         <= 0)
140         ckb_warn("uinput write failed: %s\n", strerror(errno));
141     else
142         isync(kb);
143 }

```

Here is the call graph for this function:



Here is the caller graph for this function:





```

196         return err;
197     pthread_detach(thread);
198     return 0;
199 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.22.1.8 int uinputopen ( struct uinput\_user\_dev \* indev, int mouse )

Definition at line 9 of file input\_linux.c.

References ckb\_err, and ckb\_warn.

Referenced by os\_uinputopen().

```

9
10     int fd = open("/dev/uinput", O_RDWR);
11     if(fd < 0){
12         // If that didn't work, try /dev/input/uinput instead
13         fd = open("/dev/input/uinput", O_RDWR);
14         if(fd < 0){
15             ckb_err("Failed to open uinput: %s\n", strerror(errno));
16             return 0;
17         }
18     }
19     // Enable all keys and mouse buttons
20     ioctl(fd, UI_SET_EVBIT, EV_KEY);
21     for(int i = 0; i < KEY_CNT; i++)
22         ioctl(fd, UI_SET_KEYBIT, i);
23     if(mouse){
24         // Enable mouse axes
25         ioctl(fd, UI_SET_EVBIT, EV_REL);
26         for(int i = 0; i < REL_CNT; i++)
27             ioctl(fd, UI_SET_RELBIT, i);
28     } else {
29         // Enable LEDs
30         ioctl(fd, UI_SET_EVBIT, EV_LED);
31         for(int i = 0; i < LED_CNT; i++)
32             ioctl(fd, UI_SET_LEDBIT, i);
33         // Enable autorepeat
34         ioctl(fd, UI_SET_EVBIT, EV_REP);
35     }
36     // Enable synchronization
37     ioctl(fd, UI_SET_EVBIT, EV_SYN);
38     // Create the device
39     if(write(fd, indev, sizeof(*indev)) <= 0)
40         ckb_warn("uinput write failed: %s\n", strerror(errno));
41     if(ioctl(fd, UI_DEV_CREATE)){
42         ckb_err("Failed to create uinput device: %s\n", strerror(errno));
43         close(fd);
44         return 0;
45     }
46     return fd + 1;
47 }

```

```

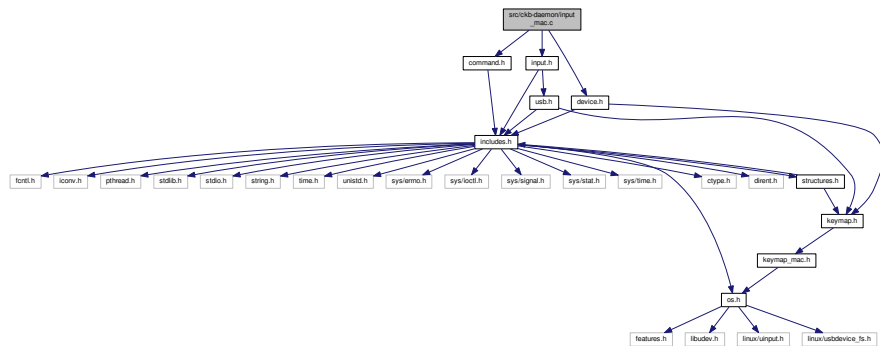
graph LR
    init[init] --> main
    main --> cmd_restart
    cmd_restart --> restart
    restart --> main
    main --> usbmain
    usbmain --> udev_enum
    udev_enum --> usbmain
    udev_enum --> usb_add_device
    usb_add_device --> usbmain
    usbmain --> usbadd
    usbadd --> setupusb
    setupusb --> _setupusb
    _setupusb --> os_inputopen
    os_inputopen --> _inputopen
    _inputopen --> init

```

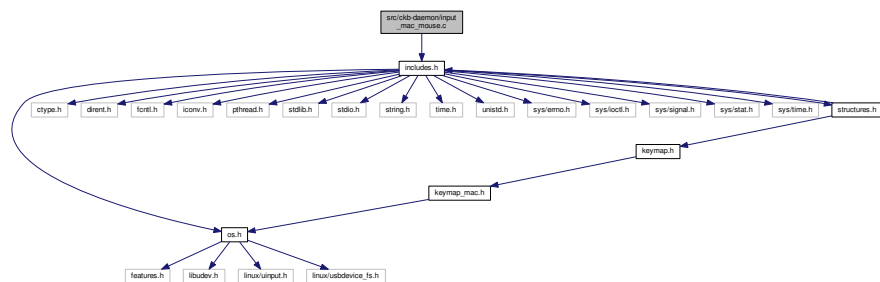
```
#include "command.h"
#include "device.h"
#include "input.h"
Include dependency graph for input_mac.c:
```



```
#include "command.h"
#include "device.h"
#include "input.h"
Include dependency graph for input_mac.c:
```



```
#include "includes.h"
Include dependency graph for input_mac_mouse.c:
```



```
#include "device.h"
#include "includes.h"
#include "keymap.h"
```



Here is the caller graph for this function:



### 9.25.2.2 void corsair\_mousecopy ( unsigned char \* kbinput, int endpoint, const unsigned char \* urbinput )

Definition at line 403 of file keymap.c.

References BUTTON\_HID\_COUNT, CLEAR\_KEYBIT, MOUSE\_BUTTON\_FIRST, N\_BUTTONS\_HW, and SET\_KEYBIT.

Referenced by os\_inputmain().

```

403                                     {
404     if(endpoint == 2 || endpoint == -2){
405         if(urbinput[0] != 3)
406             return;
407         urbinput++;
408     }
409     for(int bit = BUTTON_HID_COUNT; bit < N_BUTTONS_HW; bit++){
410         int byte = bit / 8;
411         uchar test = 1 << (bit % 8);
412         if(urbinput[byte] & test)
413             SET_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
414         else
415             CLEAR_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
416     }
417 }

```

Here is the caller graph for this function:



### 9.25.2.3 void hid\_kb\_translate ( unsigned char \* kbinput, int endpoint, int length, const unsigned char \* urbinput )

Definition at line 223 of file keymap.c.

References ckb\_warn, CLEAR\_KEYBIT, and SET\_KEYBIT.

Referenced by os\_inputmain().

```

223                                     {
224     if(length < 1)
225         return;
226     // LUT for HID -> Corsair scan codes (-1 for no scan code, -2 for currently unsupported)
227     // Modified from Linux drivers/hid/usbhid/usbkbd.c, key codes replaced with array indices and K95 keys
    added
228     static const short hid_codes[256] = {
229         -1, -1, -1, -1, 37, 54, 52, 39, 27, 40, 41, 42, 32, 43, 44, 45,
230         56, 55, 33, 34, 25, 28, 38, 29, 31, 53, 26, 51, 30, 50, 13, 14,
231         15, 16, 17, 18, 19, 20, 21, 22, 82, 0, 86, 24, 64, 23, 84, 35,
232         79, 80, 81, 46, 47, 12, 57, 58, 59, 36, 1, 2, 3, 4, 5, 6,
233         7, 8, 9, 10, 11, 72, 73, 74, 75, 76, 77, 78, 87, 88, 89, 95,
234         93, 94, 92, 102, 103, 104, 105, 106, 107, 115, 116, 117, 112, 113, 114, 108,
235         109, 110, 118, 119, 49, 69, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2,
236         -2, -2, -2, -2, -2, -2, -2, 98, -2, -2, -2, -2, -2, -2, 97,
237         130, 131, -1, -1, -1, -2, -1, -2, -2, -2, -2, -2, -1, -1, -1,
238         -2, -2, -2, -2, -2, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
239         -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
240         -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
241         -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -3, -1, -1, -1, // <- -3 = non-RGB
    program key

```

```

242     120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 136, 137, 138, 139, 140, 141,
243     60,  48,  62,  61,  91,  90,  67,  68, 142, 143,  99, 101, -2, 130, 131,  97,
244     -2, 133, 134, 135, -2,  96, -2, 132, -2, -2,  71,  71,  71,  71, -1, -1,
245 };
246 switch(endpoint){
247 case 1:
248 case -1:
249     // EP 1: 6KRO input (RGB and non-RGB)
250     // Clear previous input
251     for(int i = 0; i < 256; i++){
252         if(hid_codes[i] >= 0)
253             CLEAR_KEYBIT(kbinput, hid_codes[i]);
254     }
255     // Set new input
256     for(int i = 0; i < 8; i++){
257         if((urbinput[0] >> i) & 1)
258             SET_KEYBIT(kbinput, hid_codes[i + 224]);
259     }
260     for(int i = 2; i < length; i++){
261         if(urbinput[i] > 3){
262             int scan = hid_codes[urbinput[i]];
263             if(scan >= 0)
264                 SET_KEYBIT(kbinput, scan);
265             else
266                 ckb_warn("Got unknown key press %d on EP 1\n", urbinput[i]);
267         }
268     }
269     break;
270 case -2:
271     // EP 2 RGB: NKRO input
272     if(urbinput[0] == 1){
273         // Type 1: standard key
274         if(length != 21)
275             return;
276         for(int bit = 0; bit < 8; bit++){
277             if((urbinput[1] >> bit) & 1)
278                 SET_KEYBIT(kbinput, hid_codes[bit + 224]);
279             else
280                 CLEAR_KEYBIT(kbinput, hid_codes[bit + 224]);
281         }
282         for(int byte = 0; byte < 19; byte++){
283             char input = urbinput[byte + 2];
284             for(int bit = 0; bit < 8; bit++){
285                 int keybit = byte * 8 + bit;
286                 int scan = hid_codes[keybit];
287                 if((input >> bit) & 1){
288                     if(scan >= 0)
289                         SET_KEYBIT(kbinput, hid_codes[keybit]);
290                     else
291                         ckb_warn("Got unknown key press %d on EP 2\n", keybit);
292                 } else if(scan >= 0)
293                     CLEAR_KEYBIT(kbinput, hid_codes[keybit]);
294             }
295         }
296         break;
297     } else if(urbinput[0] == 2)
298         ; // Type 2: media key (fall through)
299     else
300         break; // No other known types
301 case 2:
302     // EP 2 Non-RGB: media keys
303     CLEAR_KEYBIT(kbinput, 97); // mute
304     CLEAR_KEYBIT(kbinput, 98); // stop
305     CLEAR_KEYBIT(kbinput, 99); // prev
306     CLEAR_KEYBIT(kbinput, 100); // play
307     CLEAR_KEYBIT(kbinput, 101); // next
308     CLEAR_KEYBIT(kbinput, 130); // volup
309     CLEAR_KEYBIT(kbinput, 131); // voldown
310     for(int i = 0; i < length; i++){
311         switch(urbinput[i]){
312             case 181:
313                 SET_KEYBIT(kbinput, 101); // next
314                 break;
315             case 182:
316                 SET_KEYBIT(kbinput, 99); // prev
317                 break;
318             case 183:
319                 SET_KEYBIT(kbinput, 98); // stop
320                 break;
321             case 205:
322                 SET_KEYBIT(kbinput, 100); // play
323                 break;
324             case 226:
325                 SET_KEYBIT(kbinput, 97); // mute
326                 break;
327             case 233:
328                 SET_KEYBIT(kbinput, 130); // volup

```



```

329         break;
330     case 234:
331         SET_KEYBIT(kbinput, 131);    // voldn
332         break;
333     }
334 }
335 break;
336 case 3:
337     // EP 3 non-RGB: NKRO input
338     if(length != 15)
339         return;
340     for(int bit = 0; bit < 8; bit++){
341         if((urbinput[0] >> bit) & 1)
342             SET_KEYBIT(kbinput, hid_codes[bit + 224]);
343         else
344             CLEAR_KEYBIT(kbinput, hid_codes[bit + 224]);
345     }
346     for(int byte = 0; byte < 14; byte++){
347         char input = urbinput[byte + 1];
348         for(int bit = 0; bit < 8; bit++){
349             int keybit = byte * 8 + bit;
350             int scan = hid_codes[keybit];
351             if((input >> bit) & 1){
352                 if(scan >= 0)
353                     SET_KEYBIT(kbinput, hid_codes[keybit]);
354                 else
355                     ckb_warn("Got unknown key press %d on EP 3\n", keybit);
356             } else if(scan >= 0)
357                 CLEAR_KEYBIT(kbinput, hid_codes[keybit]);
358         }
359     }
360     break;
361 }
362 }

```

Here is the caller graph for this function:



#### 9.25.2.4 void hid\_mouse\_translate ( unsigned char \* kbinput, short \* xaxis, short \* yaxis, int endpoint, int length, const unsigned char \* urbinput )

Definition at line 366 of file keymap.c.

References `BUTTON_HID_COUNT`, `CLEAR_KEYBIT`, `MOUSE_BUTTON_FIRST`, `MOUSE_EXTRA_FIRST`, and `SET_KEYBIT`.

Referenced by `os_inputmain()`.

```

366     {
367         if((endpoint != 2 && endpoint != -2) || length < 10)
368             return;
369         // EP 2: mouse input
370         if(urbinput[0] != 1)
371             return;
372         // Byte 1 = mouse buttons (bitfield)
373         for(int bit = 0; bit < BUTTON_HID_COUNT; bit++){
374             if(urbinput[1] & (1 << bit))
375                 SET_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
376             else
377                 CLEAR_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
378         }
379         // Bytes 5 - 8: movement
380         *xaxis += *(short*)(urbinput + 5);
381         *yaxis += *(short*)(urbinput + 7);
382         // Byte 9: wheel
383         char wheel = urbinput[9];
384         if(wheel > 0)
385             SET_KEYBIT(kbinput, MOUSE_EXTRA_FIRST);    // wheelup
386         else
387             CLEAR_KEYBIT(kbinput, MOUSE_EXTRA_FIRST);
388         if(wheel < 0)

```

```

389         SET_KEYBIT(kbinput, MOUSE_EXTRA_FIRST + 1);    // wheeldn
390     else
391         CLEAR_KEYBIT(kbinput, MOUSE_EXTRA_FIRST + 1);
392 }

```

Here is the caller graph for this function:



## 9.25.3 Variable Documentation

### 9.25.3.1 const key keymap[(((152+3+12)+25)+11)]

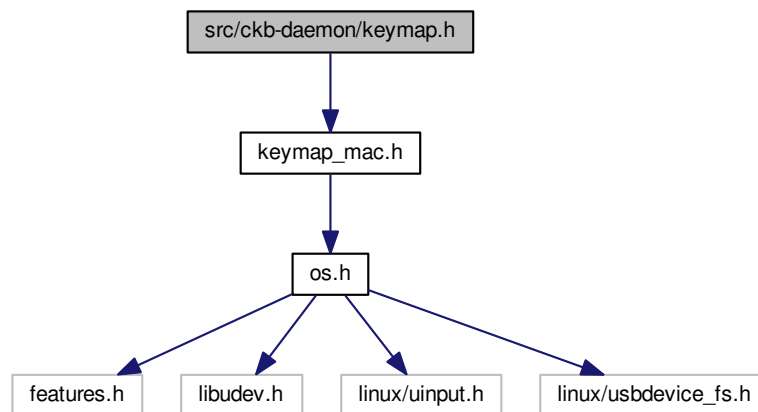
Definition at line 5 of file keymap.c.

Referenced by `_cmd_get()`, `_cmd_macro()`, `cmd_bind()`, `cmd_rebind()`, `cmd_rgb()`, `initbind()`, `inputupdate_keys()`, `nprintkey()`, `printrgb()`, `readcmd()`, and `setactive_kb()`.

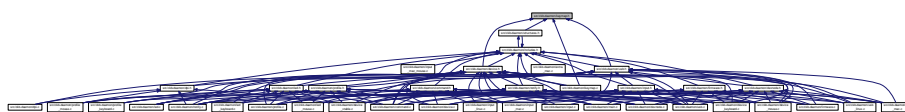
## 9.26 src/ckb-daemon/keymap.h File Reference

```
#include "keymap_mac.h"
```

Include dependency graph for keymap.h:



This graph shows which files directly or indirectly include this file:



## Data Structures

- struct [key](#)

## Macros

- #define [KEY\\_NONE](#) -1
- #define [KEY\\_CORSAIR](#) -2
- #define [KEY\\_UNBOUND](#) -3
- #define [BTN\\_WHEELUP](#) 0x1f01
- #define [BTN\\_WHEELDOWN](#) 0x1f02
- #define [KEY\\_BACKSLASH\\_ISO](#) KEY\_BACKSLASH
- #define [N\\_KEYS\\_HW](#) 152
- #define [N\\_KEYBYTES\\_HW](#) (([N\\_KEYS\\_HW](#) + 7) / 8)
- #define [N\\_KEY\\_ZONES](#) 3
- #define [N\\_KEYS\\_EXTRA](#) 12
- #define [N\\_BUTTONS\\_HW](#) 20
- #define [N\\_BUTTONS\\_EXTENDED](#) 25
- #define [MOUSE\\_BUTTON\\_FIRST](#) ([N\\_KEYS\\_HW](#) + [N\\_KEY\\_ZONES](#) + [N\\_KEYS\\_EXTRA](#))
- #define [MOUSE\\_EXTRA\\_FIRST](#) ([MOUSE\\_BUTTON\\_FIRST](#) + [N\\_BUTTONS\\_HW](#))
- #define [N\\_KEYS\\_INPUT](#) ([MOUSE\\_BUTTON\\_FIRST](#) + [N\\_BUTTONS\\_EXTENDED](#))
- #define [N\\_KEYBYTES\\_INPUT](#) (([N\\_KEYS\\_INPUT](#) + 7) / 8)
- #define [LED\\_MOUSE](#) [N\\_KEYS\\_HW](#)
- #define [N\\_MOUSE\\_ZONES](#) 5
- #define [N\\_MOUSE\\_ZONES\\_EXTENDED](#) 11
- #define [LED\\_DPI](#) ([LED\\_MOUSE](#) + 2)
- #define [N\\_KEYS\\_EXTENDED](#) ([N\\_KEYS\\_INPUT](#) + [N\\_MOUSE\\_ZONES\\_EXTENDED](#))
- #define [N\\_KEYBYTES\\_EXTENDED](#) (([N\\_KEYS\\_EXTENDED](#) + 7) / 8)
- #define [SCAN\\_SILENT](#) 0x8000
- #define [SCAN\\_KBD](#) 0
- #define [SCAN\\_MOUSE](#) 0x1000

## Functions

- void [hid\\_kb\\_translate](#) (unsigned char \*kbinput, int endpoint, int length, const unsigned char \*urbinput)
- void [hid\\_mouse\\_translate](#) (unsigned char \*kbinput, short \*xaxis, short \*yaxis, int endpoint, int length, const unsigned char \*urbinput)
- void [corsair\\_kbcopy](#) (unsigned char \*kbinput, int endpoint, const unsigned char \*urbinput)
- void [corsair\\_mousecopy](#) (unsigned char \*kbinput, int endpoint, const unsigned char \*urbinput)

## Variables

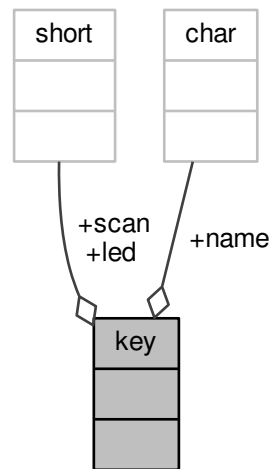
- const [key keymap](#) [(((152+3+12)+25)+11)]

### 9.26.1 Data Structure Documentation

#### 9.26.1.1 struct key

Definition at line 49 of file keymap.h.

Collaboration diagram for key:



#### Data Fields

short	led	
const char *	name	
short	scan	

## 9.26.2 Macro Definition Documentation

### 9.26.2.1 #define BTN\_WHEELDOWN 0x1f02

Definition at line 13 of file keymap.h.

Referenced by os\_keypress().

### 9.26.2.2 #define BTN\_WHEELUP 0x1f01

Definition at line 12 of file keymap.h.

Referenced by os\_keypress().

### 9.26.2.3 #define KEY\_BACKSLASH\_ISO KEY\_BACKSLASH

Definition at line 20 of file keymap.h.

### 9.26.2.4 #define KEY\_CORSAIR -2

Definition at line 8 of file keymap.h.

**9.26.2.5 #define KEY\_NONE -1**

Definition at line 7 of file keymap.h.

**9.26.2.6 #define KEY\_UNBOUND -3**

Definition at line 9 of file keymap.h.

Referenced by cmd\_unbind().

**9.26.2.7 #define LED\_DPI (LED\_MOUSE + 2)**

Definition at line 43 of file keymap.h.

Referenced by loadrgb\_mouse(), and savergb\_mouse().

**9.26.2.8 #define LED\_MOUSE N\_KEYS\_HW**

Definition at line 39 of file keymap.h.

Referenced by isblack(), loaddpi(), loadrgb\_mouse(), rgbcmp(), savedpi(), savergb\_mouse(), and updatergb\_mouse().

**9.26.2.9 #define MOUSE\_BUTTON\_FIRST (N\_KEYS\_HW + N\_KEY\_ZONES + N\_KEYS\_EXTRA)**

Definition at line 33 of file keymap.h.

Referenced by corsair\_mousecopy(), and hid\_mouse\_translate().

**9.26.2.10 #define MOUSE\_EXTRA\_FIRST (MOUSE\_BUTTON\_FIRST + N\_BUTTONS\_HW)**

Definition at line 34 of file keymap.h.

Referenced by hid\_mouse\_translate().

**9.26.2.11 #define N\_BUTTONS\_EXTENDED 25**

Definition at line 32 of file keymap.h.

**9.26.2.12 #define N\_BUTTONS\_HW 20**

Definition at line 31 of file keymap.h.

Referenced by corsair\_mousecopy().

**9.26.2.13 #define N\_KEY\_ZONES 3**

Definition at line 27 of file keymap.h.

**9.26.2.14 #define N\_KEYBYTES\_EXTENDED ((N\_KEYS\_EXTENDED + 7) / 8)**

Definition at line 46 of file keymap.h.

**9.26.2.15** `#define N_KEYBYTES_HW ((N_KEYS_HW + 7) / 8)`

Definition at line 25 of file keymap.h.

Referenced by corsair\_kbcopy().

**9.26.2.16** `#define N_KEYBYTES_INPUT ((N_KEYS_INPUT + 7) / 8)`

Definition at line 37 of file keymap.h.

Referenced by `_cmd_macro()`, `inputupdate_keys()`, and `macromask()`.

**9.26.2.17** `#define N_KEYS_EXTENDED (N_KEYS_INPUT + N_MOUSE_ZONES_EXTENDED)`

Definition at line 45 of file keymap.h.

Referenced by `printrgb()`, and `readcmd()`.

**9.26.2.18** `#define N_KEYS_EXTRA 12`

Definition at line 29 of file keymap.h.

**9.26.2.19** `#define N_KEYS_HW 152`

Definition at line 24 of file keymap.h.

Referenced by `loadrgb_kb()`, `makergb_512()`, `rgbcmp()`, and `setactive_kb()`.

**9.26.2.20** `#define N_KEYS_INPUT (MOUSE_BUTTON_FIRST + N_BUTTONS_EXTENDED)`

Definition at line 36 of file keymap.h.

Referenced by `_cmd_get()`, `_cmd_macro()`, `cmd_bind()`, `cmd_notify()`, `cmd_rebind()`, `cmd_unbind()`, `initbind()`, and `inputupdate_keys()`.

**9.26.2.21** `#define N_MOUSE_ZONES 5`

Definition at line 40 of file keymap.h.

Referenced by `isblack()`, `loaddpi()`, `rgbcmp()`, `savedpi()`, and `updatergb_mouse()`.

**9.26.2.22** `#define N_MOUSE_ZONES_EXTENDED 11`

Definition at line 41 of file keymap.h.

**9.26.2.23** `#define SCAN_KBD 0`

Definition at line 57 of file keymap.h.

**9.26.2.24** `#define SCAN_MOUSE 0x1000`

Definition at line 58 of file keymap.h.

Referenced by `os_keypress()`.

### 9.26.2.25 #define SCAN\_SILENT 0x8000

Definition at line 56 of file keymap.h.

Referenced by inputupdate\_keys().

## 9.26.3 Function Documentation

### 9.26.3.1 void corsair\_kbcopy ( unsigned char \* kbinput, int endpoint, const unsigned char \* urbinput )

Definition at line 394 of file keymap.c.

References N\_KEYBYTES\_HW.

Referenced by os\_inputmain().

```

394                                     {
395     if(endpoint == 2 || endpoint == -2){
396         if(urbinput[0] != 3)
397             return;
398         urbinput++;
399     }
400     memcpy(kbinput, urbinput, N_KEYBYTES_HW);
401 }
```

Here is the caller graph for this function:



### 9.26.3.2 void corsair\_mousecopy ( unsigned char \* kbinput, int endpoint, const unsigned char \* urbinput )

Definition at line 403 of file keymap.c.

References BUTTON\_HID\_COUNT, CLEAR\_KEYBIT, MOUSE\_BUTTON\_FIRST, N\_BUTTONS\_HW, and SET\_KEYBIT.

Referenced by os\_inputmain().

```

403                                     {
404     if(endpoint == 2 || endpoint == -2){
405         if(urbinput[0] != 3)
406             return;
407         urbinput++;
408     }
409     for(int bit = BUTTON_HID_COUNT; bit < N_BUTTONS_HW; bit++){
410         int byte = bit / 8;
411         uchar test = 1 << (bit % 8);
412         if(urbinput[byte] & test)
413             SET_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
414         else
415             CLEAR_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
416     }
417 }
```

Here is the caller graph for this function:



### 9.26.3.3 void hid\_kb\_translate ( unsigned char \* kbinput, int endpoint, int length, const unsigned char \* urbinput )

Definition at line 223 of file keymap.c.

References ckb\_warn, CLEAR\_KEYBIT, and SET\_KEYBIT.

Referenced by os\_inputmain().

```

223                                     {
224     if(length < 1)
225         return;
226     // LUT for HID -> Corsair scancodes (-1 for no scan code, -2 for currently unsupported)
227     // Modified from Linux drivers/hid/usbhid/usbkbd.c, key codes replaced with array indices and K95 keys
    added
228     static const short hid_codes[256] = {
229         -1, -1, -1, -1, 37, 54, 52, 39, 27, 40, 41, 42, 32, 43, 44, 45,
230         56, 55, 33, 34, 25, 28, 38, 29, 31, 53, 26, 51, 30, 50, 13, 14,
231         15, 16, 17, 18, 19, 20, 21, 22, 82, 0, 86, 24, 64, 23, 84, 35,
232         79, 80, 81, 46, 47, 12, 57, 58, 59, 36, 1, 2, 3, 4, 5, 6,
233         7, 8, 9, 10, 11, 72, 73, 74, 75, 76, 77, 78, 87, 88, 89, 95,
234         93, 94, 92, 102, 103, 104, 105, 106, 107, 115, 116, 117, 112, 113, 114, 108,
235         109, 110, 118, 119, 49, 69, -2, -2, -2, -2, -2, -2, -2, -2, -2, -2,
236         -2, -2, -2, -2, -2, -2, -2, -2, 98, -2, -2, -2, -2, -2, 97,
237         130, 131, -1, -1, -1, -2, -1, -2, -2, -2, -2, -2, -2, -1, -1, -1,
238         -2, -2, -2, -2, -2, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
239         -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
240         -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1,
241         -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -3, -1, -1, -1, // <- -3 = non-RGB
    program key
242         120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 136, 137, 138, 139, 140, 141,
243         60, 48, 62, 61, 91, 90, 67, 68, 142, 143, 99, 101, -2, 130, 131, 97,
244         -2, 133, 134, 135, -2, 96, -2, 132, -2, -2, 71, 71, 71, 71, -1, -1,
245     };
246     switch(endpoint){
247     case 1:
248     case -1:
249         // EP 1: 6KRO input (RGB and non-RGB)
250         // Clear previous input
251         for(int i = 0; i < 256; i++){
252             if(hid_codes[i] >= 0)
253                 CLEAR_KEYBIT(kbinput, hid_codes[i]);
254         }
255         // Set new input
256         for(int i = 0; i < 8; i++){
257             if((urbinput[0] >> i) & 1)
258                 SET_KEYBIT(kbinput, hid_codes[i + 224]);
259         }
260         for(int i = 2; i < length; i++){
261             if(urbinput[i] > 3){
262                 int scan = hid_codes[urbinput[i]];
263                 if(scan >= 0)
264                     SET_KEYBIT(kbinput, scan);
265                 else
266                     ckb_warn("Got unknown key press %d on EP 1\n", urbinput[i]);
267             }
268         }
269         break;
270     case -2:
271         // EP 2 RGB: NKRO input
272         if(urbinput[0] == 1){
273             // Type 1: standard key
274             if(length != 21)
275                 return;
276             for(int bit = 0; bit < 8; bit++){
277                 if((urbinput[1] >> bit) & 1)
278                     SET_KEYBIT(kbinput, hid_codes[bit + 224]);
279                 else
280                     CLEAR_KEYBIT(kbinput, hid_codes[bit + 224]);
281             }
282             for(int byte = 0; byte < 19; byte++){
283                 char input = urbinput[byte + 2];
284                 for(int bit = 0; bit < 8; bit++){
285                     int keybit = byte * 8 + bit;
286                     int scan = hid_codes[keybit];
287                     if((input >> bit) & 1){
288                         if(scan >= 0)
289                             SET_KEYBIT(kbinput, hid_codes[keybit]);
290                         else
291                             ckb_warn("Got unknown key press %d on EP 2\n", keybit);
292                     } else if(scan >= 0)
293                         CLEAR_KEYBIT(kbinput, hid_codes[keybit]);
294                 }
295             }
296             break;
297         } else if(urbinput[0] == 2)

```



```

298         ;          // Type 2: media key (fall through)
299     else
300         break; // No other known types
301 case 2:
302     // EP 2 Non-RGB: media keys
303     CLEAR_KEYBIT(kbinput, 97); // mute
304     CLEAR_KEYBIT(kbinput, 98); // stop
305     CLEAR_KEYBIT(kbinput, 99); // prev
306     CLEAR_KEYBIT(kbinput, 100); // play
307     CLEAR_KEYBIT(kbinput, 101); // next
308     CLEAR_KEYBIT(kbinput, 130); // volup
309     CLEAR_KEYBIT(kbinput, 131); // voldown
310     for(int i = 0; i < length; i++){
311         switch(urbinput[i]){
312             case 181:
313                 SET_KEYBIT(kbinput, 101); // next
314                 break;
315             case 182:
316                 SET_KEYBIT(kbinput, 99); // prev
317                 break;
318             case 183:
319                 SET_KEYBIT(kbinput, 98); // stop
320                 break;
321             case 205:
322                 SET_KEYBIT(kbinput, 100); // play
323                 break;
324             case 226:
325                 SET_KEYBIT(kbinput, 97); // mute
326                 break;
327             case 233:
328                 SET_KEYBIT(kbinput, 130); // volup
329                 break;
330             case 234:
331                 SET_KEYBIT(kbinput, 131); // voldown
332                 break;
333         }
334     }
335     break;
336 case 3:
337     // EP 3 non-RGB: NKRO input
338     if(length != 15)
339         return;
340     for(int bit = 0; bit < 8; bit++){
341         if((urbinput[0] >> bit) & 1)
342             SET_KEYBIT(kbinput, hid_codes[bit + 224]);
343         else
344             CLEAR_KEYBIT(kbinput, hid_codes[bit + 224]);
345     }
346     for(int byte = 0; byte < 14; byte++){
347         char input = urbinput[byte + 1];
348         for(int bit = 0; bit < 8; bit++){
349             int keybit = byte * 8 + bit;
350             int scan = hid_codes[keybit];
351             if((input >> bit) & 1){
352                 if(scan >= 0)
353                     SET_KEYBIT(kbinput, hid_codes[keybit]);
354                 else
355                     ckb_warn("Got unknown key press %d on EP 3\n", keybit);
356             } else if(scan >= 0)
357                 CLEAR_KEYBIT(kbinput, hid_codes[keybit]);
358         }
359     }
360     break;
361 }
362 }

```

Here is the caller graph for this function:



#### 9.26.3.4 void hid\_mouse\_translate ( unsigned char \* kbinput, short \* xaxis, short \* yaxis, int endpoint, int length, const unsigned char \* urbinput )

Definition at line 366 of file keymap.c.

References `BUTTON_HID_COUNT`, `CLEAR_KEYBIT`, `MOUSE_BUTTON_FIRST`, `MOUSE_EXTRA_FIRST`, and `SET_KEYBIT`.

Referenced by `os_inputmain()`.

```

366
367         {
368             if((endpoint != 2 && endpoint != -2) || length < 10)
369                 return;
370             // EP 2: mouse input
371             if(urbinput[0] != 1)
372                 return;
373             // Byte 1 = mouse buttons (bitfield)
374             for(int bit = 0; bit < BUTTON_HID_COUNT; bit++){
375                 if(urbinput[1] & (1 << bit))
376                     SET_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
377                 else
378                     CLEAR_KEYBIT(kbinput, MOUSE_BUTTON_FIRST + bit);
379             }
380             // Bytes 5 - 8: movement
381             *xaxis += *(short*)(urbinput + 5);
382             *yaxis += *(short*)(urbinput + 7);
383             // Byte 9: wheel
384             char wheel = urbinput[9];
385             if(wheel > 0)
386                 SET_KEYBIT(kbinput, MOUSE_EXTRA_FIRST); // wheelup
387             else
388                 CLEAR_KEYBIT(kbinput, MOUSE_EXTRA_FIRST);
389             if(wheel < 0)
390                 SET_KEYBIT(kbinput, MOUSE_EXTRA_FIRST + 1); // wheeldn
391             else
392                 CLEAR_KEYBIT(kbinput, MOUSE_EXTRA_FIRST + 1);
393         }

```

Here is the caller graph for this function:



## 9.26.4 Variable Documentation

### 9.26.4.1 `const key keymap[(((152+3+12)+25)+11)]`

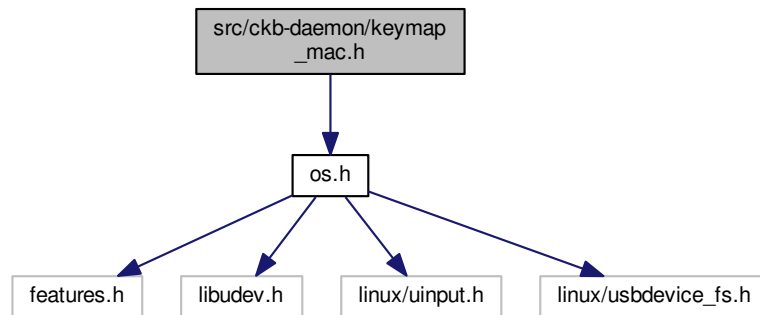
Definition at line 5 of file `keymap.c`.

Referenced by `_cmd_get()`, `_cmd_macro()`, `cmd_bind()`, `cmd_rebind()`, `cmd_rgb()`, `initbind()`, `inputupdate_keys()`, `nprintkey()`, `printrgb()`, `readcmd()`, and `setactive_kb()`.

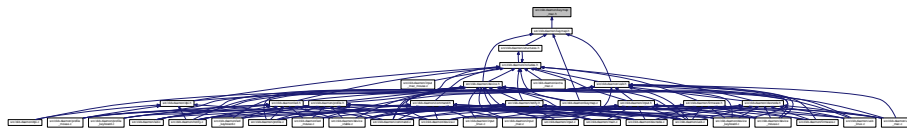
## 9.27 `src/ckb-daemon/keymap_mac.h` File Reference

```
#include "os.h"
```

Include dependency graph for keymap\_mac.h:



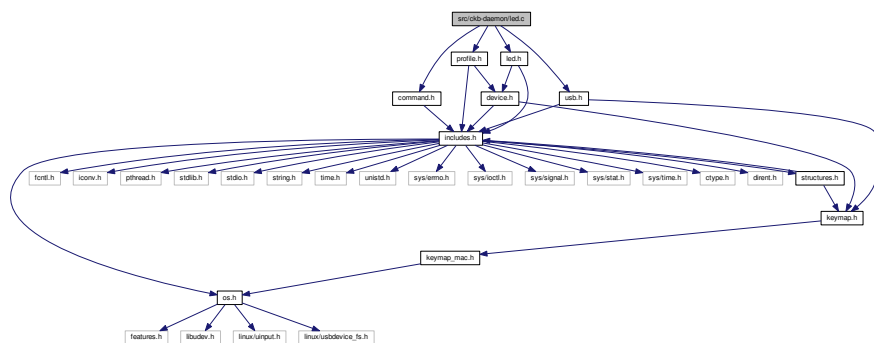
This graph shows which files directly or indirectly include this file:



## 9.28 src/ckb-daemon/led.c File Reference

```
#include "command.h"
#include "led.h"
#include "profile.h"
#include "usb.h"
```

Include dependency graph for led.c:



## Functions

- void `cmd_rgb` (`usbdevice` \*kb, `usbmode` \*mode, int dummy, int keyindex, const char \*code)
- static `uchar` `iselect` (const char \*led)
- void `cmd_ioff` (`usbdevice` \*kb, `usbmode` \*mode, int dummy1, int dummy2, const char \*led)

- void `cmd_ion` (`usbdevice` \*`kb`, `usbmode` \*`mode`, int `dummy1`, int `dummy2`, const char \*`led`)
- void `cmd_iauto` (`usbdevice` \*`kb`, `usbmode` \*`mode`, int `dummy1`, int `dummy2`, const char \*`led`)
- void `cmd_inotify` (`usbdevice` \*`kb`, `usbmode` \*`mode`, int `nnumber`, int `dummy`, const char \*`led`)
- static int `has_key` (const char \*`name`, const `usbdevice` \*`kb`)
- char \* `printrgb` (const `lighting` \*`light`, const `usbdevice` \*`kb`)

## 9.28.1 Function Documentation

### 9.28.1.1 void `cmd_iauto` ( `usbdevice` \* `kb`, `usbmode` \* `mode`, int `dummy1`, int `dummy2`, const char \* `led` )

Definition at line 54 of file `led.c`.

References `usbmode::ioff`, `usbmode::ion`, `iselect()`, and `usbdevice::vtable`.

```

54                                     {
55     uchar bits = iselect(led);
56     // Remove the bits from both ioff and ion
57     mode->ioff &= ~bits;
58     mode->ion &= ~bits;
59     kb->vtable->updateindicators(kb, 0);
60 }
```

Here is the call graph for this function:



### 9.28.1.2 void `cmd_inotify` ( `usbdevice` \* `kb`, `usbmode` \* `mode`, int `nnumber`, int `dummy`, const char \* `led` )

Definition at line 62 of file `led.c`.

References `usbmode::inotify`, and `iselect()`.

```

62                                     {
63     uchar bits = iselect(led);
64     if(strstr(led, ":off"))
65         // Turn notifications for these bits off
66         mode->inotify[nnumber] &= ~bits;
67     else
68         // Turn notifications for these bits on
69         mode->inotify[nnumber] |= bits;
70 }
```

Here is the call graph for this function:



### 9.28.1.3 void cmd\_ioff ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* led )

Definition at line 38 of file led.c.

References `usbmode::ioff`, `usbmode::ion`, `iselect()`, and `usbdevice::vtable`.

```

38                                     {
39     uchar bits = iselect(led);
40     // Add the bits to ioff, remove them from ion
41     mode->ioff |= bits;
42     mode->ion  &= ~bits;
43     kb->vtable->updateindicators(kb, 0);
44 }
```

Here is the call graph for this function:



### 9.28.1.4 void cmd\_ion ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* led )

Definition at line 46 of file led.c.

References `usbmode::ioff`, `usbmode::ion`, `iselect()`, and `usbdevice::vtable`.

```

46                                     {
47     uchar bits = iselect(led);
48     // Remove the bits from ioff, add them to ion
49     mode->ioff &= ~bits;
50     mode->ion  |= bits;
51     kb->vtable->updateindicators(kb, 0);
52 }
```

Here is the call graph for this function:



### 9.28.1.5 void cmd\_rgb ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* code )

Definition at line 6 of file led.c.

References `lighting::b`, `lighting::g`, `keymap`, `key::led`, `usbmode::light`, `lighting::r`, and `lighting::sidelight`.

```

6                                     {
7     int index = keymap[keyindex].led;
```

```

8     if(index < 0) {
9         if (index == -2){ // Process strafe sidelights
10             uchar sideshine;
11             if (sscanf(code, "%2hhx",&sideshine)) // monochromatic
12                 mode->light.sidelight = sideshine;
13         }
14         return;
15     }
16     uchar r, g, b;
17     if(sscanf(code, "%2hhx%2hhx%2hhx", &r, &g, &b) == 3){
18         mode->light.r[index] = r;
19         mode->light.g[index] = g;
20         mode->light.b[index] = b;
21     }
22 }

```

#### 9.28.1.6 static int has\_key ( const char \* name, const usbdevice \* kb ) [static]

Definition at line 73 of file led.c.

References IS\_K65, IS\_K95, IS\_MOUSE, IS\_SABRE, IS\_SCIMITAR, usbdevice::product, and usbdevice::vendor.

Referenced by printrgb().

```

73                                     {
74     if(!name)
75         return 0;
76     if(IS_MOUSE(kb->vendor, kb->product)){
77         // Mice only have the RGB zones
78         if((IS_SABRE(kb) || IS_SCIMITAR(kb)) && !strcmp(name, "wheel"))
79             return 1;
80         if(IS_SCIMITAR(kb) && !strcmp(name, "thumb"))
81             return 1;
82         if(strstr(name, "dpi") == name || !strcmp(name, "front") || !strcmp(name, "back"))
83             return 1;
84         return 0;
85     } else {
86         // But keyboards don't have them at all
87         if(strstr(name, "dpi") == name || !strcmp(name, "front") || !strcmp(name, "back") || !strcmp(name,
"wheel") || !strcmp(name, "thumb"))
88             return 0;
89         // Only K95 has G keys and M keys (G1 - G18, MR, M1 - M3)
90         if(!IS_K95(kb) && ((name[0] == 'g' && name[1] >= '1' && name[1] <= '9') || (name[0] == 'm' &&
(name[1] == 'r' || name[1] == '1' || name[1] == '2' || name[1] == '3'))))
91             return 0;
92         // Only K65 has lights on VolUp/VolDn
93         if(!IS_K65(kb) && (!strcmp(name, "volup") || !strcmp(name, "voldn")))
94             return 0;
95         // K65 lacks numpad and media buttons
96         if(IS_K65(kb) && (strstr(name, "num") == name || !strcmp(name, "stop") || !strcmp(name, "prev
") || !strcmp(name, "play") || !strcmp(name, "next")))
97             return 0;
98     }
99     return 1;
100 }

```

Here is the caller graph for this function:



#### 9.28.1.7 static uchar iselect ( const char \* led ) [static]

Definition at line 25 of file led.c.

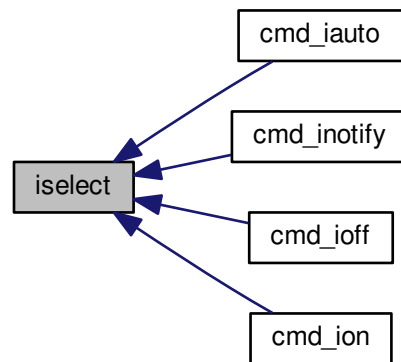
References I\_CAPS, I\_NUM, and I\_SCROLL.

Referenced by cmd\_iauto(), cmd\_inotify(), cmd\_ioff(), and cmd\_ion().

```

25         {
26     int result = 0;
27     if(!strcmp(led, "num", 3) || strstr(led, ",num"))
28         result |= I_NUM;
29     if(!strcmp(led, "caps", 4) || strstr(led, ",caps"))
30         result |= I_CAPS;
31     if(!strcmp(led, "scroll", 6) || strstr(led, ",scroll"))
32         result |= I_SCROLL;
33     if(!strcmp(led, "all", 3) || strstr(led, ",all"))
34         result |= I_NUM | I_CAPS | I_SCROLL;
35     return result;
36 }
```

Here is the caller graph for this function:



#### 9.28.1.8 char\* printrgb ( const lighting \* light, const usbdevice \* kb )

Definition at line 102 of file led.c.

References lighting::b, lighting::g, has\_key(), keymap, key::led, N\_KEYS\_EXTENDED, key::name, and lighting::r.

Referenced by \_cmd\_get().

```

102         {
103     uchar r[N_KEYS_EXTENDED], g[N_KEYS_EXTENDED], b[
104     N_KEYS_EXTENDED];
105     const uchar* mr = light->r;
106     const uchar* mg = light->g;
107     const uchar* mb = light->b;
108     for(int i = 0; i < N_KEYS_EXTENDED; i++){
109         // Translate the key index to an RGB index using the key map
110         int k = keymap[i].led;
111         if(k < 0)
112             continue;
113         r[i] = mr[k];
114         g[i] = mg[k];
115         b[i] = mb[k];
116     }
117     // Make a buffer to track key names and to filter out duplicates
118     char names[N_KEYS_EXTENDED][11];
119     for(int i = 0; i < N_KEYS_EXTENDED; i++){
120         const char* name = keymap[i].name;
121         if(keymap[i].led < 0 || !has_key(name, kb))
122             names[i][0] = 0;
123         else
```

```

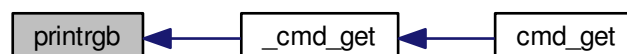
123         strncpy(names[i], name, 11);
124     }
125     // Check to make sure these aren't all the same color
126     int same = 1;
127     for(int i = 1; i < N_KEYS_EXTENDED; i++){
128         if(!names[i][0])
129             continue;
130         if(r[i] != r[0] || g[i] != g[0] || b[i] != b[0]){
131             same = 0;
132             break;
133         }
134     }
135     // If they are, just output that color
136     if(same){
137         char* buffer = malloc(7);
138         snprintf(buffer, 7, "%02x%02x%02x", r[0], g[0], b[0]);
139         return buffer;
140     }
141     const int BUFFER_LEN = 4096; // Should be more than enough to fit all keys
142     char* buffer = malloc(BUFFER_LEN);
143     int length = 0;
144     for(int i = 0; i < N_KEYS_EXTENDED; i++){
145         if(!names[i][0])
146             continue;
147         // Print the key name
148         int newlen = 0;
149         snprintf(buffer + length, BUFFER_LEN - length, length == 0 ? "%s\n" : " %s\n", names[i], &newlen);
150         length += newlen;
151         // Look ahead to see if any other keys have this color. If so, print them here as well.
152         uchar kr = r[i], kg = g[i], kb = b[i];
153         for(int j = i + 1; j < N_KEYS_EXTENDED; j++){
154             if(!names[j][0])
155                 continue;
156             if(r[j] != kr || g[j] != kg || b[j] != kb)
157                 continue;
158             snprintf(buffer + length, BUFFER_LEN - length, "%s\n", names[j], &newlen);
159             length += newlen;
160             // Erase the key's name so it won't get printed later
161             names[j][0] = 0;
162         }
163         // Print the color
164         snprintf(buffer + length, BUFFER_LEN - length, ":%02x%02x%02x\n", kr, kg, kb, &newlen);
165         length += newlen;
166     }
167     return buffer;
168 }

```

Here is the call graph for this function:



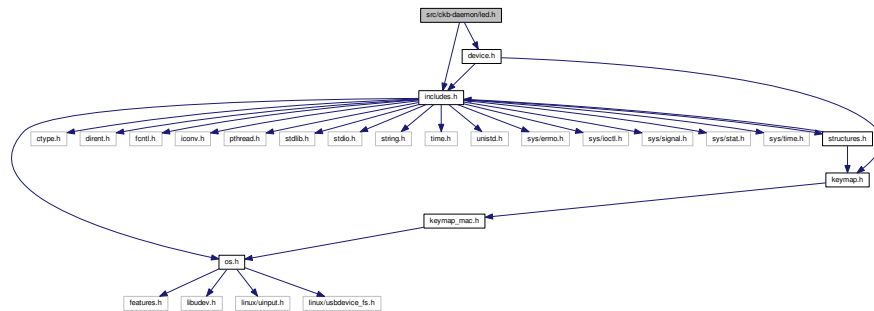
Here is the caller graph for this function:





## 9.29 src/ckb-daemon/led.h File Reference

```
#include "includes.h"
#include "device.h"
Include dependency graph for led.h:
```



This graph shows which files directly or indirectly include this file:



## Functions

- int [updatergb\\_kb](#) (usbdevice \*kb, int force)
- int [updatergb\\_mouse](#) (usbdevice \*kb, int force)
- int [savergb\\_kb](#) (usbdevice \*kb, lighting \*light, int mode)
- int [savergb\\_mouse](#) (usbdevice \*kb, lighting \*light, int mode)
- int [loadrgb\\_kb](#) (usbdevice \*kb, lighting \*light, int mode)
- int [loadrgb\\_mouse](#) (usbdevice \*kb, lighting \*light, int mode)
- char \* [printrgb](#) (const lighting \*light, const usbdevice \*kb)
- void [cmd\\_rgb](#) (usbdevice \*kb, usbmode \*mode, int dummy, int keyindex, const char \*code)
- void [cmd\\_ioff](#) (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*led)
- void [cmd\\_ion](#) (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*led)
- void [cmd\\_iauto](#) (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*led)
- void [cmd\\_inotify](#) (usbdevice \*kb, usbmode \*mode, int nnumber, int dummy, const char \*led)

### 9.29.1 Function Documentation

#### 9.29.1.1 void [cmd\\_iauto](#) ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* led )

Definition at line 54 of file led.c.

References [usbmode::ioff](#), [usbmode::ion](#), [iselect\(\)](#), and [usbdevice::vtable](#).

```

54
55     uchar bits = iselect(led);
56     // Remove the bits from both ioff and ion
57     mode->ioff &= ~bits;
58     mode->ion &= ~bits;
59     kb->vtable->updateindicators(kb, 0);
60 }
```

Here is the call graph for this function:



#### 9.29.1.2 void cmd\_inotify ( usbdevice \* kb, usbmode \* mode, int nnumber, int dummy, const char \* led )

Definition at line 62 of file led.c.

References usbmode::inotify, and iselect().

```

62                                     {
63     uchar bits = iselect(led);
64     if(strstr(led, ":off"))
65         // Turn notifications for these bits off
66         mode->inotify[nnumber] &= ~bits;
67     else
68         // Turn notifications for these bits on
69         mode->inotify[nnumber] |= bits;
70 }
```

Here is the call graph for this function:



#### 9.29.1.3 void cmd\_ioff ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* led )

Definition at line 38 of file led.c.

References usbmode::ioff, usbmode::ion, iselect(), and usbdevice::vtable.

```

38                                     {
39     uchar bits = iselect(led);
40     // Add the bits to ioff, remove them from ion
41     mode->ioff |= bits;
42     mode->ion &= ~bits;
43     kb->vtable->updateindicators(kb, 0);
44 }
```

Here is the call graph for this function:



#### 9.29.1.4 void cmd\_ion ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* led )

Definition at line 46 of file led.c.

References usbmode::ioff, usbmode::ion, iselect(), and usbdevice::vtable.

```

46                                     {
47     uchar bits = iselect(led);
48     // Remove the bits from ioff, add them to ion
49     mode->ioff &= ~bits;
50     mode->ion |= bits;
51     kb->vtable->updateindicators(kb, 0);
52 }
```

Here is the call graph for this function:



#### 9.29.1.5 void cmd\_rgb ( usbdevice \* kb, usbmode \* mode, int dummy, int keyindex, const char \* code )

Definition at line 6 of file led.c.

References lighting::b, lighting::g, keymap, key::led, usbmode::light, lighting::r, and lighting::sidelight.

```

6                                     {
7     int index = keymap[keyindex].led;
8     if(index < 0) {
9         if (index == -2){           // Process strafe sidelights
10             uchar sideshine;
11             if (sscanf(code, "%2hhx",&sideshine)) // monochromatic
12                 mode->light.sidelight = sideshine;
13         }
14         return;
15     }
16     uchar r, g, b;
17     if(sscanf(code, "%2hhx%2hhx%2hhx", &r, &g, &b) == 3){
18         mode->light.r[index] = r;
19         mode->light.g[index] = g;
20         mode->light.b[index] = b;
21     }
22 }
```

### 9.29.1.6 int loadrgb\_kb ( usbdevice \* kb, lighting \* light, int mode )

Since Firmware Version 2.05 for K95RGB the answers for getting the stored color-maps from the hardware has changed a bit. So comparing for the correct answer cannot validate against the cmd, and has to be done against a third map. Up to now we know, that K70RGB Pro and K70 Lux RGB have firmware version 2.04 and having the problem also. So we have to determine in the most inner loop the firmware version and type of KB to select the correct compare-table.

Read colors

< That is the old comparison method: you get back what you sent.

Normally a firmware version  $\geq 2.05$  runs with the new compare array. Up to now there is a 2.04 running in K70 RGB Lux with the same behavior. It seems that K70RGB has the same problem

Definition at line 181 of file led\_keyboard.c.

References lighting::b, ckb\_err, usbdevice::fwversion, lighting::g, MSG\_SIZE, N\_KEYS\_HW, P\_K70\_LUX, P\_K70\_LUX\_NRGB, usbdevice::product, lighting::r, usbrecv, and usbsend.

Referenced by hwloadmode().

```

181                                     {
182     if(kb->fwversion >= 0x0120){
183         uchar data_pkt[12][MSG_SIZE] = {
184             { 0x0e, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x01 },
185             { 0xff, 0x01, 60, 0 },
186             { 0xff, 0x02, 60, 0 },
187             { 0xff, 0x03, 24, 0 },
188             { 0x0e, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x02 },
189             { 0xff, 0x01, 60, 0 },
190             { 0xff, 0x02, 60, 0 },
191             { 0xff, 0x03, 24, 0 },
192             { 0x0e, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x03 },
193             { 0xff, 0x01, 60, 0 },
194             { 0xff, 0x02, 60, 0 },
195             { 0xff, 0x03, 24, 0 },
196         };
197         uchar in_pkt[4][MSG_SIZE] = {
198             { 0x0e, 0x14, 0x03, 0x01 },
199             { 0xff, 0x01, 60, 0 },
200             { 0xff, 0x02, 60, 0 },
201             { 0xff, 0x03, 24, 0 },
202         };
203
204
205         uchar cmp_pkt[4][4] = {
206             { 0x0e, 0x14, 0x03, 0x01 },
207             { 0x0e, 0xff, 0x01, 60 },
208             { 0x0e, 0xff, 0x02, 60 },
209             { 0x0e, 0xff, 0x03, 24 },
210         };
211
212         uchar* colors[3] = { light->r, light->g, light->b };
213         for(int clr = 0; clr < 3; clr++){
214             for(int i = 0; i < 4; i++){
215                 if(!usbrecv(kb, data_pkt[i + clr * 4], in_pkt[i]))
216                     return -1;
217
218                 uchar* comparePacket = data_pkt[i + clr * 4];
219                 if ((kb->fwversion >= 0x205)
220                     || ((kb->fwversion >= 0x204)
221                         && ((kb->product == P_K70_LUX_NRGB) || (kb->
222 product == P_K70_LUX)))) {
223                     comparePacket = cmp_pkt[i];
224                 }
225
226                 if (memcmp(in_pkt[i], comparePacket, 4)) {
227                     ckb_err("Bad input header\n");
228                     ckb_err("color = %d, i = %d, mode = %d\nOutput (Request): %2.2x %2.2x %2.2x
229 %2.2x\nInput (Reply): %2.2x %2.2x %2.2x %2.2x %2.2x %2.2x %2.2x %2.2x\n", clr, i, mode,
230 comparePacket[0], comparePacket[1], comparePacket[2], comparePacket[3],
231 in_pkt[i][0], in_pkt[i][1], in_pkt[i][2], in_pkt[i][3], in_pkt[i][4], in_pkt[i][5],
232 in_pkt[i][6], in_pkt[i][7]);
233                     in_pkt[2][0] = 0x99;
234                     in_pkt[2][1] = 0x99;
235                     in_pkt[2][2] = 0x99;
236                     in_pkt[2][3] = 0x99;
237                     usbrecv(kb, in_pkt[2], in_pkt[2]); // just to find it in the wireshark log
238                     return -1;
239                 }
240             }
241         }
242     }

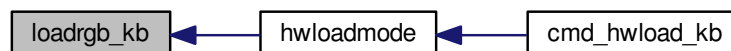
```

```

245     }
246     // Copy colors to lighting. in_pkt[0] is irrelevant.
247     memcpy(colors[clr], in_pkt[1] + 4, 60);
248     memcpy(colors[clr] + 60, in_pkt[2] + 4, 60);
249     memcpy(colors[clr] + 120, in_pkt[3] + 4, 24);
250 }
251 } else {
252     uchar data_pkt[5][MSG_SIZE] = {
253         { 0x0e, 0x14, 0x02, 0x01, 0x01, mode + 1, 0 },
254         { 0xff, 0x01, 60, 0 },
255         { 0xff, 0x02, 60, 0 },
256         { 0xff, 0x03, 60, 0 },
257         { 0xff, 0x04, 36, 0 },
258     };
259     uchar in_pkt[4][MSG_SIZE] = {
260         { 0xff, 0x01, 60, 0 },
261         { 0xff, 0x02, 60, 0 },
262         { 0xff, 0x03, 60, 0 },
263         { 0xff, 0x04, 36, 0 },
264     };
265     // Write initial packet
266     if(!usbSEND(kb, data_pkt[0], 1))
267         return -1;
268     // Read colors
269     for(int i = 1; i < 5; i++){
270         if(!usbRECV(kb, data_pkt[i], in_pkt[i - 1]))
271             return -1;
272         if(memcmp(in_pkt[i - 1], data_pkt[i], 4)){
273             ckb_err("Bad input header\n");
274             return -1;
275         }
276     }
277     // Copy the data back to the mode
278     uint8_t mr[N_KEYS_HW / 2], mg[N_KEYS_HW / 2], mb[
N_KEYS_HW / 2];
279     memcpy(mr, in_pkt[0] + 4, 60);
280     memcpy(mr + 60, in_pkt[1] + 4, 12);
281     memcpy(mg, in_pkt[1] + 16, 48);
282     memcpy(mg + 48, in_pkt[2] + 4, 24);
283     memcpy(mb, in_pkt[2] + 28, 36);
284     memcpy(mb + 36, in_pkt[3] + 4, 36);
285     // Unpack LED data to 8bpc format
286     for(int i = 0; i < N_KEYS_HW; i++){
287         int i_2 = i / 2;
288         uint8_t r, g, b;
289
290         // 3-bit intensities stored in alternate nybbles.
291         if (i & 1) {
292             r = 7 - (mr[i_2] >> 4);
293             g = 7 - (mg[i_2] >> 4);
294             b = 7 - (mb[i_2] >> 4);
295         } else {
296             r = 7 - (mr[i_2] & 0x0F);
297             g = 7 - (mg[i_2] & 0x0F);
298             b = 7 - (mb[i_2] & 0x0F);
299         }
300         // Scale 3-bit values up to 8 bits.
301         light->r[i] = r << 5 | r << 2 | r >> 1;
302         light->g[i] = g << 5 | g << 2 | g >> 1;
303         light->b[i] = b << 5 | b << 2 | b >> 1;
304     }
305 }
306 return 0;
307 }

```

Here is the caller graph for this function:



### 9.29.1.7 int loadrgb\_mouse ( usbdevice \* kb, lighting \* light, int mode )

Definition at line 81 of file led\_mouse.c.

References `lighting::b`, `ckb_err`, `lighting::g`, `IS_SABRE`, `IS_SCIMITAR`, `LED_DPI`, `LED_MOUSE`, `MSG_SIZE`, `lighting::r`, and `usbrecv`.

Referenced by `cmd_hwload_mouse()`.

```

81      {
82          uchar data_pkt[MSG_SIZE] = { 0x0e, 0x13, 0x10, 1, 0 };
83          uchar in_pkt[MSG_SIZE] = { 0 };
84          // Load each RGB zone
85          int zonecount = IS_SCIMITAR(kb) ? 4 : IS_SABRE(kb) ? 3 : 2;
86          for(int i = 0; i < zonecount; i++){
87              if(!usbrecv(kb, data_pkt, in_pkt))
88                  return -1;
89              if(memcmp(in_pkt, data_pkt, 4)){
90                  ckb_err("Bad input header\n");
91                  return -2;
92              }
93              // Copy data
94              int led = LED_MOUSE + i;
95              if(led >= LED_DPI)
96                  led++; // Skip DPI light
97              light->r[led] = in_pkt[4];
98              light->g[led] = in_pkt[5];
99              light->b[led] = in_pkt[6];
100              // Set packet for next zone
101              data_pkt[2]++;
102          }
103          return 0;
104      }

```

Here is the caller graph for this function:



### 9.29.1.8 char\* printrgb ( const lighting \* light, const usbdevice \* kb )

Definition at line 102 of file led.c.

References `lighting::b`, `lighting::g`, `has_key()`, `keymap`, `key::led`, `N_KEYS_EXTENDED`, `key::name`, and `lighting::r`.

Referenced by `_cmd_get()`.

```

102      {
103          uchar r[N_KEYS_EXTENDED], g[N_KEYS_EXTENDED], b[
104              N_KEYS_EXTENDED];
105          const uchar* mr = light->r;
106          const uchar* mg = light->g;
107          const uchar* mb = light->b;
108          for(int i = 0; i < N_KEYS_EXTENDED; i++){
109              // Translate the key index to an RGB index using the key map
110              int k = keymap[i].led;
111              if(k < 0)
112                  continue;
113              r[i] = mr[k];
114              g[i] = mg[k];
115              b[i] = mb[k];
116          }
117          // Make a buffer to track key names and to filter out duplicates
118          char names[N_KEYS_EXTENDED][11];
119          for(int i = 0; i < N_KEYS_EXTENDED; i++){

```

```

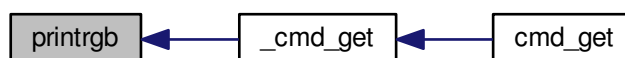
119     const char* name = keymap[i].name;
120     if(keymap[i].led < 0 || !has_key(name, kb))
121         names[i][0] = 0;
122     else
123         strncpy(names[i], name, 11);
124 }
125 // Check to make sure these aren't all the same color
126 int same = 1;
127 for(int i = 1; i < N_KEYS_EXTENDED; i++){
128     if(!names[i][0])
129         continue;
130     if(r[i] != r[0] || g[i] != g[0] || b[i] != b[0]){
131         same = 0;
132         break;
133     }
134 }
135 // If they are, just output that color
136 if(same){
137     char* buffer = malloc(7);
138     snprintf(buffer, 7, "%02x%02x%02x", r[0], g[0], b[0]);
139     return buffer;
140 }
141 const int BUFFER_LEN = 4096; // Should be more than enough to fit all keys
142 char* buffer = malloc(BUFFER_LEN);
143 int length = 0;
144 for(int i = 0; i < N_KEYS_EXTENDED; i++){
145     if(!names[i][0])
146         continue;
147     // Print the key name
148     int newlen = 0;
149     snprintf(buffer + length, BUFFER_LEN - length, length == 0 ? "%s\n" : " %s\n", names[i], &newlen);
150     length += newlen;
151     // Look ahead to see if any other keys have this color. If so, print them here as well.
152     uchar kr = r[i], kg = g[i], kb = b[i];
153     for(int j = i + 1; j < N_KEYS_EXTENDED; j++){
154         if(!names[j][0])
155             continue;
156         if(r[j] != kr || g[j] != kg || b[j] != kb)
157             continue;
158         snprintf(buffer + length, BUFFER_LEN - length, "%s\n", names[j], &newlen);
159         length += newlen;
160         // Erase the key's name so it won't get printed later
161         names[j][0] = 0;
162     }
163     // Print the color
164     snprintf(buffer + length, BUFFER_LEN - length, ":%02x%02x%02x\n", kr, kg, kb, &newlen);
165     length += newlen;
166 }
167 return buffer;
168 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.29.1.9 int savergb\_kb ( usbdevice \* kb, lighting \* light, int mode )

Definition at line 139 of file led\_keyboard.c.

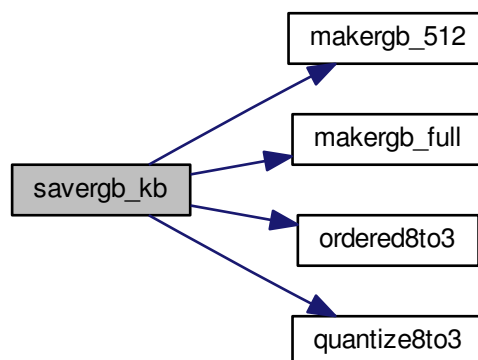
References `usbdevice::dither`, `usbdevice::fwversion`, `IS_STRAFE`, `makergb_512()`, `makergb_full()`, `MSG_SIZE`, `ordered8to3()`, `quantize8to3()`, and `usbsend`.

Referenced by `cmd_hwsave_kb()`.

```

139                                     {
140     if(kb->fwversion >= 0x0120){
141         uchar data_pkt[12][MSG_SIZE] = {
142             // Red
143             { 0x7f, 0x01, 60, 0 },
144             { 0x7f, 0x02, 60, 0 },
145             { 0x7f, 0x03, 24, 0 },
146             { 0x07, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x01 },
147             // Green
148             { 0x7f, 0x01, 60, 0 },
149             { 0x7f, 0x02, 60, 0 },
150             { 0x7f, 0x03, 24, 0 },
151             { 0x07, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x02 },
152             // Blue
153             { 0x7f, 0x01, 60, 0 },
154             { 0x7f, 0x02, 60, 0 },
155             { 0x7f, 0x03, 24, 0 },
156             { 0x07, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x03 }
157         };
158         makergb_full(light, data_pkt);
159         if(!usbsend(kb, data_pkt[0], 12))
160             return -1;
161         if (IS_STRAFE(kb)){ // end save
162             uchar save_end_pkt[MSG_SIZE] = { 0x07, 0x14, 0x04, 0x01, 0x01 };
163             if(!usbsend(kb, save_end_pkt, 1))
164                 return -1;
165         }
166     } else {
167         uchar data_pkt[5][MSG_SIZE] = {
168             { 0x7f, 0x01, 60, 0 },
169             { 0x7f, 0x02, 60, 0 },
170             { 0x7f, 0x03, 60, 0 },
171             { 0x7f, 0x04, 36, 0 },
172             { 0x07, 0x14, 0x02, 0x00, 0x01, mode + 1 }
173         };
174         makergb_512(light, data_pkt, kb->dither ? ordered8to3 :
175         quantize8to3);
176         if(!usbsend(kb, data_pkt[0], 5))
177             return -1;
178     }
179     return 0;
180 }
```

Here is the call graph for this function:





Here is the caller graph for this function:



#### 9.29.1.10 int savergb\_mouse ( usbdevice \* kb, lighting \* light, int mode )

Definition at line 62 of file led\_mouse.c.

References lighting::b, lighting::g, IS\_SABRE, IS\_SCIMITAR, LED\_DPI, LED\_MOUSE, MSG\_SIZE, lighting::r, and usbsend.

Referenced by cmd\_hwsave\_mouse().

```

62
63     uchar data_pkt[MSG_SIZE] = { 0x07, 0x13, 0x10, 1, 0 };
64     // Save each RGB zone, minus the DPI light which is sent in the DPI packets
65     int zonecount = IS_SCIMITAR(kb) ? 4 : IS_SABRE(kb) ? 3 : 2;
66     for(int i = 0; i < zonecount; i++){
67         int led = LED_MOUSE + i;
68         if(led >= LED_DPI)
69             led++; // Skip DPI light
70         data_pkt[4] = light->r[led];
71         data_pkt[5] = light->g[led];
72         data_pkt[6] = light->b[led];
73         if(!usbsend(kb, data_pkt, 1))
74             return -1;
75         // Set packet for next zone
76         data_pkt[2]++;
77     }
78     return 0;
79 }
  
```

Here is the caller graph for this function:



#### 9.29.1.11 int updatergb\_kb ( usbdevice \* kb, int force )

Definition at line 77 of file led\_keyboard.c.

References usbdevice::active, usbprofile::currentmode, usbdevice::dither, lighting::forceupdate, IS\_FULLRANGE, usbprofile::lastlight, usbmode::light, makergb\_512(), makergb\_full(), MSG\_SIZE, ordered8to3(), usbdevice::profile, quantize8to3(), rgbcmp(), lighting::sidelight, and usbsend.

```

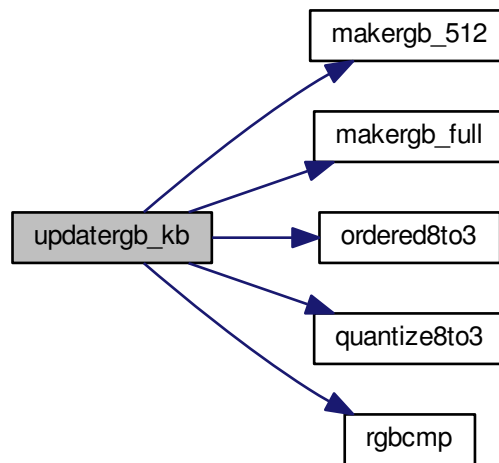
77
{
  
```

```

78     if(!kb->active)
79         return 0;
80     lighting* lastlight = &kb->profile->lastlight;
81     lighting* newlight = &kb->profile->currentmode->
light;
82     // Don't do anything if the lighting hasn't changed
83     if(!force && !lastlight->forceupdate && !newlight->forceupdate
84         && !rgbcmp(lastlight, newlight) && lastlight->sidelight == newlight->
sidelight) // strafe sidelights
85         return 0;
86     lastlight->forceupdate = newlight->forceupdate = 0;
87
88     if(IS_FULLRANGE(kb)){
89         // Update strafe sidelights if necessary
90         if(lastlight->sidelight != newlight->sidelight) {
91             uchar data_pkt[2][MSG_SIZE] = {
92                 { 0x07, 0x05, 0x08, 0x00, 0x00 },
93                 { 0x07, 0x05, 0x02, 0, 0x03 }
94             };
95             if (newlight->sidelight)
96                 data_pkt[0][4]=1; // turn on
97             if(!usbSEND(kb, data_pkt[0], 2))
98                 return -1;
99         }
100         // 16.8M color lighting works fine on strafe and is the only way it actually works
101         uchar data_pkt[12][MSG_SIZE] = {
102             // Red
103             { 0x7f, 0x01, 0x3c, 0 },
104             { 0x7f, 0x02, 0x3c, 0 },
105             { 0x7f, 0x03, 0x18, 0 },
106             { 0x07, 0x28, 0x01, 0x03, 0x01, 0 },
107             // Green
108             { 0x7f, 0x01, 0x3c, 0 },
109             { 0x7f, 0x02, 0x3c, 0 },
110             { 0x7f, 0x03, 0x18, 0 },
111             { 0x07, 0x28, 0x02, 0x03, 0x01, 0 },
112             // Blue
113             { 0x7f, 0x01, 0x3c, 0 },
114             { 0x7f, 0x02, 0x3c, 0 },
115             { 0x7f, 0x03, 0x18, 0 },
116             { 0x07, 0x28, 0x03, 0x03, 0x02, 0 }
117         };
118         makergb_full(newlight, data_pkt);
119         if(!usbSEND(kb, data_pkt[0], 12))
120             return -1;
121     } else {
122         // On older keyboards it looks flickery and causes lighting glitches, so we don't use it.
123         uchar data_pkt[5][MSG_SIZE] = {
124             { 0x7f, 0x01, 60, 0 },
125             { 0x7f, 0x02, 60, 0 },
126             { 0x7f, 0x03, 60, 0 },
127             { 0x7f, 0x04, 36, 0 },
128             { 0x07, 0x27, 0x00, 0x00, 0xD8 }
129         };
130         makergb_512(newlight, data_pkt, kb->dither ?
ordered8to3 : quantize8to3);
131         if(!usbSEND(kb, data_pkt[0], 5))
132             return -1;
133     }
134
135     memcpy(lastlight, newlight, sizeof(lighting));
136     return 0;
137 }

```

Here is the call graph for this function:



#### 9.29.1.12 int updatergb\_mouse ( usbdevice \* kb, int force )

Definition at line 20 of file led\_mouse.c.

References `usbdevice::active`, `lighting::b`, `usbprofile::currentmode`, `lighting::forceupdate`, `lighting::g`, `isblack()`, `usbprofile::lastlight`, `LED_MOUSE`, `usbmode::light`, `MSG_SIZE`, `N_MOUSE_ZONES`, `usbdevice::profile`, `lighting::r`, `rgbcmp()`, and `usb send`.

```

20                                     {
21     if(!kb->active)
22         return 0;
23     lighting* lastlight = &kb->profile->lastlight;
24     lighting* newlight = &kb->profile->currentmode->
light;
25     // Don't do anything if the lighting hasn't changed
26     if(!force && !lastlight->forceupdate && !newlight->forceupdate
27         && !rgbcmp(lastlight, newlight))
28         return 0;
29     lastlight->forceupdate = newlight->forceupdate = 0;
30
31     // Send the RGB values for each zone to the mouse
32     uchar data_pkt[2][MSG_SIZE] = {
33         { 0x07, 0x22, N_MOUSE_ZONES, 0x01, 0 }, // RGB colors
34         { 0x07, 0x05, 0x02, 0 } // Lighting on/off
35     };
36     uchar* rgb_data = &data_pkt[0][4];
37     for(int i = 0; i < N_MOUSE_ZONES; i++){
38         *rgb_data++ = i + 1;
39         *rgb_data++ = newlight->r[LED_MOUSE + i];
40         *rgb_data++ = newlight->g[LED_MOUSE + i];
41         *rgb_data++ = newlight->b[LED_MOUSE + i];
42     }
43     // Send RGB data
44     if(!usb send(kb, data_pkt[0], 1))
45         return -1;
46     int was_black = isblack(kb, lastlight), is_black = isblack(kb, newlight);
47     if(is_black){
48         // If the lighting is black, send the deactivation packet (M65 only)
49         if(!usb send(kb, data_pkt[1], 1))
50             return -1;
51     } else if(was_black || force){
52         // If the lighting WAS black, or if we're on forced update, send the activation packet
53         data_pkt[1][4] = 1;
54         if(!usb send(kb, data_pkt[1], 1))

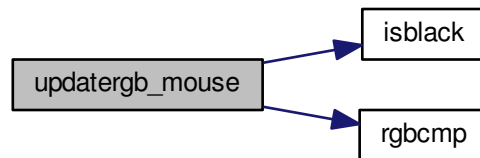
```

```

55         return -1;
56     }
57
58     memcpy(lastlight, newlight, sizeof(lighting));
59     return 0;
60 }

```

Here is the call graph for this function:



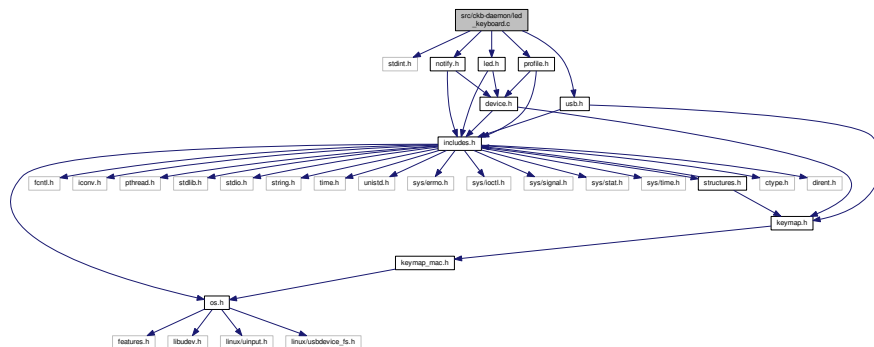
### 9.30 src/ckb-daemon/led\_keyboard.c File Reference

```

#include <stdint.h>
#include "led.h"
#include "notify.h"
#include "profile.h"
#include "usb.h"

```

Include dependency graph for `led_keyboard.c`:



### Macros

- `#define BR1(x) (((x) & 0xaa) >> 1) | (((x) & 0x55) << 1)`
- `#define BR2(x) (((BR1(x) & 0xcc) >> 2) | ((BR1(x) & 0x33) << 2))`
- `#define BR4(x) (((BR2(x) & 0xf0) >> 4) | ((BR2(x) & 0x0f) << 4))`
- `#define O0(i) BR4(i),`
- `#define O1(i) O0(i) O0((i) + 1)`
- `#define O2(i) O1(i) O1((i) + 2)`
- `#define O3(i) O2(i) O2((i) + 4)`
- `#define O4(i) O3(i) O3((i) + 8)`
- `#define O5(i) O4(i) O4((i) + 16)`

- `#define O6(i) O5(i) O5((i) + 32)`
- `#define O7(i) O6(i) O6((i) + 64)`
- `#define O8(i) O7(i) O7((i) + 127)`

## Functions

- static `uchar ordered8to3` (int index, `uchar` value)
- static `uchar quantize8to3` (int index, `uchar` value)
- static void `makergb_512` (const `lighting` \*light, `uchar` data\_pkt[5][64], `uchar`(\*ditherfn)(int, `uchar`))
- static void `makergb_full` (const `lighting` \*light, `uchar` data\_pkt[12][64])
- static int `rgbcmp` (const `lighting` \*lhs, const `lighting` \*rhs)
- int `updatergb_kb` (`usbdevice` \*kb, int force)
- int `savergb_kb` (`usbdevice` \*kb, `lighting` \*light, int mode)
- int `loadrgb_kb` (`usbdevice` \*kb, `lighting` \*light, int mode)

## Variables

- [illegible]



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### 9.30.1 Macro Definition Documentation

9.30.1.1 `#define BR1( x ) (((x) & 0xaa) >> 1) | (((x) & 0x55) << 1)`

Definition at line 9 of file led\_keyboard.c.

9.30.1.2 `#define BR2( x ) (((BR1(x) & 0xcc) >> 2) | ((BR1(x) & 0x33) << 2))`

Definition at line 10 of file led\_keyboard.c.

9.30.1.3 `#define BR4( x ) (((BR2(x) & 0xf0) >> 4) | ((BR2(x) & 0x0f) << 4))`

Definition at line 11 of file led\_keyboard.c.

9.30.1.4 `#define O0( i ) BR4(i),`

Definition at line 12 of file led\_keyboard.c.

9.30.1.5 `#define O1( i ) O0(i) O0((i) + 1)`

Definition at line 13 of file led\_keyboard.c.

9.30.1.6 `#define O2( i ) O1(i) O1((i) + 2)`

Definition at line 14 of file led\_keyboard.c.

9.30.1.7 `#define O3( i ) O2(i) O2((i) + 4)`

Definition at line 15 of file led\_keyboard.c.

9.30.1.8 `#define O4( i ) O3(i) O3((i) + 8)`

Definition at line 16 of file led\_keyboard.c.

9.30.1.9 `#define O5( i ) O4(i) O4((i) + 16)`

Definition at line 17 of file led\_keyboard.c.

9.30.1.10 `#define O6( i ) O5(i) O5((i) + 32)`

Definition at line 18 of file led\_keyboard.c.

9.30.1.11 `#define O7( i ) O6(i) O6((i) + 64)`

Definition at line 19 of file led\_keyboard.c.

9.30.1.12 `#define O8( i ) O7(i) O7((i) + 127)`

Definition at line 20 of file led\_keyboard.c.

## 9.30.2 Function Documentation

### 9.30.2.1 int loadrgb\_kb ( usbdevice \* kb, lighting \* light, int mode )

Since Firmware Version 2.05 for K95RGB the answers for getting the stored color-maps from the hardware has changed a bit. So comparing for the correct answer cannot validate against the cmd, and has to be done against a third map. Up to now we know, that K70RGB Pro and K70 Lux RGB have firmware version 2.04 and having the problem also. So we have to determine in the most inner loop the firmware version and type of KB to select the correct compare-table.

Read colors

< That is the old comparison method: you get back what you sent.

Normally a firmware version  $\geq 2.05$  runs with the new compare array. Up to now there is a 2.04 running in K70 RGB Lux with the same behavior. It seems that K70RGB has the same problem

Definition at line 181 of file led\_keyboard.c.

References lighting::b, ckb\_err, usbdevice::fwversion, lighting::g, MSG\_SIZE, N\_KEYS\_HW, P\_K70\_LUX, P\_K70\_LUX\_NRGB, usbdevice::product, lighting::r, usbrecv, and usbsend.

Referenced by hwwloadmode().

```

181                                     {
182     if (kb->fwversion >= 0x0120){
183         uchar data_pkt[12][MSG_SIZE] = {
184             { 0x0e, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x01 },
185             { 0xff, 0x01, 60, 0 },
186             { 0xff, 0x02, 60, 0 },
187             { 0xff, 0x03, 24, 0 },
188             { 0x0e, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x02 },
189             { 0xff, 0x01, 60, 0 },
190             { 0xff, 0x02, 60, 0 },
191             { 0xff, 0x03, 24, 0 },
192             { 0x0e, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x03 },
193             { 0xff, 0x01, 60, 0 },
194             { 0xff, 0x02, 60, 0 },
195             { 0xff, 0x03, 24, 0 },
196         };
197         uchar in_pkt[4][MSG_SIZE] = {
198             { 0x0e, 0x14, 0x03, 0x01 },
199             { 0xff, 0x01, 60, 0 },
200             { 0xff, 0x02, 60, 0 },
201             { 0xff, 0x03, 24, 0 },
202         };
203
204
205         uchar cmp_pkt[4][4] = {
206             { 0x0e, 0x14, 0x03, 0x01 },
207             { 0x0e, 0xff, 0x01, 60 },
208             { 0x0e, 0xff, 0x02, 60 },
209             { 0x0e, 0xff, 0x03, 24 },
210         };
211
212         uchar* colors[3] = { light->r, light->g, light->b };
213         for(int clr = 0; clr < 3; clr++){
214             for(int i = 0; i < 4; i++){
215                 if(!usbrecv(kb, data_pkt[i + clr * 4], in_pkt[i]))
216                     return -1;
217
218                 uchar* comparePacket = data_pkt[i + clr * 4];
219                 if ((kb->fwversion >= 0x205)
220                     || ((kb->fwversion >= 0x204)
221                         && ((kb->product == P_K70_LUX_NRGB) || (kb->
222 product == P_K70_LUX)))) {
223                     comparePacket = cmp_pkt[i];
224                 }
225
226                 if (memcmp(in_pkt[i], comparePacket, 4)) {
227                     ckb_err("Bad input header\n");
228                     ckb_err("color = %d, i = %d, mode = %d\nOutput (Request): %2.2x %2.2x %2.2x
229 %2.2x\nInput (Reply): %2.2x %2.2x %2.2x %2.2x %2.2x %2.2x %2.2x %2.2x\n", clr, i, mode,
230 comparePacket[0], comparePacket[1], comparePacket[2], comparePacket[3],
231 in_pkt[i][0], in_pkt[i][1], in_pkt[i][2], in_pkt[i][3], in_pkt[i][4], in_pkt[i][5],
232 in_pkt[i][6], in_pkt[i][7]);
233                     in_pkt[2][0] = 0x99;
234                     in_pkt[2][1] = 0x99;
235                     in_pkt[2][2] = 0x99;
236                     in_pkt[2][3] = 0x99;

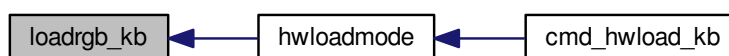
```

```

242         usbrecv(kb, in_pkt[2], in_pkt[2]); // just to find it in the wireshark log
243         return -1;
244     }
245 }
246 // Copy colors to lighting. in_pkt[0] is irrelevant.
247 memcpy(colors[clr], in_pkt[1] + 4, 60);
248 memcpy(colors[clr] + 60, in_pkt[2] + 4, 60);
249 memcpy(colors[clr] + 120, in_pkt[3] + 4, 24);
250 }
251 } else {
252     uchar data_pkt[5][MSG_SIZE] = {
253         { 0x0e, 0x14, 0x02, 0x01, 0x01, mode + 1, 0 },
254         { 0xff, 0x01, 60, 0 },
255         { 0xff, 0x02, 60, 0 },
256         { 0xff, 0x03, 60, 0 },
257         { 0xff, 0x04, 36, 0 },
258     };
259     uchar in_pkt[4][MSG_SIZE] = {
260         { 0xff, 0x01, 60, 0 },
261         { 0xff, 0x02, 60, 0 },
262         { 0xff, 0x03, 60, 0 },
263         { 0xff, 0x04, 36, 0 },
264     };
265     // Write initial packet
266     if(!usbsend(kb, data_pkt[0], 1))
267         return -1;
268     // Read colors
269     for(int i = 1; i < 5; i++){
270         if(!usbrecv(kb, data_pkt[i], in_pkt[i - 1]))
271             return -1;
272         if(memcmp(in_pkt[i - 1], data_pkt[i], 4)){
273             ckb_err("Bad input header\n");
274             return -1;
275         }
276     }
277     // Copy the data back to the mode
278     uint8_t mr[N_KEYS_HW / 2], mg[N_KEYS_HW / 2], mb[
N_KEYS_HW / 2];
279     memcpy(mr, in_pkt[0] + 4, 60);
280     memcpy(mr + 60, in_pkt[1] + 4, 12);
281     memcpy(mg, in_pkt[1] + 16, 48);
282     memcpy(mg + 48, in_pkt[2] + 4, 24);
283     memcpy(mb, in_pkt[2] + 28, 36);
284     memcpy(mb + 36, in_pkt[3] + 4, 36);
285     // Unpack LED data to 8bpc format
286     for(int i = 0; i < N_KEYS_HW; i++){
287         int i_2 = i / 2;
288         uint8_t r, g, b;
289
290         // 3-bit intensities stored in alternate nybbles.
291         if (i & 1) {
292             r = 7 - (mr[i_2] >> 4);
293             g = 7 - (mg[i_2] >> 4);
294             b = 7 - (mb[i_2] >> 4);
295         } else {
296             r = 7 - (mr[i_2] & 0x0F);
297             g = 7 - (mg[i_2] & 0x0F);
298             b = 7 - (mb[i_2] & 0x0F);
299         }
300         // Scale 3-bit values up to 8 bits.
301         light->r[i] = r << 5 | r << 2 | r >> 1;
302         light->g[i] = g << 5 | g << 2 | g >> 1;
303         light->b[i] = b << 5 | b << 2 | b >> 1;
304     }
305 }
306 return 0;
307 }

```

Here is the caller graph for this function:



### 9.30.2.2 static void makergb\_512 ( const lighting \* *light*, uchar *data\_pkt*[5][64], uchar(\*) (int, uchar) *ditherfn* ) [static]

Definition at line 36 of file led\_keyboard.c.

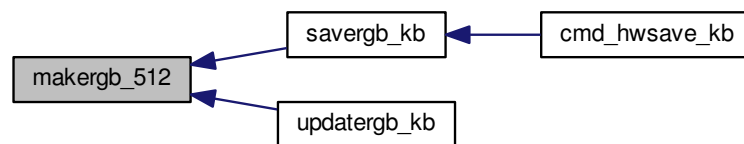
References lighting::b, lighting::g, N\_KEYS\_HW, and lighting::r.

Referenced by savergb\_kb(), and updatergb\_kb().

```

37                                     {
38     uchar r[N_KEYS_HW / 2], g[N_KEYS_HW / 2], b[N_KEYS_HW / 2];
39     // Compress RGB values to a 512-color palette
40     for(int i = 0; i < N_KEYS_HW; i += 2){
41         char r1 = ditherfn(i, light->r[i]), r2 = ditherfn(i + 1, light->r[i + 1]);
42         char g1 = ditherfn(i, light->g[i]), g2 = ditherfn(i + 1, light->g[i + 1]);
43         char b1 = ditherfn(i, light->b[i]), b2 = ditherfn(i + 1, light->b[i + 1]);
44         r[i / 2] = (7 - r2) << 4 | (7 - r1);
45         g[i / 2] = (7 - g2) << 4 | (7 - g1);
46         b[i / 2] = (7 - b2) << 4 | (7 - b1);
47     }
48     memcpy(data_pkt[0] + 4, r, 60);
49     memcpy(data_pkt[1] + 4, r + 60, 12);
50     memcpy(data_pkt[1] + 16, g, 48);
51     memcpy(data_pkt[2] + 4, g + 48, 24);
52     memcpy(data_pkt[2] + 28, b, 36);
53     memcpy(data_pkt[3] + 4, b + 36, 36);
54 }
```

Here is the caller graph for this function:



### 9.30.2.3 static void makergb\_full ( const lighting \* *light*, uchar *data\_pkt*[12][64] ) [static]

Definition at line 56 of file led\_keyboard.c.

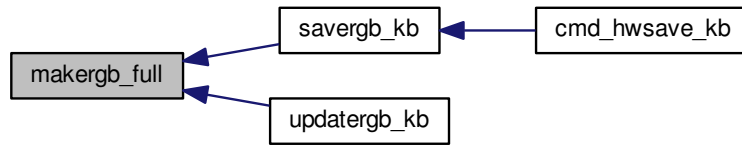
References lighting::b, lighting::g, and lighting::r.

Referenced by savergb\_kb(), and updatergb\_kb().

```

56                                     {
57     const uchar* r = light->r, *g = light->g, *b = light->b;
58     // Red
59     memcpy(data_pkt[0] + 4, r, 60);
60     memcpy(data_pkt[1] + 4, r + 60, 60);
61     memcpy(data_pkt[2] + 4, r + 120, 24);
62     // Green (final R packet is blank)
63     memcpy(data_pkt[4] + 4, g, 60);
64     memcpy(data_pkt[5] + 4, g + 60, 60);
65     memcpy(data_pkt[6] + 4, g + 120, 24);
66     // Blue (final G packet is blank)
67     memcpy(data_pkt[8] + 4, b, 60);
68     memcpy(data_pkt[9] + 4, b + 60, 60);
69     memcpy(data_pkt[10] + 4, b + 120, 24);
70 }
```

Here is the caller graph for this function:



#### 9.30.2.4 static uchar ordered8to3 ( int *index*, uchar *value* ) [static]

Definition at line 24 of file `led_keyboard.c`.

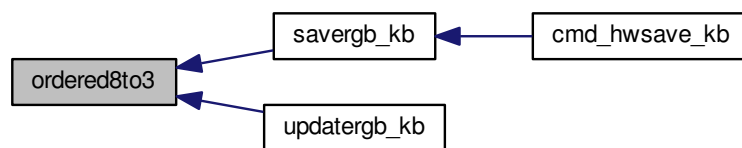
References `bit_reverse_table`.

Referenced by `savergb_kb()`, and `updatergb_kb()`.

```

24                                     {
25     int m = value * 7;
26     int b = m / 255;
27     if ( (m % 255) > bit_reverse_table[index & 0xff] )
28         b++;
29     return b;
30 }
```

Here is the caller graph for this function:



#### 9.30.2.5 static uchar quantize8to3 ( int *index*, uchar *value* ) [static]

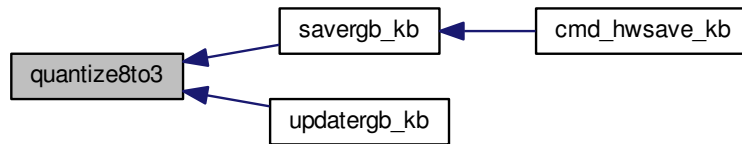
Definition at line 32 of file `led_keyboard.c`.

Referenced by `savergb_kb()`, and `updatergb_kb()`.

```

32                                     {
33     return value >> 5;
34 }
```

Here is the caller graph for this function:



### 9.30.2.6 static int rgbcmp ( const lighting \* lhs, const lighting \* rhs ) [static]

Definition at line 72 of file `led_keyboard.c`.

References `lighting::b`, `lighting::g`, `N_KEYS_HW`, and `lighting::r`.

Referenced by `updatergb_kb()`.

```

72                                     {
73     // Compare two light structures, ignore mouse zones
74     return memcmp(lhs->r, rhs->r, N_KEYS_HW) || memcmp(lhs->g, rhs->
g, N_KEYS_HW) || memcmp(lhs->b, rhs->b, N_KEYS_HW);
75 }
```

Here is the caller graph for this function:



### 9.30.2.7 int savergb\_kb ( usbdevice \* kb, lighting \* light, int mode )

Definition at line 139 of file `led_keyboard.c`.

References `usbdevice::dither`, `usbdevice::fwversion`, `IS_STRAFE`, `makergb_512()`, `makergb_full()`, `MSG_SIZE`, `ordered8to3()`, `quantize8to3()`, and `usbSEND`.

Referenced by `cmd_hwsave_kb()`.

```

139                                     {
140     if(kb->fwversion >= 0x0120){
141         uchar data_pkt[12][MSG_SIZE] = {
142             // Red
143             { 0x7f, 0x01, 60, 0 },
144             { 0x7f, 0x02, 60, 0 },
145             { 0x7f, 0x03, 24, 0 },
146             { 0x07, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x01 },
147             // Green
148             { 0x7f, 0x01, 60, 0 },
149             { 0x7f, 0x02, 60, 0 },
150             { 0x7f, 0x03, 24, 0 },
151         };
152     }
153 }
```

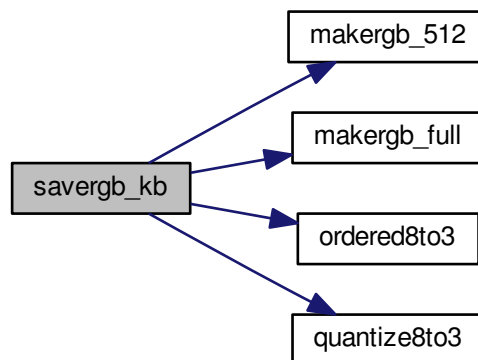


```

151         { 0x07, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x02 },
152         // Blue
153         { 0x7f, 0x01, 60, 0 },
154         { 0x7f, 0x02, 60, 0 },
155         { 0x7f, 0x03, 24, 0 },
156         { 0x07, 0x14, 0x03, 0x01, 0x01, mode + 1, 0x03 }
157     };
158     makergb_full(light, data_pkt);
159     if(!usb_send(kb, data_pkt[0], 12))
160         return -1;
161     if (IS_STRAFE(kb)){ // end save
162         uchar save_end_pkt[MSG_SIZE] = { 0x07, 0x14, 0x04, 0x01, 0x01 };
163         if(!usb_send(kb, save_end_pkt, 1))
164             return -1;
165     }
166 } else {
167     uchar data_pkt[5][MSG_SIZE] = {
168         { 0x7f, 0x01, 60, 0 },
169         { 0x7f, 0x02, 60, 0 },
170         { 0x7f, 0x03, 60, 0 },
171         { 0x7f, 0x04, 36, 0 },
172         { 0x07, 0x14, 0x02, 0x00, 0x01, mode + 1 }
173     };
174     makergb_512(light, data_pkt, kb->dither ? ordered8to3 :
quantize8to3);
175     if(!usb_send(kb, data_pkt[0], 5))
176         return -1;
177 }
178 return 0;
179 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.30.2.8 int updatergb\_kb ( usbdevice \* kb, int force )

Definition at line 77 of file led\_keyboard.c.

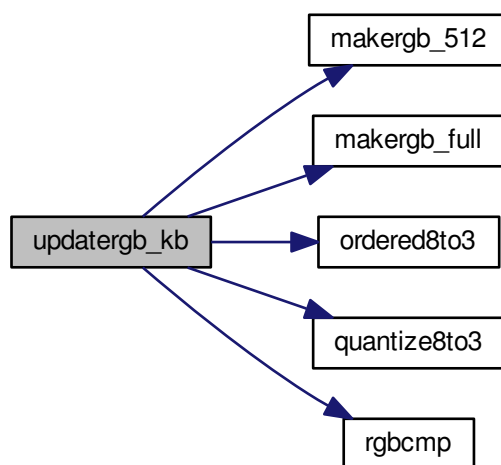
References `usbdevice::active`, `usbprofile::currentmode`, `usbdevice::dither`, `lighting::forceupdate`, `IS_FULLRANGE`, `usbprofile::lastlight`, `usbmode::light`, `makergb_512()`, `makergb_full()`, `MSG_SIZE`, `ordered8to3()`, `usbdevice::profile`, `quantize8to3()`, `rgbcmp()`, `lighting::sidelight`, and `usbsend`.

```

77                                     {
78     if(!kb->active)
79         return 0;
80     lighting* lastlight = &kb->profile->lastlight;
81     lighting* newlight = &kb->profile->currentmode->
light;
82     // Don't do anything if the lighting hasn't changed
83     if(!force && !lastlight->forceupdate && !newlight->forceupdate
84         && !rgbcmp(lastlight, newlight) && lastlight->sidelight == newlight->
sidelight) // strafe sidelights
85         return 0;
86     lastlight->forceupdate = newlight->forceupdate = 0;
87
88     if(IS_FULLRANGE(kb)){
89         // Update strafe sidelights if necessary
90         if(lastlight->sidelight != newlight->sidelight) {
91             uchar data_pkt[2][MSG_SIZE] = {
92                 { 0x07, 0x05, 0x08, 0x00, 0x00 },
93                 { 0x07, 0x05, 0x02, 0, 0x03 }
94             };
95             if (newlight->sidelight)
96                 data_pkt[0][4]=1; // turn on
97             if(!usbsend(kb, data_pkt[0], 2))
98                 return -1;
99         }
100         // 16.8M color lighting works fine on strafe and is the only way it actually works
101         uchar data_pkt[12][MSG_SIZE] = {
102             // Red
103             { 0x7f, 0x01, 0x3c, 0 },
104             { 0x7f, 0x02, 0x3c, 0 },
105             { 0x7f, 0x03, 0x18, 0 },
106             { 0x07, 0x28, 0x01, 0x03, 0x01, 0 },
107             // Green
108             { 0x7f, 0x01, 0x3c, 0 },
109             { 0x7f, 0x02, 0x3c, 0 },
110             { 0x7f, 0x03, 0x18, 0 },
111             { 0x07, 0x28, 0x02, 0x03, 0x01, 0 },
112             // Blue
113             { 0x7f, 0x01, 0x3c, 0 },
114             { 0x7f, 0x02, 0x3c, 0 },
115             { 0x7f, 0x03, 0x18, 0 },
116             { 0x07, 0x28, 0x03, 0x03, 0x02, 0 }
117         };
118         makergb_full(newlight, data_pkt);
119         if(!usbsend(kb, data_pkt[0], 12))
120             return -1;
121     } else {
122         // On older keyboards it looks flickery and causes lighting glitches, so we don't use it.
123         uchar data_pkt[5][MSG_SIZE] = {
124             { 0x7f, 0x01, 60, 0 },
125             { 0x7f, 0x02, 60, 0 },
126             { 0x7f, 0x03, 60, 0 },
127             { 0x7f, 0x04, 36, 0 },
128             { 0x07, 0x27, 0x00, 0x00, 0xD8 }
129         };
130         makergb_512(newlight, data_pkt, kb->dither ?
ordered8to3 : quantize8to3);
131         if(!usbsend(kb, data_pkt[0], 5))
132             return -1;
133     }
134
135     memcpy(lastlight, newlight, sizeof(lighting));
136     return 0;
137 }

```

Here is the call graph for this function:



### 9.30.3 Variable Documentation

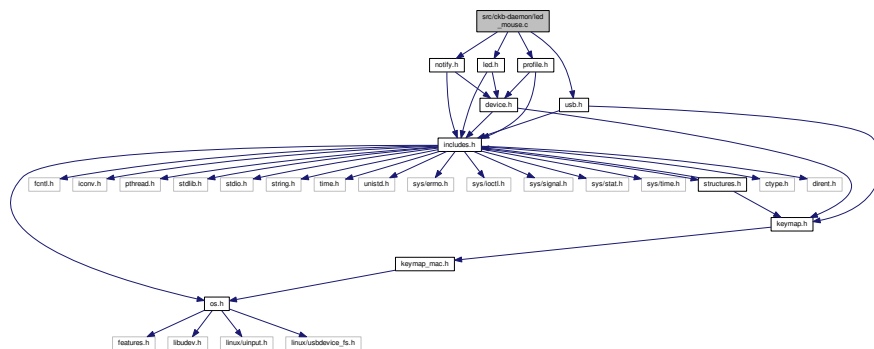


Referenced by ordered8to3().

## 9.31 src/ckb-daemon/led\_mouse.c File Reference

```
#include "led.h"
#include "notify.h"
#include "profile.h"
#include "usb.h"
```

Include dependency graph for led\_mouse.c:



## Functions

- static int `rbgcmp` (const `lighting` \*lhs, const `lighting` \*rhs)
- static int `isblack` (const `usbdevice` \*kb, const `lighting` \*light)
- int `updatergb_mouse` (`usbdevice` \*kb, int force)
- int `savergb_mouse` (`usbdevice` \*kb, `lighting` \*light, int mode)
- int `loadrgb_mouse` (`usbdevice` \*kb, `lighting` \*light, int mode)

### 9.31.1 Function Documentation

#### 9.31.1.1 static int isblack ( const usbdevice \* kb, const lighting \* light ) [static]

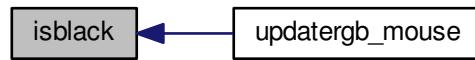
Definition at line 13 of file led\_mouse.c.

References `lighting::b`, `lighting::g`, `IS_M65`, `LED_MOUSE`, `N_MOUSE_ZONES`, and `lighting::r`.

Referenced by `updatergb_mouse()`.

```
13                                     {
14     if (!IS_M65(kb))
15         return 0;
16     uchar black[N_MOUSE_ZONES] = { 0 };
17     return !memcmp(light->r + LED_MOUSE, black, sizeof(black)) && !memcmp(light->
18     g + LED_MOUSE, black, sizeof(black)) && !memcmp(light->b + LED_MOUSE, black, sizeof(
19     black));
20 }
```

Here is the caller graph for this function:



### 9.31.1.2 `int loadrgb_mouse ( usbdevice * kb, lighting * light, int mode )`

Definition at line 81 of file `led_mouse.c`.

References `lighting::b`, `ckb_err`, `lighting::g`, `IS_SABRE`, `IS_SCIMITAR`, `LED_DPI`, `LED_MOUSE`, `MSG_SIZE`, `lighting::r`, and `usbrecv`.

Referenced by `cmd_hwload_mouse()`.

```

81
82     uchar data_pkt[MSG_SIZE] = { 0x0e, 0x13, 0x10, 1, 0 };
83     uchar in_pkt[MSG_SIZE] = { 0 };
84     // Load each RGB zone
85     int zonecount = IS_SCIMITAR(kb) ? 4 : IS_SABRE(kb) ? 3 : 2;
86     for(int i = 0; i < zonecount; i++){
87         if(!usbrecv(kb, data_pkt, in_pkt))
88             return -1;
89         if(memcmp(in_pkt, data_pkt, 4)){
90             ckb_err("Bad input header\n");
91             return -2;
92         }
93         // Copy data
94         int led = LED_MOUSE + i;
95         if(led >= LED_DPI)
96             led++; // Skip DPI light
97         light->r[led] = in_pkt[4];
98         light->g[led] = in_pkt[5];
99         light->b[led] = in_pkt[6];
100        // Set packet for next zone
101        data_pkt[2]++;
102    }
103    return 0;
104 }
  
```

Here is the caller graph for this function:



### 9.31.1.3 `static int rgbcmp ( const lighting * lhs, const lighting * rhs )` `[static]`

Definition at line 7 of file `led_mouse.c`.

References `lighting::b`, `lighting::g`, `LED_MOUSE`, `N_MOUSE_ZONES`, and `lighting::r`.

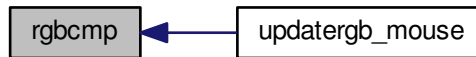
Referenced by `updatergb_mouse()`.

```

7
8     return memcmp(lhs->r + LED_MOUSE, rhs->r + LED_MOUSE,
    N_MOUSE_ZONES) || memcmp(lhs->g + LED_MOUSE, rhs->g +
    LED_MOUSE, N_MOUSE_ZONES) || memcmp(lhs->b + LED_MOUSE, rhs->
    b + LED_MOUSE, N_MOUSE_ZONES);
9 }

```

Here is the caller graph for this function:



#### 9.31.1.4 int savergb\_mouse ( usbdevice \* kb, lighting \* light, int mode )

Definition at line 62 of file led\_mouse.c.

References `lighting::b`, `lighting::g`, `IS_SABRE`, `IS_SCIMITAR`, `LED_DPI`, `LED_MOUSE`, `MSG_SIZE`, `lighting::r`, and `usb send`.

Referenced by `cmd_hwsave_mouse()`.

```

62
63     uchar data_pkt[MSG_SIZE] = { 0x07, 0x13, 0x10, 1, 0 };
64     // Save each RGB zone, minus the DPI light which is sent in the DPI packets
65     int zonecount = IS_SCIMITAR(kb) ? 4 : IS_SABRE(kb) ? 3 : 2;
66     for(int i = 0; i < zonecount; i++){
67         int led = LED_MOUSE + i;
68         if(led >= LED_DPI)
69             led++; // Skip DPI light
70         data_pkt[4] = light->r[led];
71         data_pkt[5] = light->g[led];
72         data_pkt[6] = light->b[led];
73         if(!usb send(kb, data_pkt, 1))
74             return -1;
75         // Set packet for next zone
76         data_pkt[2]++;
77     }
78     return 0;
79 }

```

Here is the caller graph for this function:



#### 9.31.1.5 int updatergb\_mouse ( usbdevice \* kb, int force )

Definition at line 20 of file led\_mouse.c.

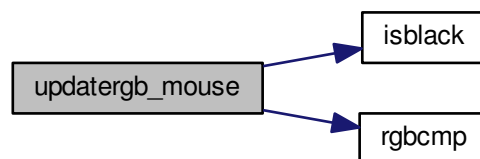
References `usbdevice::active`, `lighting::b`, `usbprofile::currentmode`, `lighting::forceupdate`, `lighting::g`, `isblack()`, `usbprofile::lastlight`, `LED_MOUSE`, `usbmode::light`, `MSG_SIZE`, `N_MOUSE_ZONES`, `usbdevice::profile`, `lighting::r`, `rgbcmp()`, and `usbsend`.

```

20                                     {
21     if(!kb->active)
22         return 0;
23     lighting* lastlight = &kb->profile->lastlight;
24     lighting* newlight = &kb->profile->currentmode->
light;
25     // Don't do anything if the lighting hasn't changed
26     if(!force && !lastlight->forceupdate && !newlight->forceupdate
27         && !rgbcmp(lastlight, newlight))
28         return 0;
29     lastlight->forceupdate = newlight->forceupdate = 0;
30
31     // Send the RGB values for each zone to the mouse
32     uchar data_pkt[2][MSG_SIZE] = {
33         { 0x07, 0x22, N_MOUSE_ZONES, 0x01, 0 }, // RGB colors
34         { 0x07, 0x05, 0x02, 0 }                // Lighting on/off
35     };
36     uchar* rgb_data = &data_pkt[0][4];
37     for(int i = 0; i < N_MOUSE_ZONES; i++){
38         *rgb_data++ = i + 1;
39         *rgb_data++ = newlight->r[LED_MOUSE + i];
40         *rgb_data++ = newlight->g[LED_MOUSE + i];
41         *rgb_data++ = newlight->b[LED_MOUSE + i];
42     }
43     // Send RGB data
44     if(!usbsend(kb, data_pkt[0], 1))
45         return -1;
46     int was_black = isblack(kb, lastlight), is_black = isblack(kb, newlight);
47     if(is_black){
48         // If the lighting is black, send the deactivation packet (M65 only)
49         if(!usbsend(kb, data_pkt[1], 1))
50             return -1;
51     } else if(was_black || force){
52         // If the lighting WAS black, or if we're on forced update, send the activation packet
53         data_pkt[1][4] = 1;
54         if(!usbsend(kb, data_pkt[1], 1))
55             return -1;
56     }
57
58     memcpy(lastlight, newlight, sizeof(lighting));
59     return 0;
60 }

```

Here is the call graph for this function:



## 9.32 src/ckb-daemon/main.c File Reference

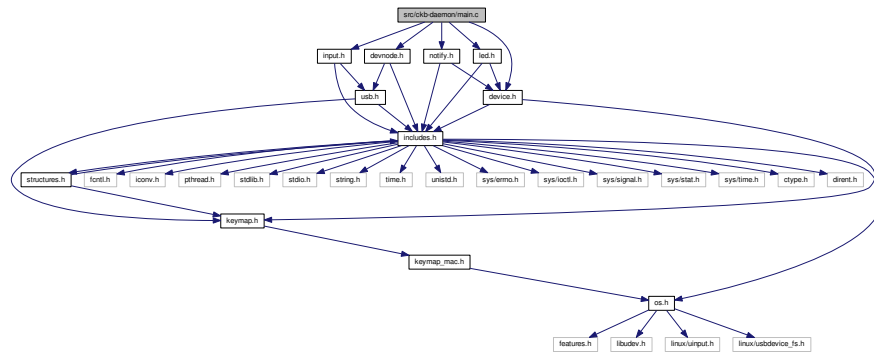
```

#include "device.h"
#include "devnode.h"
#include "input.h"
#include "led.h"
#include "notify.h"

```



Include dependency graph for main.c:



## Functions

- static void [quitWithLock](#) (char mut)
  - quitWithLock*
- int [restart](#) ()
- void [timespec\\_add](#) (struct timespec \*timespec, long nanoseconds)
- static void [quit](#) ()
  - quit* Stop working the daemon. function is called if the daemon received a sigterm In this case, locking the device-mutex is ok.
- void [sighandler2](#) (int type)
- void [sighandler](#) (int type)
- void [localecase](#) (char \*dst, size\_t length, const char \*src)
- int [main](#) (int argc, char \*\*argv)

## Variables

- static int [main\\_ac](#)
- static char \*\* [main\\_av](#)
- volatile int [reset\\_stop](#)
  - brief.*
- int [features\\_mask](#)
  - brief.*
- int [hwload\\_mode](#)
  - hwload\_mode = 1 means read hardware once. should be enough*

### 9.32.1 Function Documentation

#### 9.32.1.1 void localecase ( char \* dst, size\_t length, const char \* src )

Definition at line 71 of file main.c.

```

71                                     {
72     char* ldst = dst + length;
73     char s;
74     while ((s = *src++)) {
75         if (s == ' ')
76             s = '_';
77         else
78             s = tolower(s);
79         *dst++ = s;

```

```

80         if(dst == ldst){
81             dst--;
82             break;
83         }
84     }
85     *dst = 0;
86 }

```

### 9.32.1.2 int main ( int argc, char \*\* argv )

Definition at line 88 of file main.c.

References ckb\_fatal\_nofile, ckb\_info, ckb\_info\_nofile, ckb\_warn\_nofile, devpath, FEAT\_BIND, FEAT\_MOUSE-ACCEL, FEAT\_NOTIFY, features\_mask, gid, hwload\_mode, keyboard, main\_ac, main\_av, mkdevpath(), quit(), restart(), sighandler(), and usbmain().

Referenced by restart().

```

88         {
89             // Set output pipes to buffer on newlines, if they weren't set that way already
90             setlinebuf(stdout);
91             setlinebuf(stderr);
92             main_ac = argc;
93             main_av = argv;
94
95             printf("    ckb: Corsair RGB driver %s\n", CKB_VERSION_STR);
96             // If --help occurs anywhere in the command-line, don't launch the program but instead print usage
97             for(int i = 1; i < argc; i++){
98                 if(!strcmp(argv[i], "--help")){
99                     printf(
100 #ifdef OS_MAC
101                         "Usage: ckb-daemon [--gid=<gid>] [--hwload=<always|try|never>] [--nonotify]
102                         [--nobind] [--nomouseaccel] [--nonroot]\n"
103 #else
104                         "Usage: ckb-daemon [--gid=<gid>] [--hwload=<always|try|never>] [--nonotify]
105                         [--nobind] [--nonroot]\n"
106 #endif
107                         "\n"
108                         "See https://github.com/ccMSC/ckb/blob/master/DAEMON.md for full instructions.\n"
109                         "\n"
110                         "Command-line parameters:\n"
111                         "    --gid=<gid>\n"
112                         "        Restrict access to %s* nodes to users in group <gid>.\n"
113                         "        (Ordinarily they are accessible to anyone)\n"
114                         "    --hwload=<always|try|never>\n"
115                         "        --hwload=always will force loading of stored hardware profiles on
116                         compatible devices. May result in long start up times.\n"
117                         "        --hwload=try will try to load the profiles, but give up if not immediately
118                         successful (default).\n"
119                         "        --hwload=never will ignore hardware profiles completely.\n"
120                         "    --nonotify\n"
121                         "        Disables key monitoring/notifications.\n"
122                         "        Note that this makes reactive lighting impossible.\n"
123                         "    --nobind\n"
124                         "        Disables all key rebinding, macros, and notifications. Implies --nonotify.
125                         \n"
126 #ifdef OS_MAC
127                         "    --nomouseaccel\n"
128                         "        Disables mouse acceleration, even if the system preferences enable it.\n"
129 #endif
130                         "    --nonroot\n"
131                         "        Allows running ckb-daemon as a non root user.\n"
132                         "        This will almost certainly not work. Use only if you know what you're
133                         doing.\n"
134                         "\n", devpath);
135             exit(0);
136         }
137     }
138
139     // Check PID, quit if already running
140     char pidpath[strlen(devpath) + 6];
141     snprintf(pidpath, sizeof(pidpath), "%s0/pid", devpath);
142     FILE* pidfile = fopen(pidpath, "r");
143     if(pidfile){
144         pid_t pid;
145         fscanf(pidfile, "%d", &pid);
146         fclose(pidfile);
147         if(pid > 0){
148             // kill -s 0 checks if the PID is active but doesn't send a signal
149             if(!kill(pid, 0)){
150                 ckb_fatal_nofile("ckb-daemon is already running (PID %d). Try `killall

```

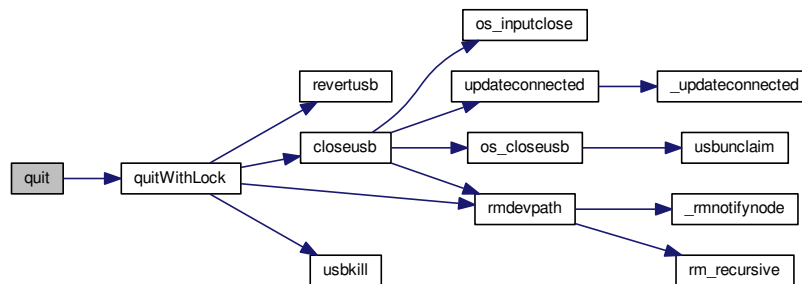
```

    ckb-daemon`.\n", pid);
145     ckb_fatal_nofile("(If you're certain the process is dead, delete %s and try
again)\n", pidpath);
146     return 0;
147 }
148 }
149 }
150
151 // Read parameters
152 int forceroor = 1;
153 for(int i = 1; i < argc; i++){
154     char* argument = argv[i];
155     unsigned newgid;
156     char hwload[7];
157     if(sscanf(argument, "--gid=%u", &newgid) == 1){
158         // Set dev node GID
159         gid = newgid;
160         ckb_info_nofile("Setting /dev node gid: %u\n", newgid);
161     } else if(!strcmp(argument, "--nobind")){
162         // Disable key notifications and rebinding
163         features_mask &= ~FEAT_BIND & ~FEAT_NOTIFY;
164         ckb_info_nofile("Key binding and key notifications are disabled\n");
165     } else if(!strcmp(argument, "--nonotify")){
166         // Disable key notifications
167         features_mask &= ~FEAT_NOTIFY;
168         ckb_info_nofile("Key notifications are disabled\n");
169     } else if(sscanf(argument, "--hwload=%6s", hwload) == 1){
170         if(!strcmp(hwload, "always") || !strcmp(hwload, "yes") || !strcmp(hwload, "y") || !strcmp(
hwload, "a")){
171             hwload_mode = 2;
172             ckb_info_nofile("Setting hardware load: always\n");
173         } else if(!strcmp(hwload, "tryonce") || !strcmp(hwload, "try") || !strcmp(hwload, "once") || !
strcmp(hwload, "t") || !strcmp(hwload, "o")){
174             hwload_mode = 1;
175             ckb_info_nofile("Setting hardware load: tryonce\n");
176         } else if(!strcmp(hwload, "never") || !strcmp(hwload, "none") || !strcmp(hwload, "no") || !
strcmp(hwload, "n")){
177             hwload_mode = 0;
178             ckb_info_nofile("Setting hardware load: never\n");
179         }
180     } else if(!strcmp(argument, "--nonroot")){
181         // Allow running as a non-root user
182         forceroor = 0;
183     }
184 #ifdef OS_MAC
185     else if(!strcmp(argument, "--nomouseaccel")){
186         // On OSX, provide an option to disable mouse acceleration
187         features_mask &= ~FEAT_MOUSEACCEL;
188         ckb_info_nofile("Mouse acceleration disabled\n");
189     }
190 #endif
191 }
192
193 // Check UID
194 if(getuid() != 0){
195     if(forceroor){
196         ckb_fatal_nofile("ckb-daemon must be run as root. Try `sudo %s`\n", argv[0]);
197         exit(0);
198     } else
199         ckb_warn_nofile("Warning: not running as root, allowing anyway per command-line
parameter...\n");
200 }
201
202 // Make root keyboard
203 umask(0);
204 memset(keyboard, 0, sizeof(keyboard));
205 if(!mkdevpath(keyboard))
206     ckb_info("Root controller ready at %s0\n", devpath);
207
208 // Set signals
209 sigset_t signals;
210 sigfillset(&signals);
211 sigdelset(&signals, SIGTERM);
212 sigdelset(&signals, SIGINT);
213 sigdelset(&signals, SIGQUIT);
214 sigdelset(&signals, SIGUSR1);
215 // Set up signal handlers for quitting the service.
216 sigprocmask(SIG_SETMASK, &signals, 0);
217 signal(SIGTERM, sighandler);
218 signal(SIGINT, sighandler);
219 signal(SIGQUIT, sighandler);
220 signal(SIGUSR1, (void (*)(void))restart);
221
222 // Start the USB system
223 int result = usbmain();
224 quit();
225 return result;

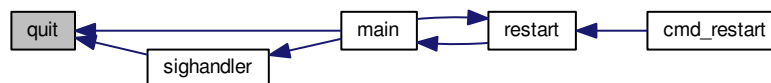
```



Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.32.1.4 void quitWithLock ( char mut ) [static]

##### Parameters

<i>mut</i>	try to close files maybe without locking the mutex if mut == true then lock
------------	---

Definition at line 40 of file main.c.

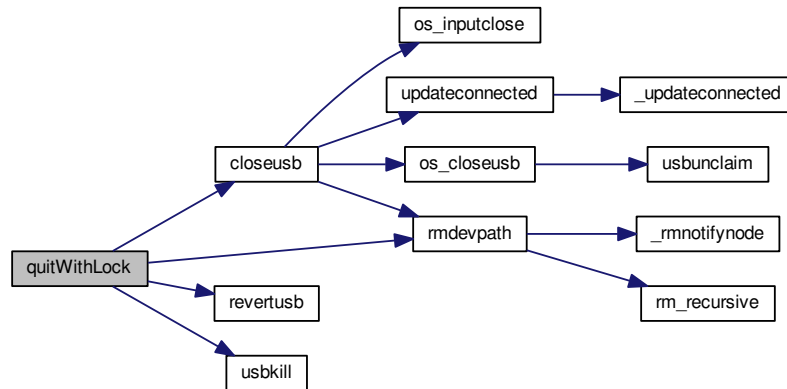
References ckb\_info, closeusb(), DEV\_MAX, devmutex, IS\_CONNECTED, keyboard, reset\_stop, revertusb(), rmdevpath(), and usbkill().

Referenced by quit(), and restart().

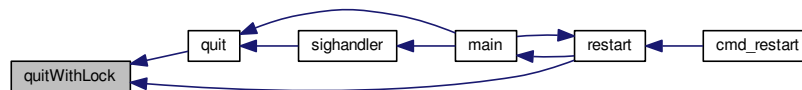
```

40     {
41         // Abort any USB resets in progress
42         reset_stop = 1;
43         for(int i = 1; i < DEV_MAX; i++){
44             // Before closing, set all keyboards back to HID input mode so that the stock driver can still talk
45             to them
46             if (mut) pthread_mutex_lock(devmutex + i);
47             if (IS_CONNECTED(keyboard + i)){
48                 revertusb(keyboard + i);
49                 closeusb(keyboard + i);
50             }
51             pthread_mutex_unlock(devmutex + i);
52         }
53         ckb_info("Closing root controller\n");
54         rmdevpath(keyboard);
55         usbkill();
56     }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.32.1.5 int restart ( )

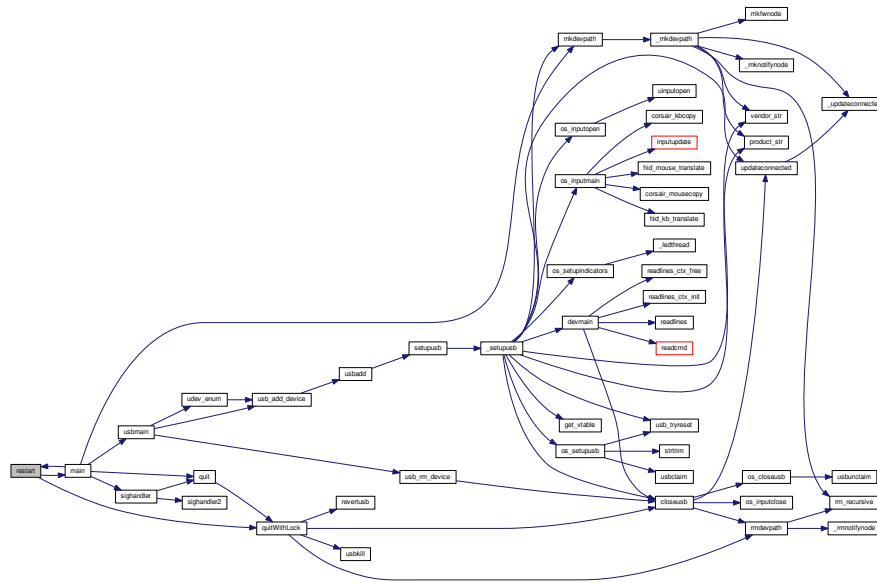
Definition at line 228 of file main.c.

References `ckb_err`, `main()`, `main_ac`, `main_av`, and `quitWithLock()`.

Referenced by `cmd_restart()`, and `main()`.

```

228     {
229         ckb_err("restart called, running quit without mutex-lock.\n");
230         quitWithLock(0);
231         return main(main_ac, main_av);
232     }
  
```

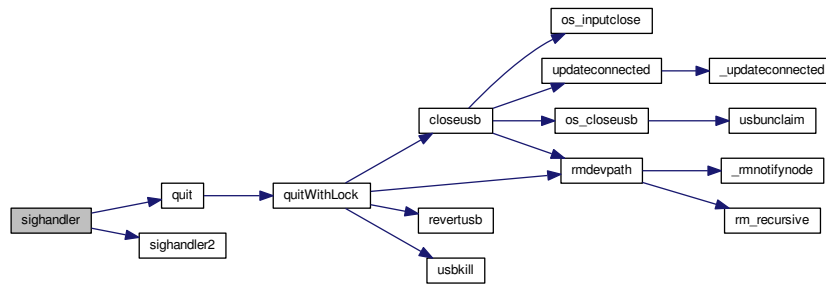


Definition at line 62 of file main.c.

Referenced by main().

Generated on Sun Jun 18 2017 18:21:35 for ckb-next by Doxygen

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.32.1.7 void sighandler2 ( int type )

Definition at line 57 of file main.c.

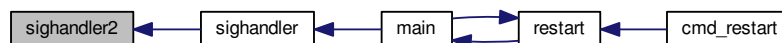
Referenced by sighandler().

```

57     {
58         // Don't use ckb_warn, we want an extra \n at the beginning
59         printf("\n[W] Ignoring signal %d (already shutting down)\n", type);
60     }

```

Here is the caller graph for this function:



#### 9.32.1.8 void timespec\_add ( struct timespec \* timespec, long nanoseconds )

Definition at line 19 of file main.c.

```

19     {
20         nanoseconds += timespec->tv_nsec;
21         timespec->tv_sec += nanoseconds / 1000000000;
22         timespec->tv_nsec = nanoseconds % 1000000000;
23     }

```



## 9.32.2 Variable Documentation

### 9.32.2.1 int features\_mask

features\_mask Mask of features to exclude from all devices

That bit mask is set to enable all (-1). When interpreting the input parameters, some of these bits can be cleared.

At the moment binding, notifying and mouse-acceleration can be disabled via command line.

Have a look at [main\(\)](#) in [main.c](#) for details.

Definition at line 35 of file usb.c.

Referenced by [\\_setupusb\(\)](#), and [main\(\)](#).

### 9.32.2.2 int hwload\_mode

Definition at line 7 of file device.c.

Referenced by [main\(\)](#).

### 9.32.2.3 int main\_ac [static]

Definition at line 7 of file main.c.

Referenced by [main\(\)](#), and [restart\(\)](#).

### 9.32.2.4 char\*\* main\_av [static]

Definition at line 8 of file main.c.

Referenced by [main\(\)](#), and [restart\(\)](#).

### 9.32.2.5 volatile int reset\_stop

reset\_stop is boolean: Reset stopper for when the program shuts down.

Is set only by [quit\(\)](#) to true (1) to inform several usb\_\* functions to end their loops and tries.

Definition at line 25 of file usb.c.

Referenced by [\\_usbrecv\(\)](#), [\\_usbseend\(\)](#), [quitWithLock\(\)](#), and [usb\\_tryreset\(\)](#).

## 9.33 src/ckb-daemon/notify.c File Reference

```
#include "device.h"
#include "devnode.h"
#include "dpi.h"
#include "led.h"
#include "notify.h"
#include "profile.h"
```



Definition at line 73 of file notify.c.

## 9.33.2 Function Documentation

### 9.33.2.1 static void \_cmd\_get ( usbdevice \* kb, usbmode \* mode, int nnumber, const char \* setting ) [static]

Definition at line 90 of file notify.c.

References dpiset::current, usbmode::dpi, hwprofile::dpi, gethwmodename(), gethwprofilename(), getid(), getmodename(), getprofilename(), usbdevice::hw, usbdevice::hw\_ileds, HW\_STANDARD, I\_CAPS, I\_NUM, I\_SCROLL, usbmode::id, usbprofile::id, hwprofile::id, usbdevice::input, keymap, usbinput::keys, dpiset::lift, usbmode::light, hwprofile::light, usbid::modified, N\_KEYS\_INPUT, nprintf(), nprintind(), nprintkey(), printdpi(), printrgb(), usbdevice::profile, and dpiset::snap.

Referenced by cmd\_get().

```

90                                     {
91     usbprofile* profile = kb->profile;
92     if(!strcmp(setting, ":mode")){
93         // Get the current mode number
94         nprintf(kb, nnumber, mode, "switch\n");
95         return;
96     } else if(!strcmp(setting, ":rgb")){
97         // Get the current RGB settings
98         char* rgb = printrgb(&mode->light, kb);
99         nprintf(kb, nnumber, mode, "rgb %s\n", rgb);
100        free(rgb);
101        return;
102    } else if(!strcmp(setting, ":hwr gb")){
103        // Get the current hardware RGB settings
104        HW_STANDARD;
105        char* rgb = printrgb(kb->hw->light + index, kb);
106        nprintf(kb, nnumber, mode, "hwr gb %s\n", rgb);
107        free(rgb);
108        return;
109    } else if(!strcmp(setting, ":profilename")){
110        // Get the current profile name
111        char* name = getprofilename(profile);
112        nprintf(kb, nnumber, 0, "profilename %s\n", name[0] ? name : "Unnamed");
113        free(name);
114    } else if(!strcmp(setting, ":name")){
115        // Get the current mode name
116        char* name = getmodename(mode);
117        nprintf(kb, nnumber, mode, "name %s\n", name[0] ? name : "Unnamed");
118        free(name);
119    } else if(!strcmp(setting, ":hwprofilename")){
120        // Get the current hardware profile name
121        if(!kb->hw)
122            return;
123        char* name = gethwprofilename(kb->hw);
124        nprintf(kb, nnumber, 0, "hwprofilename %s\n", name[0] ? name : "Unnamed");
125        free(name);
126    } else if(!strcmp(setting, ":hwname")){
127        // Get the current hardware mode name
128        HW_STANDARD;
129        char* name = gethwmodename(kb->hw, index);
130        nprintf(kb, nnumber, mode, "hwname %s\n", name[0] ? name : "Unnamed");
131        free(name);
132    } else if(!strcmp(setting, ":profileid")){
133        // Get the current profile ID
134        char* guid = getid(&profile->id);
135        int modified;
136        memcpy(&modified, &profile->id.modified, sizeof(modified));
137        nprintf(kb, nnumber, 0, "profileid %s %x\n", guid, modified);
138        free(guid);
139    } else if(!strcmp(setting, ":id")){
140        // Get the current mode ID
141        char* guid = getid(&mode->id);
142        int modified;
143        memcpy(&modified, &mode->id.modified, sizeof(modified));
144        nprintf(kb, nnumber, mode, "id %s %x\n", guid, modified);
145        free(guid);
146    } else if(!strcmp(setting, ":hwprofileid")){
147        // Get the current hardware profile ID
148        if(!kb->hw)
149            return;
150        char* guid = getid(&kb->hw->id[0]);
151        int modified;
152        memcpy(&modified, &kb->hw->id[0].modified, sizeof(modified));
153        nprintf(kb, nnumber, 0, "hwprofileid %s %x\n", guid, modified);

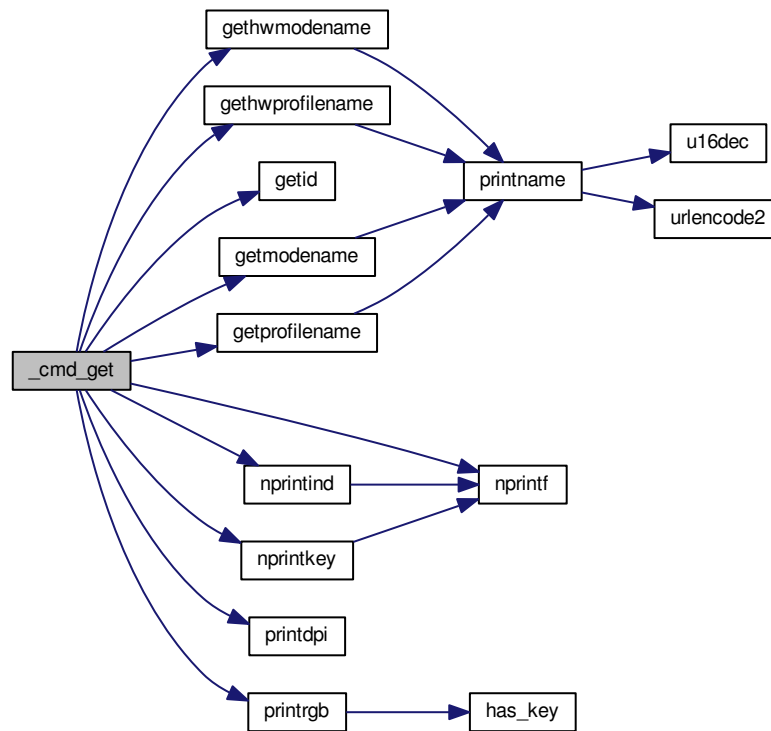
```

```

154     free(guid);
155 } else if(!strcmp(setting, ":hwid")){
156     // Get the current hardware mode ID
157     HW_STANDARD;
158     char* guid = getid(&kb->hw->id[index + 1]);
159     int modified;
160     memcpy(&modified, &kb->hw->id[index + 1].modified, sizeof(modified));
161     nprintf(kb, nnumber, mode, "hwid %s %x\n", guid, modified);
162     free(guid);
163 } else if(!strcmp(setting, ":keys")){
164     // Get the current state of all keys
165     for(int i = 0; i < N_KEYS_INPUT; i++){
166         if(!keymap[i].name)
167             continue;
168         int byte = i / 8, bit = 1 << (i & 7);
169         uchar state = kb->input.keys[byte] & bit;
170         if(state)
171             nprintkey(kb, nnumber, i, 1);
172     }
173 } else if(!strcmp(setting, ":i")){
174     // Get the current state of all indicator LEDs
175     if(kb->hw_ileds & I_NUM) nprintind(kb, nnumber,
176 I_NUM, 1);
177     if(kb->hw_ileds & I_CAPS) nprintind(kb, nnumber,
178 I_CAPS, 1);
179     if(kb->hw_ileds & I_SCROLL) nprintind(kb, nnumber,
180 I_SCROLL, 1);
181 } else if(!strcmp(setting, ":dpi")){
182     // Get the current DPI levels
183     char* dpi = printdpi(&mode->dpi, kb);
184     nprintf(kb, nnumber, mode, "dpi %s\n", dpi);
185     free(dpi);
186     return;
187 } else if(!strcmp(setting, ":hwdpi")){
188     // Get the current hardware DPI levels
189     HW_STANDARD;
190     char* dpi = printdpi(kb->hw->dpi + index, kb);
191     nprintf(kb, nnumber, mode, "hwdpi %s\n", dpi);
192     free(dpi);
193     return;
194 } else if(!strcmp(setting, ":dpisel")){
195     // Get the currently-selected DPI
196     nprintf(kb, nnumber, mode, "dpisel %d\n", mode->dpi.current);
197 } else if(!strcmp(setting, ":hwdpisel")){
198     // Get the currently-selected hardware DPI
199     HW_STANDARD;
200     nprintf(kb, nnumber, mode, "hwdpisel %d\n", kb->hw->dpi[index].
201 current);
202 } else if(!strcmp(setting, ":lift")){
203     // Get the mouse lift height
204     nprintf(kb, nnumber, mode, "lift %d\n", mode->dpi.lift);
205 } else if(!strcmp(setting, ":hwlift")){
206     // Get the hardware lift height
207     HW_STANDARD;
208     nprintf(kb, nnumber, mode, "hwlift %d\n", kb->hw->dpi[index].
209 lift);
210 } else if(!strcmp(setting, ":snap")){
211     // Get the angle snap status
212     nprintf(kb, nnumber, mode, "snap %s\n", mode->dpi.snap ? "on" : "off");
213 } else if(!strcmp(setting, ":hwsnap")){
214     // Get the hardware angle snap status
215     HW_STANDARD;
216     nprintf(kb, nnumber, mode, "hwsnap %s\n", kb->hw->dpi[index].
217 snap ? "on" : "off");
218 }
219 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.33.2.2 void cmd\_get ( usbdevice \* kb, usbmode \* mode, int nnumber, int dummy, const char \* setting )

Definition at line 215 of file notify.c.

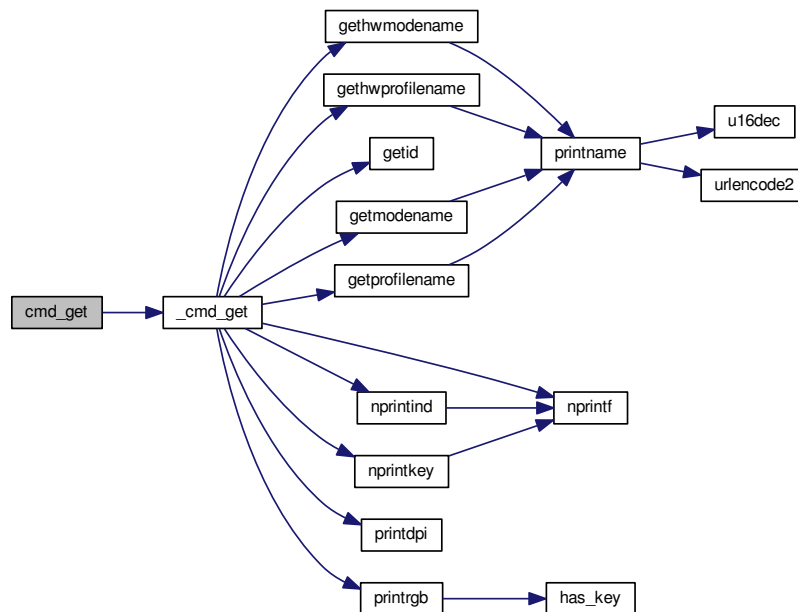
References `_cmd_get()`, and `imutex`.

```

215                                     {
216     pthread_mutex_lock(imutex(kb));
217     _cmd_get(kb, mode, nnumber, setting);
218     pthread_mutex_unlock(imutex(kb));
219 }

```

Here is the call graph for this function:



### 9.33.2.3 void cmd\_notify ( usbdevice \* kb, usbmode \* mode, int nnumber, int keyindex, const char \* toggle )

Definition at line 61 of file notify.c.

References CLEAR\_KEYBIT, imutex, N\_KEYS\_INPUT, usbmode::notify, and SET\_KEYBIT.

```

61                                     {
62     if (keyindex >= N_KEYS_INPUT)
63         return;
64     pthread_mutex_lock(imutex(kb));
65     if (!strcmp(toggle, "on") || *toggle == 0)
66         SET_KEYBIT(mode->notify[nnumber], keyindex);
67     else if (!strcmp(toggle, "off"))
68         CLEAR_KEYBIT(mode->notify[nnumber], keyindex);
69     pthread_mutex_unlock(imutex(kb));
70 }

```

### 9.33.2.4 void cmd\_restart ( usbdevice \* kb, usbmode \* mode, int nnumber, int dummy, const char \* content )

Definition at line 223 of file notify.c.

References ckb\_info, nprintf(), and restart().

```

223                                     {
224     ckb_info("RESTART called with %s\n", content);
225     nprintf(kb, -1, 0, "RESTART called with %s\n", content);
226     restart();
227 }

```

[illegible]

Referenced by `_cmd_get()`, `cmd_fwupdate()`, `cmd_restart()`, `fwupdate()`, `nprintind()`, and `nprintkey()`.

[illegible]

### 9.33.2.6 void nprintind ( usbdevice \* kb, int nnumber, int led, int on )

Definition at line 43 of file notify.c.

References I\_CAPS, I\_NUM, I\_SCROLL, and nprintf().

Referenced by \_cmd\_get(), and updateindicators\_kb().

```

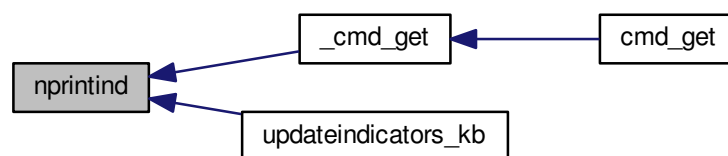
43                                     {
44     const char* name = 0;
45     switch(led){
46     case I_NUM:
47         name = "num";
48         break;
49     case I_CAPS:
50         name = "caps";
51         break;
52     case I_SCROLL:
53         name = "scroll";
54         break;
55     default:
56         return;
57     }
58     nprintf(kb, nnumber, 0, "i %c%s\n", on ? '+' : '-', name);
59 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.33.2.7 void nprintkey ( usbdevice \* kb, int nnumber, int keyindex, int down )

Definition at line 35 of file notify.c.

References keymap, key::name, and nprintf().

Referenced by \_cmd\_get(), and inputupdate\_keys().

```

35                                     {
36     const key* map = keymap + keyindex;
37     if (map->name)

```



```

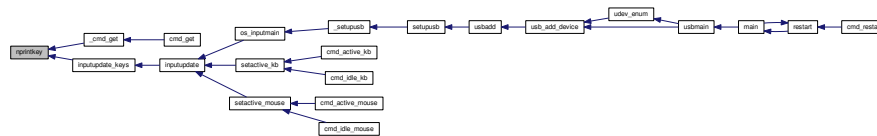
38     nprintf(kb, nnumber, 0, "key %c%s\n", down ? '+' : '-', map->name);
39     else
40     nprintf(kb, nnumber, 0, "key %c#%d\n", down ? '+' : '-', keyindex);
41 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.33.2.8 int restart ( )

Definition at line 228 of file main.c.

References `ckb_err`, `main()`, `main_ac`, `main_av`, and `quitWithLock()`.

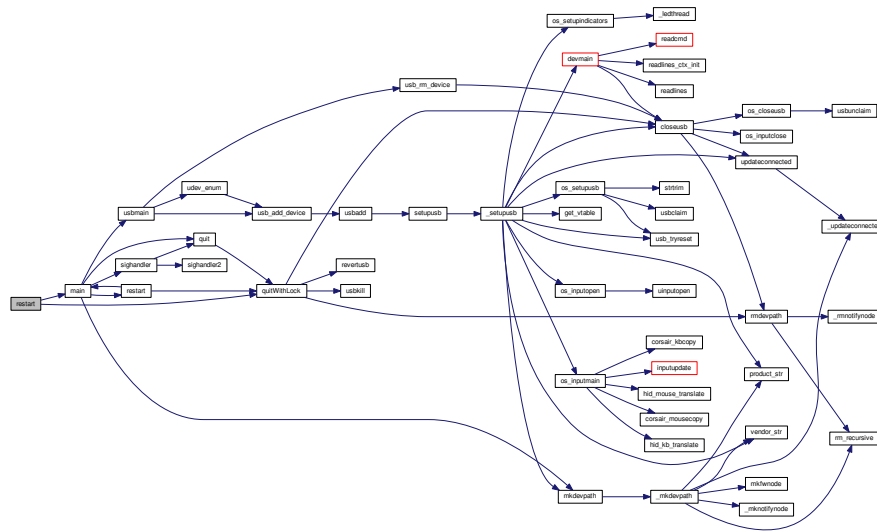
Referenced by `cmd_restart()`, and `main()`.

```

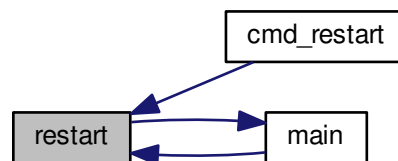
228     {
229     ckb_err("restart called, running quit without mutex-lock.\n");
230     quitWithLock(0);
231     return main(main_ac, main_av);
232 }

```

Here is the call graph for this function:

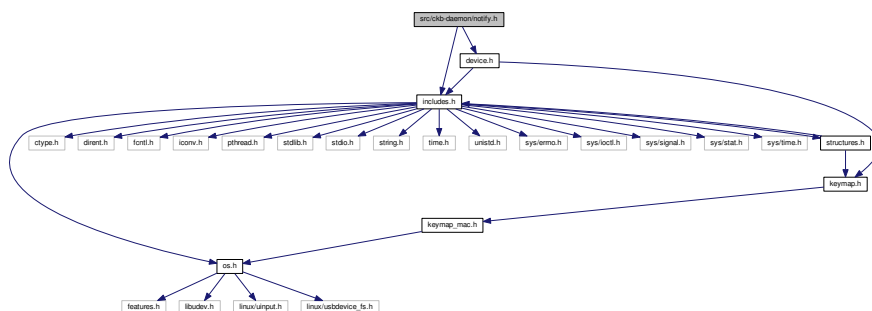


Here is the caller graph for this function:

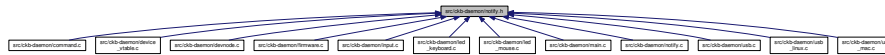


## 9.34 src/ckb-daemon/notify.h File Reference

```
#include "includes.h"
#include "device.h"
Include dependency graph for notify.h:
```



This graph shows which files directly or indirectly include this file:



## Functions

- void `nprintf` (`usbdevice` \*kb, int nodenumber, `usbmode` \*mode, const char \*format,...)
- void `nprintkey` (`usbdevice` \*kb, int nnumber, int keyindex, int down)
- void `nprintind` (`usbdevice` \*kb, int nnumber, int led, int on)
- void `cmd_notify` (`usbdevice` \*kb, `usbmode` \*mode, int nnumber, int keyindex, const char \*toggle)
- void `cmd_get` (`usbdevice` \*kb, `usbmode` \*mode, int nnumber, int dummy, const char \*setting)
- void `cmd_restart` (`usbdevice` \*kb, `usbmode` \*mode, int nnumber, int dummy, const char \*content)

### 9.34.1 Function Documentation

#### 9.34.1.1 void `cmd_get` ( `usbdevice` \* *kb*, `usbmode` \* *mode*, int *nnumber*, int *dummy*, const char \* *setting* )

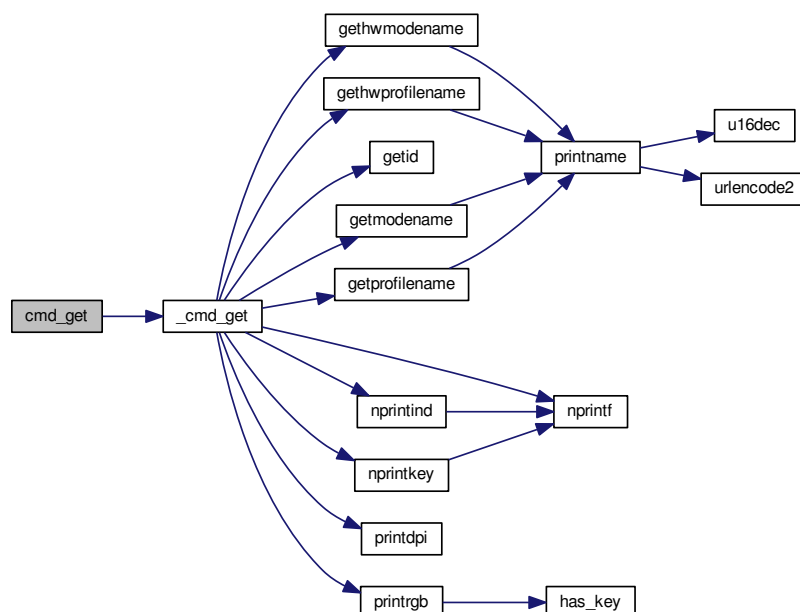
Definition at line 215 of file `notify.c`.

References `_cmd_get()`, and `imutex`.

```

215
216     pthread_mutex_lock(&imutex(kb));
217     _cmd_get(kb, mode, nnumber, setting);
218     pthread_mutex_unlock(&imutex(kb));
219 }
```

Here is the call graph for this function:



### 9.34.1.2 void cmd\_notify ( usbdevice \* kb, usbmode \* mode, int nnumber, int keyindex, const char \* toggle )

Definition at line 61 of file notify.c.

References CLEAR\_KEYBIT, imutex, N\_KEYS\_INPUT, usbmode::notify, and SET\_KEYBIT.

```

61
62     if(keyindex >= N_KEYS_INPUT)
63         return;
64     pthread_mutex_lock(imutex(kb));
65     if(!strcmp(toggle, "on") || *toggle == 0)
66         SET_KEYBIT(mode->notify[nnumber], keyindex);
67     else if(!strcmp(toggle, "off"))
68         CLEAR_KEYBIT(mode->notify[nnumber], keyindex);
69     pthread_mutex_unlock(imutex(kb));
70 }
```

### 9.34.1.3 void cmd\_restart ( usbdevice \* kb, usbmode \* mode, int nnumber, int dummy, const char \* content )

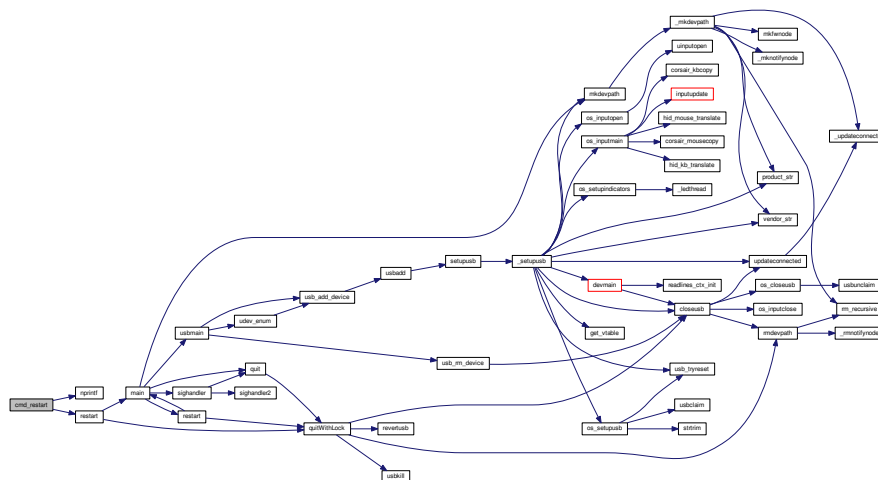
Definition at line 223 of file notify.c.

References ckb\_info, nprintf(), and restart().

```

223
224     ckb_info("RESTART called with %s\n", content);
225     nprintf(kb, -1, 0, "RESTART called with %s\n", content);
226     restart();
227 }
```

Here is the call graph for this function:



### 9.34.1.4 void nprintf ( usbdevice \* kb, int nodenumber, usbmode \* mode, const char \* format, ... )

Definition at line 8 of file notify.c.

References INDEX\_OF, usbprofile::mode, usbdevice::outfifo, OUTFIFO\_MAX, and usbdevice::profile.

Referenced by \_cmd\_get(), cmd\_fwupdate(), cmd\_restart(), fwupdate(), nprintind(), and nprintkey().

```

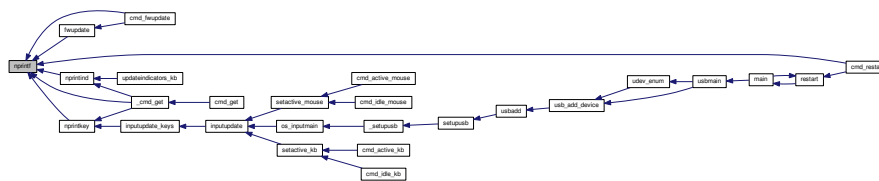
8
9     if(!kb)
10         return;
11     usbprofile* profile = kb->profile;
12     va_list va_args;
13     int fifo;
```

```

14 if (nodenumber >= 0) {
15     // If node number was given, print to that node (if open)
16     if ((fifo = kb->outfifo[nodenumber] - 1) != -1) {
17         va_start(va_args, format);
18         if (mode)
19             dprintf(fifo, "mode %d ", INDEX_OF(mode, profile->mode) + 1);
20         vdprintf(fifo, format, va_args);
21     }
22     return;
23 }
24 // Otherwise, print to all nodes
25 for (int i = 0; i < OUTFIFO_MAX; i++) {
26     if ((fifo = kb->outfifo[i] - 1) != -1) {
27         va_start(va_args, format);
28         if (mode)
29             dprintf(fifo, "mode %d ", INDEX_OF(mode, profile->mode) + 1);
30         vdprintf(fifo, format, va_args);
31     }
32 }
33 }

```

Here is the caller graph for this function:



**9.34.1.5** void nprintind ( usbdevice \* *kb*, int *nnumber*, int *led*, int *on* )

Definition at line 43 of file notify.c.

References `I_CAPS`, `I_NUM`, `I_SCROLL`, and `nprintf()`.

Referenced by `_cmd_get()`, and `updateindicators_kb()`.

```

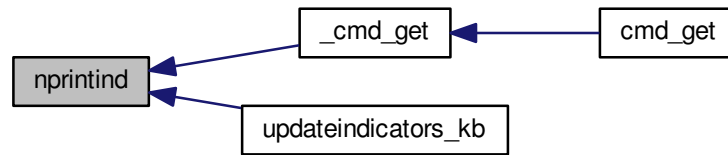
43
44     const char* name = 0;
45     switch(led){
46     case I_NUM:
47         name = "num";
48         break;
49     case I_CAPS:
50         name = "caps";
51         break;
52     case I_SCROLL:
53         name = "scroll";
54         break;
55     default:
56         return;
57     }
58     nprintf(kb, nnumber, 0, "i %c%s\n", on ? '+' : '-', name);
59 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.34.1.6 void nprintkey ( usbdevice \* kb, int nnumber, int keyindex, int down )

Definition at line 35 of file notify.c.

References keymap, key::name, and nprintf().

Referenced by \_cmd\_get(), and inputupdate\_keys().

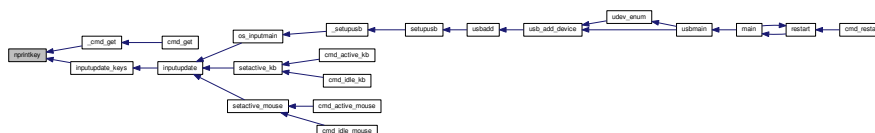
```

35                                     {
36     const key* map = keymap + keyindex;
37     if (map->name)
38         nprintf(kb, nnumber, 0, "key %c%s\n", down ? '+' : '-', map->name);
39     else
40         nprintf(kb, nnumber, 0, "key %c#%d\n", down ? '+' : '-', keyindex);
41 }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:

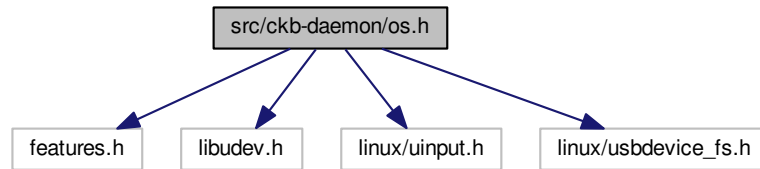


## 9.35 src/ckb-daemon/os.h File Reference

```
#include <features.h>
```

```
#include <libudev.h>
#include <linux/uinput.h>
#include <linux/usbdevice_fs.h>
```

Include dependency graph for os.h:



This graph shows which files directly or indirectly include this file:



## Macros

- `#define _DEFAULT_SOURCE`
- `#define _GNU_SOURCE`
- `#define UINPUT_VERSION 2`
- `#define euid_guard_start`
- `#define euid_guard_stop`

### 9.35.1 Macro Definition Documentation

#### 9.35.1.1 `#define _DEFAULT_SOURCE`

Definition at line 22 of file os.h.

#### 9.35.1.2 `#define _GNU_SOURCE`

Definition at line 26 of file os.h.

#### 9.35.1.3 `#define euid_guard_start`

Definition at line 40 of file os.h.

Referenced by `mkdevpath()`, `mknotifynode()`, `rmdevpath()`, `rmnotifynode()`, and `updateconnected()`.

#### 9.35.1.4 `#define euid_guard_stop`

Definition at line 41 of file os.h.

Referenced by `mkdevpath()`, `mknotifynode()`, `rmdevpath()`, `rmnotifynode()`, and `updateconnected()`.





## Variables

- static iconv\_t `utf8to16` = 0
- static iconv\_t `utf16to8` = 0

## 9.36.1 Function Documentation

### 9.36.1.1 static void \_freeprofile ( usbdevice \* kb ) [static]

Definition at line 210 of file profile.c.

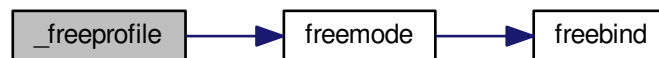
References `freemode()`, `usbprofile::mode`, `MODE_COUNT`, and `usbdevice::profile`.

Referenced by `cmd_eraseprofile()`, and `freeprofile()`.

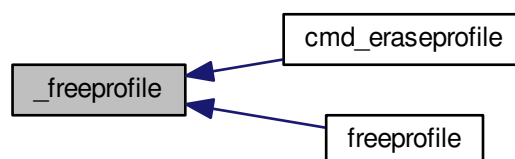
```

210
211     usbprofile* profile = kb->profile; {
212     if(!profile)
213         return;
214     // Clear all mode data
215     for(int i = 0; i < MODE_COUNT; i++)
216         freemode(profile->mode + i);
217     free(profile);
218     kb->profile = 0;
219 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.36.1.2 void allocprofile ( usbdevice \* kb )

Definition at line 182 of file profile.c.

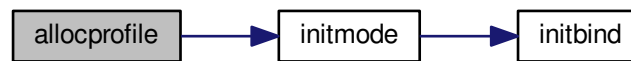
References `usbprofile::currentmode`, `dpiset::forceupdate`, `lighting::forceupdate`, `initmode()`, `usbprofile::lastdpi`, `usbprofile::lastlight`, `usbprofile::mode`, `MODE_COUNT`, and `usbdevice::profile`.

Referenced by `cmd_eraseprofile()`.

```

182                                     {
183     if(kb->profile)
184         return;
185     usbprofile* profile = kb->profile = calloc(1, sizeof(
usbprofile));
186     for(int i = 0; i < MODE_COUNT; i++)
187         initmode(profile->mode + i);
188     profile->currentmode = profile->mode;
189     profile->lastlight.forceupdate = profile->lastdpi.
forceupdate = 1;
190 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



**9.36.1.3** `void cmd_erase ( usbdevice * kb, usbmode * mode, int dummy1, int dummy2, const char * dummy3 )`

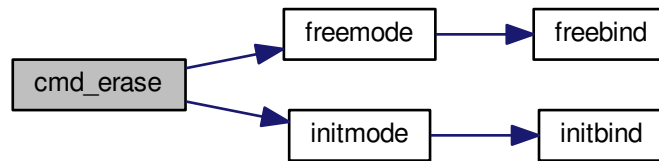
Definition at line 203 of file `profile.c`.

References `freemode()`, `imutex`, and `initmode()`.

```

203                                     {
204     pthread_mutex_lock(imutex(kb));
205     freemode(mode);
206     initmode(mode);
207     pthread_mutex_unlock(imutex(kb));
208 }
```

Here is the call graph for this function:



#### 9.36.1.4 void cmd\_eraseprofile ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

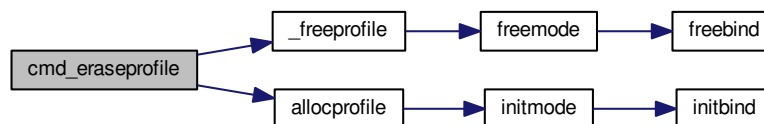
Definition at line 221 of file profile.c.

References `_freeprofile()`, `allocprofile()`, and `imutex`.

```

221
222     pthread_mutex_lock (imutex (kb) );
223     _freeprofile (kb) ;
224     allocprofile (kb) ;
225     pthread_mutex_unlock (imutex (kb) );
226 }
```

Here is the call graph for this function:



#### 9.36.1.5 void cmd\_id ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* id )

Definition at line 160 of file profile.c.

References `usbmode::id`, `usbid::modified`, and `setid()`.

```

160
161     // ID is either a GUID or an 8-digit hex number
162     int newmodified;
163     if (!setid(&mode->id, id) && sscanf(id, "%08x", &newmodified) == 1)
164         memcpy(mode->id.modified, &newmodified, sizeof(newmodified));
165 }
```

Here is the call graph for this function:



#### 9.36.1.6 void cmd\_name ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* name )

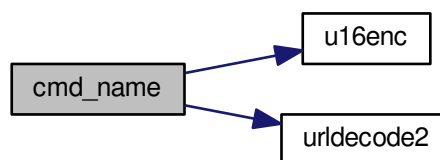
Definition at line 117 of file profile.c.

References MD\_NAME\_LEN, usbmode::name, u16enc(), and urldecode2().

```

117                                     {
118     char decoded[strlen(name) + 1];
119     urldecode2(decoded, name);
120     size_t srclen = strlen(decoded), dstlen = MD_NAME_LEN;
121     u16enc(decoded, mode->name, &srclen, &dstlen);
122 }
```

Here is the call graph for this function:



#### 9.36.1.7 void cmd\_profileid ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* id )

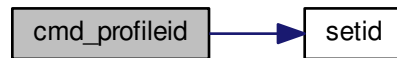
Definition at line 167 of file profile.c.

References usbprofile::id, usbid::modified, usbdevice::profile, and setid().

```

167                                     {
168     usbprofile* profile = kb->profile;
169     int newmodified;
170     if(!setid(&profile->id, id) && sscanf(id, "%08x", &newmodified) == 1)
171         memcpy(profile->id.modified, &newmodified, sizeof(newmodified));
172
173 }
```

Here is the call graph for this function:



#### 9.36.1.8 void cmd\_profilename ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* name )

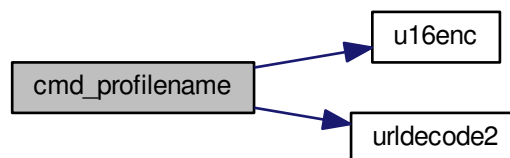
Definition at line 124 of file profile.c.

References usbprofile::name, PR\_NAME\_LEN, usbdevice::profile, u16enc(), and urldecode2().

```

124                                     {
125     usbprofile* profile = kb->profile;
126     char decoded[strlen(name) + 1];
127     urldecode2(decoded, name);
128     size_t srclen = strlen(decoded), dstlen = PR_NAME_LEN;
129     u16enc(decoded, profile->name, &srclen, &dstlen);
130 }
  
```

Here is the call graph for this function:



#### 9.36.1.9 static void freemode ( usbmode \* mode ) [static]

Definition at line 198 of file profile.c.

References usbmode::bind, and freebind().

Referenced by \_freeprofile(), and cmd\_erase().

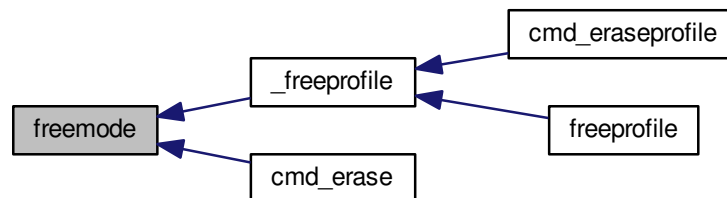
```

198                                     {
199     freebind(&mode->bind);
200     memset(mode, 0, sizeof(*mode));
201 }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.36.1.10 void freeprofile ( usbdevice \* kb )

Definition at line 228 of file profile.c.

References `_freeprofile()`, and `usbdevice::hw`.

```

228                                     {
229     _freeprofile(kb);
230     // Also free HW profile
231     free(kb->hw);
232     kb->hw = 0;
233 }
  
```

Here is the call graph for this function:



#### 9.36.1.11 char\* gethwmodename ( hwprofile \* profile, int index )

Definition at line 152 of file profile.c.

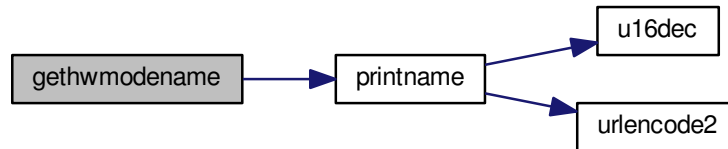
References MD\_NAME\_LEN, hwprofile::name, and printname().

Referenced by \_cmd\_get().

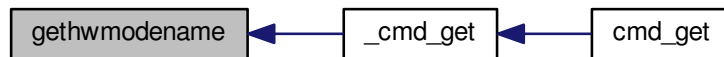
```

152
153     return printname(profile->name[index + 1], MD_NAME_LEN);
154 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.36.1.12 char\* gethwprofilename ( hwprofile \* profile )

Definition at line 156 of file profile.c.

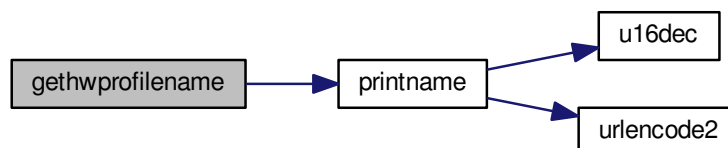
References MD\_NAME\_LEN, hwprofile::name, and printname().

Referenced by \_cmd\_get().

```

156
157     return printname(profile->name[0], MD_NAME_LEN);
158 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.36.1.13 `char* getid ( usbld * id )`

Definition at line 79 of file `profile.c`.

References `usbld::guid`.

Referenced by `_cmd_get()`.

```

79      {
80      int32_t data1;
81      int16_t data2, data3, data4a;
82      char data4b[6];
83      memcpy(&data1, id->guid + 0x0, 4);
84      memcpy(&data2, id->guid + 0x4, 2);
85      memcpy(&data3, id->guid + 0x6, 2);
86      memcpy(&data4a, id->guid + 0x8, 2);
87      memcpy(data4b, id->guid + 0xA, 6);
88      char* guid = malloc(39);
89      snprintf(guid, 39, "%08X-%04hX-%04hX-%04hX-%02hhX%02hhX%02hhX%02hhX%02hhX%02hhX",
90              data1, data2, data3, data4a, data4b[0], data4b[1], data4b[2], data4b[3], data4b[4], data4b[5])
91      ;
92      return guid;
93  }
  
```

Here is the caller graph for this function:



#### 9.36.1.14 `char* getmodename ( usbmode * mode )`

Definition at line 144 of file `profile.c`.

References `MD_NAME_LEN`, `usbmode::name`, and `printname()`.

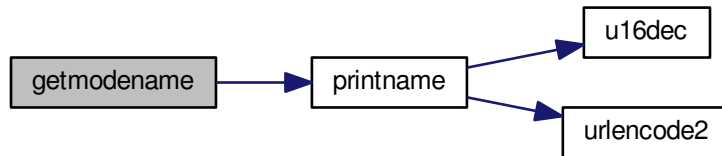
Referenced by `_cmd_get()`.

```

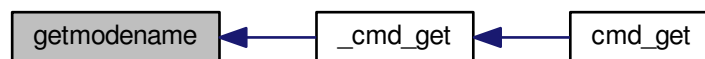
144      {
145      return printname(mode->name, MD_NAME_LEN);
146  }
  
```



Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.36.1.15 char\* getprofilename ( usbprofile \* profile )

Definition at line 148 of file profile.c.

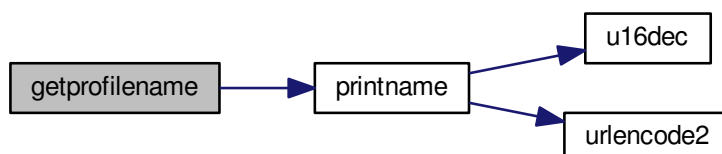
References `usbprofile::name`, `PR_NAME_LEN`, and `printname()`.

Referenced by `_cmd_get()`.

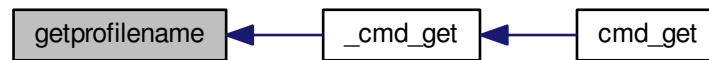
```

148
149     return printname(profile->name, PR_NAME_LEN);
150 }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.36.1.16 void hwtonative ( usbprofile \* *profile*, hwprofile \* *hw*, int *modecount* )

Definition at line 235 of file profile.c.

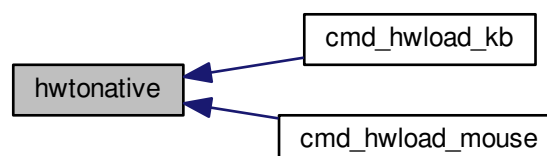
References `usbmode::dpi`, `hwprofile::dpi`, `dpiset::forceupdate`, `lighting::forceupdate`, `usbmode::id`, `usbprofile::id`, `hwprofile::id`, `usbprofile::lastdpi`, `usbprofile::lastlight`, `usbmode::light`, `hwprofile::light`, `MD_NAME_LEN`, `usbprofile::mode`, `usbmode::name`, `usbprofile::name`, `hwprofile::name`, and `PR_NAME_LEN`.

Referenced by `cmd_hwload_kb()`, and `cmd_hwload_mouse()`.

```

235                                     {
236     // Copy the profile name and ID
237     memcpy(profile->name, hw->name[0], PR_NAME_LEN * 2);
238     memcpy(&profile->id, hw->id, sizeof(usbid));
239     // Copy the mode settings
240     for(int i = 0; i < modecount; i++){
241         usbmode* mode = profile->mode + i;
242         memcpy(mode->name, hw->name[i + 1], MD_NAME_LEN * 2);
243         memcpy(&mode->id, hw->id + i + 1, sizeof(usbid));
244         memcpy(&mode->light, hw->light + i, sizeof(lighting));
245         memcpy(&mode->dpi, hw->dpi + i, sizeof(dpiset));
246         // Set a force update on the light/DPI since they've been overwritten
247         mode->light.forceupdate = mode->dpi.forceupdate = 1;
248     }
249     profile->lastlight.forceupdate = profile->lastdpi.
forceupdate = 1;
250 }
  
```

Here is the caller graph for this function:



#### 9.36.1.17 static void initmode ( usbmode \* *mode* ) [static]

Definition at line 175 of file profile.c.

References `usbmode::bind`, `usbmode::dpi`, `dpiset::forceupdate`, `lighting::forceupdate`, `initbind()`, and `usbmode::light`.

Referenced by `allocprofile()`, and `cmd_erase()`.

```

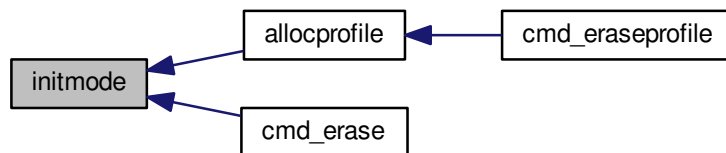
175
176     memset(mode, 0, sizeof(*mode));
177     mode->light.forceupdate = 1;
178     mode->dpi.forceupdate = 1;
179     initbind(&mode->bind);
180 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.36.1.18 int loadprofile ( usbdevice \* kb )

Definition at line 192 of file profile.c.

References hwloadprofile.

```

192
193     if(hwloadprofile(kb, 1))
194         return -1;
195     return 0;
196 }

```

#### 9.36.1.19 void nativetohw ( usbprofile \* profile, hwprofile \* hw, int modecount )

Definition at line 252 of file profile.c.

References usbmode::dpi, hwprofile::dpi, usbmode::id, usbprofile::id, hwprofile::id, usbmode::light, hwprofile::light, MD\_NAME\_LEN, usbprofile::mode, usbmode::name, usbprofile::name, hwprofile::name, and PR\_NAME\_LEN.

Referenced by cmd\_hwsave\_kb(), and cmd\_hwsave\_mouse().

```

252
253     // Copy name and ID
254     memcpy(hw->name[0], profile->name, PR_NAME_LEN * 2);
255     memcpy(hw->id, &profile->id, sizeof(usbid));
256     // Copy the mode settings

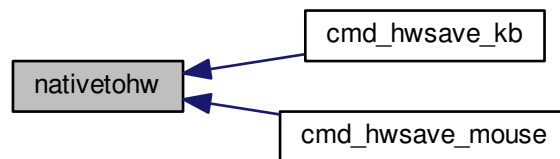
```

```

257     for(int i = 0; i < modecount; i++){
258         usbmode* mode = profile->mode + i;
259         memcpy(hw->name[i + 1], mode->name, MD_NAME_LEN * 2);
260         memcpy(hw->id + i + 1, &mode->id, sizeof(usbid));
261         memcpy(hw->light + i, &mode->light, sizeof(lighting));
262         memcpy(hw->dpi + i, &mode->dpi, sizeof(dpi));
263     }
264 }

```

Here is the caller graph for this function:



#### 9.36.1.20 char\* printname ( ushort \* name, int length )

Definition at line 132 of file profile.c.

References `u16dec()`, and `urlencode2()`.

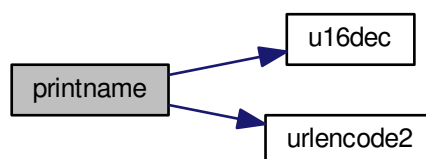
Referenced by `gethwmodename()`, `gethwprofilename()`, `getmodename()`, and `getprofilename()`.

```

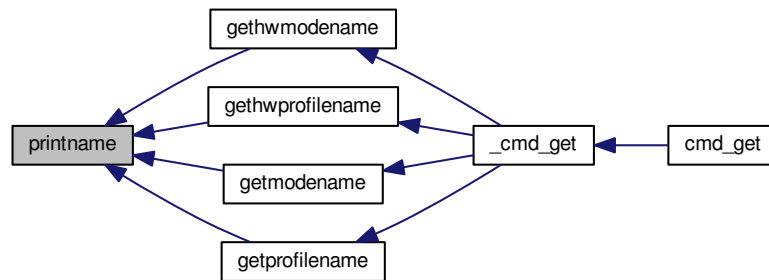
132     {
133         // Convert the name to UTF-8
134         char* buffer = calloc(1, length * 4 - 3);
135         size_t srclen = length, dstlen = length * 4 - 4;
136         u16dec(name, buffer, &srclen, &dstlen);
137         // URL-encode it
138         char* buffer2 = malloc(strlen(buffer) * 3 + 1);
139         urlencode2(buffer2, buffer);
140         free(buffer);
141         return buffer2;
142     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.36.1.21 `int setid ( usbid * id, const char * guid )`

Definition at line 64 of file `profile.c`.

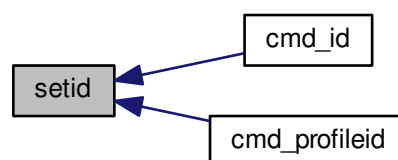
References `usbid::guid`.

Referenced by `cmd_id()`, and `cmd_profileid()`.

```

64     {
65         int32_t data1;
66         int16_t data2, data3, data4a;
67         char data4b[6];
68         if(sscanf(guid, "%08X-%04hX-%04hX-%02hhX%02hhX%02hhX%02hhX%02hhX",
69             &data1, &data2, &data3, &data4a, data4b, data4b + 1, data4b + 2, data4b + 3, data4b + 4,
70             data4b + 5) != 10)
71             return 0;
72         memcpy(id->guid + 0x0, &data1, 4);
73         memcpy(id->guid + 0x4, &data2, 2);
74         memcpy(id->guid + 0x6, &data3, 2);
75         memcpy(id->guid + 0x8, &data4a, 2);
76         memcpy(id->guid + 0xA, data4b, 6);
77         return 1;
78     }
  
```

Here is the caller graph for this function:



#### 9.36.1.22 `void u16dec ( ushort * in, char * out, size_t * srclen, size_t * dstlen )`

Definition at line 105 of file `profile.c`.

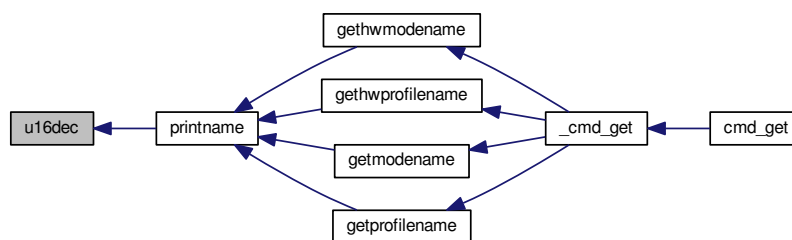
References utf16to8.

Referenced by printname().

```

105                                     {
106     if(!utf16to8)
107         utf16to8 = iconv_open("UTF-8", "UTF-16LE");
108     size_t srclen2 = 0, srclenmax = *srclen;
109     for(; srclen2 < srclenmax; srclen2++){
110         if(!in[srclen2])
111             break;
112     }
113     *srclen = srclen2 * 2;
114     iconv(utf16to8, (char**)&in, srclen, &out, dstlen);
115 }
```

Here is the caller graph for this function:



**9.36.1.23** void u16enc ( char \* in, ushort \* out, size\_t \* srclen, size\_t \* dstlen )

Definition at line 97 of file profile.c.

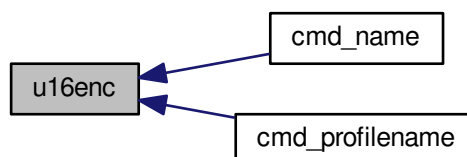
References utf8to16.

Referenced by cmd\_name(), and cmd\_profilename().

```

97                                     {
98     if(!utf8to16)
99         utf8to16 = iconv_open("UTF-16LE", "UTF-8");
100     memset(out, 0, *dstlen * 2);
101     *dstlen = *dstlen * 2 - 2;
102     iconv(utf8to16, &in, srclen, (char**)&out, dstlen);
103 }
```

Here is the caller graph for this function:



## 9.36.1.24 void urldecode2 ( char \* dst, const char \* src )

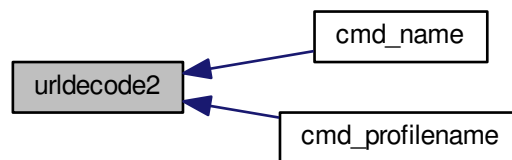
Definition at line 8 of file profile.c.

Referenced by cmd\_name(), and cmd\_profilename().

```

8                                     {
9     char a, b;
10    char s;
11    while((s = *src)){
12        if((s == '%') &&
13            ((a = src[1]) && (b = src[2])) &&
14            (isxdigit(a) && isxdigit(b))){
15            if(a >= 'a')
16                a -= 'a' - 'A';
17            if(a >= 'A')
18                a -= 'A' - 10;
19            else
20                a -= '0';
21            if(b >= 'a')
22                b -= 'a' - 'A';
23            if(b >= 'A')
24                b -= 'A' - 10;
25            else
26                b -= '0';
27            *dst++ = 16 * a + b;
28            src += 3;
29        } else {
30            *dst++ = s;
31            src++;
32        }
33    }
34    *dst = '\0';
35 }
```

Here is the caller graph for this function:



## 9.36.1.25 void urlencode2 ( char \* dst, const char \* src )

Definition at line 37 of file profile.c.

Referenced by printname().

```

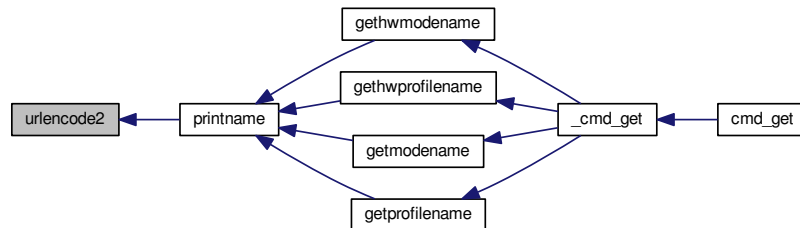
37                                     {
38    char s;
39    while((s = *src++){
40        if(s <= ',' || s == '/' ||
41            (s >= ':' && s <= '@') ||
42            s == '[' || s == ']' ||
43            s >= 0x7F){
44        char a = s >> 4, b = s & 0xF;
45        if(a >= 10)
46            a += 'A' - 10;
47        else
48            a += '0';
49        if(b >= 10)
50            b += 'A' - 10;
51        else
```

```

52         b += '0';
53         dst[0] = '%';
54         dst[1] = a;
55         dst[2] = b;
56         dst += 3;
57     } else
58         *dst++ = s;
59     }
60     *dst = '\\0';
61 }

```

Here is the caller graph for this function:



## 9.36.2 Variable Documentation

### 9.36.2.1 `iconv_t utf16to8 = 0` [static]

Definition at line 95 of file profile.c.

Referenced by u16dec().

### 9.36.2.2 `iconv_t utf8to16 = 0` [static]

Definition at line 95 of file profile.c.

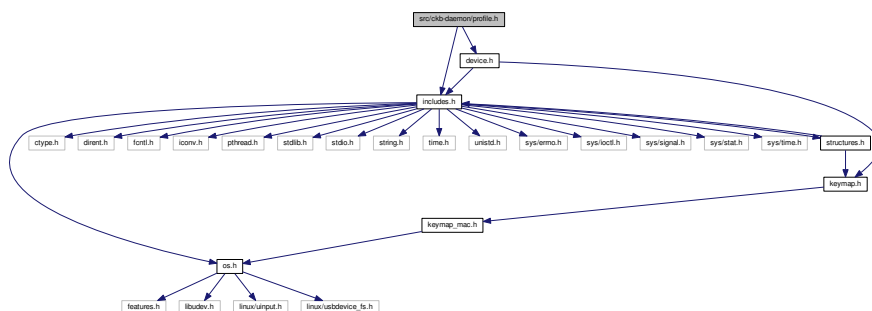
Referenced by u16enc().

## 9.37 `src/ckb-daemon/profile.h` File Reference

```
#include "includes.h"
```

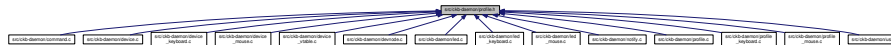
```
#include "device.h"
```

Include dependency graph for profile.h:





This graph shows which files directly or indirectly include this file:



## Macros

- `#define hwloadprofile(kb, apply) (kb)->vtable->hwload(kb, 0, 0, apply, 0)`

## Functions

- void **allocprofile** (usbdevice \*kb)
- int **loadprofile** (usbdevice \*kb)
- void **freeprofile** (usbdevice \*kb)
- void **cmd\_erase** (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*dummy3)
- void **cmd\_eraseprofile** (usbdevice \*kb, usbmode \*dummy1, int dummy2, int dummy3, const char \*dummy4)
- void **cmd\_name** (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*name)
- void **cmd\_profilename** (usbdevice \*kb, usbmode \*dummy1, int dummy2, int dummy3, const char \*name)
- char \* **getmodename** (usbmode \*mode)
- char \* **getprofilename** (usbprofile \*profile)
- char \* **gethwmodename** (hwprofile \*profile, int index)
- char \* **gethwprofilename** (hwprofile \*profile)
- int **setid** (usbid \*id, const char \*guid)
- char \* **getid** (usbid \*id)
- void **hwtonative** (usbprofile \*profile, hwprofile \*hw, int modecount)
- void **nativetohw** (usbprofile \*profile, hwprofile \*hw, int modecount)
- void **cmd\_id** (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*id)
- void **cmd\_profileid** (usbdevice \*kb, usbmode \*mode, int dummy1, int dummy2, const char \*id)
- int **cmd\_hwload\_kb** (usbdevice \*kb, usbmode \*dummy1, int dummy2, int apply, const char \*dummy3)
- int **cmd\_hwload\_mouse** (usbdevice \*kb, usbmode \*dummy1, int dummy2, int apply, const char \*dummy3)
- int **cmd\_hwsave\_kb** (usbdevice \*kb, usbmode \*dummy1, int dummy2, int dummy3, const char \*dummy4)
- int **cmd\_hwsave\_mouse** (usbdevice \*kb, usbmode \*dummy1, int dummy2, int dummy3, const char \*dummy4)

### 9.37.1 Macro Definition Documentation

```
9.37.1.1 #define hwloadprofile( kb, apply ) (kb)->vtable->hwload(kb, 0, 0, apply, 0)
```

Definition at line 52 of file profile.h.

Referenced by `_start_dev()`, and `loadprofile()`.

### 9.37.2 Function Documentation

### 9.37.2.1 void allocprofile ( usbdevice \* kb )

Definition at line 182 of file profile.c.

References `usbprofile::currentmode`, `dpiset::forceupdate`, `lighting::forceupdate`, `initmode()`, `usbprofile::lastdpi`, `usbprofile::lastlight`, `usbprofile::mode`, `MODE COUNT`, and `usbdevice::profile`.

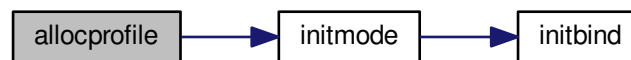
Referenced by cmd eraseprofile().

```

182                                     {
183     if(kb->profile)
184         return;
185     usbprofile* profile = kb->profile = calloc(1, sizeof(
usbprofile));
186     for(int i = 0; i < MODE_COUNT; i++)
187         initmode(profile->mode + i);
188     profile->currentmode = profile->mode;
189     profile->lastlight.forceupdate = profile->lastdpi.
forceupdate = 1;
190 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.37.2.2 void cmd\_erase ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* dummy3 )

Definition at line 203 of file profile.c.

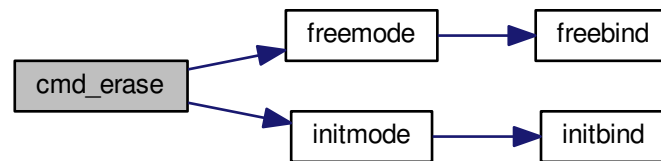
References `freemode()`, `imutex`, and `initmode()`.

```

203                                     {
204     pthread_mutex_lock(imutex(kb));
205     freemode(mode);
206     initmode(mode);
207     pthread_mutex_unlock(imutex(kb));
208 }

```

Here is the call graph for this function:



### 9.37.2.3 void cmd\_eraseprofile ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

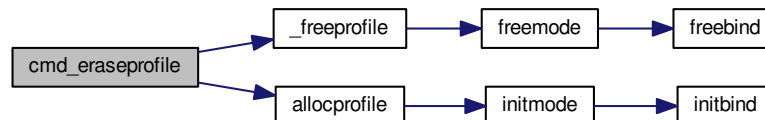
Definition at line 221 of file profile.c.

References `_freeprofile()`, `allocprofile()`, and `imutex`.

```

221
222     pthread_mutex_lock (imutex (kb) );
223     _freeprofile (kb);
224     allocprofile (kb);
225     pthread_mutex_unlock (imutex (kb) );
226 }
```

Here is the call graph for this function:



### 9.37.2.4 int cmd\_hwload\_kb ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int apply, const char \* dummy3 )

Definition at line 16 of file profile\_keyboard.c.

References `DELAY_LONG`, `usbdevice::hw`, `hwloadmode()`, `HWMODE_K70`, `HWMODE_K95`, `hwtonative()`, `hwprofile::id`, `IS_K95`, `MSG_SIZE`, `hwprofile::name`, `PR_NAME_LEN`, `usbdevice::profile`, and `usbrecv`.

```

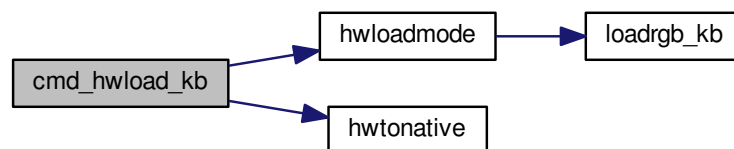
16
17     DELAY_LONG (kb);
18     hwprofile* hw = calloc (1, sizeof (hwprofile));
19     // Ask for profile and mode IDs
20     uchar data_pkt [2] [MSG_SIZE] = {
21         { 0x0e, 0x15, 0x01, 0 },
22         { 0x0e, 0x16, 0x01, 0 }
23     };
24     uchar in_pkt [MSG_SIZE];
25     int modes = (IS_K95 (kb) ? HWMODE_K95 : HWMODE_K70);
26     for (int i = 0; i <= modes; i++) {
27         data_pkt [0] [3] = i;
28         if (!usbrecv (kb, data_pkt [0], in_pkt)) {
```

```

29         free(hw);
30         return -1;
31     }
32     memcpy(hw->id + i, in_pkt + 4, sizeof(usbid));
33 }
34 // Ask for profile name
35 if(!usbrecv(kb, data_pkt[1], in_pkt)){
36     free(hw);
37     return -1;
38 }
39 memcpy(hw->name[0], in_pkt + 4, PR_NAME_LEN * 2);
40 // Load modes
41 for(int i = 0; i < modes; i++){
42     if(hwloadmode(kb, hw, i)){
43         free(hw);
44         return -1;
45     }
46 }
47 // Make the profile active (if requested)
48 if(apply)
49     hwtonative(kb->profile, hw, modes);
50 // Free the existing profile (if any)
51 free(kb->hw);
52 kb->hw = hw;
53 DELAY_LONG(kb);
54 return 0;
55 }

```

Here is the call graph for this function:



### 9.37.2.5 int cmd\_hwload\_mouse ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int apply, const char \* dummy3 )

Definition at line 6 of file profile\_mouse.c.

References DELAY\_LONG, hwprofile::dpi, usbdevice::hw, hwtonative(), hwprofile::id, hwprofile::light, loaddpi(), loadrgb\_mouse(), MSG\_SIZE, hwprofile::name, PR\_NAME\_LEN, usbdevice::profile, and usbrecv.

```

6
7     DELAY_LONG(kb);
8     hwprofile* hw = calloc(1, sizeof(hwprofile));
9     // Ask for profile and mode IDs
10    uchar data_pkt[2][MSG_SIZE] = {
11        { 0x0e, 0x15, 0x01, 0 },
12        { 0x0e, 0x16, 0x01, 0 }
13    };
14    uchar in_pkt[MSG_SIZE];
15    for(int i = 0; i <= 1; i++){
16        data_pkt[0][3] = i;
17        if(!usbrecv(kb, data_pkt[0], in_pkt)){
18            free(hw);
19            return -1;
20        }
21        memcpy(hw->id + i, in_pkt + 4, sizeof(usbid));
22    }
23    // Ask for profile and mode names
24    for(int i = 0; i <= 1; i++){
25        data_pkt[1][3] = i;
26        if(!usbrecv(kb, data_pkt[1], in_pkt)){
27            free(hw);
28            return -1;
29        }

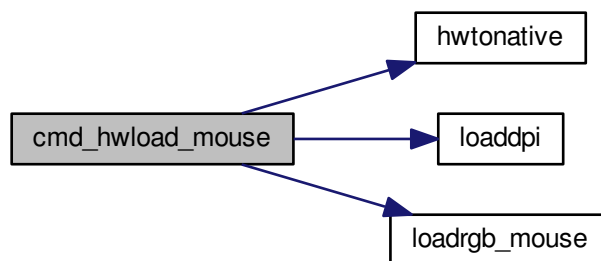
```

```

30     memcpy(hw->name[i], in_pkt + 4, PR_NAME_LEN * 2);
31 }
32
33 // Load the RGB and DPI settings
34 if(loadrgb_mouse(kb, hw->light, 0)
35    || loaddpi(kb, hw->dpi, hw->light)){
36     free(hw);
37     return -1;
38 }
39
40 // Make the profile active (if requested)
41 if(apply)
42     hwtonative(kb->profile, hw, 1);
43 // Free the existing profile (if any)
44 free(kb->hw);
45 kb->hw = hw;
46 DELAY_LONG(kb);
47 return 0;
48 }

```

Here is the call graph for this function:



#### 9.37.2.6 int cmd\_hwsave\_kb ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

Definition at line 57 of file profile\_keyboard.c.

References `DELAY_LONG`, `usbdevice::hw`, `HWMODE_K70`, `HWMODE_K95`, `hwprofile::id`, `IS_K95`, `hwprofile::light`, `MD_NAME_LEN`, `MSG_SIZE`, `hwprofile::name`, `nativetohw()`, `usbdevice::profile`, `savergb_kb()`, and `usb send`.

```

57
58     DELAY_LONG(kb);
59     hwprofile* hw = kb->hw;
60     if(!hw)
61         hw = kb->hw = calloc(1, sizeof(hwprofile));
62     int modes = (IS_K95(kb) ? HWMODE_K95 : HWMODE_K70);
63     nativetohw(kb->profile, hw, modes);
64     // Save the profile and mode names
65     uchar data_pkt[2][MSG_SIZE] = {
66         { 0x07, 0x16, 0x01, 0 },
67         { 0x07, 0x15, 0x01, 0 },
68     };
69     // Save the mode names
70     for(int i = 0; i <= modes; i++){
71         data_pkt[0][3] = i;
72         memcpy(data_pkt[0] + 4, hw->name[i], MD_NAME_LEN * 2);
73         if(!usb send(kb, data_pkt[0], 1))
74             return -1;
75     }
76     // Save the IDs
77     for(int i = 0; i <= modes; i++){
78         data_pkt[1][3] = i;
79         memcpy(data_pkt[1] + 4, hw->id + i, sizeof(usb id));
80         if(!usb send(kb, data_pkt[1], 1))
81             return -1;
82     }

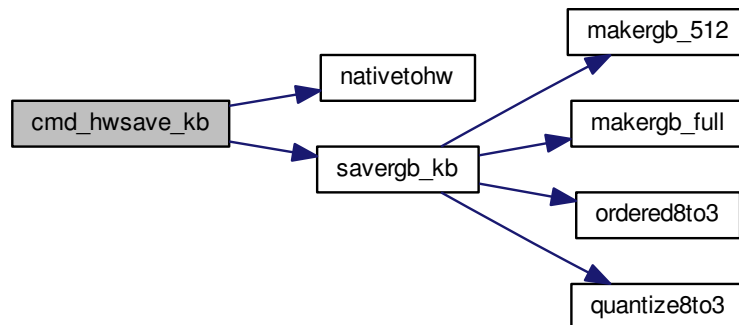
```

```

83 // Save the RGB data
84 for(int i = 0; i < modes; i++){
85     if(savergb_kb(kb, hw->light + i, i))
86         return -1;
87 }
88 DELAY_LONG(kb);
89 return 0;
90 }

```

Here is the call graph for this function:



**9.37.2.7** `int cmd_hwsave_mouse ( usbdevice * kb, usbmode * dummy1, int dummy2, int dummy3, const char * dummy4 )`

Definition at line 50 of file `profile_mouse.c`.

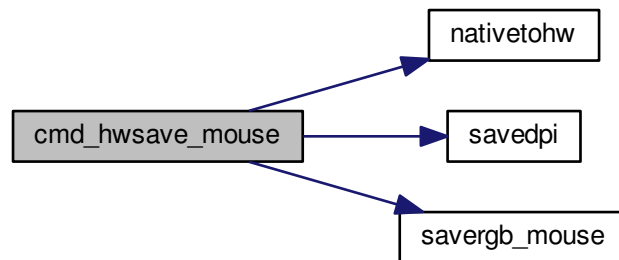
References `DELAY_LONG`, `hwprofile::dpi`, `usbdevice::hw`, `hwprofile::id`, `hwprofile::light`, `MD_NAME_LEN`, `MSG_SIZE`, `hwprofile::name`, `nativetohw()`, `usbdevice::profile`, `savedpi()`, `savergb_mouse()`, and `usb send`.

```

50
51     DELAY_LONG(kb);
52     hwprofile* hw = kb->hw;
53     if(!hw)
54         hw = kb->hw = calloc(1, sizeof(hwprofile));
55     nativetohw(kb->profile, hw, 1);
56     // Save the profile and mode names
57     uchar data_pkt[2][MSG_SIZE] = {
58         { 0x07, 0x16, 0x01, 0 },
59         { 0x07, 0x15, 0x01, 0 },
60     };
61     for(int i = 0; i <= 1; i++){
62         data_pkt[0][3] = i;
63         memcpy(data_pkt[0] + 4, hw->name[i], MD_NAME_LEN * 2);
64         if(!usb send(kb, data_pkt[0], 1))
65             return -1;
66     }
67     // Save the IDs
68     for(int i = 0; i <= 1; i++){
69         data_pkt[1][3] = i;
70         memcpy(data_pkt[1] + 4, hw->id + i, sizeof(usb id));
71         if(!usb send(kb, data_pkt[1], 1))
72             return -1;
73     }
74     // Save the RGB data for the non-DPI zones
75     if(savergb_mouse(kb, hw->light, 0))
76         return -1;
77     // Save the DPI data (also saves RGB for those states)
78     if(savedpi(kb, hw->dpi, hw->light))
79         return -1;
80     DELAY_LONG(kb);
81     return 0;
82 }

```

Here is the call graph for this function:



#### 9.37.2.8 void cmd\_id ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* id )

Definition at line 160 of file profile.c.

References `usbmode::id`, `usbid::modified`, and `setid()`.

```

160                                     {
161     // ID is either a GUID or an 8-digit hex number
162     int newmodified;
163     if(!setid(&mode->id, id) && sscanf(id, "%08x", &newmodified) == 1)
164         memcpy(mode->id.modified, &newmodified, sizeof(newmodified));
165 }
```

Here is the call graph for this function:



#### 9.37.2.9 void cmd\_name ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* name )

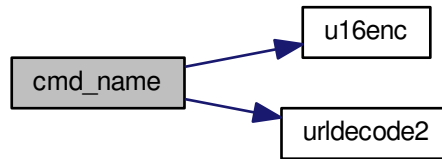
Definition at line 117 of file profile.c.

References `MD_NAME_LEN`, `usbmode::name`, `u16enc()`, and `urldecode2()`.

```

117                                     {
118     char decoded[strlen(name) + 1];
119     urldecode2(decoded, name);
120     size_t srclen = strlen(decoded), dstlen = MD_NAME_LEN;
121     u16enc(decoded, mode->name, &srclen, &dstlen);
122 }
```

Here is the call graph for this function:



#### 9.37.2.10 void cmd\_profileid ( usbdevice \* kb, usbmode \* mode, int dummy1, int dummy2, const char \* id )

Definition at line 167 of file profile.c.

References `usbprofile::id`, `usbid::modified`, `usbdevice::profile`, and `setid()`.

```

167                                     {
168     usbprofile* profile = kb->profile;
169     int newmodified;
170     if(!setid(&profile->id, id) && sscanf(id, "%08x", &newmodified) == 1)
171         memcpy(profile->id.modified, &newmodified, sizeof(newmodified));
172
173 }
```

Here is the call graph for this function:



#### 9.37.2.11 void cmd\_profilename ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* name )

Definition at line 124 of file profile.c.

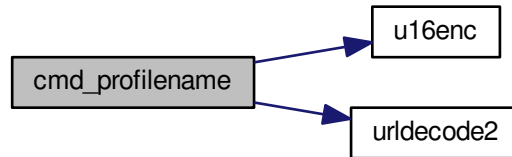
References `usbprofile::name`, `PR_NAME_LEN`, `usbdevice::profile`, `u16enc()`, and `urldecode2()`.

```

124                                     {
125     usbprofile* profile = kb->profile;
126     char decoded[strlen(name) + 1];
127     urldecode2(decoded, name);
128     size_t srclen = strlen(decoded), dstlen = PR_NAME_LEN;
129     u16enc(decoded, profile->name, &srclen, &dstlen);
130 }
```



Here is the call graph for this function:



#### 9.37.2.12 void freeprofile ( usbdevice \* kb )

Definition at line 228 of file profile.c.

References `_freeprofile()`, and `usbdevice::hw`.

```

228                                     {
229     _freeprofile(kb);
230     // Also free HW profile
231     free(kb->hw);
232     kb->hw = 0;
233 }
```

Here is the call graph for this function:



#### 9.37.2.13 char\* gethwmodename ( hwprofile \* profile, int index )

Definition at line 152 of file profile.c.

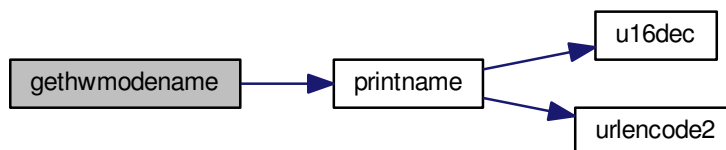
References `MD_NAME_LEN`, `hwprofile::name`, and `printname()`.

Referenced by `_cmd_get()`.

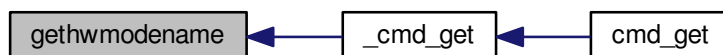
```

152                                     {
153     return printname(profile->name[index + 1], MD_NAME_LEN);
154 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.37.2.14 `char* gethwprofilename ( hwprofile * profile )`

Definition at line 156 of file `profile.c`.

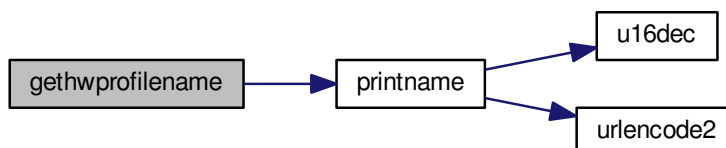
References `MD_NAME_LEN`, `hwprofile::name`, and `printname()`.

Referenced by `_cmd_get()`.

```

156
157     return printname(profile->name[0], MD_NAME_LEN);
158 }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.37.2.15 `char* getid ( usbld * id )`

Definition at line 79 of file `profile.c`.

References `usbld::guid`.

Referenced by `_cmd_get()`.

```

79      {
80      int32_t data1;
81      int16_t data2, data3, data4a;
82      char data4b[6];
83      memcpy(&data1, id->guid + 0x0, 4);
84      memcpy(&data2, id->guid + 0x4, 2);
85      memcpy(&data3, id->guid + 0x6, 2);
86      memcpy(&data4a, id->guid + 0x8, 2);
87      memcpy(data4b, id->guid + 0xA, 6);
88      char* guid = malloc(39);
89      snprintf(guid, 39, "%08X-%04hX-%04hX-%04hX-%02hhX%02hhX%02hhX%02hhX%02hhX",
90              data1, data2, data3, data4a, data4b[0], data4b[1], data4b[2], data4b[3], data4b[4], data4b[5])
91      ;
92      return guid;
93  }
  
```

Here is the caller graph for this function:



#### 9.37.2.16 `char* getmodename ( usbmode * mode )`

Definition at line 144 of file `profile.c`.

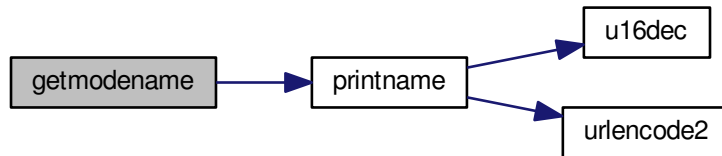
References `MD_NAME_LEN`, `usbmode::name`, and `printname()`.

Referenced by `_cmd_get()`.

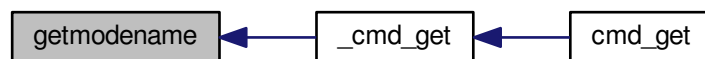
```

144      {
145      return printname(mode->name, MD_NAME_LEN);
146  }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.37.2.17 `char* getprofilename ( usbprofile * profile )`

Definition at line 148 of file `profile.c`.

References `usbprofile::name`, `PR_NAME_LEN`, and `printname()`.

Referenced by `_cmd_get()`.

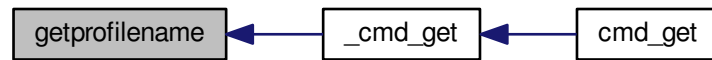
```

148 {
149     return printname(profile->name, PR_NAME_LEN);
150 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.37.2.18 void hwtonative ( usbprofile \* profile, hwprofile \* hw, int modecount )

Definition at line 235 of file profile.c.

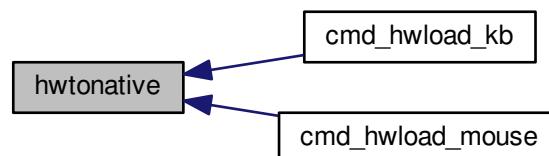
References `usbmode::dpi`, `hwprofile::dpi`, `dpiset::forceupdate`, `lighting::forceupdate`, `usbmode::id`, `usbprofile::id`, `hwprofile::id`, `usbprofile::lastdpi`, `usbprofile::lastlight`, `usbmode::light`, `hwprofile::light`, `MD_NAME_LEN`, `usbprofile::mode`, `usbmode::name`, `usbprofile::name`, `hwprofile::name`, and `PR_NAME_LEN`.

Referenced by `cmd_hwload_kb()`, and `cmd_hwload_mouse()`.

```

235                                     {
236     // Copy the profile name and ID
237     memcpy(profile->name, hw->name[0], PR_NAME_LEN * 2);
238     memcpy(&profile->id, hw->id, sizeof(usbid));
239     // Copy the mode settings
240     for(int i = 0; i < modecount; i++){
241         usbmode* mode = profile->mode + i;
242         memcpy(mode->name, hw->name[i + 1], MD_NAME_LEN * 2);
243         memcpy(&mode->id, hw->id + i + 1, sizeof(usbid));
244         memcpy(&mode->light, hw->light + i, sizeof(lighting));
245         memcpy(&mode->dpi, hw->dpi + i, sizeof(dpiset));
246         // Set a force update on the light/DPI since they've been overwritten
247         mode->light.forceupdate = mode->dpi.forceupdate = 1;
248     }
249     profile->lastlight.forceupdate = profile->lastdpi.
forceupdate = 1;
250 }
```

Here is the caller graph for this function:



#### 9.37.2.19 int loadprofile ( usbdevice \* kb )

Definition at line 192 of file profile.c.

References `hwloadprofile`.

```

192     {
193         if(hwloadprofile(kb, 1))
194             return -1;
195         return 0;
196     }

```

### 9.37.2.20 void nativetohw ( usbprofile \* profile, hwprofile \* hw, int modecount )

Definition at line 252 of file profile.c.

References usbmode::dpi, hwprofile::dpi, usbmode::id, usbprofile::id, hwprofile::id, usbmode::light, hwprofile::light, MD\_NAME\_LEN, usbprofile::mode, usbmode::name, usbprofile::name, hwprofile::name, and PR\_NAME\_LEN.

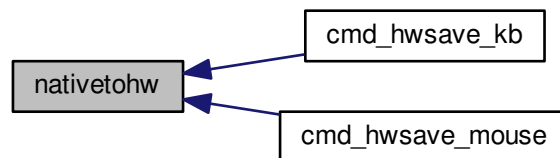
Referenced by cmd\_hwsave\_kb(), and cmd\_hwsave\_mouse().

```

252     {
253         // Copy name and ID
254         memcpy(hw->name[0], profile->name, PR_NAME_LEN * 2);
255         memcpy(hw->id, &profile->id, sizeof(usbid));
256         // Copy the mode settings
257         for(int i = 0; i < modecount; i++){
258             usbmode* mode = profile->mode + i;
259             memcpy(hw->name[i + 1], mode->name, MD_NAME_LEN * 2);
260             memcpy(hw->id + i + 1, &mode->id, sizeof(usbid));
261             memcpy(hw->light + i, &mode->light, sizeof(lighting));
262             memcpy(hw->dpi + i, &mode->dpi, sizeof(dpi));
263         }
264     }

```

Here is the caller graph for this function:



### 9.37.2.21 int setid ( usbid \* id, const char \* guid )

Definition at line 64 of file profile.c.

References usbid::guid.

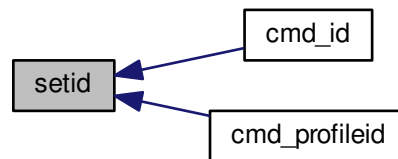
Referenced by cmd\_id(), and cmd\_profileid().

```

64     {
65         int32_t data1;
66         int16_t data2, data3, data4a;
67         char data4b[6];
68         if(sscanf(guid, "%08X-%04hX-%04hX-%04hX-%02hhX%02hhX%02hhX%02hhX%02hhX%02hhX",
69             &data1, &data2, &data3, &data4a, data4b, data4b + 1, data4b + 2, data4b + 3, data4b + 4,
70             data4b + 5) != 10)
71             return 0;
72         memcpy(id->guid + 0x0, &data1, 4);
73         memcpy(id->guid + 0x4, &data2, 2);
74         memcpy(id->guid + 0x6, &data3, 2);
75         memcpy(id->guid + 0x8, &data4a, 2);
76         memcpy(id->guid + 0xA, data4b, 6);
77         return 1;
78     }

```

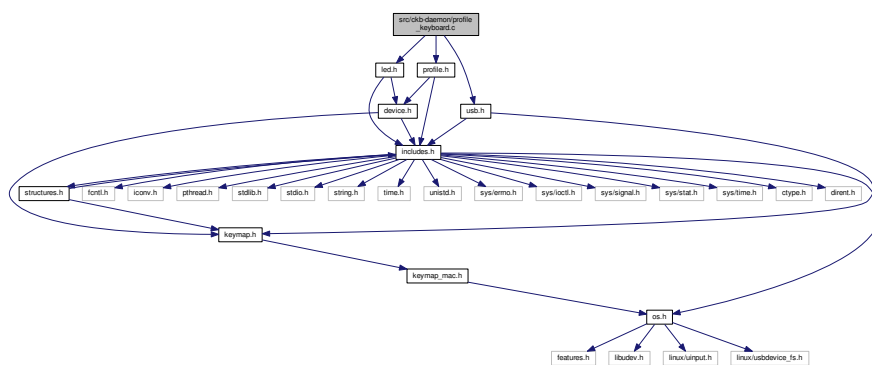
Here is the caller graph for this function:



## 9.38 src/ckb-daemon/profile\_keyboard.c File Reference

```
#include "profile.h"
#include "usb.h"
#include "led.h"
```

Include dependency graph for profile\_keyboard.c:



## Functions

- static int [hwloadmode](#) (usbdevice \*kb, hwprofile \*hw, int mode)
- int [cmd\\_hwload\\_kb](#) (usbdevice \*kb, usbmode \*dummy1, int dummy2, int apply, const char \*dummy3)
- int [cmd\\_hwsave\\_kb](#) (usbdevice \*kb, usbmode \*dummy1, int dummy2, int dummy3, const char \*dummy4)

### 9.38.1 Function Documentation

**9.38.1.1** int [cmd\\_hwload\\_kb](#) ( usbdevice \* *kb*, usbmode \* *dummy1*, int *dummy2*, int *apply*, const char \* *dummy3* )

Definition at line 16 of file [profile\\_keyboard.c](#).

References [DELAY\\_LONG](#), [usbdevice::hw](#), [hwloadmode\(\)](#), [HWMODE\\_K70](#), [HWMODE\\_K95](#), [hwtonative\(\)](#), [hwprofile::id](#), [IS\\_K95](#), [MSG\\_SIZE](#), [hwprofile::name](#), [PR\\_NAME\\_LEN](#), [usbdevice::profile](#), and [usbrecv](#).

```

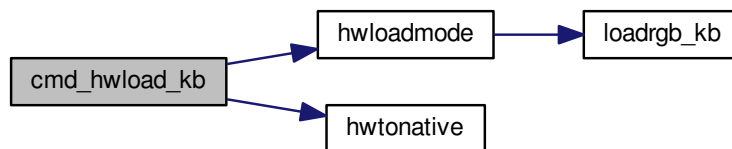
16
17     DELAY_LONG(kb);
18     hwprofile* hw = calloc(1, sizeof(hwprofile));
19     // Ask for profile and mode IDs
  
```

```

20     uchar data_pkt[2][MSG_SIZE] = {
21         { 0x0e, 0x15, 0x01, 0 },
22         { 0x0e, 0x16, 0x01, 0 }
23     };
24     uchar in_pkt[MSG_SIZE];
25     int modes = (IS_K95(kb) ? HWMODE_K95 : HWMODE_K70);
26     for(int i = 0; i <= modes; i++){
27         data_pkt[0][3] = i;
28         if(!usbrecv(kb, data_pkt[0], in_pkt)){
29             free(hw);
30             return -1;
31         }
32         memcpy(hw->id + i, in_pkt + 4, sizeof(usbid));
33     }
34     // Ask for profile name
35     if(!usbrecv(kb, data_pkt[1], in_pkt)){
36         free(hw);
37         return -1;
38     }
39     memcpy(hw->name[0], in_pkt + 4, PR_NAME_LEN * 2);
40     // Load modes
41     for(int i = 0; i < modes; i++){
42         if(hwloadmode(kb, hw, i)){
43             free(hw);
44             return -1;
45         }
46     }
47     // Make the profile active (if requested)
48     if(apply)
49         hwtonative(kb->profile, hw, modes);
50     // Free the existing profile (if any)
51     free(kb->hw);
52     kb->hw = hw;
53     DELAY_LONG(kb);
54     return 0;
55 }

```

Here is the call graph for this function:



#### 9.38.1.2 int cmd\_hwsave\_kb ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int dummy3, const char \* dummy4 )

Definition at line 57 of file profile\_keyboard.c.

References DELAY\_LONG, usbdevice::hw, HWMODE\_K70, HWMODE\_K95, hwprofile::id, IS\_K95, hwprofile::light, MD\_NAME\_LEN, MSG\_SIZE, hwprofile::name, nativetohw(), usbdevice::profile, savergb\_kb(), and usbsend.

```

57     {
58         DELAY_LONG(kb);
59         hwprofile* hw = kb->hw;
60         if(!hw)
61             hw = kb->hw = calloc(1, sizeof(hwprofile));
62         int modes = (IS_K95(kb) ? HWMODE_K95 : HWMODE_K70);
63         nativetohw(kb->profile, hw, modes);
64         // Save the profile and mode names
65         uchar data_pkt[2][MSG_SIZE] = {
66             { 0x07, 0x16, 0x01, 0 },
67             { 0x07, 0x15, 0x01, 0 },
68         };
69         // Save the mode names
70         for(int i = 0; i <= modes; i++){
71             data_pkt[0][3] = i;

```

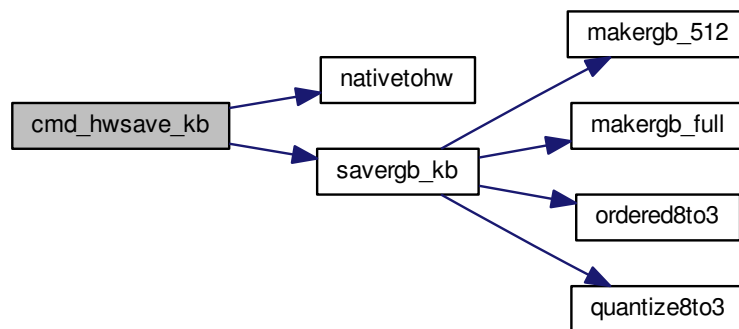


```

72     memcpy(data_pkt[0] + 4, hw->name[i], MD_NAME_LEN * 2);
73     if(!usb_send(kb, data_pkt[0], 1))
74         return -1;
75 }
76 // Save the IDs
77 for(int i = 0; i <= modes; i++){
78     data_pkt[1][3] = i;
79     memcpy(data_pkt[1] + 4, hw->id + i, sizeof(usb_id));
80     if(!usb_send(kb, data_pkt[1], 1))
81         return -1;
82 }
83 // Save the RGB data
84 for(int i = 0; i < modes; i++){
85     if(savergb_kb(kb, hw->light + i, i))
86         return -1;
87 }
88 DELAY_LONG(kb);
89 return 0;
90 }

```

Here is the call graph for this function:



#### 9.38.1.3 static int hwloadmode ( usbdevice \* kb, hwprofile \* hw, int mode ) [static]

Definition at line 5 of file profile\_keyboard.c.

References hwprofile::light, loadrgb\_kb(), MD\_NAME\_LEN, MSG\_SIZE, hwprofile::name, and usbrecv.

Referenced by cmd\_hwload\_kb().

```

5
6     // Ask for mode's name
7     uchar data_pkt[MSG_SIZE] = { 0x0e, 0x16, 0x01, mode + 1, 0 };
8     uchar in_pkt[MSG_SIZE];
9     if(!usbrecv(kb, data_pkt, in_pkt))
10         return -1;
11     memcpy(hw->name[mode + 1], in_pkt + 4, MD_NAME_LEN * 2);
12     // Load the RGB setting
13     return loadrgb_kb(kb, hw->light + mode, mode);
14 }

```

Here is the call graph for this function:



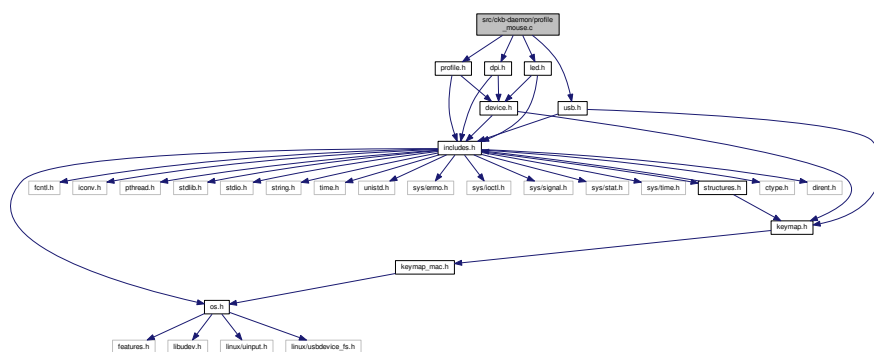
Here is the caller graph for this function:



## 9.39 src/ckb-daemon/profile\_mouse.c File Reference

```
#include "dpi.h"
#include "profile.h"
#include "usb.h"
#include "led.h"
```

Include dependency graph for `profile_mouse.c`:



## Functions

- `int cmd_hwload_mouse(usbdevice *kb, usbmode *dummy1, int dummy2, int apply, const char *dummy3)`
- `int cmd_hwsave_mouse(usbdevice *kb, usbmode *dummy1, int dummy2, int dummy3, const char *dummy4)`

### 9.39.1 Function Documentation

## 9.39.1.1 int cmd\_hwload\_mouse ( usbdevice \* kb, usbmode \* dummy1, int dummy2, int apply, const char \* dummy3 )

Definition at line 6 of file profile\_mouse.c.

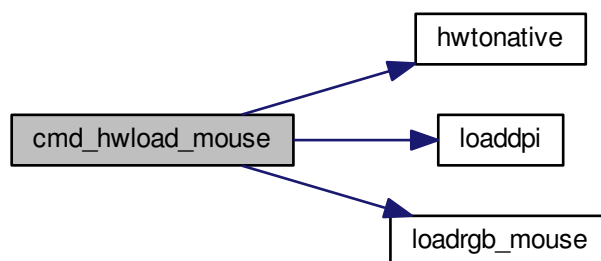
References `DELAY_LONG`, `hwprofile::dpi`, `usbdevice::hw`, `hwtonative()`, `hwprofile::id`, `hwprofile::light`, `loaddpi()`, `loadrgb_mouse()`, `MSG_SIZE`, `hwprofile::name`, `PR_NAME_LEN`, `usbdevice::profile`, and `usbrecv`.

```

6
7     DELAY_LONG(kb);
8     hwprofile* hw = calloc(1, sizeof(hwprofile));
9     // Ask for profile and mode IDs
10    uchar data_pkt[2][MSG_SIZE] = {
11        { 0x0e, 0x15, 0x01, 0 },
12        { 0x0e, 0x16, 0x01, 0 }
13    };
14    uchar in_pkt[MSG_SIZE];
15    for(int i = 0; i <= 1; i++){
16        data_pkt[0][3] = i;
17        if(!usbrecv(kb, data_pkt[0], in_pkt)){
18            free(hw);
19            return -1;
20        }
21        memcpy(hw->id + i, in_pkt + 4, sizeof(usbid));
22    }
23    // Ask for profile and mode names
24    for(int i = 0; i <= 1; i++){
25        data_pkt[1][3] = i;
26        if(!usbrecv(kb, data_pkt[1], in_pkt)){
27            free(hw);
28            return -1;
29        }
30        memcpy(hw->name[i], in_pkt + 4, PR_NAME_LEN * 2);
31    }
32
33    // Load the RGB and DPI settings
34    if(loadrgb_mouse(kb, hw->light, 0)
35        || loaddpi(kb, hw->dpi, hw->light)){
36        free(hw);
37        return -1;
38    }
39
40    // Make the profile active (if requested)
41    if(apply)
42        hwtonative(kb->profile, hw, 1);
43    // Free the existing profile (if any)
44    free(kb->hw);
45    kb->hw = hw;
46    DELAY_LONG(kb);
47    return 0;
48 }

```

Here is the call graph for this function:



9.39.1.2 `int cmd_hwsave_mouse ( usbdevice * kb, usbmode * dummy1, int dummy2, int dummy3, const char * dummy4 )`

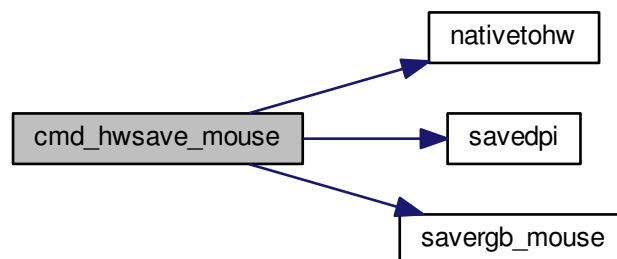
Definition at line 50 of file `profile_mouse.c`.

References `DELAY_LONG`, `hwprofile::dpi`, `usbdevice::hw`, `hwprofile::id`, `hwprofile::light`, `MD_NAME_LEN`, `MSG_SIZE`, `hwprofile::name`, `nativetohw()`, `usbdevice::profile`, `savedpi()`, `savergb_mouse()`, and `usbsend`.

```

50                                     {
51     DELAY_LONG(kb);
52     hwprofile* hw = kb->hw;
53     if(!hw)
54         hw = kb->hw = calloc(1, sizeof(hwprofile));
55     nativetohw(kb->profile, hw, 1);
56     // Save the profile and mode names
57     uchar data_pkt[2][MSG_SIZE] = {
58         { 0x07, 0x16, 0x01, 0 },
59         { 0x07, 0x15, 0x01, 0 },
60     };
61     for(int i = 0; i <= 1; i++){
62         data_pkt[0][3] = i;
63         memcpy(data_pkt[0] + 4, hw->name[i], MD_NAME_LEN * 2);
64         if(!usbsend(kb, data_pkt[0], 1))
65             return -1;
66     }
67     // Save the IDs
68     for(int i = 0; i <= 1; i++){
69         data_pkt[1][3] = i;
70         memcpy(data_pkt[1] + 4, hw->id + i, sizeof(usbid));
71         if(!usbsend(kb, data_pkt[1], 1))
72             return -1;
73     }
74     // Save the RGB data for the non-DPI zones
75     if(savergb_mouse(kb, hw->light, 0))
76         return -1;
77     // Save the DPI data (also saves RGB for those states)
78     if(savedpi(kb, hw->dpi, hw->light))
79         return -1;
80     DELAY_LONG(kb);
81     return 0;
82 }
```

Here is the call graph for this function:

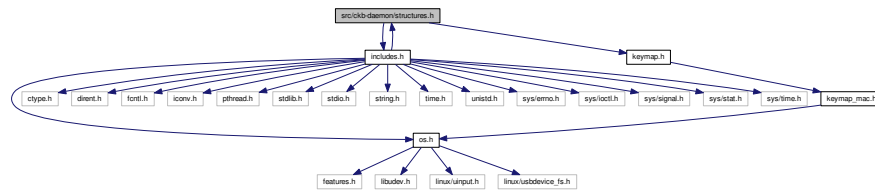


## 9.40 src/ckb-daemon/structures.h File Reference

```

#include "includes.h"
#include "keymap.h"
```

Include dependency graph for structures.h:



This graph shows which files directly or indirectly include this file:



## Data Structures

- struct [usbid](#)
- struct [macroaction](#)
- struct [keymacro](#)
- struct [binding](#)
- struct [dpiset](#)
- struct [lighting](#)
- struct [usbmode](#)
- struct [usbprofile](#)
- struct [hwprofile](#)
- struct [usbinput](#)
- struct [usbdevice](#)

## Macros

- #define [SET\\_KEYBIT](#)(array, index) do { (array)[(index) / 8] |= 1 << ((index) % 8); } while(0)
- #define [CLEAR\\_KEYBIT](#)(array, index) do { (array)[(index) / 8] &= ~(1 << ((index) % 8)); } while(0)
- #define [I\\_NUM](#) 1
- #define [I\\_CAPS](#) 2
- #define [I\\_SCROLL](#) 4
- #define [OUTFIFO\\_MAX](#) 10
- #define [MACRO\\_MAX](#) 1024
- #define [DPI\\_COUNT](#) 6
- #define [LIFT\\_MIN](#) 1
- #define [LIFT\\_MAX](#) 5
- #define [MD\\_NAME\\_LEN](#) 16
- #define [PR\\_NAME\\_LEN](#) 16
- #define [MODE\\_COUNT](#) 6
- #define [HWMODE\\_K70](#) 1
- #define [HWMODE\\_K95](#) 3
- #define [HWMODE\\_MAX](#) 3
- #define [FEAT\\_RGB](#) 0x001
- #define [FEAT\\_MONOCHROME](#) 0x002
- #define [FEAT\\_POLLRATE](#) 0x004

- `#define FEAT_ADJRATE 0x008`
- `#define FEAT_BIND 0x010`
- `#define FEAT_NOTIFY 0x020`
- `#define FEAT_FWVERSION 0x040`
- `#define FEAT_FWUPDATE 0x080`
- `#define FEAT_HWLOAD 0x100`
- `#define FEAT_ANSI 0x200`
- `#define FEAT_ISO 0x400`
- `#define FEAT_MOUSEACCEL 0x800`
- `#define FEAT_COMMON (FEAT_BIND | FEAT_NOTIFY | FEAT_FWVERSION | FEAT_MOUSEACCEL | FEAT_HWLOAD)`
- `#define FEAT_STD_RGB (FEAT_COMMON | FEAT_RGB | FEAT_POLLRATE | FEAT_FWUPDATE)`
- `#define FEAT_STD_NRGB (FEAT_COMMON)`
- `#define FEAT_LMASK (FEAT_ANSI | FEAT_ISO)`
- `#define HAS_FEATURES(kb, feat) (((kb)->features & (feat)) == (feat))`
- `#define HAS_ANY_FEATURE(kb, feat) (!!(kb)->features & (feat))`
- `#define NEEDS_FW_UPDATE(kb) ((kb)->fwversion == 0 && HAS_FEATURES((kb), FEAT_FWUPDATE | FEAT_FWVERSION))`
- `#define SCROLL_ACCELERATED 0`
- `#define SCROLL_MIN 1`
- `#define SCROLL_MAX 10`
- `#define KB_NAME_LEN 40`
- `#define SERIAL_LEN 34`
- `#define MSG_SIZE 64`
- `#define IFACE_MAX 4`

## Variables

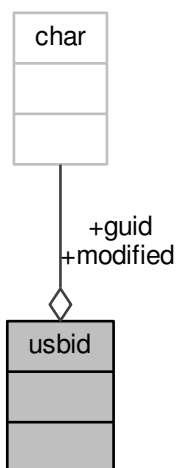
- `const union devcmd vtable_keyboard`  
*RGB keyboard vtable holds functions for each device type.*
- `const union devcmd vtable_keyboard_nonrgb`
- `const union devcmd vtable_mouse`

## 9.40.1 Data Structure Documentation

### 9.40.1.1 struct usbid

Definition at line 8 of file structures.h.

Collaboration diagram for usbid:



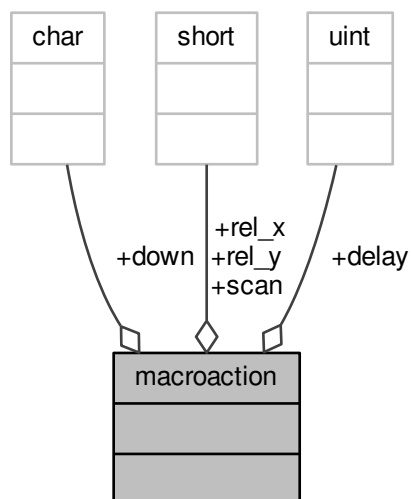
#### Data Fields

char	guid[16]	
char	modified[4]	

#### 9.40.1.2 struct macroaction

Definition at line 27 of file structures.h.

Collaboration diagram for macroaction:



#### Data Fields

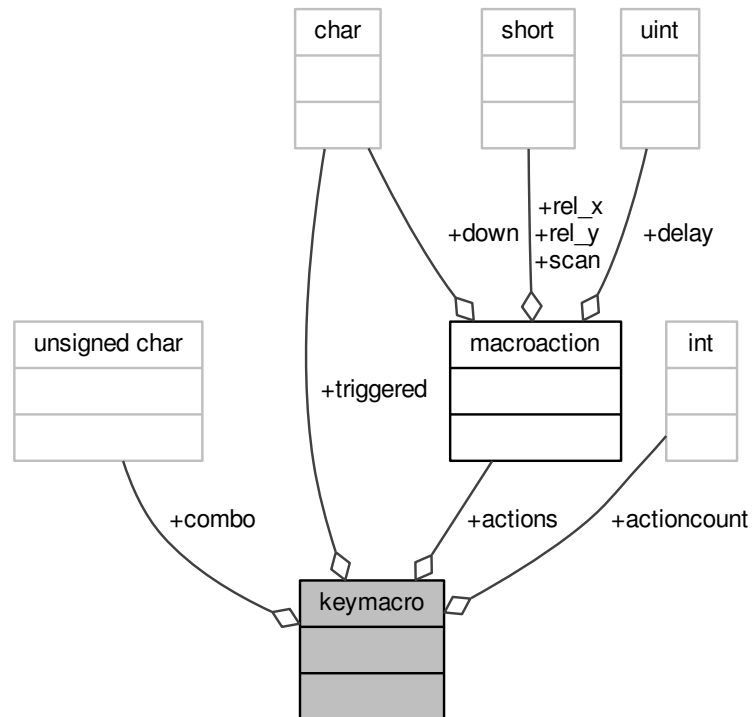
uint	delay	
char	down	
short	rel_x	
short	rel_y	
short	scan	

#### 9.40.1.3 struct keymacro

Definition at line 35 of file structures.h.



Collaboration diagram for keymacro:



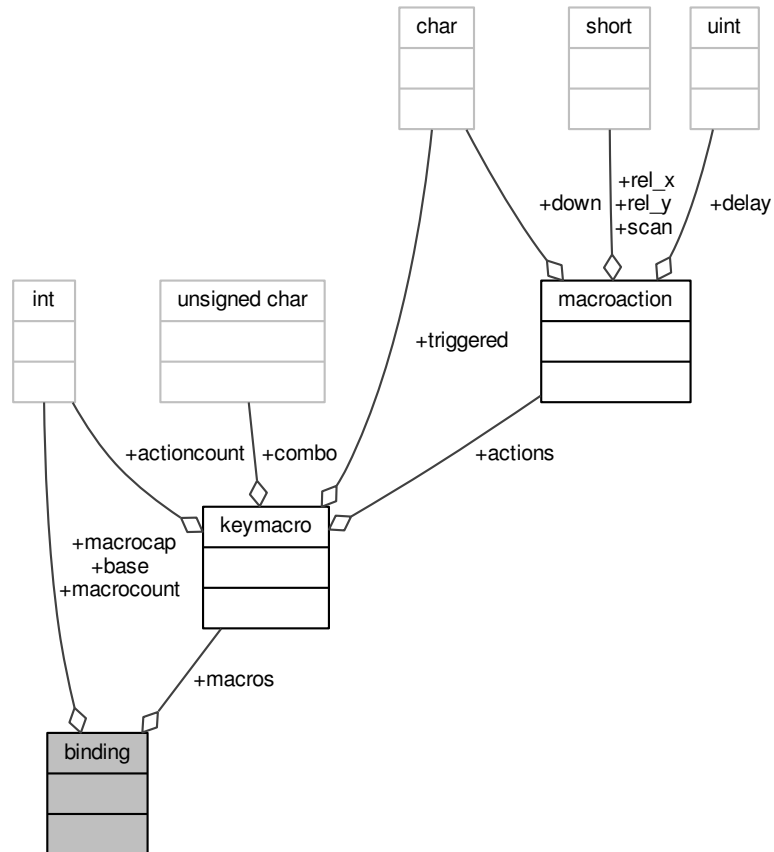
#### Data Fields

int	actioncount	
<a href="#">macroaction</a> *	actions	
<a href="#">uchar</a>	combo[(((152+3+12)+25)+7)/8]]	
char	triggered	

#### 9.40.1.4 struct binding

Definition at line 43 of file structures.h.

Collaboration diagram for binding:



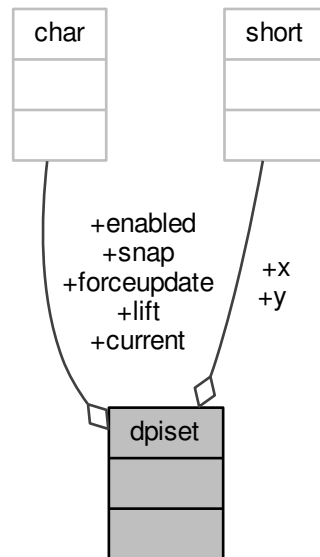
#### Data Fields

int	base[((152+3+12)+25)]	
int	macrocap	
int	macrocount	
<a href="#">keymacro</a> *	macros	

#### 9.40.1.5 struct dpiset

Definition at line 57 of file structures.h.

Collaboration diagram for dpiset:



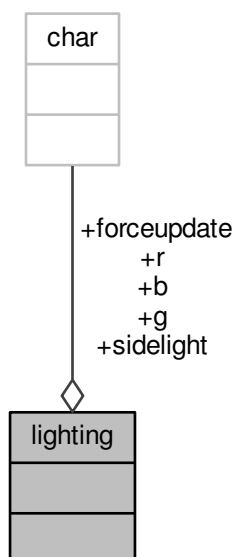
#### Data Fields

<a href="#">uchar</a>	current	
<a href="#">uchar</a>	enabled	
<a href="#">uchar</a>	forceupdate	
<a href="#">uchar</a>	lift	
<a href="#">uchar</a>	snap	
<a href="#">ushort</a>	x[6]	
<a href="#">ushort</a>	y[6]	

#### 9.40.1.6 struct lighting

Definition at line 73 of file structures.h.

Collaboration diagram for lighting:



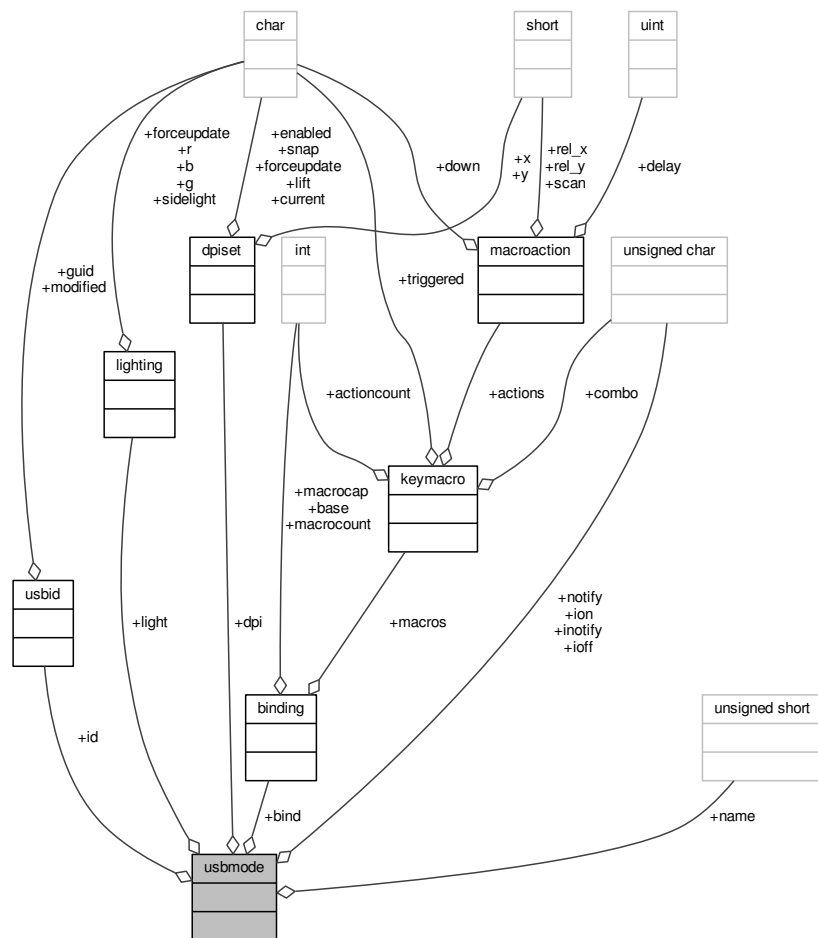
#### Data Fields

uchar	b[152+11]	
uchar	forceupdate	
uchar	g[152+11]	
uchar	r[152+11]	
uchar	sidelight	

#### 9.40.1.7 struct usbmode

Definition at line 83 of file structures.h.

Collaboration diagram for usbmode:



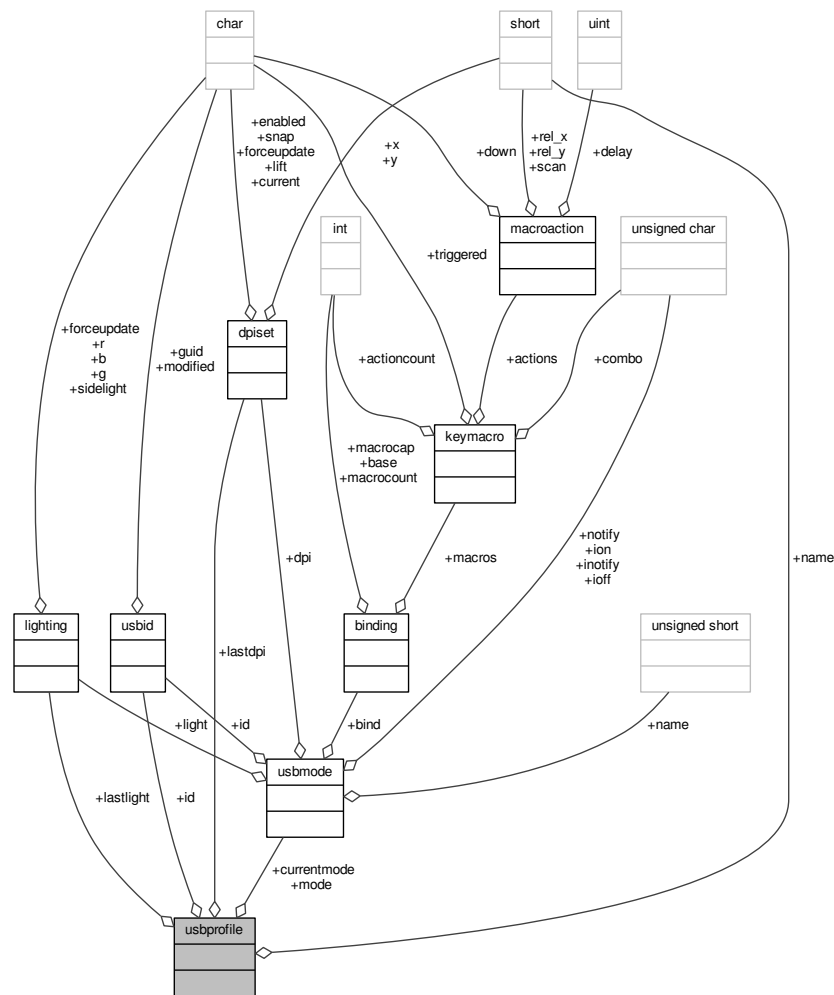
#### Data Fields

<a href="#">binding</a>	bind	
<a href="#">dpiset</a>	dpi	
<a href="#">usb_id</a>	id	
<a href="#">uchar</a>	inotify[10]	
<a href="#">uchar</a>	ioff	
<a href="#">uchar</a>	ion	
<a href="#">lighting</a>	light	
<a href="#">ushort</a>	name[16]	
<a href="#">uchar</a>	notify[10][((((152+3+12)+25)+7)/8)]	

#### 9.40.1.8 struct usbprofile

Definition at line 101 of file structures.h.

Collaboration diagram for usbprofile:



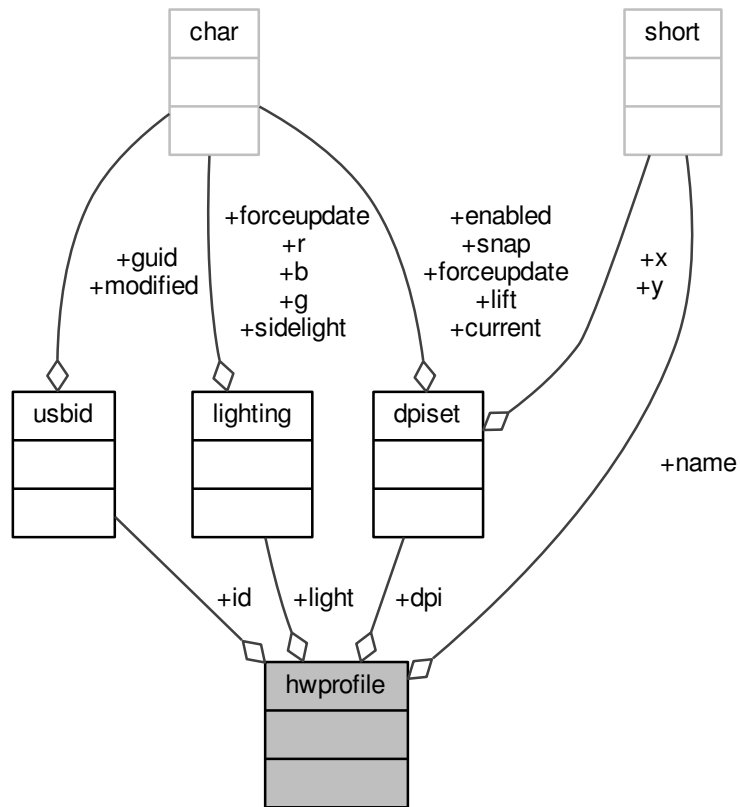
#### Data Fields

<a href="#">usbmode</a> *	currentmode	
<a href="#">usbid</a>	id	
<a href="#">dpiset</a>	lastdpi	
<a href="#">lighting</a>	lastlight	
<a href="#">usbmode</a>	mode[6]	
<a href="#">ushort</a>	name[16]	

#### 9.40.1.9 struct hwprofile

Definition at line 118 of file structures.h.

Collaboration diagram for hwprofile:



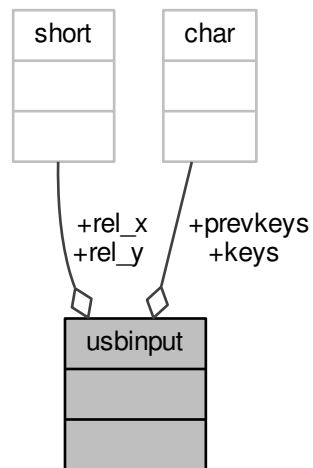
#### Data Fields

<a href="#">dpiset</a>	<code>dpi[3]</code>	
<a href="#">usbid</a>	<code>id[3+1]</code>	
<a href="#">lighting</a>	<code>light[3]</code>	
<a href="#">ushort</a>	<code>name[3+1][16]</code>	

#### 9.40.1.10 struct usbinput

Definition at line 129 of file structures.h.

Collaboration diagram for usbinput:



#### Data Fields

uchar	keys[((((152+3+12)+25)+7)/8)]	
uchar	prevkeys[((((152+3+12)+25)+7)/8)]	
short	rel_x	
short	rel_y	

#### 9.40.1.11 struct usbdevice

Definition at line 178 of file structures.h.



The diagram illustrates the architecture of the libusb library, showing the relationships between various components:

- lib** (Library Core):
  - Associates with **keymacro** via `+macrocap`, `+macrocount`, and `+macrocount`.
  - Associates with **binding** via `+macrocount`, `+macrocount`, and `+macrocount`.
  - Associates with **usbdevice** via `+do_macro`, `+do_cmd`, and `+@1`.
- char** (Character):
  - Inherits from **uint** and **short**.
  - Associates with **keymacro** via `+triggered`.
  - Associates with **binding** via `+actions`.
  - Associates with **lighting** via `+modify`, `+non`, `+modify`, and `+off`.
  - Associates with **usbset** via `+forceupdate`, `+t`, `+b`, `+g`, and `+sideight`.
  - Associates with **dpset** via `+enabled`, `+snap`, `+forceupdate`, `+lift`, and `+current`.
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- uint** (Unsigned Integer):
  - Associates with **keymacro** via `+macrocount`.
  - Associates with **binding** via `+macrocount`.
  - Associates with **lighting** via `+modify`, `+non`, `+modify`, and `+off`.
  - Associates with **usbset** via `+forceupdate`, `+t`, `+b`, `+g`, and `+sideight`.
  - Associates with **dpset** via `+enabled`, `+snap`, `+forceupdate`, `+lift`, and `+current`.
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- short** (Short Integer):
  - Associates with **keymacro** via `+macrocount`.
  - Associates with **binding** via `+macrocount`.
  - Associates with **lighting** via `+modify`, `+non`, `+modify`, and `+off`.
  - Associates with **usbset** via `+forceupdate`, `+t`, `+b`, `+g`, and `+sideight`.
  - Associates with **dpset** via `+enabled`, `+snap`, `+forceupdate`, `+lift`, and `+current`.
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- keymacro** (Key Macro):
  - Associates with **binding** via `+macrocount`.
  - Associates with **lighting** via `+modify`, `+non`, `+modify`, and `+off`.
  - Associates with **usbset** via `+forceupdate`, `+t`, `+b`, `+g`, and `+sideight`.
  - Associates with **dpset** via `+enabled`, `+snap`, `+forceupdate`, `+lift`, and `+current`.
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- binding** (Binding):
  - Associates with **lighting** via `+modify`, `+non`, `+modify`, and `+off`.
  - Associates with **usbset** via `+forceupdate`, `+t`, `+b`, `+g`, and `+sideight`.
  - Associates with **dpset** via `+enabled`, `+snap`, `+forceupdate`, `+lift`, and `+current`.
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- lighting** (Lighting):
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- usbset** (USB Set):
  - Associates with **dpset** via `+enabled`, `+snap`, `+forceupdate`, `+lift`, and `+current`.
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- dpset** (Device Profile Set):
  - Associates with **usbmode** via `+light` and `+id`.
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- usbmode** (USB Mode):
  - Associates with **heurprofile** via `+light` and `+id`.
  - Associates with **usbdevice** via `+profile`.
- heurprofile** (Heuristic Profile):
  - Associates with **usbdevice** via `+profile`.
- usbdevice** (USB Device):
  - Associates with **devcmd** via `+do_macro`, `+do_cmd`, and `+@1`.
  - Associates with **struct udev\_device** via `+udev`.
  - Associates with **pthread\_t** via `+inputthread` and `+thread`.
- devcmd** (Device Command):
  - Associates with **usbdevice** via `+do_macro`, `+do_cmd`, and `+@1`.
- struct udev\_device** (udev Device Structure):
  - Associates with **usbdevice** via `+udev`.
- pthread\_t** (POSIX Thread):
  - Associates with **usbdevice** via `+inputthread` and `+thread`.

char	active	
uint	delay	
char	dither	
int	epcount	
ushort	features	
ushort	fwversion	
int	handle	
hwprofile *	hw	
uchar	hw_ileds	
uchar	hw_ileds_old	
uchar	ileds	
int	infifo	
usbinput	input	
pthread_t	inputthread	
char	name[40+1]	
int	outfifo[10]	
char	pollrate	

short	product	
<a href="#">usbprofile</a> *	profile	
char	serial[34]	
pthread_t	thread	
struct udev_device *	udev	
int	uinput_kb	
int	uinput_mouse	
char	usbdelay	
short	vendor	
const union <a href="#">devcmd</a> *	vtable	

## 9.40.2 Macro Definition Documentation

### 9.40.2.1 `#define CLEAR_KEYBIT( array, index ) do { (array)[(index) / 8] &= ~(1 << ((index) % 8)); } while(0)`

Definition at line 16 of file structures.h.

Referenced by `cmd_notify()`, `corsair_mousecopy()`, `hid_kb_translate()`, and `hid_mouse_translate()`.

### 9.40.2.2 `#define DPI_COUNT 6`

Definition at line 54 of file structures.h.

Referenced by `cmd_dpi()`, `cmd_dpisel()`, `loaddpi()`, `printdpi()`, `savedpi()`, and `updatedpi()`.

### 9.40.2.3 `#define FEAT_ADJRATE 0x008`

Definition at line 139 of file structures.h.

Referenced by `_mkdevpath()`, `_setupusb()`, and `_start_dev()`.

### 9.40.2.4 `#define FEAT_ANSI 0x200`

Definition at line 146 of file structures.h.

Referenced by `readcmd()`.

### 9.40.2.5 `#define FEAT_BIND 0x010`

Definition at line 140 of file structures.h.

Referenced by `_mkdevpath()`, `main()`, and `readcmd()`.

### 9.40.2.6 `#define FEAT_COMMON (FEAT_BIND | FEAT_NOTIFY | FEAT_FWVERSION | FEAT_MOUSEACCEL | FEAT_HWLOAD)`

Definition at line 151 of file structures.h.

### 9.40.2.7 `#define FEAT_FWUPDATE 0x080`

Definition at line 143 of file structures.h.

Referenced by `_mkdevpath()`, `_start_dev()`, and `cmd_fwupdate()`.

**9.40.2.8 #define FEAT\_FWVERSION 0x040**

Definition at line 142 of file structures.h.

Referenced by `_mkdevpath()`, and `_start_dev()`.

**9.40.2.9 #define FEAT\_HWLOAD 0x100**

Definition at line 144 of file structures.h.

Referenced by `_start_dev()`.

**9.40.2.10 #define FEAT\_ISO 0x400**

Definition at line 147 of file structures.h.

Referenced by `readcmd()`.

**9.40.2.11 #define FEAT\_LMASK (FEAT\_ANSI | FEAT\_ISO)**

Definition at line 154 of file structures.h.

Referenced by `readcmd()`.

**9.40.2.12 #define FEAT\_MONOCHROME 0x002**

Definition at line 137 of file structures.h.

Referenced by `_mkdevpath()`, and `_setupusb()`.

**9.40.2.13 #define FEAT\_MOUSEACCEL 0x800**

Definition at line 148 of file structures.h.

Referenced by `main()`, and `readcmd()`.

**9.40.2.14 #define FEAT\_NOTIFY 0x020**

Definition at line 141 of file structures.h.

Referenced by `_mkdevpath()`, `main()`, and `readcmd()`.

**9.40.2.15 #define FEAT\_POLLRATE 0x004**

Definition at line 138 of file structures.h.

Referenced by `_mkdevpath()`, `_start_dev()`, and `getfwversion()`.

**9.40.2.16 #define FEAT\_RGB 0x001**

Definition at line 136 of file structures.h.

Referenced by `_mkdevpath()`, `_start_dev()`, `revertusb()`, and `usbunclaim()`.

**9.40.2.17 #define FEAT\_STD\_NRGB (FEAT\_COMMON)**

Definition at line 153 of file structures.h.

Referenced by `_setupusb()`.

**9.40.2.18 #define FEAT\_STD\_RGB (FEAT\_COMMON | FEAT\_RGB | FEAT\_POLLRATE | FEAT\_FWUPDATE)**

Definition at line 152 of file structures.h.

Referenced by `_setupusb()`.

**9.40.2.19 #define HAS\_ANY\_FEATURE( kb, feat ) (!((kb)->features & (feat)))**

Definition at line 158 of file structures.h.

**9.40.2.20 #define HAS\_FEATURES( kb, feat ) (((kb)->features & (feat)) == (feat))**

Definition at line 157 of file structures.h.

Referenced by `_mkdevpath()`, `_start_dev()`, `cmd_fwupdate()`, `readcmd()`, `revertusb()`, and `usbunclaim()`.

**9.40.2.21 #define HWMODE\_K70 1**

Definition at line 115 of file structures.h.

Referenced by `cmd_hwload_kb()`, and `cmd_hwsave_kb()`.

**9.40.2.22 #define HWMODE\_K95 3**

Definition at line 116 of file structures.h.

Referenced by `cmd_hwload_kb()`, and `cmd_hwsave_kb()`.

**9.40.2.23 #define HWMODE\_MAX 3**

Definition at line 117 of file structures.h.

**9.40.2.24 #define I\_CAPS 2**

Definition at line 20 of file structures.h.

Referenced by `_cmd_get()`, `iselect()`, `nprintind()`, and `updateindicators_kb()`.

**9.40.2.25 #define I\_NUM 1**

Definition at line 19 of file structures.h.

Referenced by `_cmd_get()`, `iselect()`, `nprintind()`, and `updateindicators_kb()`.

**9.40.2.26 #define I\_SCROLL 4**

Definition at line 21 of file structures.h.

Referenced by `_cmd_get()`, `iselect()`, `nprintind()`, and `updateindicators_kb()`.

**9.40.2.27 #define IFACE\_MAX 4**

Definition at line 177 of file structures.h.

**9.40.2.28 #define KB\_NAME\_LEN 40**

Definition at line 174 of file structures.h.

Referenced by `_setupusb()`, and `os_setupusb()`.

**9.40.2.29 #define LIFT\_MAX 5**

Definition at line 56 of file structures.h.

Referenced by `cmd_lift()`, and `loaddpi()`.

**9.40.2.30 #define LIFT\_MIN 1**

Definition at line 55 of file structures.h.

Referenced by `cmd_lift()`, and `loaddpi()`.

**9.40.2.31 #define MACRO\_MAX 1024**

Definition at line 51 of file structures.h.

Referenced by `_cmd_macro()`.

**9.40.2.32 #define MD\_NAME\_LEN 16**

Definition at line 82 of file structures.h.

Referenced by `cmd_hwsave_kb()`, `cmd_hwsave_mouse()`, `cmd_name()`, `gethwmodename()`, `gethwprofilename()`, `getmodename()`, `hwloadmode()`, `hwtonative()`, and `nativetohw()`.

**9.40.2.33 #define MODE\_COUNT 6**

Definition at line 100 of file structures.h.

Referenced by `_freeprofile()`, `allocprofile()`, and `readcmd()`.

**9.40.2.34 #define MSG\_SIZE 64**

Definition at line 176 of file structures.h.

Referenced by `_usbend()`, `cmd_hwload_kb()`, `cmd_hwload_mouse()`, `cmd_hwsave_kb()`, `cmd_hwsave_mouse()`, `cmd_pollrate()`, `fwupdate()`, `getfwversion()`, `hwloadmode()`, `loaddpi()`, `loadrgb_kb()`, `loadrgb_mouse()`, `os_inputmain()`, `os_usbreceive()`, `os_usbend()`, `savedpi()`, `savergb_kb()`, `savergb_mouse()`, `setactive_kb()`, `setactive_mouse()`, `updatedpi()`, `updatergb_kb()`, and `updatergb_mouse()`.

**9.40.2.35 #define NEEDS\_FW\_UPDATE( kb ) ((kb)->fwversion == 0 && HAS\_FEATURES((kb), FEAT\_FWUPDATE | FEAT\_FWVERSION))**

Definition at line 161 of file structures.h.

Referenced by `_start_dev()`, `readcmd()`, `revertusb()`, `setactive_kb()`, and `setactive_mouse()`.

#### 9.40.2.36 `#define OUTFIFO_MAX 10`

Definition at line 24 of file structures.h.

Referenced by `_mknotifynode()`, `_rmnotifynode()`, `inputupdate_keys()`, `nprintf()`, `readcmd()`, `rmdevpath()`, and `updateindicators_kb()`.

#### 9.40.2.37 `#define PR_NAME_LEN 16`

Definition at line 99 of file structures.h.

Referenced by `cmd_hwload_kb()`, `cmd_hwload_mouse()`, `cmd_profilename()`, `getprofilename()`, `hwtonative()`, and `nativeohw()`.

#### 9.40.2.38 `#define SCROLL_ACCELERATED 0`

Definition at line 164 of file structures.h.

Referenced by `readcmd()`.

#### 9.40.2.39 `#define SCROLL_MAX 10`

Definition at line 166 of file structures.h.

Referenced by `readcmd()`.

#### 9.40.2.40 `#define SCROLL_MIN 1`

Definition at line 165 of file structures.h.

Referenced by `readcmd()`.

#### 9.40.2.41 `#define SERIAL_LEN 34`

Definition at line 175 of file structures.h.

Referenced by `_setupusb()`, and `os_setupusb()`.

#### 9.40.2.42 `#define SET_KEYBIT( array, index ) do { (array)[(index) / 8] |= 1 << ((index) % 8); } while(0)`

Definition at line 15 of file structures.h.

Referenced by `_cmd_macro()`, `cmd_notify()`, `corsair_mousecopy()`, `hid_kb_translate()`, and `hid_mouse_translate()`.

### 9.40.3 Variable Documentation

#### 9.40.3.1 `const union devcmd vtable_keyboard`

Definition at line 29 of file device\_vtable.c.

Referenced by `get_vtable()`.

#### 9.40.3.2 `const union devcmd vtable_keyboard_nonrgb`

Definition at line 76 of file device\_vtable.c.

Referenced by `get_vtable()`.

#### 9.40.3.3 const union devcmd vtable\_mouse

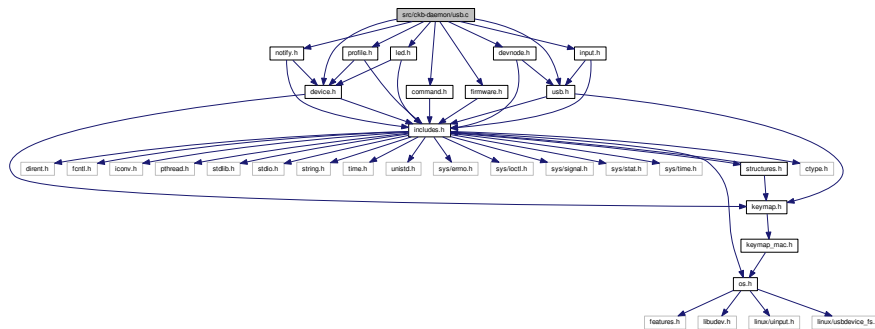
Definition at line 123 of file device\_vtable.c.

Referenced by `get_vtable()`.

## 9.41 src/ckb-daemon/usb.c File Reference

```
#include "command.h"
#include "device.h"
#include "devnode.h"
#include "firmware.h"
#include "input.h"
#include "led.h"
#include "notify.h"
#include "profile.h"
#include "usb.h"
```

Include dependency graph for usb.c:



## Functions

- const char \* [vendor\\_str](#) (short vendor)  
*brief .*
- const char \* [product\\_str](#) (short product)  
*brief .*
- static const [devcmd](#) \* [get\\_vtable](#) (short vendor, short product)  
*brief .*
- static void \* [devmain](#) ([usbdevice](#) \*kb)  
*brief .*
- static void \* [\\_setupusb](#) (void \*context)  
*brief .*
- void [setupusb](#) ([usbdevice](#) \*kb)
- int [revertusb](#) ([usbdevice](#) \*kb)
- int [\\_resetusb](#) ([usbdevice](#) \*kb, const char \*file, int line)
- int [usb\\_tryreset](#) ([usbdevice](#) \*kb)
- int [\\_usbsend](#) ([usbdevice](#) \*kb, const [uchar](#) \*messages, int count, const char \*file, int line)
- int [\\_usbrecv](#) ([usbdevice](#) \*kb, const [uchar](#) \*out\_msg, [uchar](#) \*in\_msg, const char \*file, int line)
- int [closeusb](#) ([usbdevice](#) \*kb)

## Variables

- pthread\_mutex\_t [usbmutex](#) = PTHREAD\_MUTEX\_INITIALIZER  
*brief .*
- volatile int [reset\\_stop](#) = 0  
*brief .*
- int [features\\_mask](#) = -1  
*brief .*
- int [hload\\_mode](#)  
*hload\_mode is defined in [device.c](#)*

## 9.41.1 Function Documentation

### 9.41.1.1 int \_resetusb ( usbdevice \* kb, const char \* file, int line )

`_resetusb` Reset a USB device.

First reset the device via [os\\_resetusb\(\)](#) after a long delay (it may send something to the host). If this worked (retval == 0), give the device another long delay Then perform the initialization via the device specific start() function entry in kb->vtable and if this is successful also, return the result of the device depenten updatetrgb() with force=true.

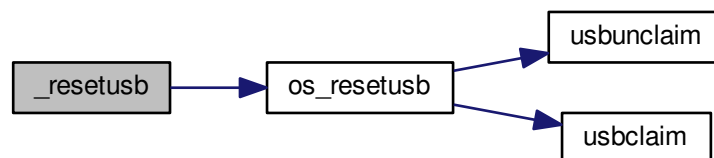
Definition at line 426 of file [usb.c](#).

References [usbdevice::active](#), [DELAY\\_LONG](#), [os\\_resetusb\(\)](#), and [usbdevice::vtable](#).

```

426                                     {
427     // Perform a USB reset
428     DELAY_LONG(kb);
429     int res = os_resetusb(kb, file, line);
430     if(res)
431         return res;
432     DELAY_LONG(kb);
433     // Re-initialize the device
434     if(kb->vtable->start(kb, kb->active) != 0)
435         return -1;
436     if(kb->vtable->updatetrgb(kb, 1) != 0)
437         return -1;
438     return 0;
439 }
```

Here is the call graph for this function:



### 9.41.1.2 static void\* \_setupusb ( void \* context ) [static]

`_setupusb` A horrible function for setting up an usb device



## Parameters

<i>context</i>	As <a href="#">_setupusb()</a> is called as a new thread, the kb* is transferred as void*
----------------	---

## Returns

a pthread\_t\* 0, here casted as void\*. Retval is always null

The basic structure of the function is somewhat habituated. It is more like an assembler routine than a structured program. This is not really bad, but just getting used to.

After every action, which can be practically fault-prone, the routine goes into the same error handling: It goes via goto to one of two exit labels. The difference is whether or not an unlock has to be performed on the imutex variable. In both cases, [closeusb\(\)](#) is called, then an unlock is performed on the dmutex.

The only case where this error handling is not performed is the correct return of the call to [devmain\(\)](#). Here simply the return value of [devmain\(\)](#) is passed to the caller.

In either case, the routine terminates with a void\* 0 because either [devmain\(\)](#) has returned constant null or the routine itself returns zero.

The basic idea of this routine is the following:

First some initialization of kb standard structured and local vars is done.

- **kb** is set to the pointer given from start environment
- local vars **vendor** and **product** are set to the values from the corresponding fields of kb
- local var **vt** and the **kb->vtable** are both set to the retval of [get\\_vtable\(\)](#)
- **kb->features** are set depending on the type of hardware connected:
  - set either to standard non rgb (all common flags like binding, notify, FW, hardware-loading etc) or in case of RGB-device set to standard + RGB, pollrate-change and fw-update
  - exclude all features which are disabled via feature\_mask (set by daemon CLI parameters)
  - if it is a mouse, add adjust-rate
  - if it is a monochrome device, set the flag for RGB-protocol, but single color
- the standard delay time is initialized in kb->usbdelay
- A fixed 100ms wait is the start. **Although the DELAY\_LONG macro is given a parameter, it is ignored. Occasionally refactor it.**
- The first relevant point is the operating system-specific opening of the interface in [os\\_setupusb\(\)](#). As a result, some parameters should be set in kb (name, serial, fwversion, epcount = number of usb endpoints), and all endpoints should be claimed with [usbclaim\(\)](#). Claiming is the only point where [os\\_setupusb\(\)](#) can produce an error (-1, otherwise 0).
- The following two statements deal with possible errors when setting the kb values in the current routine: If the version or the name was not read correctly, they are set to default values:
  - serial is set to "<vendor>: <product> -NoID"
  - the name is set to "<vendor> <product>".
- Then the user level input subsystem is activated via [os\\_openinput\(\)](#). There are two file descriptors, one for the mouse and one for the keyboard. **As mentioned in [structures.h](#), not the just opened FD numbers are stored under kb->uinput\_kb or kb->uinput\_mouse, but the values increased by 1!** The reason is, if the open fails or not open has been done until now, that struct member is set to 0, not to -1 or other negative value. So all usage of this kb->handle must be something like "kb->handle - 1", as you can find it in the code.
- The next action is to create a separate thread, which gets as parameter kb and starts with [os\\_inputmain\(\)](#). The thread is immediately detached so that it can return its resource completely independently if it should terminate.

- The same happens with `os_setupindicators()`, which initially initializes all LED variables in kb to off and then starts the `_ledthread()` thread with kb as parameter and then detaches it. Here again only the generation of the thread can fail.
- Via an entry in the vtable (allocprofile, identical for all three vtable types), `allocprofile()` is called in `profile.c`. With a valid parameter kb, a usbprofile structure is allocated and stored as a kb->profile. Then `initmode()` is called for each of the initializable modes (MODE\_COUNT, currently 6). This procedure creates the memory space for the mode information, initializes the range to 0, and then sets the light.forceupdate and dpi.forceupdate to true. This forces an update later in the initialization of the device.

The first mode is set as the current mode and two force flags are set (this seems to be mode-intersecting flags for light and update).

#### Warning

There is no error handling for the `allocprofile()` and `initmode()` procedures. However, since they allocate storage areas, the subsequent assignments and initializations can run in a SEGV.

- Not completely understandable is why now via the vtable the function `updateindicators()` is called. But this actually happens in the just started thread `_ledthread()`. Either the initialization is wrong und must done here with force or the overview is lost, what happens when...

Regardless: For a mouse nothing happens here, for a keyboard `updateindicators_kb()` is called via the entry in kb->vtable. The first parameter is kb again, the second is constant 1 (means force = true). This causes the LED status to be sent after a 5ms delay via `os_sendindicators()` (ioctl with a `usbdevfs_ctrltransfer`).

The notification is sent to all currently open notification channels then.

`Setupindicators()` and with it `updateindicators_kb()` can fail.

- From this point - if an error is detected - the error label is addressed by goto statement, which first performs an unlock on the imutex. This is interesting because the next statement is exactly this: An unlock on the imutex.
- Via vtable the `kb->start()` function is called next. This is the same for a mouse and an RGB keyboard: `start_dev()`, for a non RGB keyboard it is `start_kb_nrgb()`.

First parameter is as always kb, second is 0 (makeactive = false).

- In `start_kb_nrgb()` set the keyboard into a so-called software mode (NK95\_HWOFF) via ioctl with `usbdevfs_ctrltransfer` in function `_nk95cmd()`, which will in turn is called via macro `nk95cmd()` via `start_kb_nrgb()`.

Then two dummy values (active and pollrate) are set in the kb structure and ready.

- `start_dev()` does a bit more - because this function is for both mouse and keyboard. `start_dev()` calls - after setting an extended timeout parameter - `_start_dev()`. Both are located in `device.c`.

- First, `_start_dev()` attempts to determine the firmware version of the device, but only if two conditions are met: hwload-mode is not null (then hw-loading is disabled) and the device has the FEAT\_HWLOAD feature. Then the firmware and the poll rate are fetched via `getfwversion()`.

If hwload\_mode is set to "load only once" (==1), then the HWLOAD feature is masked, so that no further reading can take place.

- Now check if device needs a firmware update. If so, set it up and leave the function without error.
- Else load the hardware profile from device if the hw-pointer is not set and hw-loading is possible and allowed.

Return error if mode == 2 (load always) and loading got an error. Else mask the HWLOAD feature, because hwload must be 1 and the error could be a repeated hw-reading.

**Puh, that is real Horror code. It seems to be not faulty, but completely unreadable.**

- Finally, the second parameter of `_startdev()` is used to check whether the device is to be activated. Depending on the parameter, the active or the idle-member in the correspondig vtable is called. These are device-dependent again:

Device	active	idle
RGB Keyboard	<a href="#">cmd_active_kb()</a> means: start the device with a lot of kb-specific initializers (software controlled mode)	<a href="#">cmd_idle_kb()</a> set the device with a lot of kb-specific initializers into the hardware controlled mode)
non RGB Keyboard	<a href="#">cmd_io_none()</a> means: Do nothing	<a href="#">cmd_io_none()</a> means: Do nothing
Mouse	<a href="#">cmd_active_mouse()</a> similar to <a href="#">cmd_active_kb()</a>	<a href="#">cmd_idle_mouse</a> similar to <a href="#">cmd_idle_kb()</a>

- If either *start()* succeeded or the next following [usb\\_tryreset\(\)](#), it goes on, otherwise again a hard abort occurs.
- Next, go to [mkdevpath\(\)](#). After securing the EUID (effective UID) especially for macOS, work starts really in [\\_mkdevpath\(\)](#). Create - no matter how many devices were registered - either the ckb0/ files **version**, **pid** and **connected** or the **cmd** command fifo, the first notification fifo **notify0**, **model** and **serial** as well as the **features** of the device and the **pollrate**.
- If all this is done and no error has occurred, a debug info is printed ("Setup finished for ckbx") [updateconnected\(\)](#) writes the new device into the text file under ckb0/ and [devmain\(\)](#) is called.

[devmain\(\)](#)'s return value is returned by [\\_setupusb\(\)](#) when we terminate.

- The remaining code lines are the two exit labels as described above

Definition at line 214 of file usb.c.

References [ckb\\_info](#), [closeusb\(\)](#), [DELAY\\_LONG](#), [devmain\(\)](#), [devpath](#), [dmutex](#), [FEAT\\_ADJRATE](#), [FEAT\\_MONOCHROME](#), [FEAT\\_STD\\_NRGB](#), [FEAT\\_STD\\_RGB](#), [usbdevice::features](#), [features\\_mask](#), [get\\_vtable\(\)](#), [imutex](#), [INDEX\\_OF](#), [usbdevice::inputthread](#), [IS\\_MONOCHROME](#), [IS\\_MOUSE](#), [IS\\_RGB](#), [KB\\_NAME\\_LEN](#), [keyboard](#), [mkdevpath\(\)](#), [usbdevice::name](#), [os\\_inputmain\(\)](#), [os\\_inputopen\(\)](#), [os\\_setupindicators\(\)](#), [os\\_setupusb\(\)](#), [usbdevice::product](#), [product\\_str\(\)](#), [usbdevice::serial](#), [SERIAL\\_LEN](#), [updateconnected\(\)](#), [USB\\_DELAY\\_DEFAULT](#), [usb\\_tryreset\(\)](#), [usbdevice::usbdelay](#), [usbdevice::vendor](#), [vendor\\_str\(\)](#), and [usbdevice::vtable](#).

Referenced by [setupusb\(\)](#).

```

214                                     {
227     usbdevice* kb = context;
228     // Set standard fields
229     short vendor = kb->vendor, product = kb->product;
230     const devcmd* vt = kb->vtable = get_vtable(vendor, product);
231     kb->features = (IS_RGB(vendor, product) ? FEAT_STD_RGB :
FEAT_STD_NRGB) & features_mask;
232     if(IS_MOUSE(vendor, product)) kb->features |= FEAT_ADJRATE;
233     if(IS_MONOCHROME(vendor, product)) kb->features |=
FEAT_MONOCHROME;
234     kb->usbdelay = USB_DELAY_DEFAULT;
235
236     // Perform OS-specific setup
240     DELAY_LONG(kb);
241
242     if(os_setupusb(kb))
243         goto fail;
244
245     // Make up a device name and serial if they weren't assigned
246     if(!kb->serial[0])
247         snprintf(kb->serial, SERIAL_LEN, "%04x:%04x-NoID", kb->
vendor, kb->product);
248     if(!kb->name[0])
249         snprintf(kb->name, KB_NAME_LEN, "%s %s", vendor_str(kb->
vendor), product_str(kb->product));
250
251     // Set up an input device for key events
252     if(os_inputopen(kb))
253         goto fail;
254     if(pthread_create(&kb->inputthread, 0, os_inputmain, kb))
255         goto fail;
256     pthread_detach(kb->inputthread);
257     if(os_setupindicators(kb))
258         goto fail;
259
260     // Set up device
261     vt->allocprofile(kb);

```

```

309     vt->updateindicators(kb, 1);
314     pthread_mutex_unlock(&imutex(kb));
348     if(vt->start(kb, 0) && usb_tryreset(kb))
349         goto fail_noinput;
355     // Make /dev path
356     if(mkdevpath(kb))
357         goto fail_noinput;
363     // Finished. Enter main loop
364     int index = INDEX_OF(kb, keyboard);
365     ckb_info("Setup finished for %s%d\n", devpath, index);
366     updateconnected();
369     return devmain(kb);
372 fail:
373     pthread_mutex_unlock(&imutex(kb));
374     fail_noinput:
375     closeusb(kb);
376     pthread_mutex_unlock(&dmutex(kb));
377     return 0;
378 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



9.41.1.3 `int _usbrecv ( usbdevice * kb, const uchar * out_msg, uchar * in_msg, const char * file, int line )`

`_usbrecv` Request data from a USB device by first sending an output packet and then reading the response.

To fully understand this, you need to know about usb: All control is at the usb host (the CPU). If the device wants to communicate something to the host, it must wait for the host to ask. The usb protocol defines the cycles and periods in which actions are to be taken.

So in order to receive a data packet from the device, the host must first send a send request.

This is done by `_usbrecv()` in the first block by sending the MSG\_SIZE large data block from `out_msg` via `os_usbsend()` as it is a machine depending implementation. The usb target device is as always determined over `kb`.

For `os_usbsend()` to know that it is a receive request, the `is_recv` parameter is set to true (1). With this, `os_usbsend()` generates a control package for the hardware, not a data packet.

If sending of the control package is not successful, a maximum of 5 times the transmission is repeated (including the first attempt). If a non-cancelable error is signaled or the drive is stopped via `reset_stop`, `_usbrecv()` immediately returns 0.

After this, the function waits for the requested response from the device using `os_usbrecv()`.

`os_usbrecv()` returns 0, -1 or something else.

Zero signals a serious error which is not treatable and `_usbrecv()` also returns 0.

-1 means that it is a treatable error - a timeout for example - and therefore the next transfer attempt is started after a long pause (DELAY\_LONG) if not `reset_stop` or the wrong `hwload_mode` require a termination with a return value of 0.

After 5 attempts, `_usbrecv()` returns and returns 0 as well as an error message.

When data is received, the number of received bytes is returned. This should always be MSG\_SIZE, but `os_usbrecv()` can also return less. It should not be more, because then there would be an unhandled buffer overflow, but it could be less. This would be signaled in `os_usbrecv()` with a message.

The buffers behind `out_msg` and `in_msg` are MSG\_SIZE at least (currently 64 Bytes). More is ok but useless, less brings unpredictable behavior. < Synchronization between macro and color information

Definition at line 601 of file usb.c.

References `ckb_err_fn`, `DELAY_LONG`, `DELAY_MEDIUM`, `DELAY_SHORT`, `hwload_mode`, `mmutex`, `os_usbrecv()`, `os_usbsend()`, and `reset_stop`.

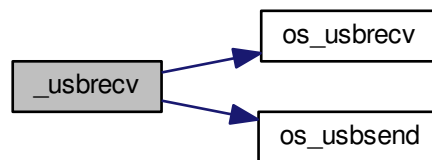
```

601
602     // Try a maximum of 5 times
603     for (int try = 0; try < 5; try++) {
604         // Send the output message
605         pthread_mutex_lock(&mmutex(kb));
606         DELAY_SHORT(kb);
607         int res = os_usbsend(kb, out_msg, 1, file, line);
608         pthread_mutex_unlock(&mmutex(kb));
609         if (res == 0)
610             return 0;
611         else if (res == -1) {
612             // Retry on temporary failure
613             if (reset_stop)
614                 return 0;
615             DELAY_LONG(kb);
616             continue;
617         }
618         // Wait for the response
619         DELAY_MEDIUM(kb);
620         res = os_usbrecv(kb, in_msg, file, line);
621         if (res == 0)
622             return 0;
623         else if (res != -1)
624             return res;
625         if (reset_stop || hwload_mode != 2)
626             return 0;
627         DELAY_LONG(kb);
628     }
629     // Give up
630     ckb_err_fn("Too many send/recv failures. Dropping.\n", file, line);
631     return 0;

```

```
632 }
```

Here is the call graph for this function:



9.41.1.4 `int _usbsend ( usbdevice * kb, const uchar * messages, int count, const char * file, int line )`

`_usbsend` send a logical message completely to the given device

**Todo** A lot of different conditions are combined in this code. Don't think, it is good in every combination...

The main task of `_usbsend ()` is to transfer the complete logical message from the buffer beginning with *messages* to *count \* MSG\_SIZE*.

According to usb 2.0 specification, a USB transmits a maximum of 64 byte user data packets. For the transmission of longer messages we need a segmentation. And that is exactly what happens here.

The message is given one by one to `os_usbsend()` in `MSG_SIZE` (= 64) byte large bites.

#### Attention

This means that the buffer given as argument must be  $n * \text{MSG\_SIZE}$  Byte long.

An essential constant parameter which is relevant for `os_usbsend()` only is `is_rcv = 0`, which means sending.

Now it gets a little complicated again:

- If `os_usbsend()` returns 0, only zero bytes could be sent in one of the packets, or it was an error (-1 from the systemcall), but not a timeout. How many Bytes were sent in total from earlier calls does not seem to matter, `_usbsend()` returns a total of 0.
- Returns `os_usbsend()` -1, first check if **reset\_stop** is set globally or (incomprehensible) `hwload_mode` is not set to "always". In either case, `_usbsend()` returns 0, otherwise it is assumed to be a temporary transfer error and it simply retransmits the physical packet after a long delay.
- If the return value of `os_usbsend()` was neither 0 nor -1, it specifies the number of bytes transferred.

Here is an information hiding conflict with `os_usbsend()` (at least in the Linux version):

If `os_usbsend()` can not transfer the entire packet, errors are thrown and the number of bytes sent is returned. `_usbsend()` interprets this as well and remembers the total number of bytes transferred in the local variable **total\_sent**. Subsequently, however, transmission is continued with the next complete `MSG_SIZE` block and not with the first of the possibly missing bytes.

**Todo** Check whether this is the same in the macOS variant. It is not dramatic, but if errors occur, it can certainly irritate the devices completely if they receive incomplete data streams. Do we have errors with the messages "Wrote YY bytes (expected 64)" in the system logs? If not, we do not need to look any further.

When the last packet is transferred, `_usbsend()` returns the effectively counted set of bytes (from `total_sent`). This at least gives the caller the opportunity to check whether something has been lost in the middle.

A bit strange is the structure of the program: Handling the `count` `MSG_SIZE` blocks to be transferred is done in the outer `for (...)` loop. Repeating the transfer with a treatable error is managed by the inner `while(1)` loop.

This must be considered when reading the code; The "break" on successful block transfer leaves the inner while, not the `for (...)`. < Synchronization between macro and color information

Definition at line 532 of file `usb.c`.

References `DELAY_LONG`, `DELAY_SHORT`, `hwload_mode`, `mmutex`, `MSG_SIZE`, `os_usbsend()`, and `reset_stop`.

```

532                                     {
533     int total_sent = 0;
534     for(int i = 0; i < count; i++){
535         // Send each message via the OS function
536         while(1){
537             pthread_mutex_lock(&mutex(kb));
538             DELAY_SHORT(kb);
539             int res = os_usbsend(kb, messages + i * MSG_SIZE, 0, file, line);
540             pthread_mutex_unlock(&mutex(kb));
541             if(res == 0)
542                 return 0;
543             else if(res != -1){
544                 total_sent += res;
545                 break;
546             }
547             // Stop immediately if the program is shutting down or hardware load is set to tryonce
548             if(reset_stop || hwload_mode != 2)
549                 return 0;
550             // Retry as long as the result is temporary failure
551             DELAY_LONG(kb);
552         }
553     }
554     return total_sent;
555 }
```

Here is the call graph for this function:



#### 9.41.1.5 int closeusb ( usbdevice \* kb )

`closeusb` Close a USB device and remove device entry.

An imutex lock ensures first of all, that no communication is currently running from the viewpoint of the driver to the user input device (ie the virtual driver with which characters or mouse movements are sent from the daemon to the operating system as inputs).

If the `kb` has an acceptable value `!= 0`, the index of the device is looked for and with this index `os_inputclose()` is called. After this no more characters can be sent to the operating system.

Then the connection to the usb device is capped by `os_closeusb()`.

**Todo** What is not yet comprehensible is the call to `updateconnected()` BEFORE `os_closeusb()`. Should that be in the other sequence? Or is `updateconnected()` not displaying the connected usb devices, but the representation which uinput devices are loaded? Questions about questions ...

If there is no valid **handle**, only `updateconnected()` is called. We are probably trying to disconnect a connection under construction. Not clear.

The cmd pipe as well as all open notify pipes are deleted via `rmdevpath()`.

This means that nothing can happen to the input path - so the device-specific imutex is unlocked again and remains unlocked.

Also the dmutex is unlocked now, but only to join the thread, which was originally taken under **kb->thread** (which started with `_setupusb()`) with `pthread_join()` again. Because of the closed devices that thread would have to quit sometime

### See Also

the hack note with `rmdevpath()`

As soon as the thread is caught, the dmutex is locked again, which is what I do not understand yet: What other thread can do usb communication now?

If the vtable exists for the given kb (why not? It seems to have race conditions here!!), via the vtable the actually device-specific, but still everywhere identical `freeprofile()` is called. This frees areas that are no longer needed. Then the **usbdevice** structure in its array is set to zero completely.

Error handling is rather unusual in `closeusb()`; Everything works (no matter what the called functions return), and `closeusb()` always returns zero (success).

Definition at line 677 of file `usb.c`.

References `ckb_info`, `devpath`, `dmutex`, `usbdevice::handle`, `imutex`, `INDEX_OF`, `keyboard`, `os_closeusb()`, `os_inputclose()`, `rmdevpath()`, `usbdevice::thread`, `updateconnected()`, and `usbdevice::vtable`.

Referenced by `_setupusb()`, `devmain()`, `quitWithLock()`, and `usb_rm_device()`.

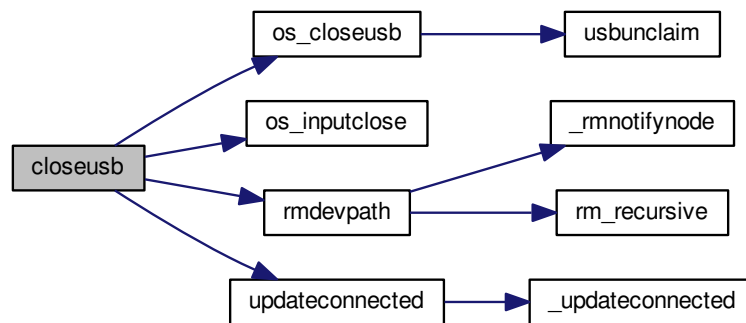
```

677         {
678     pthread_mutex_lock(imutex(kb));
679     if(kb->handle){
680         int index = INDEX_OF(kb, keyboard);
681         ckb_info("Disconnecting %s%d\n", devpath, index);
682         os_inputclose(kb);
683         updateconnected();
684         // Close USB device
685         os_closeusb(kb);
686     } else
687         updateconnected();
688     rmdevpath(kb);
689
690     // Wait for thread to close
691     pthread_mutex_unlock(imutex(kb));
692     pthread_mutex_unlock(dmutex(kb));
693     pthread_join(kb->thread, 0);
694     pthread_mutex_lock(dmutex(kb));
695
696     // Delete the profile and the control path
697     if(!kb->vtable)
698         return 0;
699     kb->vtable->freeprofile(kb);
700     memset(kb, 0, sizeof(usbdevice));
701     return 0;
702 }

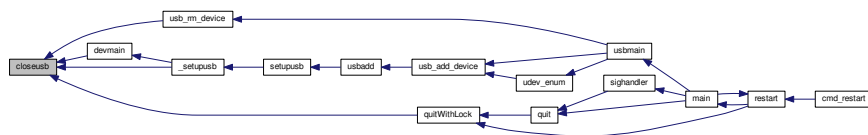
```



Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.41.1.6 static void\* devmain ( usbdevice \* kb ) [static]

devmain is called by `_setupusb`

##### Parameters

<i>kb</i>	the pointer to the device. Even if it has the name kb, it is valid also for a mouse (the whole driver seems to be implemented first for a keyboard).
-----------	--

##### Returns

always a nullptr

## Synchronization

The syncing via mutexes is interesting:

#### 1. *imutex* (the Input mutex)

This one is locked in `setupusb()`. That function does only two things: Locking the mutex and trying to start a thread at `_setupusb()`. `_setupusb()` unlocks *imutex* after getting some buffers and initializing internal structures from the indicators (this function often gets problems with error messages like "unable to read indicators" or "Timeout bla blubb").

**Warning**

have a look at `updateindicators()` later.

if creating the thread is not successful, the `mutex` remains blocked. Have a look at `setupusb()` later.

2. `dmutex` (the Device mutex)

This one is very interesting, because it is handled in `devmain()`. It seems that it is locked only in `_ledthread()`, which is a thread created in `os_setupindicators()`. `os_setupindicators()` again is called in `_setupusb()` long before calling `devmain()`. So this mutex is locked when we start the function as the old comment says.

Before reading from the FIFO and direct afterwards an `unlock..lock` sequence is implemented here. Even if only the function `readlines()` should be surrounded by the `unlock..lock`, the variable definition of the line pointer is also included here. Not nice, but does not bother either. Probably the `Unlock..lock` is needed so that now another process can change the control structure `linectx` while we wait in `readlines()`.

**Todo** Hope to find the need for `dmutex` usage later.

Should this function be declared as `pthread_t*` function, because of the definition of `pthread-create`? But `void*` works also...

**Attention**

`dmutex` should still be locked when this is called

First a `readlines_ctx` buffer structure is initialized by `readlines_ctx_init()`.

After some setup functions, beginning in `_setupusb()` which has called `devmain()`, we read the command input-Fifo designated to that device in an endless loop. This loop has two possible exits (plus reaction to signals, not mentioned here).

If the reading via `readlines()` is successful (we might have read multiple lines), the interpretation is done by `readcmd()` iff the connection to the device is still available (checked via `IS_CONNECTED(kb)`). This is true if the `kb`-structure has a handle and an event pointer both `!= Null`). If not, the loop is left (the first exit point).

if nothing is in the line buffer (some magic interrupt?), continue in the endless while without any reaction.

**Todo** `readcmd()` gets a **line**, not **lines**. Have a look on that later.

Is the condition `IS_CONNECTED` valid? What functions change the condition for the macro?

If interpretation and communication with the usb device got errors, they are signalled by `readcmd()` (non zero retcode). In this case the usb device is closed via `closeusb()` and the endless loop is left (the second exit point).

After leaving the endless loop the `readlines_ctx` structure and its buffers are freed by `readlines_ctx_free()`.

Definition at line 135 of file `usb.c`.

References `closeusb()`, `dmutex`, `usbdevice::infifo`, `IS_CONNECTED`, `readcmd()`, `readlines()`, `readlines_ctx_free()`, and `readlines_ctx_init()`.

Referenced by `_setupusb()`.

```

135                                     {
137     int kbfifo = kb->infifo - 1;
140     readlines_ctx linectx;
141     readlines_ctx_init(&linectx);
146     while(1){
153         pthread_mutex_unlock(dmutex(kb));
154         // Read from FIFO
155         const char* line;
156         int lines = readlines(kbfifo, linectx, &line);
157         pthread_mutex_lock(dmutex(kb));
158         // End thread when the handle is removed
159         if(!IS_CONNECTED(kb))
160             break;
164         if(lines){
167             if(readcmd(kb, line)){
173                 // USB transfer failed; destroy device
174                 closeusb(kb);
175                 break;

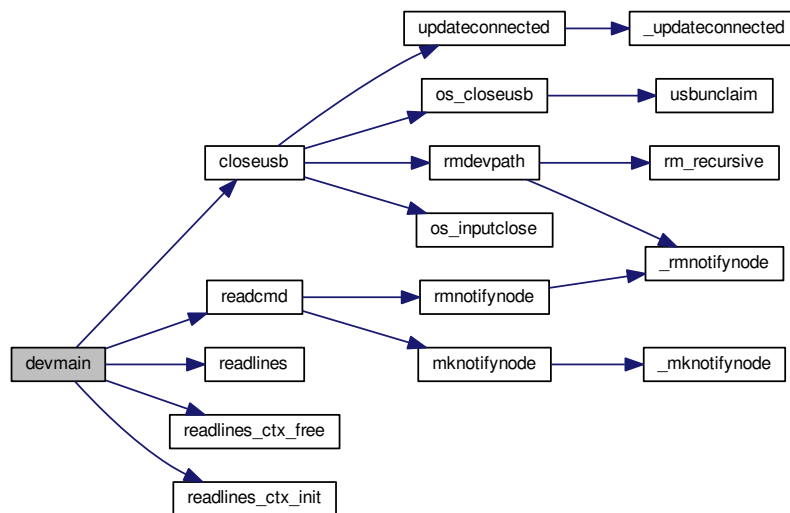
```

```

176         }
177     }
178 }
179 pthread_mutex_unlock (dmutex (kb));
182 readlines_ctx_free (linectx);
183 return 0;
184 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.41.1.7 static const devcmd\* get\_vtable ( short vendor, short product ) [static]

get\_vtable returns the correct vtable pointer

##### Parameters

<i>vendor</i>	short usb vendor ID
<i>product</i>	short usb product ID

##### Returns

Depending on the type and model, the corresponding vtable pointer is returned (see below)

At present, we have three different vtables:

- `vtable_mouse` is used for all mouse types. This may be wrong with some newer mice?
- `vtable_keyboard` is used for all RGB Keyboards.
- `vtable_keyboard_nonrgb` for all the rest.

**Todo** Is the last point really a good decision and always correct?

Definition at line 102 of file usb.c.

References IS\_MOUSE, IS\_RGB, vtable\_keyboard, vtable\_keyboard\_nonrgb, and vtable\_mouse.

Referenced by \_setupusb().

```

102                                     {
103     return IS_MOUSE(vendor, product) ? &vtable_mouse :
       IS_RGB(vendor, product) ? &vtable_keyboard : &
       vtable_keyboard_nonrgb;
104 }
```

Here is the caller graph for this function:



#### 9.41.1.8 const char\* product\_str ( short product )

product\_str returns a condensed view on what type of device we have.

At present, various models and their properties are known from corsair products. Some models differ in principle (mice and keyboards), others differ in the way they function (for example, RGB and non RGB), but they are very similar.

Here, only the first point is taken into consideration and we return a unified model string. If the model is not known with its number, *product\_str* returns an empty string.

The model numbers and corresponding strings with the numbers in hex-string are defined in [usb.h](#)

At present, this function is used to initialize kb->name and to give information in debug strings.

#### Attention

The combinations below have to fit to the combinations in the macros mentioned above. So if you add a device with a new number, change both.

**Todo** There are macros defined in [usb.h](#) to detect all the combinations below. the only difference is the parameter: The macros need the *kb\**, *product\_str()* needs the *product ID*

Definition at line 70 of file usb.c.

References P\_K65, P\_K65\_LUX, P\_K65\_NRGB, P\_K65\_RFIRE, P\_K70, P\_K70\_LUX, P\_K70\_LUX\_NRGB, P\_K70\_NRGB, P\_K70\_RFIRE, P\_K70\_RFIRE\_NRGB, P\_K95, P\_K95\_NRGB, P\_K95\_PLATINUM, P\_M65, P\_M65\_PRO, P\_SABRE\_L, P\_SABRE\_N, P\_SABRE\_O, P\_SABRE\_O2, P\_SCIMITAR, P\_SCIMITAR\_PRO, P\_STRAFE, and P\_STRAFE\_NRGB.

Referenced by \_mkdevpath(), and \_setupusb().

```

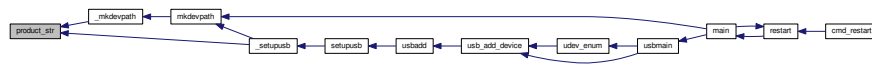
70                                     {
71     if (product == P_K95 || product == P_K95_NRGB || product ==
       P_K95_PLATINUM)
72         return "k95";
73     if (product == P_K70 || product == P_K70_NRGB || product ==
       P_K70_LUX || product == P_K70_LUX_NRGB || product ==
       P_K70_RFIRE || product == P_K70_RFIRE_NRGB)
74         return "k70";
75     if (product == P_K65 || product == P_K65_NRGB || product ==
       P_K65_LUX || product == P_K65_RFIRE)
76         return "k65";
77     if (product == P_STRAFE || product == P_STRAFE_NRGB)
```

```

78     return "strafe";
79     if (product == P_M65 || product == P_M65_PRO)
80         return "m65";
81     if (product == P_SABRE_O || product == P_SABRE_L || product ==
P_SABRE_N || product == P_SABRE_O2)
82         return "sabre";
83     if (product == P_SCIMITAR || product == P_SCIMITAR_PRO)
84         return "scimitar";
85     return "";
86 }

```

Here is the caller graph for this function:



#### 9.41.1.9 int revertusb ( usbdevice \* kb )

revertusb sets a given device to inactive (hardware controlled) mode if not a fw-upgrade is indicated

First is checked, whether a firmware-upgrade is indicated for the device. If so, `revertusb()` returns 0.

**Todo** Why is this useful? Are there problems seen with deactivating a device with older fw-version??? Why isn't this an error indicating reason and we return success (0)?

Anyway, the following steps are similar to some other procs, dealing with low level usb handling:

- If we do not have an RGB device, a simple setting to Hardware-mode (NK95\_HWON) is sent to the device via `nk95cmd()`.

**Todo** The return value of `nk95cmd()` is ignored (but sending the ioctl may produce an error and `_nk95_cmd` will indicate this), instead `revertusb()` returns success in any case.

- If we have an RGB device, `setactive()` is called with second param `active = false`. That function will have a look on differences between keyboards and mice.

More precisely `setactive()` is just a macro to call via the `kb->vtable` entries either the `active()` or the `idle()` function where the `vtable` points to. `setactive()` may return error indications. If so, `revertusb()` returns -1, otherwise 0 in any other case.

Definition at line 407 of file `usb.c`.

References `FEAT_RGB`, `HAS_FEATURES`, `NEEDS_FW_UPDATE`, `NK95_HWON`, `nk95cmd`, and `setactive`.

Referenced by `quitWithLock()`.

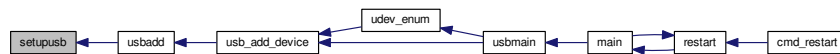
```

407     {
408         if (NEEDS_FW_UPDATE(kb))
409             return 0;
410         if (!HAS_FEATURES(kb, FEAT_RGB)) {
411             nk95cmd(kb, NK95_HWON);
412             return 0;
413         }
414         if (setactive(kb, 0))
415             return -1;
416         return 0;
417     }

```



Here is the caller graph for this function:



#### 9.41.1.11 int usb\_tryreset ( usbdevice \* kb )

usb\_tryreset does what the name means: Try to reset the usb via [resetusb\(\)](#)

This function is called if an usb command ran into an error in case of one of the following two situations:

- When setting up a new usb device and the start() function got an error (

See Also

[\\_setupusb\(\)](#)

- If upgrading to a new firmware gets an error (

See Also

[cmd\\_fwupdate\(\)](#)).

The previous action which got the error will NOT be re-attempted.

In an endless loop [usb\\_tryreset\(\)](#) tries to reset the given usb device via the macro [resetusb\(\)](#).

This macro calls [\\_resetusb\(\)](#) with debugging information.

[\\_resetusb\(\)](#) sends a command via the operating system dependent function [os\\_resetusb\(\)](#) and - if successful - reinitializes the device. [os\\_resetusb\(\)](#) returns -2 to indicate a broken device and all structures should be removed for it.

In that case, the loop is terminated, an error message is produced and [usb\\_tryreset\(\)](#) returns -1.

In case [resetusb\(\)](#) has success, the endless loop is left via a return 0 (success).

If the return value from [resetusb\(\)](#) is -1, the loop is continued with the next try.

If the global variable **reset\_stop** is set directly when the function is called or after each try, [usb\\_tryreset\(\)](#) stops working and returns -1.

**Todo** Why does [usb\\_tryreset\(\)](#) hide the information returned from [resetusb\(\)](#)? Isn't it needed by the callers?

Definition at line 465 of file usb.c.

References [ckb\\_err](#), [ckb\\_info](#), [reset\\_stop](#), and [resetusb](#).

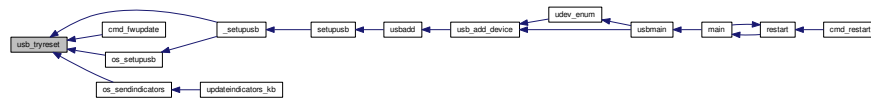
Referenced by [\\_setupusb\(\)](#), [cmd\\_fwupdate\(\)](#), [os\\_sendindicators\(\)](#), and [os\\_setupusb\(\)](#).

```

465         {
466     if(reset_stop)
467         return -1;
468     ckb_info("Attempting reset...\n");
469     while(1){
470         int res = resetusb(kb);
471         if(!res){
472             ckb_info("Reset success\n");
473             return 0;
474         }
475         if(res == -2 || reset_stop)
476             break;
477     }
478     ckb_err("Reset failed. Disconnecting.\n");
479     return -1;
480 }

```

Here is the caller graph for this function:



#### 9.41.1.12 const char\* vendor\_str ( short vendor )

uncomment the following Define to see USB packets sent to the device

vendor\_str returns "corsair" iff the given *vendor* argument is equal to *V\_CORSAIR* (0x1bc) else it returns ""

#### Attention

There is also a string defined *V\_CORSAIR\_STR*, which returns the device number as string in hex "1b1c".

Definition at line 43 of file usb.c.

References *V\_CORSAIR*.

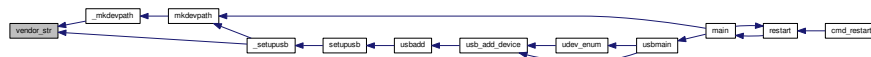
Referenced by *\_mkdevpath()*, and *\_setupusb()*.

```

43     {
44         if (vendor == V_CORSAIR)
45             return "corsair";
46         return "";
47     }

```

Here is the caller graph for this function:



### 9.41.2 Variable Documentation

#### 9.41.2.1 int features\_mask = -1

features\_mask Mask of features to exclude from all devices

That bit mask ist set to enable all (-1). When interpreting the input parameters, some of these bits can be cleared.

At the moment binding, notifying and mouse-acceleration can be disabled via command line.

Have a look at [main\(\)](#) in [main.c](#) for details.

Definition at line 35 of file usb.c.

Referenced by *\_setupusb()*, and *main()*.

#### 9.41.2.2 int hwload\_mode

hwload\_mode is defined in [device.c](#)

Definition at line 7 of file device.c.

Referenced by *\_start\_dev()*, *\_usbrecv()*, and *\_usbSEND()*.





```

• #define P_K65_LUX_STR "1b37"
• #define P_K65_RFIRE 0x1b39
• #define P_K65_RFIRE_STR "1b39"
• #define IS_K65(kb) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_K65 || (kb)->product == P_K65-
_NRGB || (kb)->product == P_K65_LUX || (kb)->product == P_K65_RFIRE))
• #define P_K70 0x1b13
• #define P_K70_STR "1b13"
• #define P_K70_NRGB 0x1b09
• #define P_K70_NRGB_STR "1b09"
• #define P_K70_LUX 0x1b33
• #define P_K70_LUX_STR "1b33"
• #define P_K70_LUX_NRGB 0x1b36
• #define P_K70_LUX_NRGB_STR "1b36"
• #define P_K70_RFIRE 0x1b38
• #define P_K70_RFIRE_STR "1b38"
• #define P_K70_RFIRE_NRGB 0x1b3a
• #define P_K70_RFIRE_NRGB_STR "1b3a"
• #define IS_K70(kb) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_K70 || (kb)->product == P_-
K70_NRGB || (kb)->product == P_K70_RFIRE || (kb)->product == P_K70_RFIRE_NRGB || (kb)->product
== P_K70_LUX || (kb)->product == P_K70_LUX_NRGB))
• #define P_K95 0x1b11
• #define P_K95_STR "1b11"
• #define P_K95_NRGB 0x1b08
• #define P_K95_NRGB_STR "1b08"
• #define P_K95_PLATINUM 0x1b2d
• #define P_K95_PLATINUM_STR "1b2d"
• #define IS_K95(kb) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_K95 || (kb)->product == P_K95-
_NRGB || (kb)->product == P_K95_PLATINUM))
• #define P_STRAFE 0x1b20
• #define P_STRAFE_STR "1b20"
• #define P_STRAFE_NRGB 0x1b15
• #define P_STRAFE_NRGB_STR "1b15"
• #define IS_STRAFE(kb) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_STRAFE || (kb)->product
== P_STRAFE_NRGB))
• #define P_M65 0x1b12
• #define P_M65_STR "1b12"
• #define P_M65_PRO 0x1b2e
• #define P_M65_PRO_STR "1b2e"
• #define IS_M65(kb) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_M65 || (kb)->product == P_-
M65_PRO))
• #define P_SABRE_O 0x1b14 /* optical */
• #define P_SABRE_O_STR "1b14"
• #define P_SABRE_L 0x1b19 /* laser */
• #define P_SABRE_L_STR "1b19"
• #define P_SABRE_N 0x1b2f /* new? */
• #define P_SABRE_N_STR "1b2f"
• #define P_SABRE_O2 0x1b32 /* Observed on a CH-9000111-EU model SABRE */
• #define P_SABRE_O2_STR "1b32"
• #define IS_SABRE(kb) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_SABRE_O || (kb)->product
== P_SABRE_L || (kb)->product == P_SABRE_N || (kb)->product == P_SABRE_O2))
• #define P_SCIMITAR 0x1b1e
• #define P_SCIMITAR_STR "1b1e"
• #define P_SCIMITAR_PRO 0x1b3e
• #define P_SCIMITAR_PRO_STR "1b3e"

```

- `#define IS_SCIMITAR(kb) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_SCIMITAR || (kb)->product == P_SCIMITAR_PRO))`
- `#define IS_RGB(vendor, product) ((vendor) == (V_CORSAIR) && (product) != (P_K65_NRGB) && (product) != (P_K70_NRGB) && (product) != (P_K95_NRGB))`  
*RGB vs non-RGB test (note: non-RGB Strafe is still considered "RGB" in that it shares the same protocol. The difference is denoted with the "monochrome" feature).*
- `#define IS_MONOCHROME(vendor, product) ((vendor) == (V_CORSAIR) && (product) == (P_STRAFE_NRGB))`  
*The difference between non RGB and monochrome is, that monochrome has lights, but just in one color. nonRGB has no lights. Change this if new **monochrome** devices are added.*
- `#define IS_RGB_DEV(kb) IS_RGB((kb)->vendor, (kb)->product)`  
*For calling with a usbdevice\*, vendor and product are extracted and `IS_RGB()` is returned.*
- `#define IS_MONOCHROME_DEV(kb) IS_MONOCHROME((kb)->vendor, (kb)->product)`  
*For calling with a usbdevice\*, vendor and product are extracted and `IS_MONOCHROME()` is returned.*
- `#define IS_FULLRANGE(kb) (IS_RGB((kb)->vendor, (kb)->product) && (kb)->product != P_K65 && (kb)->product != P_K70 && (kb)->product != P_K95)`  
*Full color range (16.8M) vs partial color range (512)*
- `#define IS_MOUSE(vendor, product) ((vendor) == (V_CORSAIR) && ((product) == (P_M65) || (product) == (P_M65_PRO) || (product) == (P_SABRE_O) || (product) == (P_SABRE_L) || (product) == (P_SABRE_N) || (product) == (P_SCIMITAR) || (product) == (P_SCIMITAR_PRO) || (product) == (P_SABRE_O2)))`  
*Mouse vs keyboard test.*
- `#define IS_MOUSE_DEV(kb) IS_MOUSE((kb)->vendor, (kb)->product)`  
*For calling with a usbdevice\*, vendor and product are extracted and `IS_MOUSE()` is returned.*
- `#define DELAY_SHORT(kb) usleep((int)(kb)->usbdelay * 1000)`  
*USB delays for when the keyboards get picky about timing That was the original comment, but it is used anytime. The short delay is used before any send or receive.*
- `#define DELAY_MEDIUM(kb) usleep((int)(kb)->usbdelay * 10000)`  
*the medium delay is used after sending a command before waiting for the answer.*
- `#define DELAY_LONG(kb) usleep(100000)`  
*The longest delay takes place where something went wrong (eg when resetting the device)*
- `#define USB_DELAY_DEFAULT 5`  
*This constant is used to initialize **kb->usbdelay**. It is used in many places (see macros above) but often also overwritten to the fixed value of 10. Pure Hacker code.*
- `#define resetusb(kb) _resetusb(kb, __FILE__ __NOPATH__, __LINE__)`  
*resetusb() is just a macro to call `_resetusb()` with debuggin constants (file, lineno)*
- `#define usbSEND(kb, messages, count) _usbSEND(kb, messages, count, __FILE__ __NOPATH__, __LINE__)`  
*usbSEND macro is used to wrap `_usbSEND()` with debugging information (file and lineno)*
- `#define usbRECV(kb, out_msg, in_msg) _usbRECV(kb, out_msg, in_msg, __FILE__ __NOPATH__, __LINE__)`  
*usbRECV macro is used to wrap `_usbRECV()` with debugging information (file and lineno)*
- `#define nk95cmd(kb, command) _nk95cmd(kb, (command) >> 16 & 0xFF, (command) & 0xFFFF, __FILE__ __NOPATH__, __LINE__)`  
*nk95cmd() macro is used to wrap `_nk95cmd()` with debugging information (file and lineno). the command structure is different:  
Just the bits 23..16 are used as bits 7..0 for bRequest  
Bits 15..0 are used as wValue*
- `#define NK95_HWOFF 0x020030`  
*Hardware-specific commands for the K95 nonRGB,.*
- `#define NK95_HWON 0x020001`  
*Hardware playback on.*
- `#define NK95_M1 0x140001`  
*Switch to mode 1.*
- `#define NK95_M2 0x140002`  
*Switch to mode 2.*
- `#define NK95_M3 0x140003`  
*Switch to mode 3.*

## Functions

- const char \* [vendor\\_str](#) (short vendor)  
*uncomment the following Define to see USB packets sent to the device*
- const char \* [product\\_str](#) (short product)  
*product\_str returns a condensed view on what type of device we have.*
- int [usbmain](#) ()  
*Start the USB main loop. Returns program exit code when finished.*
- void [usbkill](#) ()  
*Stop the USB system.*
- void [setupusb](#) (usbdevice \*kb)  
*setupusb starts a thread with kb as parameter and [\\_setupusb\(\)](#) as entrypoint.*
- int [os\\_setupusb](#) (usbdevice \*kb)  
*os\_setupusb OS-specific setup for a specific usb device.*
- void \* [os\\_inputmain](#) (void \*context)  
*os\_inputmain is run in a separate thread and will be detached from the main thread, so it needs to clean up its own resources.*
- int [revertusb](#) (usbdevice \*kb)  
*revertusb sets a given device to inactive (hardware controlled) mode if not a fw-upgrade is indicated*
- int [closeusb](#) (usbdevice \*kb)  
*closeusb Close a USB device and remove device entry.*
- void [os\\_closeusb](#) (usbdevice \*kb)  
*os\_closeusb unclaim it, destroy the udev device and clear data structures at kb*
- int [\\_resetusb](#) (usbdevice \*kb, const char \*file, int line)  
*\_resetusb Reset a USB device.*
- int [os\\_resetusb](#) (usbdevice \*kb, const char \*file, int line)  
*os\_resetusb is the os specific implementation for resetting usb*
- int [\\_usbSEND](#) (usbdevice \*kb, const uchar \*messages, int count, const char \*file, int line)  
*\_usbSEND send a logical message completely to the given device*
- int [\\_usbRECV](#) (usbdevice \*kb, const uchar \*out\_msg, uchar \*in\_msg, const char \*file, int line)  
*\_usbRECV Request data from a USB device by first sending an output packet and then reading the response.*
- int [os\\_usbSEND](#) (usbdevice \*kb, const uchar \*out\_msg, int is\_rcv, const char \*file, int line)  
*os\_usbSEND sends a data packet (MSG\_SIZE = 64) Bytes long*
- int [os\\_usbRECV](#) (usbdevice \*kb, uchar \*in\_msg, const char \*file, int line)  
*os\_usbRECV receives a max MSGSIZE long buffer from usb device*
- void [os\\_sendindicators](#) (usbdevice \*kb)  
*os\_sendindicators update the indicators for the special keys (Numlock, Capslock and what else?)*
- int [\\_nk95cmd](#) (usbdevice \*kb, uchar bRequest, ushort wValue, const char \*file, int line)  
*\_nk95cmd If we control a non RGB keyboard, set the keyboard via ioctl with usbdevfs\_ctrltransfer*
- int [usb\\_tryreset](#) (usbdevice \*kb)  
*usb\_tryreset does what the name means: Try to reset the usb via [resetusb\(\)](#)*

### 9.42.1 Detailed Description

#### Vendor/product codes

The list of defines in the first part of the file describes the various types of equipment from Corsair and summarizes them according to specific characteristics.

Each device type is described with two defines:

- On the one hand the device ID with which the device can be recognized on the USB as a short
- and on the other hand the same representation as a string, but without leading "0x".

First entry-pair is the Provider ID (vendorID) from Corsair.

Block No.	contains	Devices are bundled via
1	The first block contains the K65-like keyboards, regardless of their properties (RGB, ...).	In summary, they can be queried using the macro <a href="#">IS_K65()</a> .
2	the K70-like Keyboards with all their configuration types	summarized by <a href="#">IS_K70()</a> .
3	the K95 series keyboards	collected with the macro <a href="#">IS_K95()</a> .
4	strafe keyboards	<a href="#">IS_STRAFE()</a>
5	M65 mice with and without RGB	<a href="#">IS_M65()</a>
6	The SABRE and HARPOON mice. Maybe this will be divided into two different blocks later because of different number of special keys	<a href="#">IS_SABRE()</a>
7	The Scimitar mouse devices	<a href="#">IS_SCIMITAR()</a>

Definition in file [usb.h](#).

## 9.42.2 Macro Definition Documentation

### 9.42.2.1 `#define DELAY_LONG( kb ) usleep(100000)`

Definition at line 155 of file [usb.h](#).

Referenced by [\\_resetusb\(\)](#), [\\_setupusb\(\)](#), [\\_usbrecv\(\)](#), [\\_usbseend\(\)](#), [cmd\\_hwload\\_kb\(\)](#), [cmd\\_hwload\\_mouse\(\)](#), [cmd\\_hwsave\\_kb\(\)](#), and [cmd\\_hwsave\\_mouse\(\)](#).

### 9.42.2.2 `#define DELAY_MEDIUM( kb ) usleep((int)(kb)->usbdelay * 10000)`

Definition at line 152 of file [usb.h](#).

Referenced by [\\_usbrecv\(\)](#), and [setactive\\_kb\(\)](#).

### 9.42.2.3 `#define DELAY_SHORT( kb ) usleep((int)(kb)->usbdelay * 1000)`

Definition at line 149 of file [usb.h](#).

Referenced by [\\_usbrecv\(\)](#), [\\_usbseend\(\)](#), and [updateindicators\\_kb\(\)](#).

### 9.42.2.4 `#define IS_FULLRANGE( kb ) (IS_RGB((kb)->vendor, (kb)->product) && (kb)->product != P_K65 && (kb)->product != P_K70 && (kb)->product != P_K95)`

Definition at line 138 of file [usb.h](#).

Referenced by [readcmd\(\)](#), and [updatergb\\_kb\(\)](#).

### 9.42.2.5 `#define IS_K65( kb ) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_K65 || (kb)->product == P_K65_NRGB || (kb)->product == P_K65_LUX || (kb)->product == P_K65_RFIRE))`

Definition at line 49 of file [usb.h](#).

Referenced by [has\\_key\(\)](#).

### 9.42.2.6 `#define IS_K70( kb ) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_K70 || (kb)->product == P_K70_NRGB || (kb)->product == P_K70_RFIRE || (kb)->product == P_K70_RFIRE_NRGB || (kb)->product == P_K70_LUX || (kb)->product == P_K70_LUX_NRGB))`

Definition at line 63 of file [usb.h](#).

```
9.42.2.7 #define IS_K95( kb ) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_K95 || (kb)->product ==  
P_K95_NRGB || (kb)->product == P_K95_PLATINUM))
```

Definition at line 71 of file usb.h.

Referenced by cmd\_hwload\_kb(), cmd\_hwsave\_kb(), and has\_key().

```
9.42.2.8 #define IS_M65( kb ) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_M65 || (kb)->product ==  
P_M65_PRO))
```

Definition at line 83 of file usb.h.

Referenced by isblack().

```
9.42.2.9 #define IS_MONOCHROME( vendor, product ) ((vendor) == (V_CORSAIR) && (product) == (P_STRAFE_NRGB))
```

Definition at line 129 of file usb.h.

Referenced by \_setupusb().

```
9.42.2.10 #define IS_MONOCHROME_DEV( kb ) IS_MONOCHROME((kb)->vendor, (kb)->product)
```

Definition at line 135 of file usb.h.

```
9.42.2.11 #define IS_MOUSE( vendor, product ) ((vendor) == (V_CORSAIR) && ((product) == (P_M65) || (product) ==  
(P_M65_PRO) || (product) == (P_SABRE_O) || (product) == (P_SABRE_L) || (product) == (P_SABRE_N) ||  
(product) == (P_SCIMITAR) || (product) == (P_SCIMITAR_PRO) || (product) == (P_SABRE_O2)))
```

Definition at line 141 of file usb.h.

Referenced by \_setupusb(), get\_vtable(), has\_key(), and os\_inputmain().

```
9.42.2.12 #define IS_MOUSE_DEV( kb ) IS_MOUSE((kb)->vendor, (kb)->product)
```

Definition at line 144 of file usb.h.

Referenced by readcmd().

```
9.42.2.13 #define IS_RGB( vendor, product ) ((vendor) == (V_CORSAIR) && (product) != (P_K65_NRGB) && (product) !=  
(P_K70_NRGB) && (product) != (P_K95_NRGB))
```

Definition at line 124 of file usb.h.

Referenced by \_setupusb(), get\_vtable(), and os\_inputmain().

```
9.42.2.14 #define IS_RGB_DEV( kb ) IS_RGB((kb)->vendor, (kb)->product)
```

Definition at line 132 of file usb.h.

```
9.42.2.15 #define IS_SABRE( kb ) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_SABRE_O || (kb)->product ==  
P_SABRE_L || (kb)->product == P_SABRE_N || (kb)->product == P_SABRE_O2))
```

Definition at line 93 of file usb.h.

Referenced by has\_key(), loadrgb\_mouse(), and savergb\_mouse().

9.42.2.16 `#define IS_SCIMITAR( kb ) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_SCIMITAR || (kb)->product == P_SCIMITAR_PRO))`

Definition at line 99 of file usb.h.

Referenced by `has_key()`, `loadrgb_mouse()`, and `savergb_mouse()`.

9.42.2.17 `#define IS_STRAFE( kb ) ((kb)->vendor == V_CORSAIR && ((kb)->product == P_STRAFE || (kb)->product == P_STRAFE_NRGB))`

Definition at line 77 of file usb.h.

Referenced by `savergb_kb()`.

9.42.2.18 `#define NK95_HWOFF 0x020030`

See Also

[usb2.0 documentation for details](#). Set Hardware playback off

Definition at line 301 of file usb.h.

Referenced by `start_kb_nrgb()`.

9.42.2.19 `#define NK95_HWON 0x020001`

Definition at line 304 of file usb.h.

Referenced by `revertusb()`.

9.42.2.20 `#define NK95_M1 0x140001`

Definition at line 307 of file usb.h.

Referenced by `setmodeindex_nrgb()`.

9.42.2.21 `#define NK95_M2 0x140002`

Definition at line 310 of file usb.h.

Referenced by `setmodeindex_nrgb()`.

9.42.2.22 `#define NK95_M3 0x140003`

Definition at line 313 of file usb.h.

Referenced by `setmodeindex_nrgb()`.

9.42.2.23 `#define nk95cmd( kb, command ) _nk95cmd(kb, (command) >> 16 & 0xFF, (command) & 0xFFFF, __FILE_NOPATH__, __LINE__)`

Definition at line 296 of file usb.h.

Referenced by `revertusb()`, `setmodeindex_nrgb()`, and `start_kb_nrgb()`.

**9.42.2.24 #define P\_K65 0x1b17**

Definition at line 41 of file usb.h.

Referenced by product\_str().

**9.42.2.25 #define P\_K65\_LUX 0x1b37**

Definition at line 45 of file usb.h.

Referenced by product\_str().

**9.42.2.26 #define P\_K65\_LUX\_STR "1b37"**

Definition at line 46 of file usb.h.

**9.42.2.27 #define P\_K65\_NRGB 0x1b07**

Definition at line 43 of file usb.h.

Referenced by product\_str().

**9.42.2.28 #define P\_K65\_NRGB\_STR "1b07"**

Definition at line 44 of file usb.h.

**9.42.2.29 #define P\_K65\_RFIRE 0x1b39**

Definition at line 47 of file usb.h.

Referenced by product\_str().

**9.42.2.30 #define P\_K65\_RFIRE\_STR "1b39"**

Definition at line 48 of file usb.h.

**9.42.2.31 #define P\_K65\_STR "1b17"**

Definition at line 42 of file usb.h.

**9.42.2.32 #define P\_K70 0x1b13**

Definition at line 51 of file usb.h.

Referenced by product\_str().

**9.42.2.33 #define P\_K70\_LUX 0x1b33**

Definition at line 55 of file usb.h.

Referenced by loadrgb\_kb(), and product\_str().



**9.42.2.34 #define P\_K70\_LUX\_NRGB 0x1b36**

Definition at line 57 of file usb.h.

Referenced by loadrgb\_kb(), and product\_str().

**9.42.2.35 #define P\_K70\_LUX\_NRGB\_STR "1b36"**

Definition at line 58 of file usb.h.

**9.42.2.36 #define P\_K70\_LUX\_STR "1b33"**

Definition at line 56 of file usb.h.

**9.42.2.37 #define P\_K70\_NRGB 0x1b09**

Definition at line 53 of file usb.h.

Referenced by product\_str().

**9.42.2.38 #define P\_K70\_NRGB\_STR "1b09"**

Definition at line 54 of file usb.h.

**9.42.2.39 #define P\_K70\_RFIRE 0x1b38**

Definition at line 59 of file usb.h.

Referenced by product\_str().

**9.42.2.40 #define P\_K70\_RFIRE\_NRGB 0x1b3a**

Definition at line 61 of file usb.h.

Referenced by product\_str().

**9.42.2.41 #define P\_K70\_RFIRE\_NRGB\_STR "1b3a"**

Definition at line 62 of file usb.h.

**9.42.2.42 #define P\_K70\_RFIRE\_STR "1b38"**

Definition at line 60 of file usb.h.

**9.42.2.43 #define P\_K70\_STR "1b13"**

Definition at line 52 of file usb.h.

**9.42.2.44 #define P\_K95 0x1b11**

Definition at line 65 of file usb.h.

Referenced by product\_str().

9.42.2.45 `#define P_K95_NRGB 0x1b08`

Definition at line 67 of file usb.h.

Referenced by `_nk95cmd()`, and `product_str()`.

9.42.2.46 `#define P_K95_NRGB_STR "1b08"`

Definition at line 68 of file usb.h.

9.42.2.47 `#define P_K95_PLATINUM 0x1b2d`

Definition at line 69 of file usb.h.

Referenced by `product_str()`.

9.42.2.48 `#define P_K95_PLATINUM_STR "1b2d"`

Definition at line 70 of file usb.h.

9.42.2.49 `#define P_K95_STR "1b11"`

Definition at line 66 of file usb.h.

9.42.2.50 `#define P_M65 0x1b12`

Definition at line 79 of file usb.h.

Referenced by `product_str()`.

9.42.2.51 `#define P_M65_PRO 0x1b2e`

Definition at line 81 of file usb.h.

Referenced by `product_str()`.

9.42.2.52 `#define P_M65_PRO_STR "1b2e"`

Definition at line 82 of file usb.h.

9.42.2.53 `#define P_M65_STR "1b12"`

Definition at line 80 of file usb.h.

9.42.2.54 `#define P_SABRE_L 0x1b19 /* laser */`

Definition at line 87 of file usb.h.

Referenced by `product_str()`.

9.42.2.55 `#define P_SABRE_L_STR "1b19"`

Definition at line 88 of file usb.h.

**9.42.2.56** `#define P_SABRE_N 0x1b2f /* new? */`

Definition at line 89 of file usb.h.

Referenced by `product_str()`.

**9.42.2.57** `#define P_SABRE_N_STR "1b2f"`

Definition at line 90 of file usb.h.

**9.42.2.58** `#define P_SABRE_O 0x1b14 /* optical */`

Definition at line 85 of file usb.h.

Referenced by `product_str()`.

**9.42.2.59** `#define P_SABRE_O2 0x1b32 /* Observed on a CH-9000111-EU model SABRE */`

Definition at line 91 of file usb.h.

Referenced by `product_str()`.

**9.42.2.60** `#define P_SABRE_O2_STR "1b32"`

Definition at line 92 of file usb.h.

**9.42.2.61** `#define P_SABRE_O_STR "1b14"`

Definition at line 86 of file usb.h.

**9.42.2.62** `#define P_SCIMITAR 0x1b1e`

Definition at line 95 of file usb.h.

Referenced by `product_str()`.

**9.42.2.63** `#define P_SCIMITAR_PRO 0x1b3e`

Definition at line 97 of file usb.h.

Referenced by `product_str()`.

**9.42.2.64** `#define P_SCIMITAR_PRO_STR "1b3e"`

Definition at line 98 of file usb.h.

**9.42.2.65** `#define P_SCIMITAR_STR "1b1e"`

Definition at line 96 of file usb.h.

#### 9.42.2.66 `#define P_STRAFE 0x1b20`

Definition at line 73 of file usb.h.

Referenced by `product_str()`.

#### 9.42.2.67 `#define P_STRAFE_NRGB 0x1b15`

Definition at line 75 of file usb.h.

Referenced by `product_str()`.

#### 9.42.2.68 `#define P_STRAFE_NRGB_STR "1b15"`

Definition at line 76 of file usb.h.

#### 9.42.2.69 `#define P_STRAFE_STR "1b20"`

Definition at line 74 of file usb.h.

#### 9.42.2.70 `#define resetusb( kb ) _resetusb(kb, __FILE__ __NOPATH__, __LINE__)`

Definition at line 214 of file usb.h.

Referenced by `usb_tryreset()`.

#### 9.42.2.71 `#define USB_DELAY_DEFAULT 5`

Definition at line 160 of file usb.h.

Referenced by `_setupusb()`, and `start_dev()`.

#### 9.42.2.72 `#define usbrecv( kb, out_msg, in_msg ) _usbrecv(kb, out_msg, in_msg, __FILE__ __NOPATH__, __LINE__)`

##### Parameters

<i>kb</i>	THE usbdevice*
<i>IN]</i>	out_msg What information does the caller want from the device?
<i>OUT]</i>	in_msg Here comes the answer; The names represent the usb view, not the view of this function! So INput from usb is OUTput of this function.

Definition at line 256 of file usb.h.

Referenced by `cmd_hwload_kb()`, `cmd_hwload_mouse()`, `getfwversion()`, `hwloadmode()`, `loaddpi()`, `loadrgb_kb()`, and `loadrgb_mouse()`.

#### 9.42.2.73 `#define usbsend( kb, messages, count ) _usbsend(kb, messages, count, __FILE__ __NOPATH__, __LINE__)`

##### Parameters

<i>kb</i>	THE usbdevice*
<i>IN]</i>	messages a Pointer to the first byte of the logical message

<i>/N/</i>	count how many MSG_SIZE buffers is the logical message long?
------------	--

Definition at line 239 of file usb.h.

Referenced by cmd\_hwsave\_kb(), cmd\_hwsave\_mouse(), cmd\_pollrate(), fwupdate(), loadrgb\_kb(), savedpi(), savergb\_kb(), savergb\_mouse(), setactive\_kb(), setactive\_mouse(), updatedpi(), updatergb\_kb(), and updatergb\_mouse().

#### 9.42.2.74 #define V\_CORSAIR 0x1b1c

##### Warning

When adding new devices please update src/ckb/fwupgradedialog.cpp as well.  
It should contain the same vendor/product IDs for any devices supporting firmware updates.  
In the same way, all other corresponding files have to be supplemented or modified: Currently known for this are [usb\\_linux.c](#) and [usb\\_mac.c](#)

Definition at line 38 of file usb.h.

Referenced by usb\_add\_device(), and vendor\_str().

#### 9.42.2.75 #define V\_CORSAIR\_STR "1b1c"

Definition at line 39 of file usb.h.

Referenced by udev\_enum(), and usb\_add\_device().

## 9.42.3 Function Documentation

### 9.42.3.1 int \_nk95cmd ( usbdevice \* kb, uchar bRequest, ushort wValue, const char \* file, int line )

#### Parameters

<i>kb</i>	THE usbdevice*
<i>bRequest</i>	the byte array with the usb request
<i>wValue</i>	a usb wValue
<i>file</i>	for error message
<i>line</i>	for error message

#### Returns

1 (true) on failure, 0 (false) on success.

To send control packets to a non RGB non color K95 Keyboard, use this function. Normally it is called via the [nk95cmd\(\)](#) macro.

If it is the wrong device for which the function is called, 0 is returned and nothing done. Otherwise a usbdevfs\_ctrltransfer structure is filled and an USBDEVFS\_CONTROL ioctl() called.

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0x40	see table below to switch hardware-modus at Keyboard	wValue	device	MSG_SIZE	5ms	the message buffer pointer

Host to Device, Type=Vendor, Recipient=Device	bRequest parameter	given wValue Parameter	device 0	0 data to write	5000	null
---	-----------------------	---------------------------	----------	--------------------	------	------

If a 0 or a negative error number is returned by the ioctl, an error message is shown depending on the errno or "No data written" if retval was 0. In either case 1 is returned to indicate the error. If the ioctl returned a value > 0, 0 is returned to indicate no error.

Currently the following combinations for bRequest and wValue are used:

Device	what it might to do	constant	bRequest	wValue
non RGB Keyboard	set HW-modus on (leave the ckb driver)	HWON	0x0002	0x0030
non RGB Keyboard	set HW-modus off (initialize the ckb driver)	HWOFF	0x0002	0x0001
non RGB Keyboard	set light modus M1 in single-color keyboards	NK95_M1	0x0014	0x0001
non RGB Keyboard	set light modus M2 in single-color keyboards	NK95_M2	0x0014	0x0002
non RGB Keyboard	set light modus M3 in single-color keyboards	NK95_M3	0x0014	0x0003

#### See Also

[usb.h](#)

Definition at line 188 of file usb\_linux.c.

References ckb\_err\_fn, usbdevice::handle, P\_K95\_NRGB, and usbdevice::product.

```

188                                     {
189     if(kb->product != P_K95_NRGB)
190         return 0;
191     struct usbdevfs_ctrltransfer transfer = { 0x40, bRequest, wValue, 0, 0, 5000, 0 };
192     int res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
193     if(res <= 0){
194         ckb_err_fn("%s\n", file, line, res ? strerror(errno) : "No data written");
195         return 1;
196     }
197     return 0;
198 }
```

#### 9.42.3.2 int \_resetusb ( usbdevice \* kb, const char \* file, int line )

##### Parameters

<i>kb</i>	THE usbdevice*
<i>file</i>	filename for error messages
<i>line</i>	line where it is called for error messages

**Returns**

Returns 0 on success, -1 if device should be removed

`_resetusb` Reset a USB device.

First reset the device via `os_resetusb()` after a long delay (it may send something to the host). If this worked (`retval == 0`), give the device another long delay Then perform the initialization via the device specific `start()` function entry in `kb->vtable` and if this is successful also, return the result of the device dependent `updatergb()` with `force=true`.

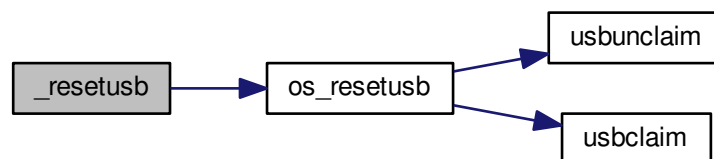
Definition at line 426 of file `usb.c`.

References `usbdevice::active`, `DELAY_LONG`, `os_resetusb()`, and `usbdevice::vtable`.

```

426                                     {
427     // Perform a USB reset
428     DELAY_LONG(kb);
429     int res = os_resetusb(kb, file, line);
430     if(res)
431         return res;
432     DELAY_LONG(kb);
433     // Re-initialize the device
434     if(kb->vtable->start(kb, kb->active) != 0)
435         return -1;
436     if(kb->vtable->updatergb(kb, 1) != 0)
437         return -1;
438     return 0;
439 }
```

Here is the call graph for this function:



### 9.42.3.3 `int _usbrecv ( usbdevice * kb, const uchar * out_msg, uchar * in_msg, const char * file, int line )`

**Parameters**

<i>kb</i>	THE <code>usbdevice*</code>
<i>IN</i> ]	<code>out_msg</code> What information does the caller want from the device?
<i>OUT</i> ]	<code>in_msg</code> Here comes the answer; The names represent the usb view, not the view of this function! So <i>IN</i> put from usb is <i>OUT</i> put of this function.
<i>IN</i> ]	<code>file</code> for debugging
<i>IN</i> ]	<code>line</code> for debugging
<i>IN</i> ]	<code>reset_stop</code> global variable is read

**Returns**

number of bytes read or zero on failure.

`_usbrecv` Request data from a USB device by first sending an output packet and then reading the response.

To fully understand this, you need to know about usb: All control is at the usb host (the CPU). If the device wants to communicate something to the host, it must wait for the host to ask. The usb protocol defines the cycles and periods in which actions are to be taken.

So in order to receive a data packet from the device, the host must first send a send request.

This is done by `_usbrecv()` in the first block by sending the MSG\_SIZE large data block from `out_msg` via `os_usbsend()` as it is a machine depending implementation. The usb target device is as always determined over kb.

For `os_usbsend()` to know that it is a receive request, the `is_rcv` parameter is set to true (1). With this, `os_usbsend()` generates a control package for the hardware, not a data packet.

If sending of the control package is not successful, a maximum of 5 times the transmission is repeated (including the first attempt). If a non-cancelable error is signaled or the drive is stopped via `reset_stop`, `_usbrecv()` immediately returns 0.

After this, the function waits for the requested response from the device using `os_usbsend()`.

`os_usbsend()` returns 0, -1 or something else.

Zero signals a serious error which is not treatable and `_usbrecv()` also returns 0.

-1 means that it is a treatable error - a timeout for example - and therefore the next transfer attempt is started after a long pause (`DELAY_LONG`) if not `reset_stop` or the wrong `hwload_mode` require a termination with a return value of 0.

After 5 attempts, `_usbrecv()` returns and returns 0 as well as an error message.

When data is received, the number of received bytes is returned. This should always be MSG\_SIZE, but `os_usbsend()` can also return less. It should not be more, because then there would be an unhandled buffer overflow, but it could be less. This would be signaled in `os_usbsend()` with a message.

The buffers behind `out_msg` and `in_msg` are MSG\_SIZE at least (currently 64 Bytes). More is ok but useless, less brings unpredictable behavior. < Synchronization between macro and color information

Definition at line 601 of file usb.c.

References `ckb_err_fn`, `DELAY_LONG`, `DELAY_MEDIUM`, `DELAY_SHORT`, `hwload_mode`, `mmutex`, `os_usbsend()`, `os_usbsend()`, and `reset_stop`.

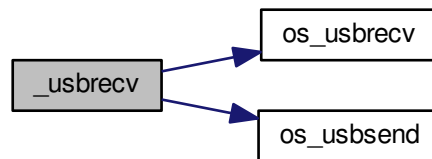
```

601
602 // Try a maximum of 5 times
603 for (int try = 0; try < 5; try++) {
604     // Send the output message
605     pthread_mutex_lock(&mmutex(kb));
606     DELAY_SHORT(kb);
607     int res = os_usbsend(kb, out_msg, 1, file, line);
608     pthread_mutex_unlock(&mmutex(kb));
609     if (res == 0)
610         return 0;
611     else if (res == -1) {
612         // Retry on temporary failure
613         if (reset_stop)
614             return 0;
615         DELAY_LONG(kb);
616         continue;
617     }
618     // Wait for the response
619     DELAY_MEDIUM(kb);
620     res = os_usbsend(kb, in_msg, file, line);
621     if (res == 0)
622         return 0;
623     else if (res != -1)
624         return res;
625     if (reset_stop || hwload_mode != 2)
626         return 0;
627     DELAY_LONG(kb);
628 }
629 // Give up
630 ckb_err_fn("Too many send/rcv failures. Dropping.\n", file, line);
631 return 0;
632 }

```



Here is the call graph for this function:



9.42.3.4 `int _usbsend ( usbdevice * kb, const uchar * messages, int count, const char * file, int line )`

#### Parameters

	<i>kb</i>	THE usbdevice*
	<i>IN]</i>	messages a Pointer to the first byte of the logical message
	<i>IN]</i>	count how many MSG_SIZE buffers is the logical message long?
	<i>IN]</i>	file for debugging
	<i>IN]</i>	line for debugging
<i>in</i>	<i>reset_stop</i>	global variable is read

#### Returns

number of Bytes sent (ideal == count \* MSG\_SIZE);  
 0 if a block could not be sent and it was not a timeout OR **reset\_stop** was required or **hload\_mode** is not set to "always"

`_usbsend` send a logical message completely to the given device

**Todo** A lot of different conditions are combined in this code. Don't think, it is good in every combination...

The main task of `_usbsend ()` is to transfer the complete logical message from the buffer beginning with *messages* to **count \* MSG\_SIZE**.

According to usb 2.0 specification, a USB transmits a maximum of 64 byte user data packets. For the transmission of longer messages we need a segmentation. And that is exactly what happens here.

The message is given one by one to `os_usbsend()` in MSG\_SIZE (= 64) byte large bites.

#### Attention

This means that the buffer given as argument must be  $n * \text{MSG\_SIZE}$  Byte long.

An essential constant parameter which is relevant for `os_usbsend()` only is `is_rcv = 0`, which means sending.

Now it gets a little complicated again:

- If `os_usbsend()` returns 0, only zero bytes could be sent in one of the packets, or it was an error (-1 from the systemcall), but not a timeout. How many Bytes were sent in total from earlier calls does not seem to matter, `_usbsend()` returns a total of 0.
- Returns `os_usbsend()` -1, first check if **reset\_stop** is set globally or (incomprehensible) `hload_mode` is not set to "always". In either case, `_usbsend()` returns 0, otherwise it is assumed to be a temporary transfer error and it simply retransmits the physical packet after a long delay.

- If the return value of `os_usbsend()` was neither 0 nor -1, it specifies the number of bytes transferred.

Here is an information hiding conflict with `os_usbsend()` (at least in the Linux version):

If `os_usbsend()` can not transfer the entire packet, errors are thrown and the number of bytes sent is returned. `_usbsend()` interprets this as well and remembers the total number of bytes transferred in the local variable `total_sent`. Subsequently, however, transmission is continued with the next complete `MSG_SIZE` block and not with the first of the possibly missing bytes.

**Todo** Check whether this is the same in the macOS variant. It is not dramatic, but if errors occur, it can certainly irritate the devices completely if they receive incomplete data streams. Do we have errors with the messages "Wrote YY bytes (expected 64)" in the system logs? If not, we do not need to look any further.

When the last packet is transferred, `_usbsend()` returns the effectively counted set of bytes (from `total_sent`). This at least gives the caller the opportunity to check whether something has been lost in the middle.

A bit strange is the structure of the program: Handling the `count` `MSG_SIZE` blocks to be transferred is done in the outer for (...) loop. Repeating the transfer with a treatable error is managed by the inner while(1) loop.

This must be considered when reading the code; The "break" on successful block transfer leaves the inner while, not the for (...). < Synchronization between macro and color information

Definition at line 532 of file usb.c.

References `DELAY_LONG`, `DELAY_SHORT`, `hwload_mode`, `mmutex`, `MSG_SIZE`, `os_usbsend()`, and `reset_stop`.

```

532                                     {
533     int total_sent = 0;
534     for(int i = 0; i < count; i++){
535         // Send each message via the OS function
536         while(1){
537             pthread_mutex_lock(&mutex(kb));
538             DELAY_SHORT(kb);
539             int res = os_usbsend(kb, messages + i * MSG_SIZE, 0, file, line);
540             pthread_mutex_unlock(&mutex(kb));
541             if(res == 0)
542                 return 0;
543             else if(res != -1){
544                 total_sent += res;
545                 break;
546             }
547             // Stop immediately if the program is shutting down or hardware load is set to tryonce
548             if(reset_stop || hwload_mode != 2)
549                 return 0;
550             // Retry as long as the result is temporary failure
551             DELAY_LONG(kb);
552         }
553     }
554     return total_sent;
555 }
```

Here is the call graph for this function:



#### 9.42.3.5 int closeusb ( usbdevice \* kb )

## Parameters

<i>IN,OUT]</i>	kb
----------------	----

## Returns

Returns 0 (everytime. No error handling is done!)

`closeusb` Close a USB device and remove device entry.

An imutex lock ensures first of all, that no communication is currently running from the viewpoint of the driver to the user input device (ie the virtual driver with which characters or mouse movements are sent from the daemon to the operating system as inputs).

If the **kb** has an acceptable value  $\neq 0$ , the index of the device is looked for and with this index `os_inputclose()` is called. After this no more characters can be sent to the operating system.

Then the connection to the usb device is capped by `os_closeusb()`.

**Todo** What is not yet comprehensible is the call to `updateconnected()` BEFORE `os_closeusb()`. Should that be in the other sequence? Or is `updateconnected()` not displaying the connected usb devices, but the representation which uinput devices are loaded? Questions about questions ...

If there is no valid **handle**, only `updateconnected()` is called. We are probably trying to disconnect a connection under construction. Not clear.

The cmd pipe as well as all open notify pipes are deleted via `rmdevpath()`.

This means that nothing can happen to the input path - so the device-specific imutex is unlocked again and remains unlocked.

Also the dmutex is unlocked now, but only to join the thread, which was originally taken under **kb->thread** (which started with `_setupusb()`) with `pthread_join()` again. Because of the closed devices that thread would have to quit sometime

## See Also

the hack note with `rmdevpath()`

As soon as the thread is caught, the dmutex is locked again, which is what I do not understand yet: What other thread can do usb communication now?

If the vtable exists for the given kb (why not? It seems to have race conditions here!!), via the vtable the actually device-specific, but still everywhere identical `freeprofile()` is called. This frees areas that are no longer needed. Then the **usbdevice** structure in its array is set to zero completely.

Error handling is rather unusual in `closeusb()`; Everything works (no matter what the called functions return), and `closeusb()` always returns zero (success).

Definition at line 677 of file `usb.c`.

References `ckb_info`, `devpath`, `dmutex`, `usbdevice::handle`, `imutex`, `INDEX_OF`, `keyboard`, `os_closeusb()`, `os_inputclose()`, `rmdevpath()`, `usbdevice::thread`, `updateconnected()`, and `usbdevice::vtable`.

Referenced by `_setupusb()`, `devmain()`, `quitWithLock()`, and `usb_rm_device()`.

```

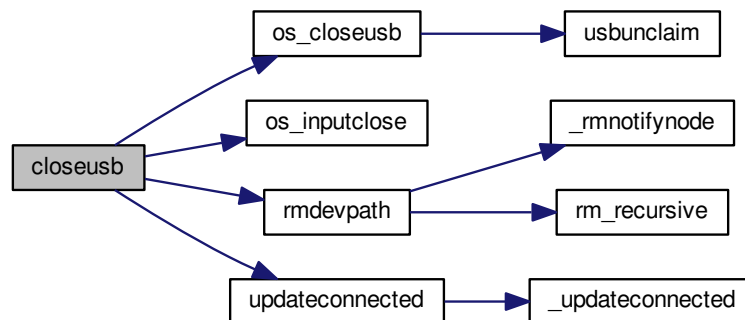
677     {
678     pthread_mutex_lock(&imutex(kb));
679     if(kb->handle) {
680         int index = INDEX_OF(kb, keyboard);
681         ckb_info("Disconnecting %s%d\n", devpath, index);
682         os_inputclose(kb);
683         updateconnected();
684         // Close USB device
685         os_closeusb(kb);
686     } else
687         updateconnected();
688     rmdevpath(kb);
689 
```

```

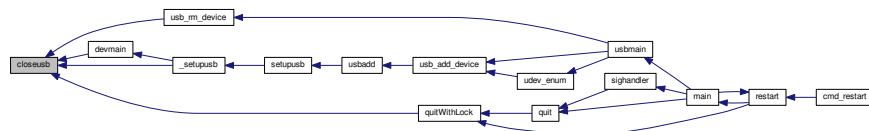
690 // Wait for thread to close
691 pthread_mutex_unlock(imutex(kb));
692 pthread_mutex_unlock(dmutex(kb));
693 pthread_join(kb->thread, 0);
694 pthread_mutex_lock(dmutex(kb));
695
696 // Delete the profile and the control path
697 if(!kb->vtable)
698     return 0;
699 kb->vtable->freeprofile(kb);
700 memset(kb, 0, sizeof(usbdevice));
701 return 0;
702 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.42.3.6 void os\_closeusb ( usbdevice \* kb )

##### Parameters

IN,OUT]	kb THE usbdevice*
---------	-------------------

os\_closeusb unclaim it, destroy the udev device and clear data structures at kb

os\_closeusb is the linux specific implementation for closing an active usb port.

If a valid handle is given in the kb structure, the usb port is unclaimed ([usbunclaim\(\)](#)).

The device is unreferenced via library function [udev\\_device\\_unref\(\)](#).

handle, udev and the first char of kbsyspath are cleared to 0 (empty string for kbsyspath).

Definition at line 435 of file [usb\\_linux.c](#).

References [usbdevice::handle](#), [INDEX\\_OF](#), [kbsyspath](#), [keyboard](#), [usbdevice::udev](#), and [usbunclaim\(\)](#).

Referenced by [closeusb\(\)](#).

```

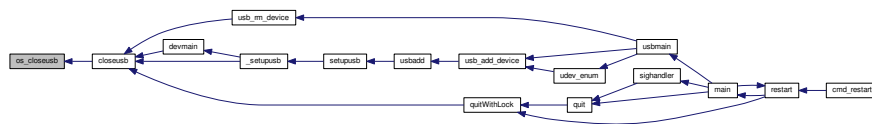
435                                     {
436     if (kb->handle) {
437         usbunclaim(kb, 0);
438         close(kb->handle - 1);
439     }
440     if (kb->udev)
441         udev_device_unref(kb->udev);
442     kb->handle = 0;
443     kb->udev = 0;
444     kbsyspath[INDEX_OF(kb, keyboard)][0] = 0;
445 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.42.3.7 void\* os\_inputmain ( void \* context )

## Parameters

<i>context</i>	THE usbdevice* ; Because <code>os_inputmain()</code> is started as a new thread, its formal parameter is named "context".
----------------	---

## Returns

null

`os_inputmain` is run in a separate thread and will be detached from the main thread, so it needs to clean up its own resources.

**Todo** This function is a collection of many tasks. It should be divided into several sub-functions for the sake of greater convenience:

1. set up an URB (Userspace Ressource Buffer) to communicate with the USBDEVFS\_\* ioctl()s
2. perform the ioctl()
3. interpretate the information got into the URB buffer or handle error situations and retry operation or leave the endless loop
4. inform the os about the data
5. loop endless via 2.

6. if endless loop has gone, deinitalize the interface, free buffers etc.
7. return null

Here the actions in detail:

Monitor input transfers on all endpoints for non-RGB devices For RGB, monitor all but the last, as it's used for input/output

Get an `usbdevfs_urb` data structure and clear it via `memset()`

Hopefully the buffer lengths are equal for all devices with congruent types. You can find out the correctness for your device with `lsusb -v` or similar on macOS. Currently the following combinations are known and implemented:

device	detect with macro combination	endpoint #	buffer-length
each	none	0	8
RGB Mouse	IS_RGB && IS_MOUSE	1	10
RGB Keyboard	IS_RGB && !IS_MOUSE	1	21
RGB Mouse or Keyboard	IS_RGB	2	MSG_SIZE (64)
non RGB Mouse or Keyboard	!IS_RGB	1	4
non RGB Mouse or Keyboard	!IS_RGB	2	15

Now submit all the URBs via `ioctl(USBDEVFS_SUBMITURB)` with type `USBDEVFS_URB_TYPE_INTERRUPT` (the endpoints are defined as type interrupt). Endpoint number is `0x80..0x82` or `0x83`, depending on the model.

The `userSpaceFS` knows the URBs now, so start monitoring input

if the `ioctl` returns something `!= 0`, let's have a deeper look what happened. Broken devices or shutting down the entire system leads to closing the device and finishing this thread.

If just an EPIPE occurred, give the device a `CLEAR_HALT` and resubmit the URB.

A correct `REAPURB` returns a Pointer to the URB which we now have a closer look into. Lock all following actions with `imutex`.

Process the input depending on type of device. Interpret the actual size of the URB buffer

device	detect with macro combination	seems to be endpoint #	actual buffer-length	function called
mouse (RGB and non RGB)	IS_MOUSE	nA	8, 10 or 11	<a href="#">hid_mouse_translate()</a>
mouse (RGB and non RGB)	IS_MOUSE	nA	MSG_SIZE (64)	<a href="#">corsair_mousecopy()</a>
RGB Keyboard	IS_RGB && !IS_MOUSE	1	8 (BIOS Mode)	<a href="#">hid_kb_translate()</a>
RGB Keyboard	IS_RGB && !IS_MOUSE	2	5 or 21, KB inactive!	<a href="#">hid_kb_translate()</a>
RGB Keyboard	IS_RGB && !IS_MOUSE	3?	MSG_SIZE	<a href="#">corsair_kbcopy()</a>
non RGB Keyboard	!IS_RGB && !IS_MOUSE	nA	nA	<a href="#">hid_kb_translate()</a>

The input data is transformed and copied to the `kb` structure. Now give it to the OS and unlock the `imutex` afterwards.

Re-submit the URB for the next run.

If the endless loop is terminated, clean up by discarding the URBs via `ioctl(USBDEVFS_DISCARDURB)`, free the URB buffers and return a null pointer as thread exit code.

Definition at line 238 of file `usb_linux.c`.

References `usbdevice::active`, `ckb_err`, `ckb_info`, `corsair_kbcopy()`, `corsair_mousecopy()`, `devpath`, `usbdevice::epcount`, `usbdevice::handle`, `hid_kb_translate()`, `hid_mouse_translate()`, `imutex`, `INDEX_OF`, `usbdevice::input`, `inputupdate()`, `IS_MOUSE`, `IS_RGB`, `keyboard`, `usbinput::keys`, `MSG_SIZE`, `usbdevice::product`, `usbinput::rel_x`,

usbinput::rel\_y, and usbdevice::vendor.

Referenced by \_setupusb().

```

238                                     {
239     usbdevice* kb = context;
240     int fd = kb->handle - 1;
241     short vendor = kb->vendor, product = kb->product;
242     int index = INDEX_OF(kb, keyboard);
243     ckb_info("Starting input thread for %s%d\n", devpath, index);
244
245     int urbcount = IS_RGB(vendor, product) ? (kb->epcount - 1) : kb->
epcount;
250     if (urbcount == 0) {
251         ckb_err("urbcount = 0, so there is nothing to claim in os_inputmain()\n");
252         return 0;
253     }
254
255     struct usbdevfs_urb urbs[urbcount + 1];
256     memset(urbs, 0, sizeof(urbs));
257
258     urbs[0].buffer_length = 8;
259     if(urbcount > 1 && IS_RGB(vendor, product)) {
260         if(IS_MOUSE(vendor, product))
261             urbs[1].buffer_length = 10;
262         else
263             urbs[1].buffer_length = 21;
264         urbs[2].buffer_length = MSG_SIZE;
265         if(urbcount != 3)
266             urbs[urbcount - 1].buffer_length = MSG_SIZE;
267     } else {
268         urbs[1].buffer_length = 4;
269         urbs[2].buffer_length = 15;
270     }
271
272     for(int i = 0; i < urbcount; i++){
273         urbs[i].type = USBDEVFS_URB_TYPE_INTERRUPT;
274         urbs[i].endpoint = 0x80 | (i + 1);
275         urbs[i].buffer = malloc(urbs[i].buffer_length);
276         ioctl(fd, USBDEVFS_SUBMITURB, urbs + i);
277     }
278
279     while (1) {
280         struct usbdevfs_urb* urb = 0;
281
282         if (ioctl(fd, USBDEVFS_REAPURB, &urb)) {
283             if (errno == ENODEV || errno == ENOENT || errno == ESHUTDOWN)
284                 // Stop the thread if the handle closes
285                 break;
286             else if(errno == EPIPE && urb){
287                 ioctl(fd, USBDEVFS_CLEAR_HALT, &urb->endpoint);
288                 // Re-submit the URB
289                 if(urb)
290                     ioctl(fd, USBDEVFS_SUBMITURB, urb);
291                 urb = 0;
292             }
293             continue;
294         }
295
296         if (urb) {
297             pthread_mutex_lock(&mutex(kb));
298             if(IS_MOUSE(vendor, product)){
299                 switch(urb->actual_length){
300                     case 8:
301                     case 10:
302                     case 11:
303                         // HID mouse input
304                         hid_mouse_translate(kb->input.keys, &kb->
input.rel_x, &kb->input.rel_y, -(urb->endpoint & 0xF), urb->actual_length, urb->buffer)
;
305                         break;
306                     case MSG_SIZE:
307                         // Corsair mouse input
308                         corsair_mousecopy(kb->input.keys, -(urb->endpoint & 0xF), urb
->buffer);
309                         break;
310                 }
311             } else if(IS_RGB(vendor, product)){
312                 switch(urb->actual_length){
313                     case 8:
314                         // RGB EP 1: 6KRO (BIOS mode) input
315                         hid_kb_translate(kb->input.keys, -1, urb->actual_length, urb->
buffer);
316                         break;
317                     case 21:
318                     case 5:

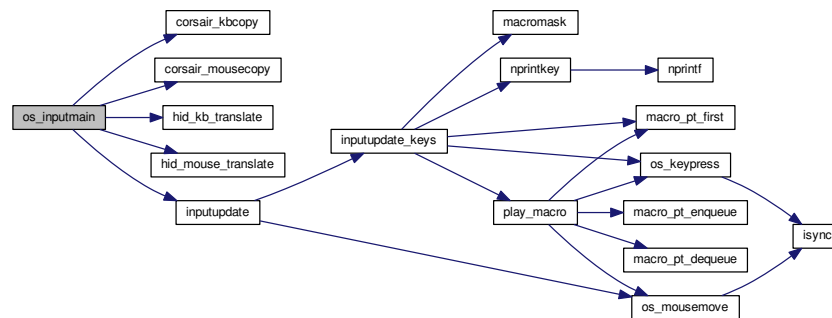
```

```

354             // RGB EP 2: NKRO (non-BIOS) input. Accept only if keyboard is inactive
355             if(!kb->active)
356                 hid_kb_translate(kb->input.keys, -2, urb->actual_length,
urb->buffer);
357             break;
358         case MSG_SIZE:
359             // RGB EP 3: Corsair input
360             corsair_kbcopy(kb->input.keys, -(urb->endpoint & 0xF), urb->
buffer);
361             break;
362     }
363     } else {
364         // Non-RGB input
365         hid_kb_translate(kb->input.keys, urb->endpoint & 0xF, urb->
actual_length, urb->buffer);
366     }
367     inputupdate(kb);
368     pthread_mutex_unlock(&mutex(kb));
369
370     ioctl(fd, USBDEVFS_SUBMITURB, urb);
371     urb = 0;
372 }
373 }
374 }
375 }
376 }
377
378 ckb_info("Stopping input thread for %s%d\n", devpath, index);
379 for(int i = 0; i < urbcount; i++){
380     ioctl(fd, USBDEVFS_DISCARDURB, urbs + i);
381     free(urbs[i].buffer);
382 }
383 return 0;
384 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.42.3.8 int os\_resetusb ( usbdevice \* kb, const char \* file, int line )

##### Parameters

<i>kb</i>	THE usbdevice*
-----------	----------------



<i>file</i>	filename for error messages
<i>line</i>	line where it is called for error messages

#### Returns

Returns 0 on success, -2 if device should be removed and -1 if reset should be tried again

os\_resetusb is the os specific implementation for resetting usb

Try to reset an usb device in a linux user space driver.

1. unclaim the device, but do not reconnect the system driver (second param resetting = true)
2. reset the device via USBDEVFS\_RESET command
3. claim the device again. Returns 0 on success, -2 if device should be removed and -1 if reset should be tried again

**Todo** it seems that no one wants to try the reset again. But I've seen it somewhere...

Definition at line 497 of file usb\_linux.c.

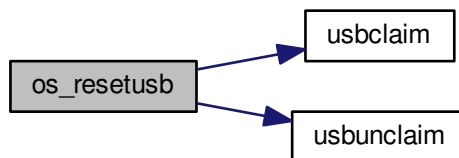
References usbdevice::handle, TEST\_RESET, usbclaim(), and usbunclaim().

Referenced by \_resetusb().

```

497                                     {
498     TEST_RESET(usbunclaim(kb, 1));
499     TEST_RESET(ioctl(kb->handle - 1, USBDEVFS_RESET));
500     TEST_RESET(usbclaim(kb));
501     // Success!
502     return 0;
503 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



9.42.3.9 void os\_sendindicators ( usbdevice \* kb )

## Parameters

<i>kb</i>	THE usbdevice*
-----------	----------------

os\_sendindicators update the indicators for the special keys (Numlock, Capslock and what else?)

os\_sendindicators update the indicators for the special keys (Numlock, Capslock and what else?)

Read the data from kb->ileds ans send them via ioctl() to the keyboard.

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0x21	0x09	0x0200	Interface 0	MSG_SIZE 1 Byte	timeout 0,5ms	the message buffer pointer
Host to Device, Type=Class, Recipi-ent=Interface (why not endpoint?)	9 = SEND?	specific	0	1	500	struct* kb->ileds

The ioctl command is USBDEVFS\_CONTROL.

Definition at line 213 of file usb\_linux.c.

References ckb\_err, usbdevice::handle, usbdevice::ileds, and usb\_tryreset().

Referenced by updateindicators\_kb().

```

213     {
214         static int countForReset = 0;
215         struct usbdevfs_ctrltransfer transfer = { 0x21, 0x09, 0x0200, 0x00, 1, 500, &kb->
ileds };
216         int res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
217         if(res <= 0) {
218             ckb_err("%s\n", res ? strerror(errno) : "No data written");
219             if (usb_tryreset(kb) == 0 && countForReset++ < 3) {
220                 os_sendindicators(kb);
221             }
222         }
223     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.42.3.10 int os\_setupusb ( usbdevice \* kb )

#### Parameters

<i>kb</i>	THE usbdevice*
-----------	----------------

#### Returns

0 on success, -1 otherwise.

os\_setupusb OS-specific setup for a specific usb device.

Perform the operating system-specific opening of the interface in [os\\_setupusb\(\)](#). As a result, some parameters should be set in kb (name, serial, fwversion, epcount = number of usb endpoints), and all endpoints should be claimed with [usbclaim\(\)](#). Claiming is the only point where [os\\_setupusb\(\)](#) can produce an error (-1).

- Copy device description and serial
- Copy firmware version (needed to determine USB protocol)
- Do some output about connecting interfaces
- Claim the USB interfaces

**Todo** in these modules a pullrequest is outstanding

< Try to reset the device and recall the function

< Don't do this endless in recursion

< [os\\_setupusb\(\)](#) has a return value (used as boolean)

Definition at line 535 of file usb\_linux.c.

References [ckb\\_err](#), [ckb\\_info](#), [devpath](#), [usbdevice::epcount](#), [usbdevice::fwversion](#), [INDEX\\_OF](#), [KB\\_NAME\\_LEN](#), [keyboard](#), [usbdevice::name](#), [usbdevice::serial](#), [SERIAL\\_LEN](#), [strtrim\(\)](#), [usbdevice::udev](#), [usb\\_tryreset\(\)](#), and [usbclaim\(\)](#).

Referenced by [\\_setupusb\(\)](#).

```

535     {
536     struct udev_device* dev = kb->udev;
537     const char* name = udev_device_get_sysattr_value(dev, "product");
538     if(name)
539         strncpy(kb->name, name, KB_NAME_LEN);
540     strtrim(kb->name);
541     const char* serial = udev_device_get_sysattr_value(dev, "serial");
542     if(serial)
543         strncpy(kb->serial, serial, SERIAL_LEN);
544     strtrim(kb->serial);
545     const char* firmware = udev_device_get_sysattr_value(dev, "bcdDevice");
546     if(firmware)
547         sscanf(firmware, "%hx", &kb->fwversion);
548     else
549         kb->fwversion = 0;
550     int index = INDEX_OF(kb, keyboard);
551
552     ckb_info("Connecting %s at %s%d\n", kb->name, devpath, index);
553
554     const char* ep_str = udev_device_get_sysattr_value(dev, "bNumInterfaces");
555     #ifdef DEBUG
556     ckb_info("claiming interfaces. name=%s, firmware=%s; Got >>%s<< as ep_str\n", name, firmware,
557             ep_str);
558     #endif //DEBUG
559     kb->epcount = 0;
560     if(ep_str)
561         sscanf(ep_str, "%d", &kb->epcount);
562     if(kb->epcount < 2){
563         // IF we have an RGB KB with 0 or 1 endpoints, it will be in BIOS mode.
564         ckb_err("Unable to read endpoint count from udev, assuming %d and reading >>%s<< or device
565         is in BIOS mode\n", kb->epcount, ep_str);
566         if (usb_tryreset(kb) == 0) {
567             static int retryCount = 0;

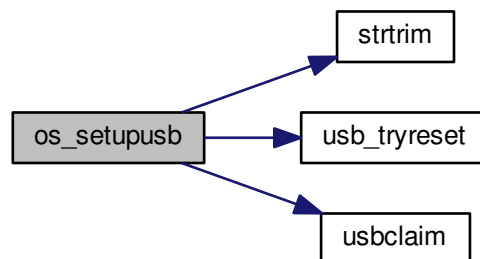
```

```

576         if (retryCount++ < 5) {
577             return os_setupusb(kb);
578         }
579     }
580     return -1;
581     // ToDo are there special versions we have to detect? If there are, that was the old code to handle
it:
582     // This shouldn't happen, but if it does, assume EP count based on ckb_warn what the device is
supposed to have
583     // kb->epcount = (HAS_FEATURES(kb, FEAT_RGB) ? 4 : 3);
584     // ckb_warn("Unable to read endpoint count from udev, assuming %d and reading >>%s<<...\n",
kb->epcount, ep_str);
585 }
586 if(usbclaim(kb)) {
587     ckb_err("Failed to claim interfaces: %s\n", strerror(errno));
588     return -1;
589 }
590 return 0;
591 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



**9.42.3.11** `int os_usbrecv ( usbdevice * kb, uchar * in_msg, const char * file, int line )`

#### Parameters

<i>kb</i>	THE usbdevice*
<i>in_msg</i>	the buffer to fill with the message received
<i>file</i>	for debugging
<i>line</i>	for debugging

#### Returns

-1 on timeout, 0 on hard error, number of bytes received otherwise

os\_usbrecv does what its name says:

The comment at the beginning of the procedure causes the suspicion that the firmware versionspecific distinction is missing for receiving from usb endpoint 3 or 4. The commented code contains only the reception from EP4, but this may be wrong for a software version 2.0 or higher (see the code for os\_usbsend ()).

So all the receiving is done via an `ioctl()` like in `os_usbrecv`. The `ioctl()` is given a struct `usbdevfs_ctrltransfer`, in which the relevant parameters are entered:

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0xA1	0x01	0x0200	endpoint to be addressed from epcount - 1	MSG_SIZE	5ms	the message buffer pointer
Device to Host, Type=Class, Recipient=Interface	1 = RECEIVE?	specific	Interface #	64	5000	in_msg

The `ioctl()` returns the number of bytes received. Here is the usual check again:

- If the return value is -1 AND the error is a timeout (ETIMEOUT), `os_usbrecv()` will return -1 to indicate that it is probably a recoverable problem and a retry is recommended.
- For another negative value or other error identifier OR 0 bytes are received, 0 is returned as an identifier for a heavy error.
- In all other cases, the function returns the number of bytes received.

If this is not the entire blocksize (MSG\_SIZE bytes), an error message is issued on the standard error channel [warning "Read YY bytes (expected 64)"].

Definition at line 129 of file `usb_linux.c`.

References `ckb_err_fn`, `ckb_warn_fn`, `usbdevice::epcount`, `usbdevice::handle`, and `MSG_SIZE`.

Referenced by `_usbrecv()`.

```

129                                     {
130     int res;
131     // This is what CUE does, but it doesn't seem to work on linux.
132     /*if(kb->fwversion >= 0x130){
133         struct usbdevfs_bulktransfer transfer = {0};
134         transfer.ep = 0x84;
135         transfer.len = MSG_SIZE;
136         transfer.timeout = 5000;
137         transfer.data = in_msg;
138         res = ioctl(kb->handle - 1, USBDEVFS_BULK, &transfer);
139     } else {*/
140     struct usbdevfs_ctrltransfer transfer = { 0xa1, 0x01, 0x0300, kb->
141     epcount - 1, MSG_SIZE, 5000, in_msg };
142     res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
143     /*}
144     if(res <= 0){
145         ckb_err_fn("%s\n", file, line, res ? strerror(errno) : "No data read");
146         if(res == -1 && errno == ETIMEDOUT)
147             return -1;
148         else
149             return 0;
150     } else if(res != MSG_SIZE)
151         ckb_warn_fn("Read %d bytes (expected %d)\n", file, line, res,
152         MSG_SIZE);
153 #ifdef DEBUG_USB_RECV
154     char converted[MSG_SIZE*3 + 1];
155     for(int i=0;i<MSG_SIZE;i++)
156         sprintf(&converted[i*3], "%02x ", in_msg[i]);
157     ckb_warn_fn("Recv %s\n", file, line, converted);
158 #endif
159     return res;
160 }

```

Here is the caller graph for this function:



9.42.3.12 `int os_usbrecv ( usbdevice * kb, const uchar * out_msg, int is_recv, const char * file, int line )`

#### Parameters

<i>kb</i>	THE usbdevice*
<i>out_msg</i>	the MSGSIZE char long buffer to send
<i>is_recv</i>	if true, just send an ioctl for further reading packets. If false, send the data at <b>out_msg</b> .
<i>file</i>	for debugging
<i>line</i>	for debugging

#### Returns

-1 on timeout (try again), 0 on hard error, number of bytes sent otherwise

os\_usbrecv has two functions:

- if `is_recv == false`, it tries to send a given MSG\_SIZE buffer via the usb interface given with kb.
- otherwise a request is sent via the usb device to initiate the receiving of a message from the remote device.

The functionality for sending distinguishes two cases, depending on the version number of the firmware of the connected device:

If the firmware is less or equal 1.2, the transmission is done via an `ioctl()`. The `ioctl()` is given a struct `usbdevfs_ctrltransfer`, in which the relevant parameters are entered:

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0x21	0x09	0x0200	endpoint / IF to be addressed from epcount-1	MSG_SIZE	5000 (=5ms)	the message buffer pointer
Host to Device, Type=Class, Recipient=Interface	9 = Send data?	specific	last or pre-last device #	64	5000	out_msg

The `ioctl` command is `USBDEVFS_CONTROL`.

The same constellation is used if the device is requested to send its data (`is_recv = true`).

For a more recent firmware and `is_recv = false`, the `ioctl` command `USBDEVFS_CONTROL` is not used (this tells the bus to enter the control mode), but the bulk method is used: `USBDEVFS_BULK`. This is astonishing, because all of the endpoints are type Interrupt, not bulk.

Anyhow, for this purpose a different structure is used for the `ioctl()` (struct **usbdevfs\_bulktransfer**) and this is also initialized differently:

The length and timeout parameters are given the same values as above. The formal parameter `out_msg` is also passed as a buffer pointer. For the endpoints, the firmware version is differentiated again:

For a firmware version between 1.3 and  $<2.0$  endpoint 4 is used, otherwise (it can only be  $\geq 2.0$ ) endpoint 3 is used.

**Todo** Since the handling of endpoints has already led to problems elsewhere, this implementation is extremely hardware-dependent and critical!

Eg. the new keyboard K95PLATINUMRGB has a version number significantly less than 2.0 - will it run with this implementation?

The `ioctl()` - no matter what type - returns the number of bytes sent. Now comes the usual check:

- If the return value is -1 AND the error is a timeout (ETIMEDOUT), `os_usb_send()` will return -1 to indicate that it is probably a recoverable problem and a retry is recommended.
- For another negative value or other error identifier OR 0 bytes sent, 0 is returned as a heavy error identifier.
- In all other cases, the function returns the number of bytes sent.

If this is not the entire blocksize (MSG\_SIZE bytes), an error message is issued on the standard error channel [warning "Wrote YY bytes (expected 64)"].

If `DEBUG_USB` is set during compilation, the number of bytes sent and their representation are logged to the error channel.

Definition at line 68 of file `usb_linux.c`.

References `ckb_err_fn`, `ckb_warn_fn`, `usbdevice::epcount`, `usbdevice::fwversion`, `usbdevice::handle`, and `MSG_SIZE`.

Referenced by `_usbrecv()`, and `_usb_send()`.

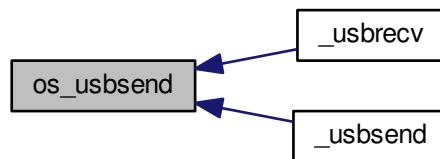
```

68                                     {
69     int res;
70     if (kb->fwversion >= 0x120 && !is_recv) {
71         struct usbdevfs_bulktransfer transfer = {0};
72         transfer.ep = (kb->fwversion >= 0x130 && kb->fwversion < 0x200) ? 4 : 3;
73         transfer.len = MSG_SIZE;
74         transfer.timeout = 5000;
75         transfer.data = (void*)out_msg;
76         res = ioctl(kb->handle - 1, USBDEVFS_BULK, &transfer);
77     } else {
78         struct usbdevfs_ctrltransfer transfer = { 0x21, 0x09, 0x0200, kb->
79         epcount - 1, MSG_SIZE, 5000, (void*)out_msg };
80         res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
81     }
82     if (res <= 0) {
83         ckb_err_fn(" %s, res = 0x%x\n", file, line, res ? strerror(errno) : "No data written",
84         res);
85         if (res == -1 && errno == ETIMEDOUT)
86             return -1;
87         else
88             return 0;
89     } else if (res != MSG_SIZE)
90         ckb_warn_fn("Wrote %d bytes (expected %d)\n", file, line, res,
91         MSG_SIZE);
92 #ifdef DEBUG_USB
93     char converted[MSG_SIZE*3 + 1];
94     for(int i=0; i<MSG_SIZE; i++)
95         sprintf(&converted[i*3], "%02x ", out_msg[i]);
96     ckb_warn_fn("Sent %s\n", file, line, converted);
97 #endif
98     return res;
99 }

```



Here is the caller graph for this function:



#### 9.42.3.13 const char\* product\_str ( short product )

##### Parameters

<i>product</i>	is the <i>short</i> USB device product ID
----------------	---

##### Returns

string to identify a type of device (see below)

product\_str returns a condensed view on what type of device we have.

At present, various models and their properties are known from corsair products. Some models differ in principle (mice and keyboards), others differ in the way they function (for example, RGB and non RGB), but they are very similar.

Here, only the first point is taken into consideration and we return a unified model string. If the model is not known with its number, *product\_str* returns an empty string.

The model numbers and corresponding strings with the numbers in hex-string are defined in [usb.h](#)

At present, this function is used to initialize *kb->name* and to give information in debug strings.

##### Attention

The combinations below have to fit to the combinations in the macros mentioned above. So if you add a device with a new number, change both.

**Todo** There are macros defined in [usb.h](#) to detect all the combinations below. the only difference is the parameter: The macros need the *kb\**, [product\\_str\(\)](#) needs the *product ID*

Definition at line 70 of file [usb.c](#).

References [P\\_K65](#), [P\\_K65\\_LUX](#), [P\\_K65\\_NRGB](#), [P\\_K65\\_RFIRE](#), [P\\_K70](#), [P\\_K70\\_LUX](#), [P\\_K70\\_LUX\\_NRGB](#), [P\\_K70\\_NRGB](#), [P\\_K70\\_RFIRE](#), [P\\_K70\\_RFIRE\\_NRGB](#), [P\\_K95](#), [P\\_K95\\_NRGB](#), [P\\_K95\\_PLATINUM](#), [P\\_M65](#), [P\\_M65\\_PRO](#), [P\\_SABRE\\_L](#), [P\\_SABRE\\_N](#), [P\\_SABRE\\_O](#), [P\\_SABRE\\_O2](#), [P\\_SCIMITAR](#), [P\\_SCIMITAR\\_PRO](#), [P\\_STRAFE](#), and [P\\_STRAFE\\_NRGB](#).

Referenced by [\\_mkdevpath\(\)](#), and [\\_setupusb\(\)](#).

```

70
71     if (product == P_K95 || product == P_K95_NRGB || product ==
72         P_K95_PLATINUM)
73         return "k95";
74     if (product == P_K70 || product == P_K70_NRGB || product ==
75         P_K70_LUX || product == P_K70_LUX_NRGB || product ==

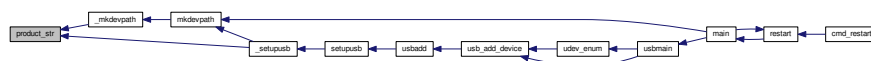
```

```

P_K70_RFIRE || product == P_K70_RFIRE_NRGB)
74     return "k70";
75     if (product == P_K65 || product == P_K65_NRGB || product ==
P_K65_LUX || product == P_K65_RFIRE)
76     return "k65";
77     if (product == P_STRAFE || product == P_STRAFE_NRGB)
78     return "strafe";
79     if (product == P_M65 || product == P_M65_PRO)
80     return "m65";
81     if (product == P_SABRE_O || product == P_SABRE_L || product ==
P_SABRE_N || product == P_SABRE_O2)
82     return "sabre";
83     if (product == P_SCIMITAR || product == P_SCIMITAR_PRO)
84     return "scimitar";
85     return "";
86 }

```

Here is the caller graph for this function:



#### 9.42.3.14 int revertusb ( usbdevice \* kb )

##### Parameters

<i>kb</i>	THE usbdevice*
-----------	----------------

##### Returns

0 on success or if device needs firmware upgrade, -1 otherwise

revertusb sets a given device to inactive (hardware controlled) mode if not a fw-upgrade is indicated

First is checked, whether a firmware-upgrade is indicated for the device. If so, [revertusb\(\)](#) returns 0.

**Todo** Why is this useful? Are there problems seen with deactivating a device with older fw-version??? Why isn't this an error indicating reason and we return success (0)?

Anyway, the following steps are similar to some other procs, dealing with low level usb handling:

- If we do not have an RGB device, a simple setting to Hardware-mode (NK95\_HWON) is sent to the device via `nk95cmd()`.

**Todo** The return value of `nk95cmd()` is ignored (but sending the ioctl may produce an error and `_nk95_cmd` will indicate this), instead `revertusb()` returns success in any case.

- If we have an RGB device, `setactive()` is called with second param active = false. That function will have a look on differences between keyboards and mice.

More precisely `setactive()` is just a macro to call via the `kb->vtable` entries either the `active()` or the `idle()` function where the `vtable` points to. `setactive()` may return error indications. If so, `revertusb()` returns -1, otherwise 0 in any other case.

Definition at line 407 of file `usb.c`.

References `FEAT_RGB`, `HAS_FEATURES`, `NEEDS_FW_UPDATE`, `NK95_HWON`, `nk95cmd`, and `setactive`.

Referenced by `quitWithLock()`.

```

407     {
408         if (NEEDS_FW_UPDATE(kb))
409             return 0;
410         if (!HAS_FEATURES(kb, FEAT_RGB)) {
411             nk95cmd(kb, NK95_HWON);
412             return 0;
413         }
414         if (setactive(kb, 0))
415             return -1;
416         return 0;
417     }

```

Here is the caller graph for this function:



#### 9.42.3.15 void setupusb ( usbdevice \* kb )

##### Attention

Lock a device's dmutex (see [device.h](#)) before accessing the USB interface.

##### Parameters

<i>kb</i>	THE usbdevice* used everywhere
<i>OUT]</i>	kb->thread is used to store the thread ID of the fresh created thread.

setupusb starts a thread with kb as parameter and [\\_setupusb\(\)](#) as entrypoint.

Set up a USB device after its handle is open. Spawns a new thread [\\_setupusb\(\)](#) with standard parameter kb. dmutex must be locked prior to calling this function. The function will unlock it when finished. In kb->thread the thread id is mentioned, because [closeusb\(\)](#) needs this info for joining that thread again.

Definition at line 386 of file usb.c.

References [\\_setupusb\(\)](#), [ckb\\_err](#), [imutex](#), and [usbdevice::thread](#).

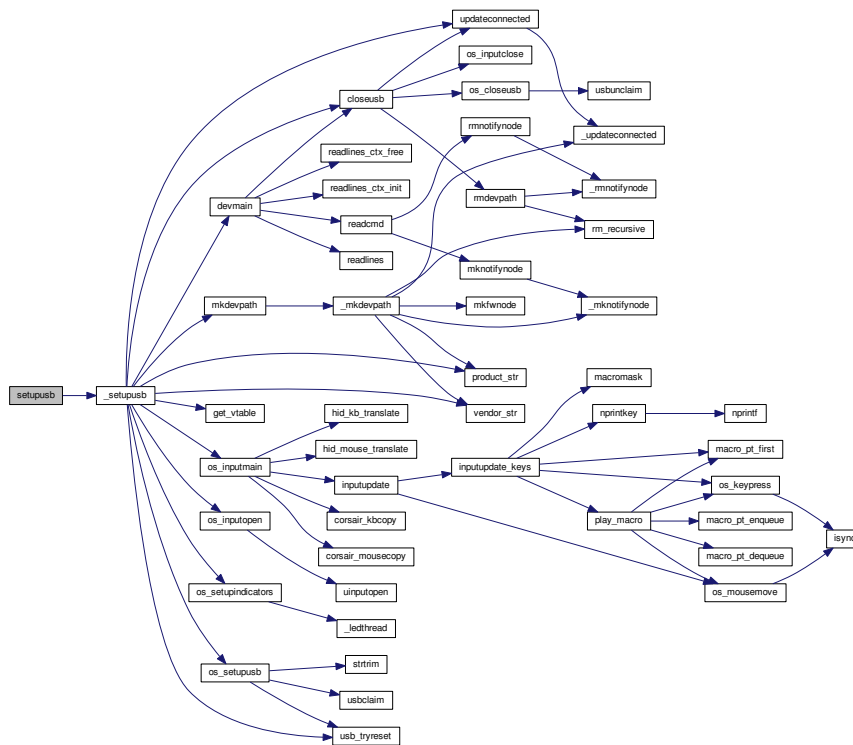
Referenced by [usbadd\(\)](#).

```

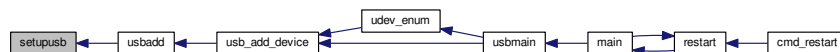
386     {
387         pthread_mutex_lock(&imutex(kb));
388         if (pthread_create(&kb->thread, 0, _setupusb, kb))
389             ckb_err("Failed to create USB thread\n");
390     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.42.3.16 int usb\_tryreset ( usbdevice \* kb )

##### Parameters

in, out	kb	THE usbdevice*
in	reset_stop	global variable is read

##### Returns

0 on success, -1 otherwise

usb\_tryreset does what the name means: Try to reset the usb via [resetusb\(\)](#)

This function is called if an usb command ran into an error in case of one of the following two situations:

- When setting up a new usb device and the start() function got an error (

See Also

[\\_setupusb\(\)](#)

- If upgrading to a new firmware gets an error (

See Also

[cmd\\_fwupdate\(\)](#).

The previous action which got the error will NOT be re-attempted.

In an endless loop [usb\\_tryreset\(\)](#) tries to reset the given usb device via the macro [resetusb\(\)](#).

This macro calls [\\_resetusb\(\)](#) with debugging information.

[\\_resetusb\(\)](#) sends a command via the operating system dependent function [os\\_resetusb\(\)](#) and - if successful - reinitializes the device. [os\\_resetusb\(\)](#) returns -2 to indicate a broken device and all structures should be removed for it.

In that case, the loop is terminated, an error message is produced and [usb\\_tryreset\(\)](#) returns -1.

In case [resetusb\(\)](#) has success, the endless loop is left via a return 0 (success).

If the return value from [resetusb\(\)](#) is -1, the loop is continued with the next try.

If the global variable **reset\_stop** is set directly when the function is called or after each try, [usb\\_tryreset\(\)](#) stops working and returns -1.

**Todo** Why does [usb\\_tryreset\(\)](#) hide the information returned from [resetusb\(\)](#)? Isn't it needed by the callers?

Definition at line 465 of file usb.c.

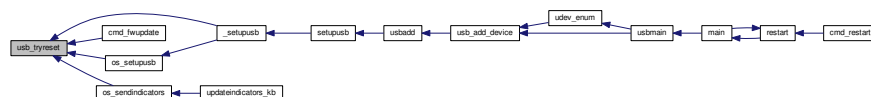
References [ckb\\_err](#), [ckb\\_info](#), [reset\\_stop](#), and [resetusb](#).

Referenced by [\\_setupusb\(\)](#), [cmd\\_fwupdate\(\)](#), [os\\_sendindicators\(\)](#), and [os\\_setupusb\(\)](#).

```

465                                     {
466     if(reset_stop)
467         return -1;
468     ckb_info("Attempting reset...\n");
469     while(1) {
470         int res = resetusb(kb);
471         if(!res) {
472             ckb_info("Reset success\n");
473             return 0;
474         }
475         if(res == -2 || reset_stop)
476             break;
477     }
478     ckb_err("Reset failed. Disconnecting.\n");
479     return -1;
480 }
```

Here is the caller graph for this function:



#### 9.42.3.17 void usbkill ( )

Definition at line 835 of file usb\_linux.c.

Referenced by [quitWithLock\(\)](#).

```

835     {
836     udev_unref(udev);
837     udev = 0;
838 }

```

Here is the caller graph for this function:



#### 9.42.3.18 int usbmain ( )

Start the USB main loop. Returns program exit code when finished.

usbmain is called by [main\(\)](#) after setting up all other stuff.

##### Returns

0 normally or -1 if fatal error occurs (up to now only if no new devices are available)

First check whether the uinput module is loaded by the kernel.

**Todo** Why isn't missing of uinput a fatal error?

Create the udev object with [udev\\_new\(\)](#) (is a function from [libudev.h](#)) terminate -1 if error

Enumerate all currently connected devices

**Todo** lae. here the work has to go on...

Definition at line 775 of file [usb\\_linux.c](#).

References [ckb\\_fatal](#), [ckb\\_warn](#), [udev\\_enum\(\)](#), [usb\\_add\\_device\(\)](#), and [usb\\_rm\\_device\(\)](#).

Referenced by [main\(\)](#).

```

775     {
780     // Load the uinput module (if it's not loaded already)
781     if(system("modprobe uinput") != 0)
782         ckb_warn("Failed to load uinput module\n");
783
787     if(!(udev = udev_new())) {
788         ckb_fatal("Failed to initialize udev in usbmain(), usb_linux.c\n");
789         return -1;
790     }
791
794     udev_enum();
795
798     // Done scanning. Enter a loop to poll for device updates
799     struct udev_monitor* monitor = udev_monitor_new_from_netlink(udev, "udev");
800     udev_monitor_filter_add_match_subsystem_devtype(monitor, "usb", 0);
801     udev_monitor_enable_receiving(monitor);
802     // Get an fd for the monitor
803     int fd = udev_monitor_get_fd(monitor);
804     fd_set fds;
805     while(udev){
806         FD_ZERO(&fds);
807         FD_SET(fd, &fds);
808         // Block until an event is read
809         if(select(fd + 1, &fds, 0, 0, 0) > 0 && FD_ISSET(fd, &fds)){
810             struct udev_device* dev = udev_monitor_receive_device(monitor);
811             if(!dev)
812                 continue;

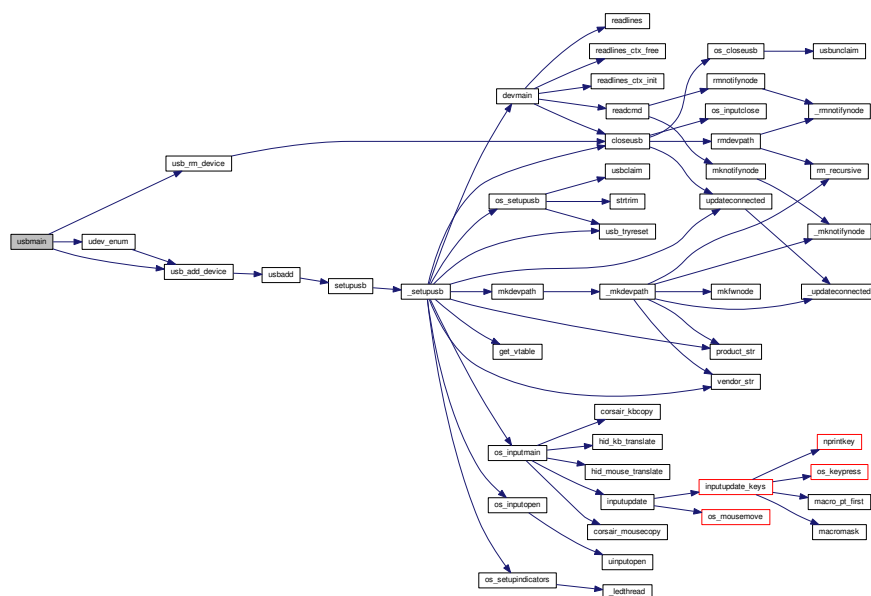
```

```

813     const char* action = udev_device_get_action(dev);
814     if(!action){
815         udev_device_unref(dev);
816         continue;
817     }
818     // Add/remove device
819     if(!strcmp(action, "add")){
820         int res = usb_add_device(dev);
821         if(res == 0)
822             continue;
823         // If the device matched but the handle wasn't opened correctly, re-enumerate (this
sometimes solves the problem)
824         if(res == -1)
825             udev_enum();
826     } else if(!strcmp(action, "remove"))
827         usb_rm_device(dev);
828     udev_device_unref(dev);
829 }
830 }
831 udev_monitor_unref(monitor);
832 return 0;
833 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.42.3.19 `const char* vendor_str ( short vendor )`

uncomment to see USB packets sent from the device vendor\_str Vendor/product string representations





## Data Structures

- struct [\\_model](#)

## Macros

- #define [DEBUG](#)  
*all open usb devices have their system path names here in this array.*
- #define [TEST\\_RESET](#)(op)  
*TEST\_RESET does a "try / catch" for resetting the usb interface.*
- #define [N\\_MODELS](#) (sizeof([models](#)) / sizeof([\\_model](#)))

## Functions

- int [os\\_usbsend](#) (usbdevice \*kb, const uchar \*out\_msg, int is\_rcv, const char \*file, int line)  
*os\_usbsend sends a data packet (MSG\_SIZE = 64) Bytes long*
- int [os\\_usbrecv](#) (usbdevice \*kb, uchar \*in\_msg, const char \*file, int line)  
*os\_usbrecv receives a max MSGSIZE long buffer from usb device*
- int [\\_nk95cmd](#) (usbdevice \*kb, uchar bRequest, ushort wValue, const char \*file, int line)  
*\_nk95cmd If we control a non RGB keyboard, set the keyboard via ioctl with usbdevfs\_ctrltransfer*
- void [os\\_sendindicators](#) (usbdevice \*kb)
- void \* [os\\_inputmain](#) (void \*context)  
*os\_inputmain This function is run in a separate thread and will be detached from the main thread, so it needs to clean up its own resources.*
- static int [usbunclaim](#) (usbdevice \*kb, int resetting)
- void [os\\_closeusb](#) (usbdevice \*kb)
- static int [usbclaim](#) (usbdevice \*kb)
- int [os\\_resetusb](#) (usbdevice \*kb, const char \*file, int line)
- void [strtrim](#) (char \*string)
- int [os\\_setupusb](#) (usbdevice \*kb)
- int [usbadd](#) (struct udev\_device \*dev, short vendor, short product)
- static int [usb\\_add\\_device](#) (struct udev\_device \*dev)  
*Add a udev device. Returns 0 if device was recognized/added.*
- static void [usb\\_rm\\_device](#) (struct udev\_device \*dev)  
*usb\_rm\_device find the usb port to remove and close it via [closeusb\(\)](#).*
- static void [udev\\_enum](#) ()  
*udev\_enum use the udev\_enumerate\_add\_match\_subsystem() to get all you need but only that.*
- int [usbmain](#) ()
- void [usbkill](#) ()  
*Stop the USB system.*

## Variables

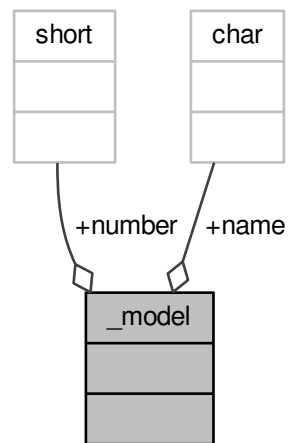
- static char [kbsyspath](#) [9][FILENAME\_MAX]
- static struct udev \* [udev](#)  
*struct udev is defined in /usr/include/libudev.h*
- pthread\_t [usbthread](#)
- pthread\_t [udevthread](#)
- static [\\_model](#) [models](#) []

### 9.43.1 Data Structure Documentation

#### 9.43.1.1 struct \_model

Definition at line 645 of file usb\_linux.c.

Collaboration diagram for \_model:



#### Data Fields

const char *	name	
short	number	

### 9.43.2 Macro Definition Documentation

#### 9.43.2.1 #define DEBUG

Definition at line 11 of file usb\_linux.c.

#### 9.43.2.2 #define N\_MODELS (sizeof(models) / sizeof(\_model))

Definition at line 682 of file usb\_linux.c.

Referenced by usb\_add\_device().

#### 9.43.2.3 #define TEST\_RESET( op )

**Value:**

```

if (op) {
    ckb_err_fn("resetusb failed: %s\n", file, line, strerror(errno)); \
    if(errno == EINTR || errno == EAGAIN)                             \
        return -1; /* try again if status code says so */           \
    return -2; /* else, remove device */                             \
}

```

Definition at line 479 of file usb\_linux.c.

Referenced by os\_resetusb().

### 9.43.3 Function Documentation

#### 9.43.3.1 int \_nk95cmd ( usbdevice \* kb, uchar bRequest, ushort wValue, const char \* file, int line )

To send control packets to a non RGB non color K95 Keyboard, use this function. Normally it is called via the [nk95cmd\(\)](#) macro.

If it is the wrong device for which the function is called, 0 is returned and nothing done. Otherwise a usbdevfs\_ -ctrltransfer structure is filled and an USBDEVFS\_CONTROL ioctl() called.

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0x40	see table below to switch hardware-modus at Keyboard	wValue	device	MSG_SIZE	5ms	the message buffer pointer
Host to Device, Type=Vendor, Recipient=Device	bRequest parameter	given wValue Parameter	device 0	0 data to write	5000	null

If a 0 or a negative error number is returned by the ioctl, an error message is shown depending on the errno or "No data written" if retval was 0. In either case 1 is returned to indicate the error. If the ioctl returned a value > 0, 0 is returned to indicate no error.

Currently the following combinations for bRequest and wValue are used:

Device	what it might to do	constant	bRequest	wValue
non RGB Keyboard	set HW-modus on (leave the ckb driver)	HWON	0x0002	0x0030
non RGB Keyboard	set HW-modus off (initialize the ckb driver)	HWOFF	0x0002	0x0001
non RGB Keyboard	set light modus M1 in single-color keyboards	NK95_M1	0x0014	0x0001
non RGB Keyboard	set light modus M2 in single-color keyboards	NK95_M2	0x0014	0x0002
non RGB Keyboard	set light modus M3 in single-color keyboards	NK95_M3	0x0014	0x0003

See Also

[usb.h](#)

Definition at line 188 of file usb\_linux.c.

References ckb\_err\_fn, usbdevice::handle, P\_K95\_NRGB, and usbdevice::product.

```

188
189     if (kb->product != P_K95_NRGB) {
```

```

190         return 0;
191     struct usbdevfs_ctrltransfer transfer = { 0x40, bRequest, wValue, 0, 0, 5000, 0 };
192     int res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
193     if(res <= 0){
194         ckb_err_fn("%s\n", file, line, res ? strerror(errno) : "No data written");
195         return 1;
196     }
197     return 0;
198 }

```

### 9.43.3.2 void os\_closeusb ( usbdevice \* kb )

os\_closeusb unclaim it, destroy the udev device and clear data structures at kb

os\_closeusb is the linux specific implementation for closing an active usb port.

If a valid handle is given in the kb structure, the usb port is unclaimed ([usbunclaim\(\)](#)).

The device is unrefenced via library function udev\_device\_unref().

handle, udev and the first char of kbsyspath are cleared to 0 (empty string for kbsyspath).

Definition at line 435 of file usb\_linux.c.

References [usbdevice::handle](#), [INDEX\\_OF](#), [kbsyspath](#), [keyboard](#), [usbdevice::udev](#), and [usbunclaim\(\)](#).

Referenced by [closeusb\(\)](#).

```

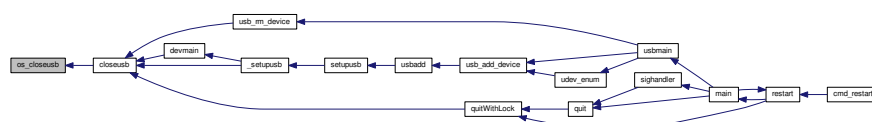
435     {
436         if(kb->handle){
437             usbunclaim(kb, 0);
438             close(kb->handle - 1);
439         }
440         if(kb->udev)
441             udev_device_unref(kb->udev);
442         kb->handle = 0;
443         kb->udev = 0;
444         kbsyspath[INDEX_OF(kb, keyboard)][0] = 0;
445     }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.43.3.3 void\* os\_inputmain ( void \* context )

os\_inputmain is run in a separate thread and will be detached from the main thread, so it needs to clean up its own resources.

**Todo** This function is a collection of many tasks. It should be divided into several sub-functions for the sake of greater convenience:

1. set up an URB (Userspace Resource Buffer) to communicate with the USBDEVFS\_\* ioctl(s)
2. perform the ioctl()
3. interpretate the information got into the URB buffer or handle error situations and retry operation or leave the endless loop
4. inform the os about the data
5. loop endless via 2.
6. if endless loop has gone, deinitalize the interface, free buffers etc.
7. return null

Here the actions in detail:

Monitor input transfers on all endpoints for non-RGB devices For RGB, monitor all but the last, as it's used for input/output

Get an usbdevfs\_urb data structure and clear it via memset()

Hopefully the buffer lengths are equal for all devices with congruent types. You can find out the correctness for your device with lsusb -v or similar on macOS. Currently the following combinations are known and implemented:

device	detect with macro combination	endpoint #	buffer-length
each	none	0	8
RGB Mouse	IS_RGB && IS_MOUSE	1	10
RGB Keyboard	IS_RGB && !IS_MOUSE	1	21
RGB Mouse or Keyboard	IS_RGB	2	MSG_SIZE (64)
non RGB Mouse or Keyboard	!IS_RGB	1	4
non RGB Mouse or Keyboard	!IS_RGB	2	15

Now submit all the URBs via ioctl(USBDEVFS\_SUBMITURB) with type USBDEVFS\_URB\_TYPE\_INTERRUPT (the endpoints are defined as type interrupt). Endpoint number is 0x80..0x82 or 0x83, depending on the model.

The userSpaceFS knows the URBs now, so start monitoring input

if the ioctl returns something != 0, let's have a deeper look what happened. Broken devices or shutting down the entire system leads to closing the device and finishing this thread.

If just an EPIPE occurred, give the device a CLEAR\_HALT and resubmit the URB.

A correct REAPURB returns a Pointer to the URB which we now have a closer look into. Lock all following actions with imutex.

Process the input depending on type of device. Interpret the actual size of the URB buffer

device	detect with macro combination	seems to be endpoint #	actual buffer-length	function called
mouse (RGB and non RGB)	IS_MOUSE	nA	8, 10 or 11	<a href="#">hid_mouse_translate()</a>
mouse (RGB and non RGB)	IS_MOUSE	nA	MSG_SIZE (64)	<a href="#">corsair_mousecopy()</a>
RGB Keyboard	IS_RGB && !IS_MOUSE	1	8 (BIOS Mode)	<a href="#">hid_kb_translate()</a>

RGB Keyboard	IS_RGB && !IS_MOUSE	2	5 or 21, KB inactive!	<a href="#">hid_kb_translate()</a>
RGB Keyboard	IS_RGB && !IS_MOUSE	3?	MSG_SIZE	<a href="#">corsair_kbcopy()</a>
non RGB Keyboard	!IS_RGB && !IS_MOUSE	nA	nA	<a href="#">hid_kb_translate()</a>

The input data is transformed and copied to the kb structure. Now give it to the OS and unlock the imutex afterwards.

Re-submit the URB for the next run.

If the endless loop is terminated, clean up by discarding the URBs via `ioctl(USBDEVFS_DISCARDURB)`, free the URB buffers and return a null pointer as thread exit code.

Definition at line 238 of file `usb_linux.c`.

References `usbdevice::active`, `ckb_err`, `ckb_info`, `corsair_kbcopy()`, `corsair_mousecopy()`, `devpath`, `usbdevice::epcount`, `usbdevice::handle`, `hid_kb_translate()`, `hid_mouse_translate()`, `imutex`, `INDEX_OF`, `usbdevice::input`, `inputupdate()`, `IS_MOUSE`, `IS_RGB`, `keyboard`, `usbinput::keys`, `MSG_SIZE`, `usbdevice::product`, `usbinput::rel_x`, `usbinput::rel_y`, and `usbdevice::vendor`.

Referenced by `_setupusb()`.

```

238                                     {
239     usbdevice* kb = context;
240     int fd = kb->handle - 1;
241     short vendor = kb->vendor, product = kb->product;
242     int index = INDEX_OF(kb, keyboard);
243     ckb_info("Starting input thread for %s%d\n", devpath, index);
244
245     int urbcount = IS_RGB(vendor, product) ? (kb->epcount - 1) : kb->
epcount;
250     if (urbcount == 0) {
251         ckb_err("urbcount = 0, so there is nothing to claim in os_inputmain()\n");
252         return 0;
253     }
254
255     struct usbdevfs_urb urbs[urbcount + 1];
256     memset(urbs, 0, sizeof(urbs));
257
258     urbs[0].buffer_length = 8;
259     if (urbcount > 1 && IS_RGB(vendor, product)) {
260         if (IS_MOUSE(vendor, product))
261             urbs[1].buffer_length = 10;
262         else
263             urbs[1].buffer_length = 21;
264         urbs[2].buffer_length = MSG_SIZE;
265         if (urbcount != 3)
266             urbs[urbcount - 1].buffer_length = MSG_SIZE;
267     } else {
268         urbs[1].buffer_length = 4;
269         urbs[2].buffer_length = 15;
270     }
271
272     for (int i = 0; i < urbcount; i++) {
273         urbs[i].type = USBDEVFS_URB_TYPE_INTERRUPT;
274         urbs[i].endpoint = 0x80 | (i + 1);
275         urbs[i].buffer = malloc(urbs[i].buffer_length);
276         ioctl(fd, USBDEVFS_SUBMITURB, urbs + i);
277     }
278
279     while (1) {
280         struct usbdevfs_urb* urb = 0;
281
282         if (ioctl(fd, USBDEVFS_REAPURB, &urb)) {
283             if (errno == ENODEV || errno == ENOENT || errno == ESHUTDOWN)
284                 // Stop the thread if the handle closes
285                 break;
286             else if (errno == EPIPE && urb) {
287                 ioctl(fd, USBDEVFS_CLEAR_HALT, &urb->endpoint);
288                 // Re-submit the URB
289                 if (urb)
290                     ioctl(fd, USBDEVFS_SUBMITURB, urb);
291                 urb = 0;
292             }
293             continue;
294         }
295
296         if (urb) {
297             pthread_mutex_lock(&imutex(kb));

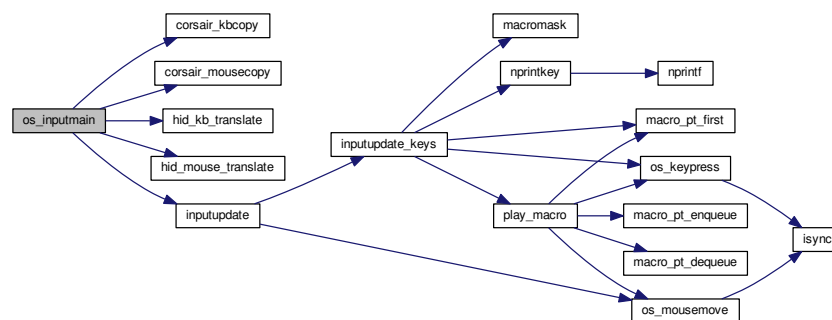
```

```

333         if(IS_MOUSE(vendor, product)){
334             switch(urb->actual_length){
335                 case 8:
336                 case 10:
337                 case 11:
338                     // HID mouse input
339                     hid_mouse_translate(kb->input.keys, &kb->
input.rel_x, &kb->input.rel_y, -(urb->endpoint & 0xF), urb->actual_length, urb->buffer)
;
340                     break;
341                 case MSG_SIZE:
342                     // Corsair mouse input
343                     corsair_mousecopy(kb->input.keys, -(urb->endpoint & 0xF), urb
->buffer);
344                     break;
345             }
346         } else if(IS_RGB(vendor, product)){
347             switch(urb->actual_length){
348                 case 8:
349                     // RGB EP 1: 6KRO (BIOS mode) input
350                     hid_kb_translate(kb->input.keys, -1, urb->actual_length, urb->
buffer);
351                     break;
352                 case 21:
353                 case 5:
354                     // RGB EP 2: NKRO (non-BIOS) input. Accept only if keyboard is inactive
355                     if(!kb->active)
356                         hid_kb_translate(kb->input.keys, -2, urb->actual_length,
urb->buffer);
357                     break;
358                 case MSG_SIZE:
359                     // RGB EP 3: Corsair input
360                     corsair_kbcopy(kb->input.keys, -(urb->endpoint & 0xF), urb->
buffer);
361                     break;
362             }
363         } else {
364             // Non-RGB input
365             hid_kb_translate(kb->input.keys, urb->endpoint & 0xF, urb->
actual_length, urb->buffer);
366         }
367         inputupdate(kb);
368         pthread_mutex_unlock(&mutex(kb));
369         ioctl(fd, USBDEVFS_SUBMITURB, urb);
370         urb = 0;
371     }
372 }
373
374 ckb_info("Stopping input thread for %s%d\n", devpath, index);
375 for(int i = 0; i < urbcount; i++){
376     ioctl(fd, USBDEVFS_DISCARDURB, urbs + i);
377     free(urbs[i].buffer);
378 }
379 return 0;
380 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.43.3.4 int os\_resetusb ( usbdevice \* kb, const char \* file, int line )

os\_resetusb is the os specific implementation for resetting usb

Try to reset an usb device in a linux user space driver.

1. unclaim the device, but do not reconnect the system driver (second param resetting = true)
2. reset the device via USBDEVFS\_RESET command
3. claim the device again. Returns 0 on success, -2 if device should be removed and -1 if reset should be tried again

**Todo** it seems that no one wants to try the reset again. But I've seen it somewhere...

Definition at line 497 of file usb\_linux.c.

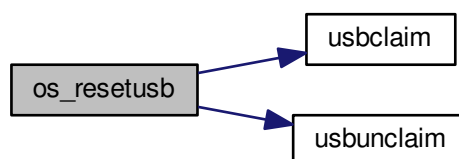
References usbdevice::handle, TEST\_RESET, usbclaim(), and usbunclaim().

Referenced by \_resetusb().

```

497                                     {
498     TEST_RESET(usbunclaim(kb, 1));
499     TEST_RESET(ioctl(kb->handle - 1, USBDEVFS_RESET));
500     TEST_RESET(usbclaim(kb));
501     // Success!
502     return 0;
503 }
```

Here is the call graph for this function:





Here is the caller graph for this function:



#### 9.43.3.5 void os\_sendindicators ( usbdevice \* kb )

os\_sendindicators update the indicators for the special keys (Numlock, Capslock and what else?)

os\_sendindicators update the indicators for the special keys (Numlock, Capslock and what else?)

Read the data from kb->ileds ans send them via ioctl() to the keyboard.

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0x21	0x09	0x0200	Interface 0	MSG_SIZE 1 Byte	timeout 0,5ms	the message buffer pointer
Host to Device, Type=Class, Recipient=Interface (why not endpoint?)	9 = SEND?	specific	0	1	500	struct* kb->ileds

The ioctl command is USBDEVFS\_CONTROL.

Definition at line 213 of file usb\_linux.c.

References ckb\_err, usbdevice::handle, usbdevice::ileds, and usb\_tryreset().

Referenced by updateindicators\_kb().

```

213                                     {
214     static int countForReset = 0;
215     struct usbdevfs_ctrltransfer transfer = { 0x21, 0x09, 0x0200, 0x00, 1, 500, &kb->
ileds };
216     int res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
217     if(res <= 0) {
218         ckb_err("%s\n", res ? strerror(errno) : "No data written");
219         if (usb_tryreset(kb) == 0 && countForReset++ < 3) {
220             os_sendindicators(kb);
221         }
222     }
223 }
  
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.43.3.6 int os\_setupusb ( usbdevice \* kb )

os\_setupusb OS-specific setup for a specific usb device.

Perform the operating system-specific opening of the interface in [os\\_setupusb\(\)](#). As a result, some parameters should be set in kb (name, serial, fwversion, epcount = number of usb endpoints), and all endpoints should be claimed with [usbclaim\(\)](#). Claiming is the only point where [os\\_setupusb\(\)](#) can produce an error (-1).

- Copy device description and serial
- Copy firmware version (needed to determine USB protocol)
- Do some output about connecting interfaces
- Claim the USB interfaces

**Todo** in these modules a pullrequest is outstanding

< Try to reset the device and recall the function

< Don't do this endless in recursion

< [os\\_setupusb\(\)](#) has a return value (used as boolean)

Definition at line 535 of file usb\_linux.c.

References [ckb\\_err](#), [ckb\\_info](#), [devpath](#), [usbdevice::epcount](#), [usbdevice::fwversion](#), [INDEX\\_OF](#), [KB\\_NAME\\_LEN](#), [keyboard](#), [usbdevice::name](#), [usbdevice::serial](#), [SERIAL\\_LEN](#), [strtrim\(\)](#), [usbdevice::udev](#), [usb\\_tryreset\(\)](#), and [usbclaim\(\)](#).

Referenced by [\\_setupusb\(\)](#).

```

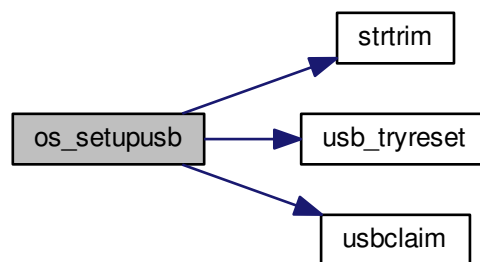
535     {
536     struct udev_device* dev = kb->udev;
537     const char* name = udev_device_get_sysattr_value(dev, "product");
538     if(name)
539         strncpy(kb->name, name, KB_NAME_LEN);
540     strtrim(kb->name);
541     const char* serial = udev_device_get_sysattr_value(dev, "serial");
542     if(serial)
543         strncpy(kb->serial, serial, SERIAL_LEN);
544     strtrim(kb->serial);
545     const char* firmware = udev_device_get_sysattr_value(dev, "bcdDevice");
546     if(firmware)
547         sscanf(firmware, "%hx", &kb->fwversion);
548     else
549         kb->fwversion = 0;
550     int index = INDEX_OF(kb, keyboard);
551     ckb_info("Connecting %s at %s%d\n", kb->name, devpath, index);
552     const char* ep_str = udev_device_get_sysattr_value(dev, "bNumInterfaces");
553     #ifdef DEBUG
554     ckb_info("claiming interfaces. name=%s, firmware=%s; Got >>%s<< as ep_str\n", name, firmware,
555             ep_str);
556     #endif //DEBUG
  
```

```

568     kb->epcount = 0;
569     if(ep_str)
570         sscanf(ep_str, "%d", &kb->epcount);
571     if(kb->epcount < 2){
572         // IF we have an RGB KB with 0 or 1 endpoints, it will be in BIOS mode.
573         ckb_err("Unable to read endpoint count from udev, assuming %d and reading >>%s<< or device
is in BIOS mode\n", kb->epcount, ep_str);
574         if (usb_tryreset(kb) == 0) {
575             static int retryCount = 0;
576             if (retryCount++ < 5) {
577                 return os_setupusb(kb);
578             }
579         }
580         return -1;
581         // ToDo are there special versions we have to detect? If there are, that was the old code to handle
it:
582         // This shouldn't happen, but if it does, assume EP count based on ckb_warn what the device is
supposed to have
583         // kb->epcount = (HAS_FEATURES(kb, FEAT_RGB) ? 4 : 3);
584         // ckb_warn("Unable to read endpoint count from udev, assuming %d and reading >>%s<<...\n",
kb->epcount, ep_str);
585     }
586     if(usbclaim(kb)) {
587         ckb_err("Failed to claim interfaces: %s\n", strerror(errno));
588         return -1;
589     }
590     return 0;
591 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.43.3.7 int os\_usbrecv ( usbdevice \* kb, uchar \* in\_msg, const char \* file, int line )

`os_usbrecv` does what its name says:

The comment at the beginning of the procedure causes the suspicion that the firmware versionspecific distinction is missing for receiving from usb endpoint 3 or 4. The commented code contains only the reception from EP4, but this may be wrong for a software version 2.0 or higher (see the code for `os_usbsend`()).

So all the receiving is done via an `ioctl()` like in `os_usbsend`. The `ioctl()` is given a struct `usbdevfs_ctrltransfer`, in which the relevant parameters are entered:

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0xA1	0x01	0x0200	endpoint to be addressed from epcount - 1	MSG_SIZE	5ms	the message buffer pointer
Device to Host, Type=Class, Recipient=Interface	1 = RECEIVE?	specific	Interface #	64	5000	in_msg

The `ioctl()` returns the number of bytes received. Here is the usual check again:

- If the return value is -1 AND the error is a timeout (ETIMEOUT), `os_usbrecv()` will return -1 to indicate that it is probably a recoverable problem and a retry is recommended.
- For another negative value or other error identifier OR 0 bytes are received, 0 is returned as an identifier for a heavy error.
- In all other cases, the function returns the number of bytes received.

If this is not the entire blocksize (MSG\_SIZE bytes), an error message is issued on the standard error channel [warning "Read YY bytes (expected 64)"].

Definition at line 129 of file `usb_linux.c`.

References `ckb_err_fn`, `ckb_warn_fn`, `usbdevice::epcount`, `usbdevice::handle`, and `MSG_SIZE`.

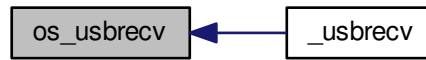
Referenced by `_usbrecv()`.

```

129                                     {
130     int res;
131     // This is what CUE does, but it doesn't seem to work on linux.
132     /*if(kb->fwversion >= 0x130){
133         struct usbdevfs_bulktransfer transfer = {0};
134         transfer.ep = 0x84;
135         transfer.len = MSG_SIZE;
136         transfer.timeout = 5000;
137         transfer.data = in_msg;
138         res = ioctl(kb->handle - 1, USBDEVFS_BULK, &transfer);
139     } else {*/
140         struct usbdevfs_ctrltransfer transfer = { 0xa1, 0x01, 0x0300, kb->
141     epcount - 1, MSG_SIZE, 5000, in_msg };
142         res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
143     }
144     if(res <= 0){
145         ckb_err_fn("%s\n", file, line, res ? strerror(errno) : "No data read");
146         if(res == -1 && errno == ETIMEDOUT)
147             return -1;
148         else
149             return 0;
150     } else if(res != MSG_SIZE)
151         ckb_warn_fn("Read %d bytes (expected %d)\n", file, line, res,
152     MSG_SIZE);
153 #ifdef DEBUG_USB_RECV
154     char converted[MSG_SIZE*3 + 1];
155     for(int i=0;i<MSG_SIZE;i++)
156         sprintf(&converted[i*3], "%02x ", in_msg[i]);
157     ckb_warn_fn("Recv %s\n", file, line, converted);
158 #endif
159     return res;
160 }

```

Here is the caller graph for this function:



9.43.3.8 `int os_usbrecv ( usbdevice * kb, const uchar * out_msg, int is_recv, const char * file, int line )`

`os_usbrecv` has two functions:

- if `is_recv == false`, it tries to send a given `MSG_SIZE` buffer via the usb interface given with `kb`.
- otherwise a request is sent via the usb device to initiate the receiving of a message from the remote device.

The functionality for sending distinguishes two cases, depending on the version number of the firmware of the connected device:

If the firmware is less or equal 1.2, the transmission is done via an `ioctl()`. The `ioctl()` is given a struct `usbdevfs_ctrltransfer`, in which the relevant parameters are entered:

bRequest-Type	bRequest	wValue	EP	size	Timeout	data
0x21	0x09	0x0200	endpoint / IF to be addressed from epcount-1	MSG_SIZE	5000 (=5ms)	the message buffer pointer
Host to Device, Type=Class, Recipient=Interface	9 = Send data?	specific	last or pre-last device #	64	5000	out_msg

The `ioctl` command is `USBDEVFS_CONTROL`.

The same constellation is used if the device is requested to send its data (`is_recv = true`).

For a more recent firmware and `is_recv = false`, the `ioctl` command `USBDEVFS_CONTROL` is not used (this tells the bus to enter the control mode), but the bulk method is used: `USBDEVFS_BULK`. This is astonishing, because all of the endpoints are type Interrupt, not bulk.

Anyhow, for this purpose a different structure is used for the `ioctl()` (struct `usbdevfs_bulktransfer`) and this is also initialized differently:

The length and timeout parameters are given the same values as above. The formal parameter `out_msg` is also passed as a buffer pointer. For the endpoints, the firmware version is differentiated again:

For a firmware version between 1.3 and <2.0 endpoint 4 is used, otherwise (it can only be  $\geq 2.0$ ) endpoint 3 is used.

**Todo** Since the handling of endpoints has already led to problems elsewhere, this implementation is extremely hardware-dependent and critical!

Eg. the new keyboard K95PLATINUMRGB has a version number significantly less than 2.0 - will it run with this implementation?

The `ioctl()` - no matter what type - returns the number of bytes sent. Now comes the usual check:

- If the return value is -1 AND the error is a timeout (ETIMEDOUT), `os_usbsend()` will return -1 to indicate that it is probably a recoverable problem and a retry is recommended.
- For another negative value or other error identifier OR 0 bytes sent, 0 is returned as a heavy error identifier.
- In all other cases, the function returns the number of bytes sent.

If this is not the entire blocksize (MSG\_SIZE bytes), an error message is issued on the standard error channel [warning "Wrote YY bytes (expected 64)"].

If `DEBUG_USB` is set during compilation, the number of bytes sent and their representation are logged to the error channel.

Definition at line 68 of file `usb_linux.c`.

References `ckb_err_fn`, `ckb_warn_fn`, `usbdevice::epcount`, `usbdevice::fwversion`, `usbdevice::handle`, and `MSG_SIZE`.

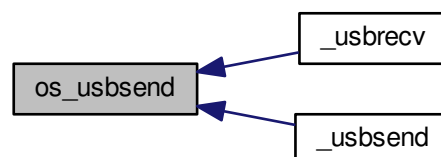
Referenced by `_usbrecv()`, and `_usbsend()`.

```

68                                     {
69     int res;
70     if (kb->fwversion >= 0x120 && !is_recv) {
71         struct usbdevfs_bulktransfer transfer = {0};
72         transfer.ep = (kb->fwversion >= 0x130 && kb->fwversion < 0x200) ? 4 : 3;
73         transfer.len = MSG_SIZE;
74         transfer.timeout = 5000;
75         transfer.data = (void*)out_msg;
76         res = ioctl(kb->handle - 1, USBDEVFS_BULK, &transfer);
77     } else {
78         struct usbdevfs_ctrltransfer transfer = { 0x21, 0x09, 0x0200, kb->
79 epcount - 1, MSG_SIZE, 5000, (void*)out_msg };
80         res = ioctl(kb->handle - 1, USBDEVFS_CONTROL, &transfer);
81     }
82     if (res <= 0){
83         ckb_err_fn(" %s, res = 0x%x\n", file, line, res ? strerror(errno) : "No data written",
84 res);
85         if(res == -1 && errno == ETIMEDOUT)
86             return -1;
87         else
88             return 0;
89     } else if (res != MSG_SIZE)
90         ckb_warn_fn("Wrote %d bytes (expected %d)\n", file, line, res,
91 MSG_SIZE);
92 #ifdef DEBUG_USB
93     char converted[MSG_SIZE*3 + 1];
94     for(int i=0;i<MSG_SIZE;i++)
95         sprintf(&converted[i*3], "%02x ", out_msg[i]);
96     ckb_warn_fn("Sent %s\n", file, line, converted);
97 #endif
98     return res;
99 }

```

Here is the caller graph for this function:



#### 9.43.3.9 void `strtrim` ( char \* *string* )

`strtrim` trims a string by removing leading and trailing spaces.

## Parameters

<i>string</i>
---------------

Definition at line 510 of file usb\_linux.c.

Referenced by os\_setupusb().

```

510     {
511         // Find last non-space
512         char* last = string;
513         for(char* c = string; *c != 0; c++){
514             if(!isspace(*c))
515                 last = c;
516         }
517         last[1] = 0;
518         // Find first non-space
519         char* first = string;
520         for(; *first != 0; first++){
521             if(!isspace(*first))
522                 break;
523         }
524         if(first != string)
525             memmove(string, first, last - first);
526     }

```

Here is the caller graph for this function:



#### 9.43.3.10 static void udev\_enumerate ( ) [static]

Reduce the hits of the enumeration by limiting to usb as technology and corsair as idVendor. Then filter with udev\_enumerate\_scan\_devices ( ) all hits.

The following call to udev\_enumerate\_get\_list\_entry() fetches the entire hitlist as udev\_list\_entry \*.

Use udev\_list\_entry\_foreach() to iterate through the hit set.

If both the device name exists (udev\_list\_entry\_get\_name) and the subsequent creation of a new udev\_device (udev\_device\_new\_from\_syspath) is ok, the new device is added to the list with usb\_add\_device().

If the latter does not work, the new device is released again (udev\_device\_unref ()).

After the last iteration, the enumerator is released with udev\_enumerate\_unref ( ).

Definition at line 747 of file usb\_linux.c.

References usb\_add\_device(), and V\_CORSAIR\_STR.

Referenced by usbmain().

```

747     {
748         struct udev_enumerator* enumerator = udev_enumerator_new(udev);
749         udev_enumerator_add_match_subsystem(enumerator, "usb");
750         udev_enumerator_add_match_sysattr(enumerator, "idVendor", V_CORSAIR_STR);
751         udev_enumerate_scan_devices(enumerator);
752         struct udev_list_entry* devices, *dev_list_entry;
753         devices = udev_enumerate_get_list_entry(enumerator);
754
755         udev_list_entry_foreach(dev_list_entry, devices){
756             const char* path = udev_list_entry_get_name(dev_list_entry);
757             if(!path)
758                 continue;
759             struct udev_device* dev = udev_device_new_from_syspath(udev, path);
760             if(!dev)
761                 continue;
762             // If the device matches a recognized device ID, open it
763             if(usb_add_device(dev))
764                 // Release device if not

```

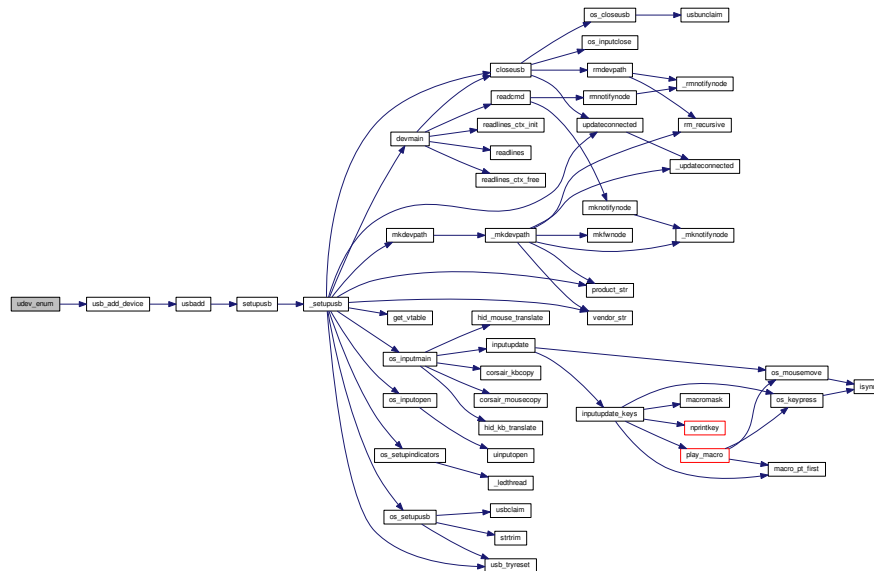


```

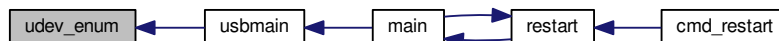
765         udev_device_unref(dev);
766     }
767     udev_enumerate_unref(enumerator);
768 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



### 9.43.3.11 static int usb\_add\_device ( struct udev\_device \* *dev* ) [static]

If the device id can be found, call `usbadd()` with the appropriate parameters.

### Parameters

<i>dev</i>	the functions <code>usb_*_device</code> get a struct <code>udev*</code> with the necessary hardware-related information.
------------	--

## Returns

the retval of `usbadd()` or 1 if either vendor is not corsair or product is not mentioned in `model[]`.

First get the idVendor via `udev_device_get_sysattr_value()`. If this is equal to the ID-string of corsair ("1b1c"), get the idProduct on the same way.

If we can find the model name in the model array, call `usbadd()` with the model number.

**Todo** So why the hell not a transformation between the string and the short presentation? Lets check if the string representation is used elsewhere.



## Parameters

<i>dev</i>	the functions <code>usb_*_device</code> get a struct <code>udev*</code> with the necessary hardware-related information.
------------	--

First try to find the system path of the device given in parameter `dev`. The index where the name is found is the same index we need to address the global keyboard array. That array holds all usbdevices.

Searching for the correct name in `kbsyspath`-array and closing the usb via `closeusb()` are protected by lock..unlock of the corresponding `devmutex` arraymember.

Definition at line 720 of file `usb_linux.c`.

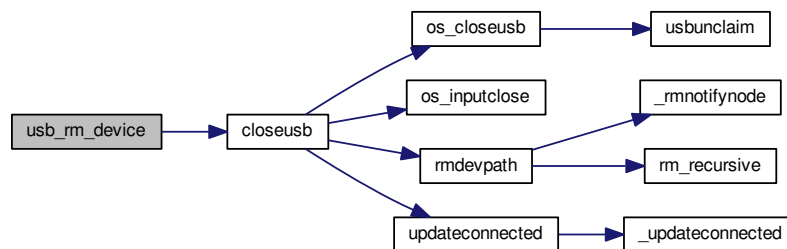
References `closeusb()`, `DEV_MAX`, `devmutex`, `kbsyspath`, and `keyboard`.

Referenced by `usbmain()`.

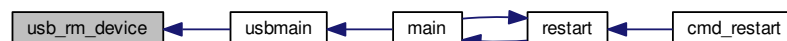
```

720                                     {
721     // Device removed. Look for it in our list of keyboards
722     const char* syspath = udev_device_get_syspath(dev);
723     if(!syspath || syspath[0] == 0)
724         return;
725     for(int i = 1; i < DEV_MAX; i++){
726         pthread_mutex_lock(devmutex + i);
727         if(!strcmp(syspath, kbsyspath[i]))
728             closeusb(keyboard + i);
729         pthread_mutex_unlock(devmutex + i);
730     }
731 }
```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.43.3.13 int usbadd ( struct udev\_device \* dev, short vendor, short product )

Definition at line 593 of file `usb_linux.c`.

References `ckb_err`, `ckb_info`, `DEV_MAX`, `dmutex`, `usbdevice::handle`, `IS_CONNECTED`, `kbsyspath`, `keyboard`, `usbdevice::product`, `setupusb()`, `usbdevice::udev`, and `usbdevice::vendor`.

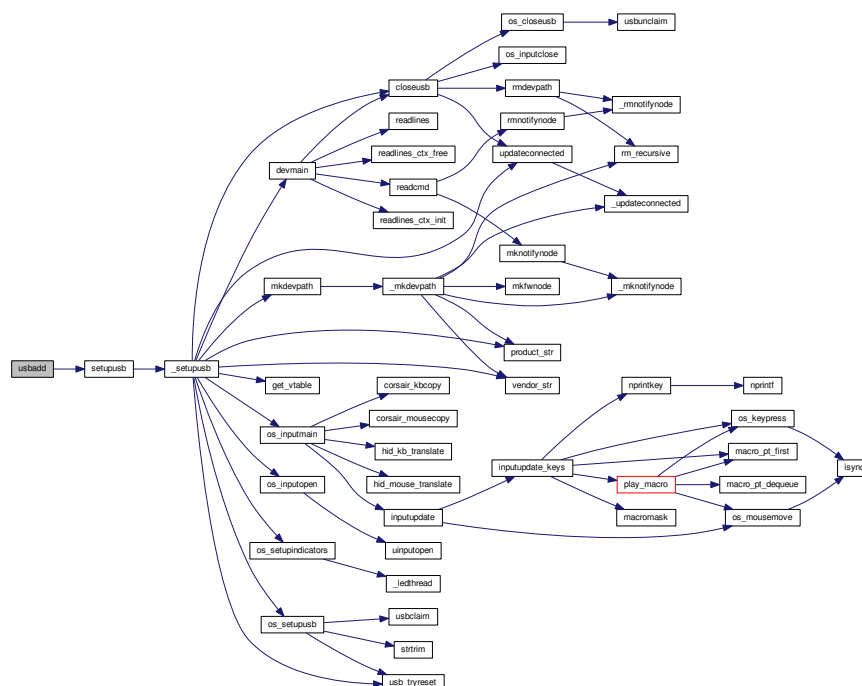
Referenced by `usb_add_device()`.

```

593
594     const char* path = udev_device_get_devnode(dev);
595     const char* syspath = udev_device_get_syspath(dev);
596     if(!path || !syspath || path[0] == 0 || syspath[0] == 0){
597         ckb_err("Failed to get device path\n");
598         return -1;
599     }
600 #ifdef DEBUG
601     ckb_info(">>>vendor = 0x%x, product = 0x%x, path = %s, syspath = %s\n", vendor, product, path,
        syspath);
602 #endif // DEDBUG
603     // Find a free USB slot
604     for(int index = 1; index < DEV_MAX; index++){
605         usbdevice* kb = keyboard + index;
606         if(pthread_mutex_trylock(dmutex(kb))){
607             // If the mutex is locked then the device is obviously in use, so keep going
608             if(!strcmp(syspath, kbsyspath[index])){
609                 // Make sure this existing keyboard doesn't have the same syspath (this shouldn't happen)
610                 return 0;
611             }
612             continue;
613         }
614         if(!IS_CONNECTED(kb)){
615             // Open the sysfs device
616             kb->handle = open(path, O_RDWR) + 1;
617             if(kb->handle <= 0){
618                 ckb_err("Failed to open USB device: %s\n", strerror(errno));
619                 kb->handle = 0;
620                 pthread_mutex_unlock(dmutex(kb));
621                 return -1;
622             } else {
623                 // Set up device
624                 kb->udev = dev;
625                 kb->vendor = vendor;
626                 kb->product = product;
627                 strncpy(kbsyspath[index], syspath, FILENAME_MAX);
628                 // Mutex remains locked
629                 setupusb(kb);
630                 return 0;
631             }
632         }
633         pthread_mutex_unlock(dmutex(kb));
634     }
635     ckb_err("No free devices\n");
636     return -1;
637 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.43.3.14 static int usbclaim ( usbdevice \* kb ) [static]

usbclaim does claiming all EPs for the usb device gicen by kb.

Parameters

<i>kb</i>	THE usbdevice*
-----------	----------------

Returns

0 on success, -1 otherwise.

Claim all endpoints for a given device (remeber the decrementing of the file descriptor) via ioctl(USBDEVFS\_DISCONNECT) and ioctl(USBDEVFS\_CLAIMINTERFACE).

Error handling is done for the ioctl(USBDEVFS\_CLAIMINTERFACE) only. If this fails, now an error message is thrown and -1 is returned. Function is called in [usb\\_linux.c](#) only, so it is declared as static now.

Definition at line 459 of file usb\_linux.c.

References [ckb\\_err](#), [ckb\\_info](#), [usbdevice::epcount](#), and [usbdevice::handle](#).

Referenced by [os\\_resetusb\(\)](#), and [os\\_setupusb\(\)](#).

```

459     {
460         int count = kb->epcount;
461         #ifdef DEBUG
462             ckb_info("claiming %d endpoints\n", count);
463         #endif // DEBUG
464
465         for(int i = 0; i < count; i++){
466             struct usbdevfs_ioctl ctl = { i, USBDEVFS_DISCONNECT, 0 };
467             ioctl(kb->handle - 1, USBDEVFS_IOCTL, &ctl);
468             if(ioctl(kb->handle - 1, USBDEVFS_CLAIMINTERFACE, &i)) {
469                 ckb_err("Failed to claim interface %d: %s\n", i, strerror(errno));
470                 return -1;
471             }
472         }
473         return 0;
474     }
  
```

Here is the caller graph for this function:



#### 9.43.3.15 void usbkill ( )

Definition at line 835 of file usb\_linux.c.

Referenced by [quitWithLock\(\)](#).

```

835     {
836     udev_unref(udev);
837     udev = 0;
838 }

```

Here is the caller graph for this function:



#### 9.43.3.16 int usbmain ( )

Start the USB main loop. Returns program exit code when finished.

usbmain is called by [main\(\)](#) after setting up all other stuff.

##### Returns

0 normally or -1 if fatal error occurs (up to now only if no new devices are available)

First check whether the uinput module is loaded by the kernel.

**Todo** Why isn't missing of uinput a fatal error?

Create the udev object with [udev\\_new\(\)](#) (is a function from [libudev.h](#)) terminate -1 if error

Enumerate all currently connected devices

**Todo** lae. here the work has to go on...

Definition at line 775 of file [usb\\_linux.c](#).

References [ckb\\_fatal](#), [ckb\\_warn](#), [udev\\_enum\(\)](#), [usb\\_add\\_device\(\)](#), and [usb\\_rm\\_device\(\)](#).

Referenced by [main\(\)](#).

```

775     {
780     // Load the uinput module (if it's not loaded already)
781     if(system("modprobe uinput") != 0)
782         ckb_warn("Failed to load uinput module\n");
783
787     if(!(udev = udev_new())) {
788         ckb_fatal("Failed to initialize udev in usbmain(), usb_linux.c\n");
789         return -1;
790     }
791
794     udev_enum();
795
798     // Done scanning. Enter a loop to poll for device updates
799     struct udev_monitor* monitor = udev_monitor_new_from_netlink(udev, "udev");
800     udev_monitor_filter_add_match_subsystem_devtype(monitor, "usb", 0);
801     udev_monitor_enable_receiving(monitor);
802     // Get an fd for the monitor
803     int fd = udev_monitor_get_fd(monitor);
804     fd_set fds;
805     while(udev){
806         FD_ZERO(&fds);
807         FD_SET(fd, &fds);
808         // Block until an event is read
809         if(select(fd + 1, &fds, 0, 0, 0) > 0 && FD_ISSET(fd, &fds)){
810             struct udev_device* dev = udev_monitor_receive_device(monitor);
811             if(!dev)
812                 continue;

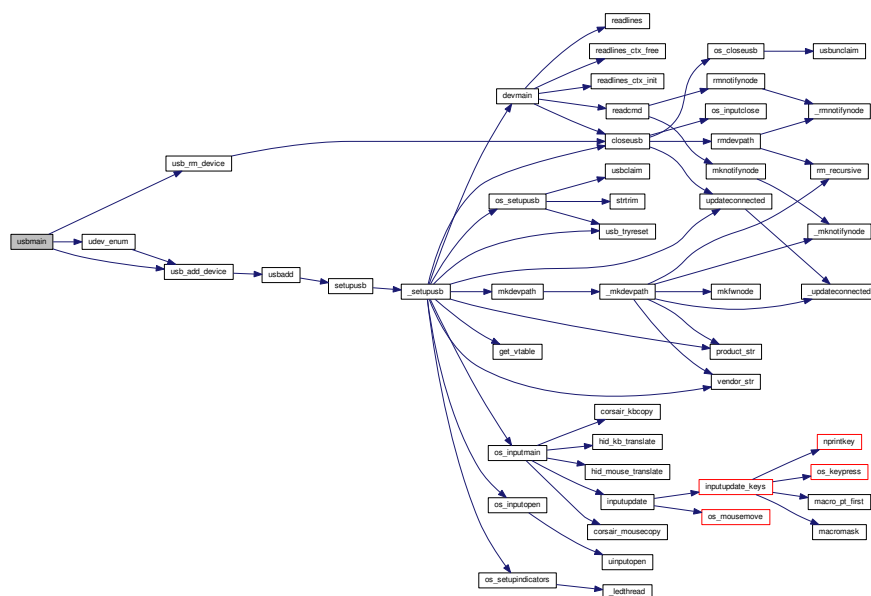
```

```

813         const char* action = udev_device_get_action(dev);
814         if(!action){
815             udev_device_unref(dev);
816             continue;
817         }
818         // Add/remove device
819         if(!strcmp(action, "add")){
820             int res = usb_add_device(dev);
821             if(res == 0)
822                 continue;
823             // If the device matched but the handle wasn't opened correctly, re-enumerate (this
            sometimes solves the problem)
824             if(res == -1)
825                 udev_enumerate();
826             } else if(!strcmp(action, "remove"))
827                 usb_rm_device(dev);
828             udev_device_unref(dev);
829         }
830     }
831     udev_monitor_unref(monitor);
832     return 0;
833 }

```

Here is the call graph for this function:



Here is the caller graph for this function:



#### 9.43.3.17 static int usbunclaim ( usbdevice \* kb, int resetting ) [static]

`usbunclaim` do an unclaiming of the usb device gicen by `kb`.





```

= {
    { "1b17", 0x1b17 },
    { "1b07", 0x1b07 },
    { "1b37", 0x1b37 },
    { "1b39", 0x1b39 },
    { "1b13", 0x1b13 },
    { "1b09", 0x1b09 },
    { "1b33", 0x1b33 },
    { "1b36", 0x1b36 },
    { "1b38", 0x1b38 },
    { "1b3a", 0x1b3a },
    { "1b11", 0x1b11 },
    { "1b08", 0x1b08 },
    { "1b2d", 0x1b2d },
    { "1b20", 0x1b20 },
    { "1b15", 0x1b15 },

    { "1b12", 0x1b12 },
    { "1b2e", 0x1b2e },
    { "1b14", 0x1b14 },
    { "1b19", 0x1b19 },
    { "1b2f", 0x1b2f },
    { "1b1e", 0x1b1e },
    { "1b3e", 0x1b3e },
    { "1b32", 0x1b32 }
}

```

**Attention**

when adding new hardware this file has to be changed too.

In this structure array *models[]* for each device the name (the device id as string in hex without leading 0x) and its usb device id as short must be entered in this array.

Definition at line 655 of file usb\_linux.c.

**9.43.4.3 struct udev\* udev [static]**

Definition at line 639 of file usb\_linux.c.

**9.43.4.4 pthread\_t udevthread**

Definition at line 642 of file usb\_linux.c.

**9.43.4.5 pthread\_t usbthread**

**Todo** These two thread variables seem to be unused: usbthread, udevthread

Definition at line 642 of file usb\_linux.c.

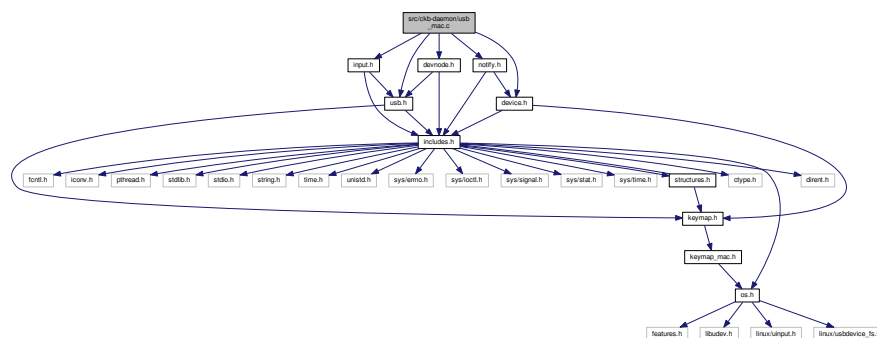
**9.44 src/ckb-daemon/usb\_mac.c File Reference**

```

#include "device.h"
#include "devnode.h"
#include "input.h"
#include "notify.h"
#include "usb.h"

```

Include dependency graph for `usb_mac.c`:



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