Release Notes Linux OS Release 1.1.0 (te-linuxfb-qt5) for OPUS-B2

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1.1.0

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1 Overview

This release contains the Linux OS 1.1.0 (te-linuxfb-qt5) for Topcon Electronics OPUS-B2 units. It is intended for all OPUS-B2 variants of series hardware revision. Details about the prerequisites to use this Linux OS release as well as the installation instructions are described in the following.

Purpose

This Linux OS release is a feature release for the OPUS-B2 hardware. The release also adds support for a new hardware variant of OPUS-B2 hardware and contains bugfixes for older release versions.

Please refer to chapter "OPUS-B2 Linux OS release history 13" for a detailed list of changes.

Please refer to chapter "Known issues 18" for a list of known issues.

Warning
This release is intended to be used on preseries units and series units only. Support for older prototypes has been dropped. Do not use this release on older prototype B or C units.

Audience

This Linux OS release is provided to all customers and Topcon Electronics development departments using OPUS-B2 units for development purposes.

This document is intended to all developers integrating software on an OPUS-B2 unit. It explains the steps to update OPUS-B2 units to this new release and provides a list of known issues.

Scope

This Linux OS release contains a new operating system including a small bootloader update, an updated service image, a new Linux kernel and root file system for the supported OPUS-B2 units.

Applications like PClient or CODESYS are not part of this release. Updates to these packages are provided separately by Topcon Electronics.

Please refer to chapter "Supported Hardware 6" for a list of supported OPUS-B2 units.

References

This document is just a short description for the new features and changes of the corresponding Linux OS release. For details about the driver and API implementations as well as C/C++ programming samples and the FAQ please refer to the "OPUS-B2 C/C++ Developer Guide" provided along with this Linux OS release.

1.1 Safety instructions

Notice
Please read the complete document and these safety instructions carefully before applying any update to any OPUS-B2 unit.

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Warning
Please follow the instructions provided in this document carefully to update the Linux OS release on an OPUS-B2 unit. Wrong usage can lead to a none-operational state of the OPUS-B2 unit which can only be repaired by Topcon Electronics.

Warning
Only use software packages and files which are provided by Topcon Electronics and are contained in this release to update the Linux OS on any OPUS-B2 unit. The usage of wrong software packages can lead to a none-operational state of the OPUS-B2 unit which can only be repaired by Topcon Electronics.

Warning
The update process contains an MD5 checksum verification to check the integrity of each software package. Only use the provided MD5 checksum files along with the software packages. The usage of wrong MD5 checksum files can lead to a none-operational state of the OPUS-B2 unit which can only be repaired by Topcon Electronics.

Warning
Before applying any update to an OPUS-B2 unit please make sure that a possibly installed application package (e.g. PClient or CODESYS) is compatible with this Linux OS release. An update of the application package may be required to support this Linux OS release.

Notice
If a possibly installed application package is a self-developed C/C++ application, additional changes may be required to support this Linux OS release.

Warning
Before applying any update to an OPUS-B2 unit please make sure that the OPUS-B2 hardware variant is supported by this Linux OS release.

Warning
Support for older OPUS-B2 prototype A samples has been dropped due to immense hardware changes. Do not install this Linux OS release on these units.

Notice
If unsure on any of these points or in case that something does go wrong please contact Topcon Electronics for further information and support.

Warning
Please avoid hard reset (battery off) of OPUS-B2 during running application. This may lead to system functionality distortions.

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2 Platform

In general this Linux OS release is provided for the Topcon Electronics platform OPUS-B2. But there are limitations regarding the support of several OPUS-B2 hardware variants due to immense hardware differences. All supported OPUS-B2 hardware variants as well as all older OPUS-B2 Linux OS releases supported for the update process are listed below.



Warning
All OPUS-B2 hardware variants not named here have to be treated as **not supported**!

2.1 Supported Hardware

This Linux OS release supports the following OPUS-B2 hardware variants:

• OPUS B2 Eco Basic	Prototype B, Pre-series and series
• OPUS B2 Eco Full	Prototype B, Pre-series and series
• OPUS B2 Plus Eco Basic	Prototype B, Pre-series and series
• OPUS B2 Plus Eco Basic Manitou	Prototype B, Pre-series and series
• OPUS B2 Plus Eco Full	Prototype B, Pre-series and series
• OPUS B2 Standard Basic	Prototype B, Pre-series and series
• OPUS B2 Standard Full	Prototype B, Pre-series and series
• OPUS B2 Plus Standard Basic	Prototype B, Pre-series and series
• OPUS B2 Plus Standard Basic	Prototype B, Pre-series and series
• OPUS B2 Eco Basic Large	Prototype B
• OPUS B2 Eco Full Large	Prototype B
• OPUS B2 Standard Basic Large	Prototype B
• OPUS B2 Standard Full Large	Prototype B

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3 Components

This Linux OS release contains a new operating system for the Topcon Electronics OPUS-B2 platform. The provided components of the release together with their version and license information are described below.

3.1 Versions

Release name and version

- OPUS-B2 Linux OS release 1.1.0 (LinuxFB/Qt5)

Component versions

- Bootloader: U-Boot 2022.07-opus-b2-1.1.0
- Linux kernel: Linux opus-b2 6.1.128
- Qt: 5.15.9

3.2 License

This Linux OS release contains Free and open-source software (FOSS). According to the Open Source definition by the Open Source Initiative (https://opensource.org/osd) FOSS is software which is licensed by the respective holders of rights to everyone with extensive rights of use and without license fees and for which the source code is available. Please refer to the license folder provided along with this Linux OS release for a complete and detailed list of provided software packages and their corresponding licenses. Source code for FOSS components are delivered in the source folder provided along with this Linux OS release.

This Linux OS release also contains software components, which are licensed under commercial or proprietary licenses. These software components are also listed in the list of software components in the license folder.

This Linux OS contains a commercially licensed version of QT Framework. These software components are also listed in the list of software components in the license folder.

3.3 Directories and files

This Linux OS release contains the following directories and files.

3.3.1 Installation images

These images are intended to be installed directly to the OPUS-B2 target. They are located in the folder `images` within the Linux OS release folder.

Software installation image files	
File name	**Description**
spl_opus-b2_1.1.0.bin	SPL image. Provided by TELE in Linux BSP release.
spl_opus-b2_1.1.0.bin.md5	MD5 checksum file for SPL image.
boot_opus-b2_1.1.0.img	Bootloader image for run-time OS. Provided by TELE in Linux BSP release.

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boot_opus-b2_1.1.0.img.md5	MD5 checksum file for Bootloader image.
service_opus-b2_1.1.0.bin	Service OS
service_opus-b2_1.1.0.bin.md5	MD5 checksum for service OS
rootfs_opus-b2_1.1.0-te-linuxfb-qt5.tar.gz	Root file system of run-time OS. Provided by TELE in Linux BSP release.
rootfs_opus-b2_1.1.0-te-linuxfb-qt5.tar.gz.md5	MD5 checksum file for root file system.
dev-tree_opus-b2_1.1.0.tar.gz	Collected device tree file. It includes device trees for all device variants.
dev-tree_opus-b2_1.1.0.tar.gz.md5	MD5 checksum file for collected device tree.

3.3.2 Boot logo pictures

This Linux OS release provides a set of default boot logo pictures. There are two types of pictures, a boot logo which is shown at start of normal operating mode and a recovery logo which is shown while loading the update RAMDISK during a software update. All provided default boot logo pictures are located in the folder `logo` within the Linux OS release folder. This folder is split in sub-folders containing the device specific logos.

Boot logo pictures	
File	**Description**
logo_opus-b2_tele-landscape.bmp	Topcon default OPUS-B2 landscape boot logo with size 480x272 px
logo_opus-b2_tele-landscape.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 landscape boot logo
logo_opus-b2_tele-portrait_90.bmp	Topcon default OPUS-B2 portrait 90 degrees rotated boot logo with size 480x272 px
logo_opus-b2_tele-portrait_90.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 portrait 90 degrees rotated boot logo
logo_opus-b2_plus_tele-landscape.bmp	Topcon default OPUS-B2 Plus landscape boot logo with size 800x480 px
logo_opus-b2_plus_tele-landscape.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 Plus landscape boot logo
logo_opus-b2_plus_tele-portrait_90.bmp	Topcon default OPUS-B2 Plus portrait 90 degrees rotated boot logo with size 800x480 px
logo_opus-b2_plus_tele-portrait_90.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 Plus portrait 90 degrees rotated boot logo
logo_opus-b2_plus_tele-portrait_270.bmp	Topcon default OPUS-B2 Plus portrait 270 degrees rotated boot logo with size 800x480 px
logo_opus-b2_plus_tele-portrait_270.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 Plus portrait 270 degrees rotated boot logo
recovery_opus-b2_plus_tele-landscape.bmp	Topcon default OPUS-B2 Plus recovery landscape boot logo with size 800x480 px
recovery_opus-b2_plus_tele-landscape.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 Plus recovery landscape boot logo
recovery_opus-b2_plus_tele-portrait_90.bmp	Topcon default OPUS-B2 Plus recovery portrait 90 degrees rotated boot logo with size 800x480 px
recovery_opus-b2_plus_tele-portrait_90.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 Plus recovery portrait 90 degrees rotated boot logo

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recovery_opus-b2_plus_tele-portrait_270.bmp	Topcon default OPUS-B2 Plus recovery portrait 270 degrees rotated boot logo with size 800x480 px
recovery_opus-b2_plus_tele-portrait_270.bmp.md5	MD5 checksum file for Topcon default OPUS-B2 Plus recovery portrait 270 degrees rotated boot logo

3.3.3 Toolchain

The Toolchain, which includes all host tools and the sysroot directory required to develop and build one's own applications for the OPUS-B2 platform, is located in the folder `toolchain` within the Linux OS release folder.

Toolchain	
File	**Description**
sdk_glibc-x86_64_te-linuxfb-qt5_we-image-production-opus-b2-1.1.0-toolchain.sh	Script to install the OPUS-B2 platform Toolchain (te-linuxfb-qt5) on a Linux host PC.
sdk_glibc-x86_64_te-linuxfb-qt5_we-image-production-opus-b2-1.1.0-toolchain.host.manifest	List of all packages included in the Toolchain/SDK package for the host machine.
sdk_glibc-x86_64_te-linuxfb-qt5_we-image-production-opus-b2-1.1.0-toolchain.target.manifest	List of all packages included in the Toolchain/SDK package for the target machine.

3.3.4 Documentation

All documentation is located in the main folder of the Linux OS release.

Documentation	
File	**Description**
OPUS-B2_Release_Notes_Linux_1.1.0.pdf	This document
OPUS-B2_C_C++_Developerguide.pdf	C/C++ Developer Guide for OPUS-B2 platform

3.3.5 Licenses

A list of all target packages, including version and license information as well as a collection of all license files for each target and built package is located in the folder `licenses` within the Linux OS release folder.

Licenses	
File	**Description**
license_opus-b2_1.1.0-te-linuxfb-qt5.manifest	List of all target packages including version and license information (te-linuxfb-qt5 specific)
licenses_opus-b2_1.1.0-te-linuxfb-qt5.tar.xz	A collection of all license files for each target package and build packages used to build the target root file system (te-linuxfb-qt5 specific)
package_opus-b2_1.1.0-te-linuxfb-qt5.manifest	List of all target packages included in the root file system (te-linuxfb-qt5 specific)

3.3.6 Sources

The source code of all software packages and the Yocto recipes used to build the Linux operating system are located in the folder `sources` within the Linux OS release folder. All source code is published under their corresponding license specified in the license manifest.

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Sources	
File	**Description**
sources_opus-b2_1.1.0-te-linuxfb-qt5-allarch.tar.xz	Source code of all packages, including original source archives, patches and invoked Yocto build recipes (te-linuxfb-qt5 specific). Split in architecture specific parts due to file sizes. Files can be extracted to the same place.
sources_opus-b2_1.1.0-te-linuxfb-qt5-allarch-poky-linux.tar.xz	
sources_opus-b2_1.1.0-te-linuxfb-qt5-arm-poky-linux-gnueabi.tar.xz	
sources_opus-b2_1.1.0-te-linuxfb-qt5-x86_64-linux.tar.xz	
sources_opus-b2_1.1.0-te-linuxfb-qt5-x86_64-pokysdk-linux.tar.xz	

3.3.7 Yocto System

The `yocto` folder contains the Yocto system, which was used to build the release. These files can be used to rebuild the images from source code. Please refer to the chapter in the Developerguide for instructions.

Sources	
File	**Description**
yocto-meta-layers_opus-b2_1.1.0.tar.xz	This tarball contains all Yocto meta layers used to build the Linux operating system.

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4 Installation instructions

4.1 Prerequisites

Before installing software on an OPUS-B2 target, please make sure that it meets the hardware and software requirements. They are specified in chapter "Platform 6".

In addition you need a clean USB Flash drive, an external power supply for powering the OPUS-B2 target and an OPUS-B2 connector cable with the connectors for power supply, SERV_EN pin and USB port.

This document only describes an update by using a USB Flash drive. For the usage of the internal file system for updating, please consult the developer guide.

4.2 Preparing a USB Flash drive

To prepare a USB Flash drive for software installation, please follow these instructions:

- Connect the USB Flash drive to your PC and copy the following files provided by this release to it. Each file has to be stored in the root directory without any sub-directories:

  - `te-linuxfb-qt5/images/boot_opus-b2_1.1.0.bin`
  - `te-linuxfb-qt5/images/boot_opus-b2_1.1.0.bin.md5`
  - `te-linuxfb-qt5/images/spl_opus-b2_1.1.0.bin`
  - `te-linuxfb-qt5/images/spl_opus-b2_1.1.0.bin.md5`
  - `te-linuxfb-qt5/images/dev-tree_opus-b2_1.1.0.tar.gz`
  - `te-linuxfb-qt5/images/dev-tree_opus-b2_1.1.0.tar.gz.md5`
  - `te-linuxfb-qt5/images/rootfs_opus-b2_1.1.0-te-linuxfb-qt5.tar.gz`
  - `te-linuxfb-qt5/images/rootfs_opus-b2_1.1.0-te-linuxfb-qt5.tar.gz.md5`
  - `te-linuxfb-qt5/images/service_opus-b2_1.1.0.bin`
  - `te-linuxfb-qt5/images/service_opus-b2_1.1.0.bin.md5`

- Optionally copy the installation packages, which contain the user application and data to the same USB Flash drive. You can also update or install these packages without the installation of the operating system, if it is already installed on the OPUS-B2 target. Replace `<version>` with a custom version string. The file `logo_opus-b2_<variant>.bmp` is the boot logo shown at regular start up, the file `recovery_opus-b2_<variant>.bmp` is the boot logo shown at start of the update RAMDISK, the file `user_opus-b2_<version>.tar.gz` contains the content which is extracted to directory `/opt` on the target. Additional user Tarball archives can be provided optionally, which are extracted to /opt in their numeric order. The files have to be named `user<1-9>_opus-b2_<version>.tar.gz` where `<1-9>` has to be replaced with a number between 1 and 9. The old content on `/opt` will only be deleted, if the `user_opus-b2` package is installed. This method can be used to split the user application into several packages for installation.

  - `logo_opus-b2_*.bmp`
  - `logo_opus-b2_*.bmp.md5`
  - `recovery_opus-b2_*.bmp`
  - `recovery_opus-b2_*.bmp.md5`
  - `user_opus-b2_<version>.tar.gz`
  - `user_opus-b2_<version>.tar.gz.md5`
  - `user<1-9>_opus-b2_<version>.tar.gz`
  - `user<1-9>_opus-b2_<version>.tar.gz.md5`

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- Disconnect and remove the USB Flash drive safely from your PC.

4.3 Installation process

To install the operating software on a supported OPUS-B2 target, please follow these instructions:

- Connect the prepared USB Flash drive to the USB port of the OPUS-B2 target
- Make sure the OPUS-B2 target is correctly connected.
- Connect the SERV_EN pin of the main connector to supply voltage to enter the maintenance mode.
- Power on the OPUS-B2 target.
- The update process will start automatically after entering the maintenance mode. During the update process the display is showing informational messages about the update progress.
- After successfully installing the files from USB Flash drive, the machine automatically performs a reboot and starts the new comic firmware and the new maintenance mode.
- The update process will start automatically after entering the maintenance mode. During the update process the display is showing informational messages about the update progress.
- Disconnect the SERV_EN pin from power supply after the display shows a message that the option bytes are updated.
- After successfully installing the files from USB Flash drive, the machine automatically performs a reboot and normal start up and the new Linux OS release is ready to use.

Notice
When a new root file system is installed on the OPUS-B2 target, both boot logos will be deleted during installation of the root file system. A reinstallation of these packages is required in this case.

Notice
When a new user application package is installed on the OPUS-B2 target, all content on `/opt` except `/opt/data` will be deleted during the installation of the first user application package. Additional user application packages will be installed in addition to the first package.

Warning
Do not switch off power supply of the OPUS-B2 target or disconnect the USB Flash drive during the whole installation process. This can result in a loss of data or data inconsistency. Also make sure that the power supply of the OPUS-B2 is stable throughout the complete installation process to avoid unwanted resets.

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5 OPUS-B2 Linux OS release history

5.1 Linux OS change history

5.1.1 Changes for OPUS-B2 Linux OS Release 0.2.0

Bootloader

- Updated GPIO related functionalities from deprecated generic API to newer driver model API.
- Implemented service-boot.

Kernel

- Enabled wake functionality for ignition (KL_15).
- added power management operations to LED drivers.

Update

- Implemented WESUD.

Root file system

- No changes.

Power Management

- Implemented WEPMD.

Rest

- implemented machine module tests.

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5.1.2 Changes for OPUS-B2 Linux OS Release 0.3.0

Bootloader

- implemented falcon mode for fast boot
- implemented differentiation between fast boot (normal) u-boot boot (serv_en signal or boot mode parameter)
- enable lighting up of LED during boot for signaling fine behaviour
- implemented detection of console mode parameter

Kernel

- added beeper volume control from userspace
- added reading state of serv_en pin
- added default intensity to multicolor LED (for lighting up during boot)
- added reading of firmware version and revision of touchscreen controller
- added usb2ethernet adapter drivers as modules

Root file system

- removed debugfs
- updated start_getty script to be able to dynamically setup a console via USB (service connector) or serial (USB2Serial adapter) connection

Power Management

- disable keypad buttons in low power state

5.1.3 Changes for OPUS-B2 Linux OS Release 0.3.1

Update

- providing of all image files for doing a complete system update

5.1.4 Changes for OPUS-B2 Linux OS Release 0.4.0

Bootloader

- updated maximum allowed kernel image size for falcon mode to 5 MiB

Kernel

- flexcan and touch controller drivers configured as built-in to kernel instead of modules
- removed keypad backlight and LED drivers

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Rest

- added display of bootlogo
- removed weston/wayland from image
- reserved larger EEPROM space for user partition
- implemented device trees for various OPUS-B2 variants

5.1.5 Changes for OPUS-B2 Linux OS Release 0.4.1

Bootloader

- added possibility to set the default display brightness

Kernel

- update key codes to represent function keys
- added possibility to change beeper volume by sending an event to the device file interface (see developer guide for detailed description)

Rest

- implemented symlinks for input devices: beeper, keyboard and touchscreen
- improved readability of stack traces

Power Management

- disable runtime power management for panel driver (fixes wake from sleep behaviour)

Update

- fix u-boot image install location

5.1.6 Changes for OPUS-B2 Linux OS Release 0.5.0

Bootloader

- implemented fix for capacity calculation of eMMCs that are not partitioned and configured as high-capacity devices

Kernel

- updated button deactivation mechanism
- add support for OPUS-B2 Plus panel and touch controller
- add support for external rtc for variants that use it
- add support for additional light sensor for variants that use it
- add support for temperature sensor

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Root file system

- add additional can-utils command line tools

5.1.7 Changes for OPUS-B2 Linux OS Release 1.0.0

Bootloader

- added capability to reset device in u-boot
- added capability to start service-mode with keypad press

Kernel

- added capability to set beeper volume via event to input device

Root file system

- added ssh-key for ssh-login via key-file
- added capability to display 24bit bmp images as bootlogo
- added capability rotate display so that OPUS-B2 devices can be used in portrait mode

Health Management

- fix issue so that the last 20 values for measured device temperature are properly stored in EEPROM

5.1.8 Changes for OPUS-B2 Linux OS Release 1.1.0

Bootloader

- Console support for the mfg system.

Kernel

- Fixed pwm-beeper out of bounds access.

Update

- Updated Device Trees of different B2 variants.

Root file system

- Replaced the wayland/weston with linuxfb support.
- Added FW-Tools (fw_printenv, fw_setenv).
- Added QREncode, to generate QR-Codes as png images from command line.

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Documentation

- Clarified the PMAPI commands for halt and reboot regarding conditions and behavior.
- Linux console overrun, cause and workaround.
- Video playback performance.
- Clarified documentation regarding RTC behavior.

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6 Known issues

Display flickering

When an applications starts a short flickering can sometimes occur after the bootlogo switches to the application screen.

Linux console overrun

When copying text and pasting it to the serial console some characters go missing. The issue is well known by NXP but no work around or fixing is available. Linux console overrun issues on the i.MX6ULL (RX FIFO overrun) typically occur because the CPU cannot drain the UART FIFO fast enough, often due to high system load. The i.MX6ULL has a 32-byte RX FIFO that requires rapid processing, especially at high baud rates.

The issue can be reproduced by pasting strings longer than 32 characters to the Linux console. For example, pasting the string *"Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua."* consisting of 123 characters, will loose characters at position 32, 33, 64, 65, 96, 97, marked red.

A work around for minicom users is, setting a character TX delay of 1 ms in minicom by pressing: CRTL-A, Z, T, F, 1, ↵, ↵. Unfortunately, this parameter is not supported to be stored in the minicom configuration file (.minirc.dfl). Workarounds for other terminal applications are not known.

Video playback performance

Tests have shown that the OPUS-B2 can smoothly display MJPEG streams at a frame rate of 25 to 30 fps. This applies to resolutions 320x240, 480x272, 640x480 and 800x480. Nevertheless, the stream format is also critical, since the OPUS-B2 lacks hardware acceleration and the internal transfer rate of the i.MX6ULL is limited to 480 Mbit/s (60 MB/s).

A modified version of gstreamer was used for these tests, which is not part of the image. Thus, a practical use is therefore virtually impossible.

Notice
Please report all found bugs to Topcon Electronics to help to improve stability and reliability of future Linux OS releases.

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