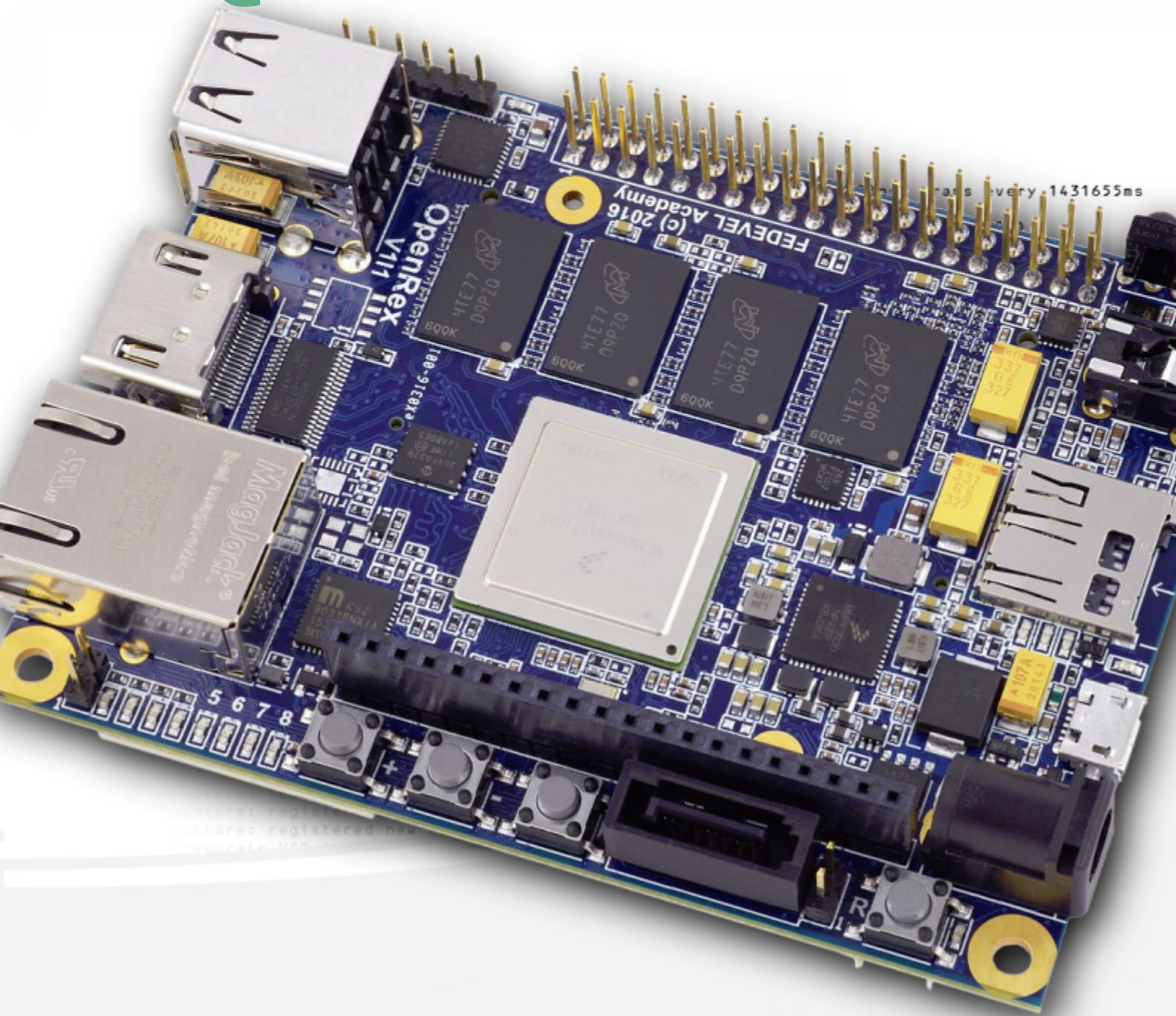


iMX6 OpenRex SBC

QUICK GUIDE



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About Voipac iMX6 OpenRex Single Board Computer (SBC)

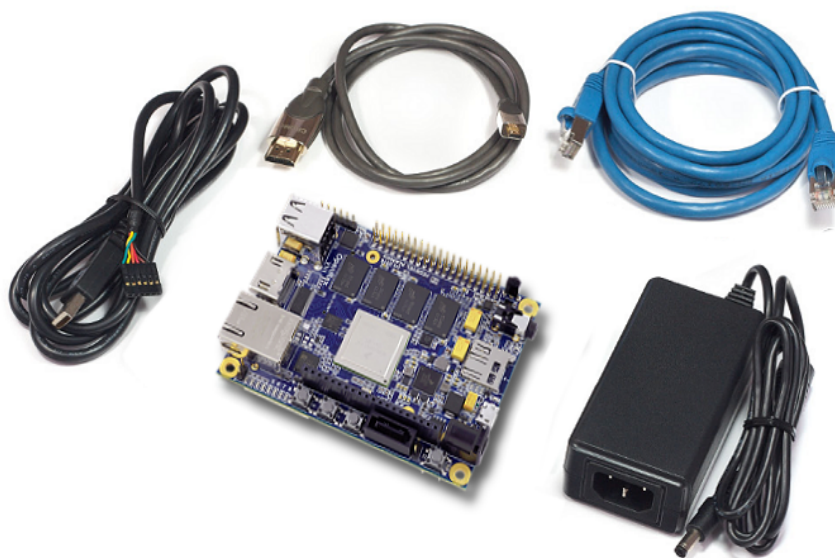
iMX6 OpenRex Single Board Computer (SBC) a **completely open source** SBC powered by NXP/Freescale i.MX6 ARM® Cortex® A9 multicore CPU. The board further features NXP LPC1345 ARM® Cortex® M3 microcontroller, multiple camera inputs, and a series of built-in sensors including compass & accelerometer, gyroscope, humidity sensor, and temperature sensor making it ideal choice for industrial as well as home automation applications.

It was designed also for playing, learning and hacking thus includes also Raspberry Pi & Arduino like GPIO headers.

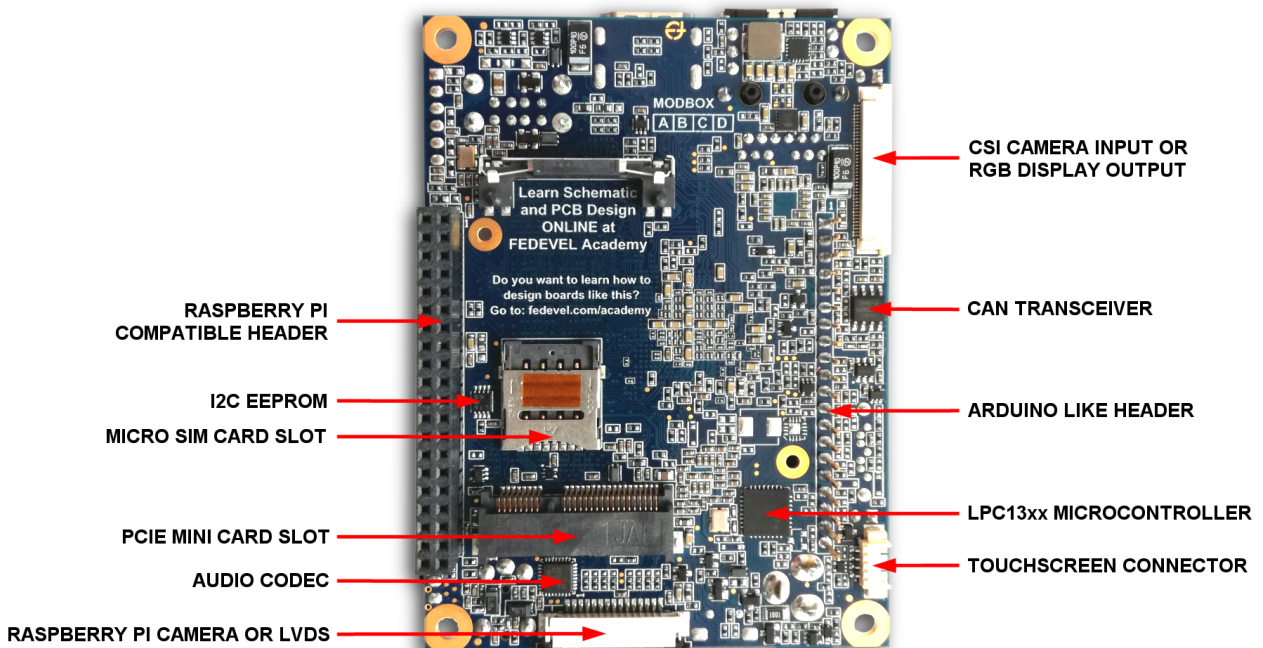
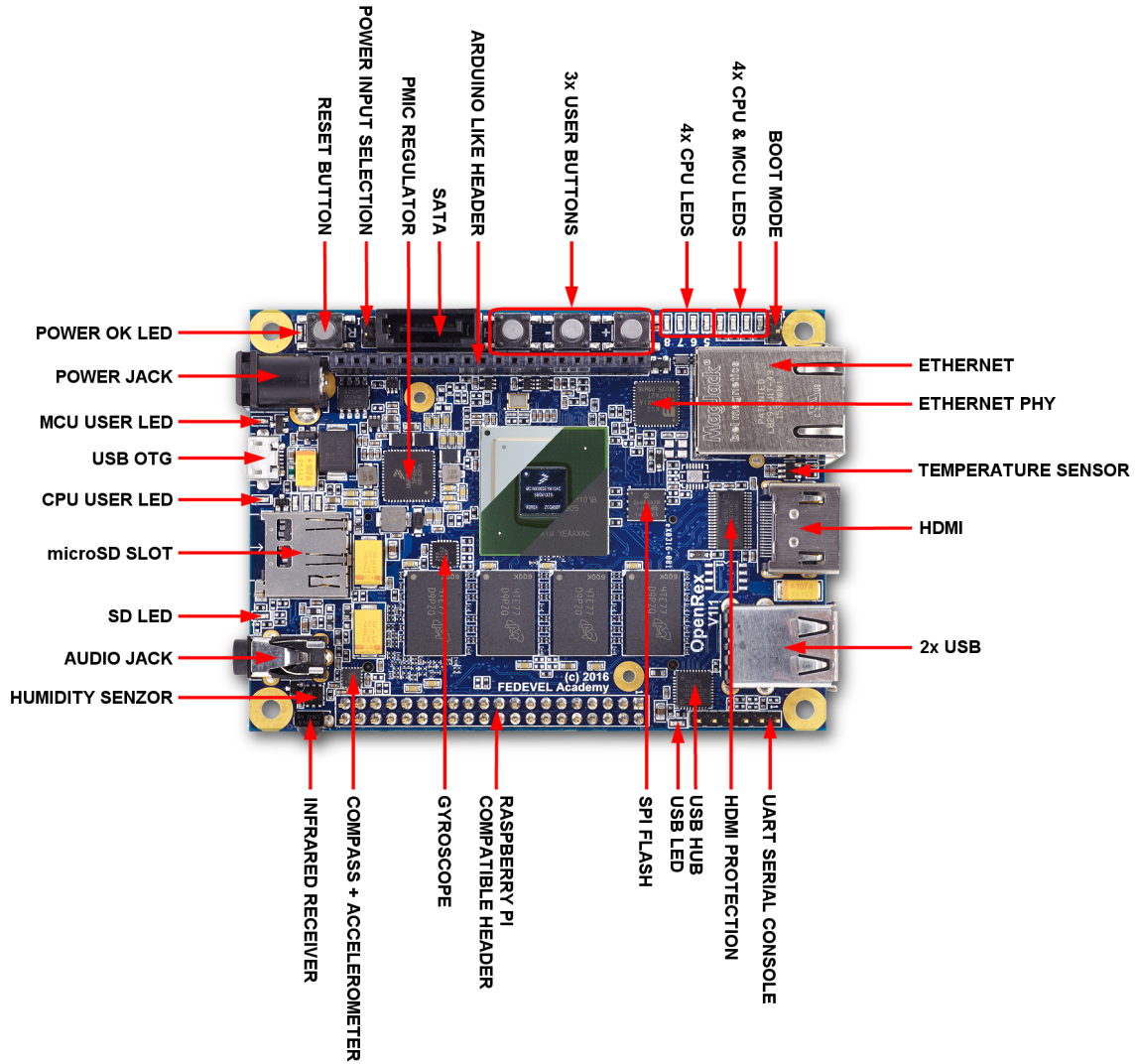
This Quick Guide shows, how to flash the board using MfgTool program, load Yocto Project Linux image on microSD card using USB writer. Programs run under Windows XP/7/8/10. More information available at: [imx6 openrex at wiki.voipac.com](http://wiki.voipac.com/imx6-openrex).

Packing List

COMPONENTS	QUANTITY
iMX6 OpenRex Single Board Computer	1
8GB microSDHC Class 4 memory card	1
Aluminum 35 x 35 x 10mm heatsink	1
TTL-232R-3V3 cable (Optional)	1
HDMI High Speed CAT.2 cable with Ethernet (Optional)	1
SFTP CAT.6 Patch Ethernet cable (Optional)	1
5V Power supply (Optional)	1
Quick Guide brochure	1
Yocto Project Linux OS preinstalled. (Android 7.1 preinstalled upon request)	

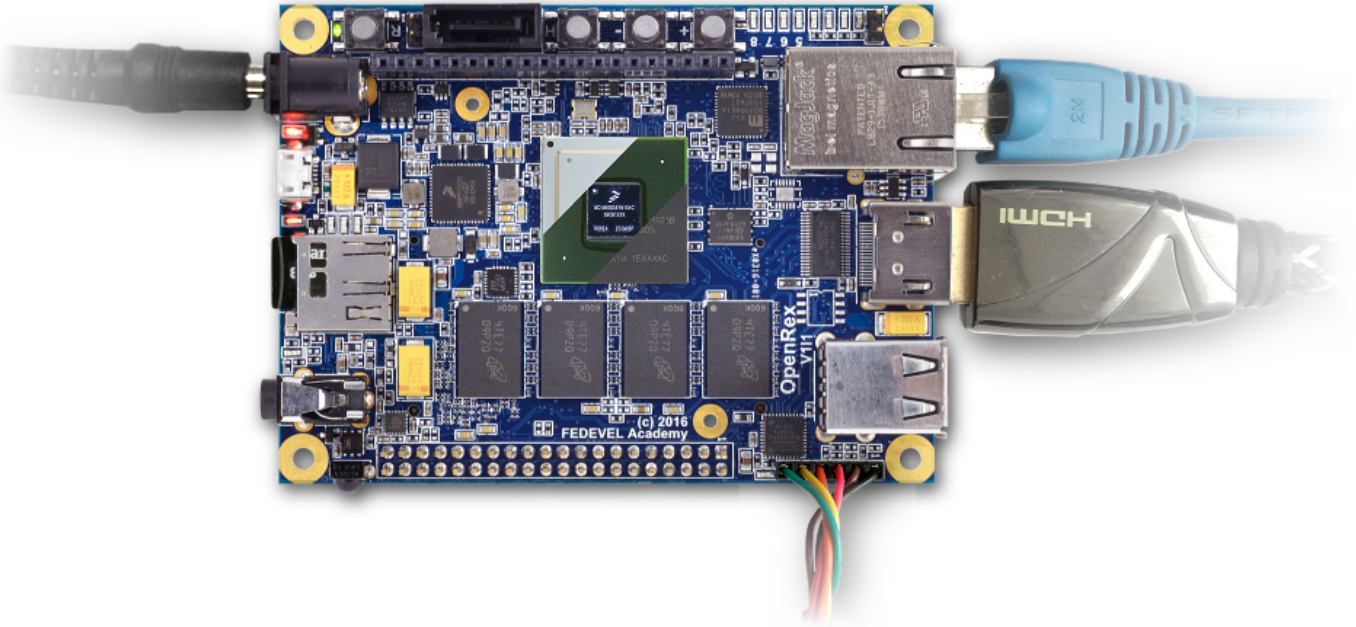


Connectors Locations

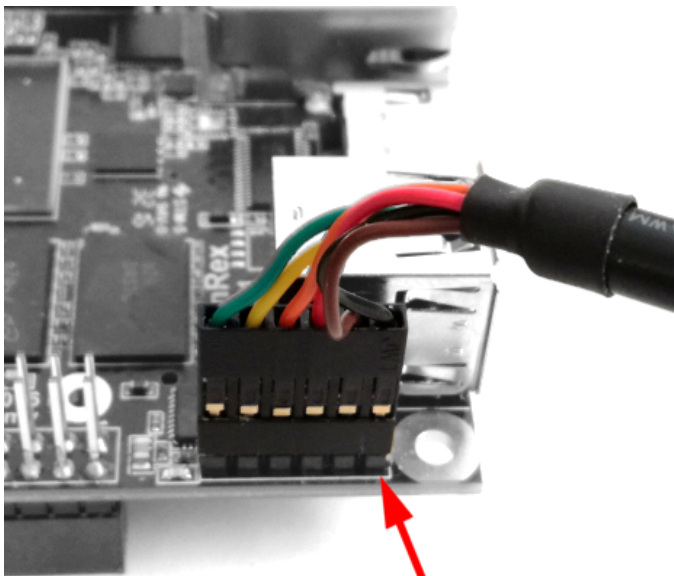


Connecting the components and cables

Prepare iMX6 OpenRex SBC and plug in (bootable) microSD card, TTL-232R-3V3 FTDI cable, Ethernet cable, HDMI cable and other devices or interfaces you need. Plug the power supply connector in.



IMPORTANT! Be careful when connecting TTL-232R FTDI cable to the board. Check if the cable conductor 1 (black wire) is connected to Pin 1 (Header connector J3 – TTL-232R FTDI) on the board.



PIN 1

To boot from microSD Card, make sure that BOOT_MODE jumper is not present.



The First Steps

Voipac iMX6 OpenRex SBC is supplied with bootloader and Yocto Project Linux distribution preinstalled on microSD card by default. The SBC can be controlled over:

Controlling iMX6 OpenRex SBC over serial line

Recommended HW:

- a) PC with USB port
- b) Voipac iMX6 OpenRex SBC
- c) [TTL-232R-3V3 \(FTDI \) cable](#)

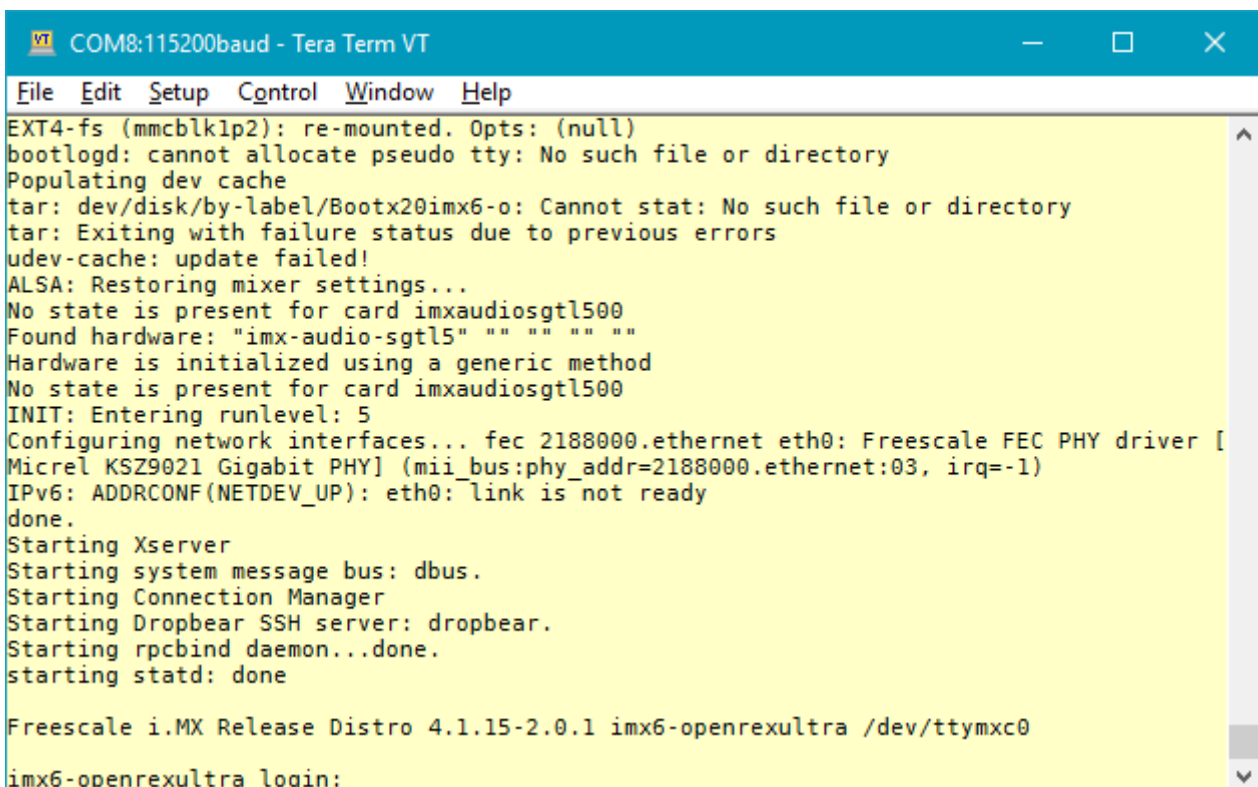
Recommended SW:

Serial line terminal (PUTTY, Minicom, Ckermit, Hyperterminal, TeraTerm, ...)

Default serial port settings:

Speed (baud):	115200
Data bits:	8
Stop bits:	1
Parity:	None
Flow control:	None

Controlling iMX6 OpenRex SBC using TeraTerm



```
VT COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
EXT4-fs (mmcblk1p2): re-mounted. Opts: (null)
bootlogd: cannot allocate pseudo tty: No such file or directory
Populating dev cache
tar: dev/disk/by-label/Bootx20imx6-o: Cannot stat: No such file or directory
tar: Exiting with failure status due to previous errors
udev-cache: update failed!
ALSA: Restoring mixer settings...
No state is present for card imxaudiosgtl500
Found hardware: "imx-audio-sgtl5" "" "" "" ""
Hardware is initialized using a generic method
No state is present for card imxaudiosgtl500
INIT: Entering runlevel: 5
Configuring network interfaces... fec 2188000.ethernet eth0: Freescale FEC PHY driver [
Micrel KSZ9021 Gigabit PHY] (mii_bus:phy_addr=2188000.ethernet:03, irq=-1)
IPv6: ADDRCONF(NETDEV_UP): eth0: link is not ready
done.
Starting Xserver
Starting system message bus: dbus.
Starting Connection Manager
Starting Dropbear SSH server: dropbear.
Starting rpcbind daemon...done.
starting statd: done

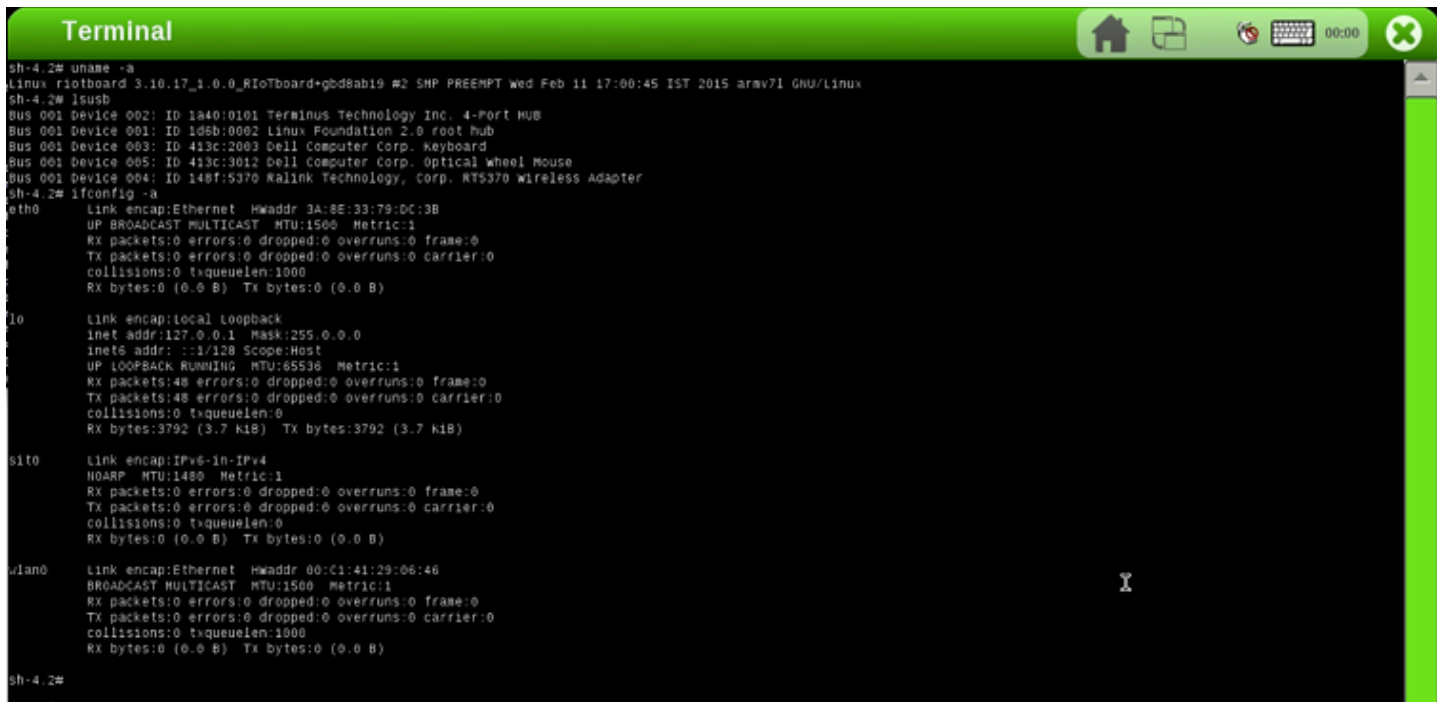
Freescale i.MX Release Distro 4.1.15-2.0.1 imx6-openrexultra /dev/ttymx0
imx6-openrexultra login:
```

Using external monitor and USB keyboard

Recommended HW:

- External monitor with HDMI connector (HDMI to VGA adapter is required for VGA monitor)
- Voipac iMX6 OpenRex SBC
- [HDMI High Speed cable](#)
- USB keyboard and USB mouse

Controlling the SBC using external monitor and USB keyboard



```
Terminal
sh-4.2# uname -a
Linux riotboard 3.10.17_1.0.0_RIoTboard-qbd8ab19 #2 SMP PREEMPT Wed Feb 11 17:00:45 IST 2015 armv7l GNU/Linux
sh-4.2# lsusb
BUS 001 Device 002: ID 1a40:0101 Terminus Technology Inc. 4-Port HUB
BUS 001 Device 001: ID 1d5b:0002 Linux Foundation 2.0 root hub
BUS 001 Device 003: ID 413c:2003 Dell Computer Corp. keyboard
BUS 001 Device 005: ID 413c:3012 Dell Computer Corp. Optical wheel Mouse
BUS 001 Device 004: ID 148f:5370 Ralink Technology, Corp. RT5370 Wireless Adapter
sh-4.2# ifconfig -a
eth0      Link encap:Ethernet  HWaddr 3A:8E:33:79:DC:3B
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  Tx bytes:0 (0.0 B)

lo        Link encap:local loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:48 errors:0 dropped:0 overruns:0 frame:0
          TX packets:48 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:3792 (3.7 KiB)  Tx bytes:3792 (3.7 KiB)

sit0      Link encap:IPv6-in-IPv4
          NOARP  MTU:1480  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  Tx bytes:0 (0.0 B)

vlan0     Link encap:Ethernet  HWaddr 00:c1:41:29:06:46
          BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  Tx bytes:0 (0.0 B)

sh-4.2#
```

Illustration Photo

Controlling iMX6 OpenRex SBC over Ethernet (telnet, ssh, ftp, sftp)

Recommended HW:

- PC with Ethernet
- Voipac iMX6 OpenRex SBC
- [Ethernet cable](#)

Recommended SW:

- Telnet client (Telnet, PUTTY, ...)
- SSH client (SSH,PUTTY, ...)
- FTP client (FTP, Filezilla, BareFTP, ...)
- SFTP client (Filezilla, PUTTY, WinSCP, ...)



IMPORTANT!

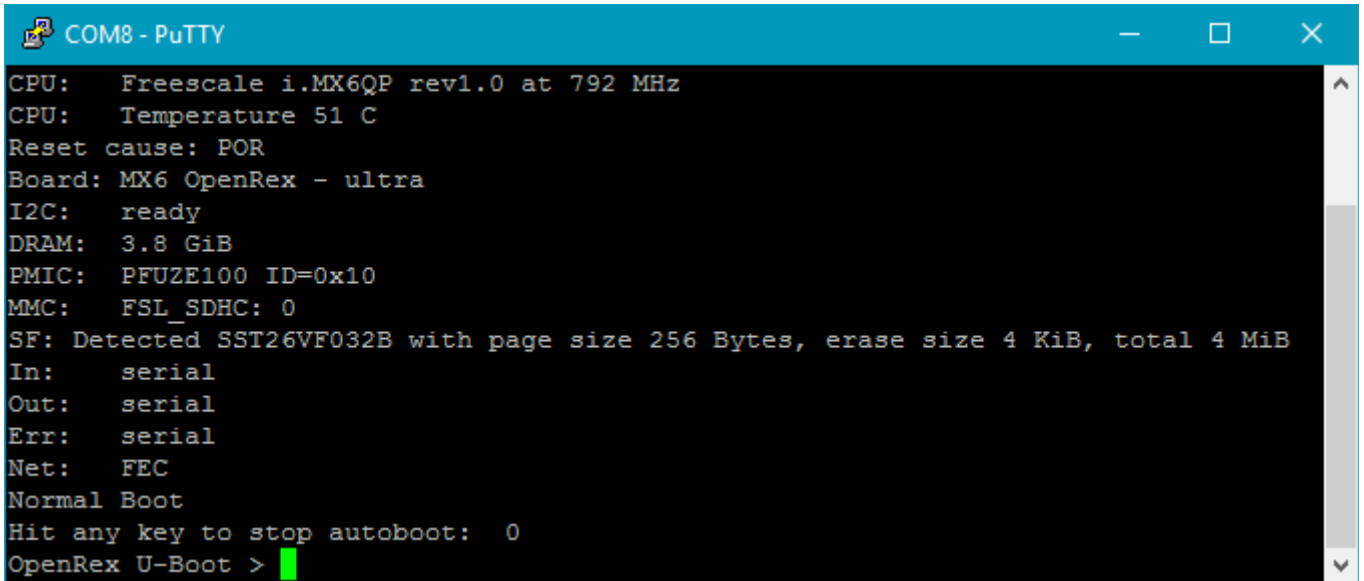
iMX6 OpenRex SBC is shipped with empty password.

Login is: root

The default IP address is dynamic and setup by your dhcp server upon boot.

**SSH, SFTP require root password to be set up. ("passwd" command)
FTP, SFTP are recommended only for data transfers. (binary mode is recommended)**

Controlling iMX6 OpenRex SBC using PUTTY connected to Serial Line.



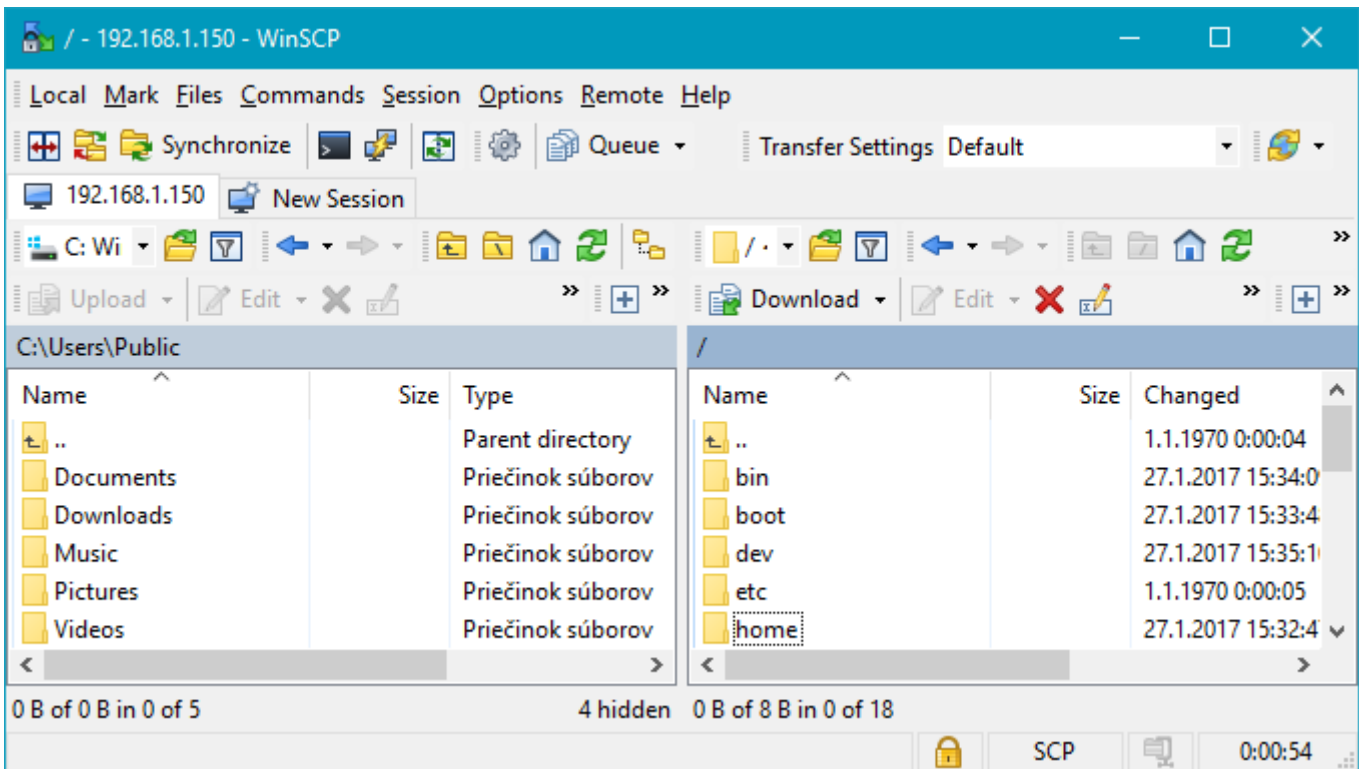
```
COM8 - PuTTY
CPU: Freescale i.MX6QP rev1.0 at 792 MHz
CPU: Temperature 51 C
Reset cause: POR
Board: MX6 OpenRex - ultra
I2C: ready
DRAM: 3.8 GiB
PMIC: PFUZE100 ID=0x10
MMC: FSL_SDHC: 0
SF: Detected SST26VF032B with page size 256 Bytes, erase size 4 KiB, total 4 MiB
In: serial
Out: serial
Err: serial
Net: FEC
Normal Boot
Hit any key to stop autoboot: 0
OpenRex U-Boot >
```

Controlling iMX6 OpenRex SBC using PUTTY SSH client.



```
192.168.1.122 - PuTTY
login as: root
root@imx6-openrexultra:~#
```

Controlling iMX6 OpenRex SBC using WinSCP.



MfgTool for booting by USB OTG

MfgTool

U-boot is a bootloader responsible for hardware initialization, loading and booting linux kernel. It is also used for module flashing. Following example is for iMX6 OpenRex SBC in Ultra configuration.

Recommended HW:

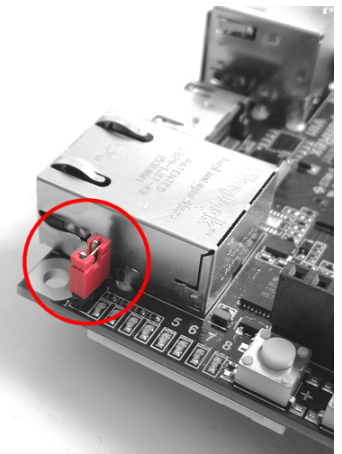
- a) PC with USB port
- b) Voipac iMX6 OpenRex SBC
- c) USB to Micro-USB cable

Recommended SW:

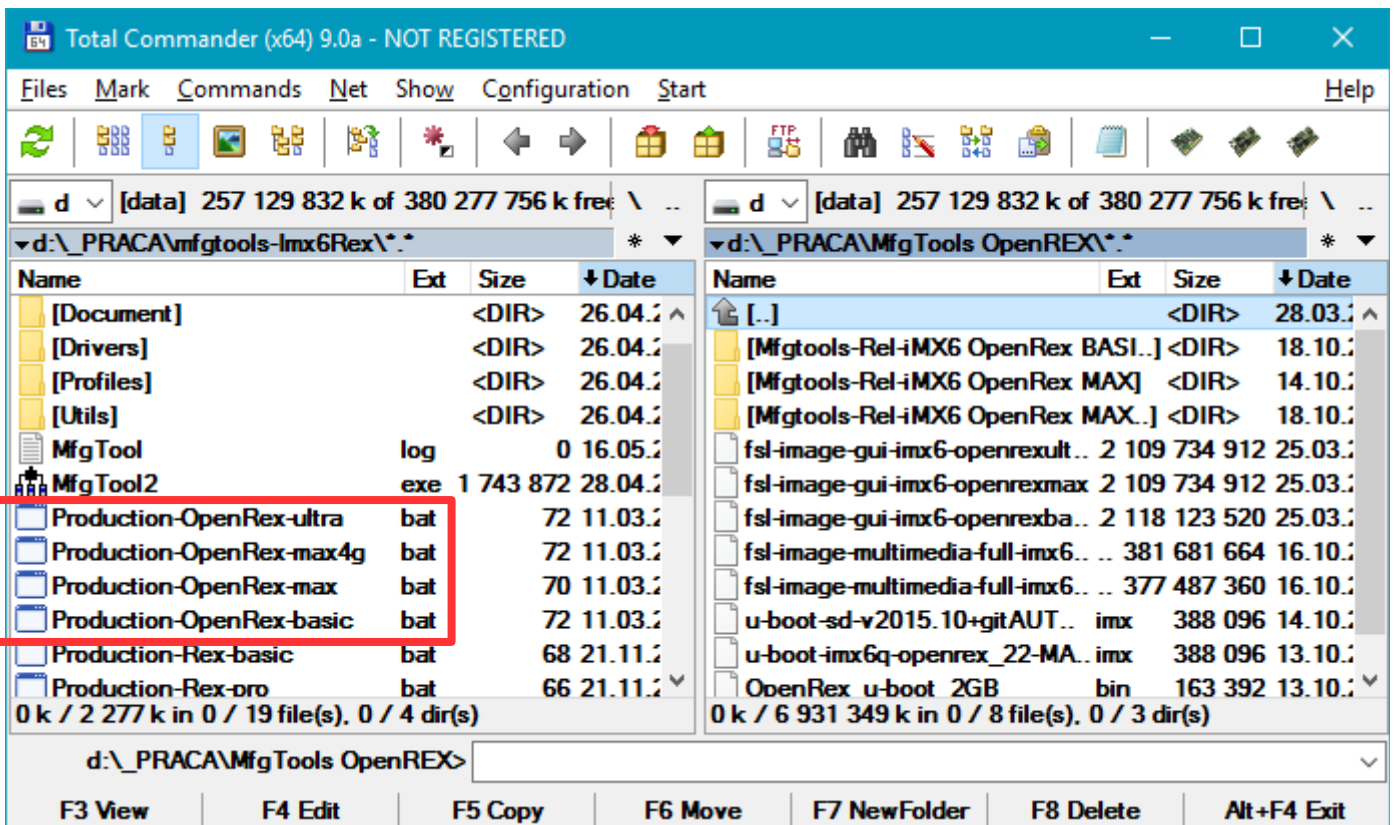
- [MfgTool](#)
- Serial line terminal

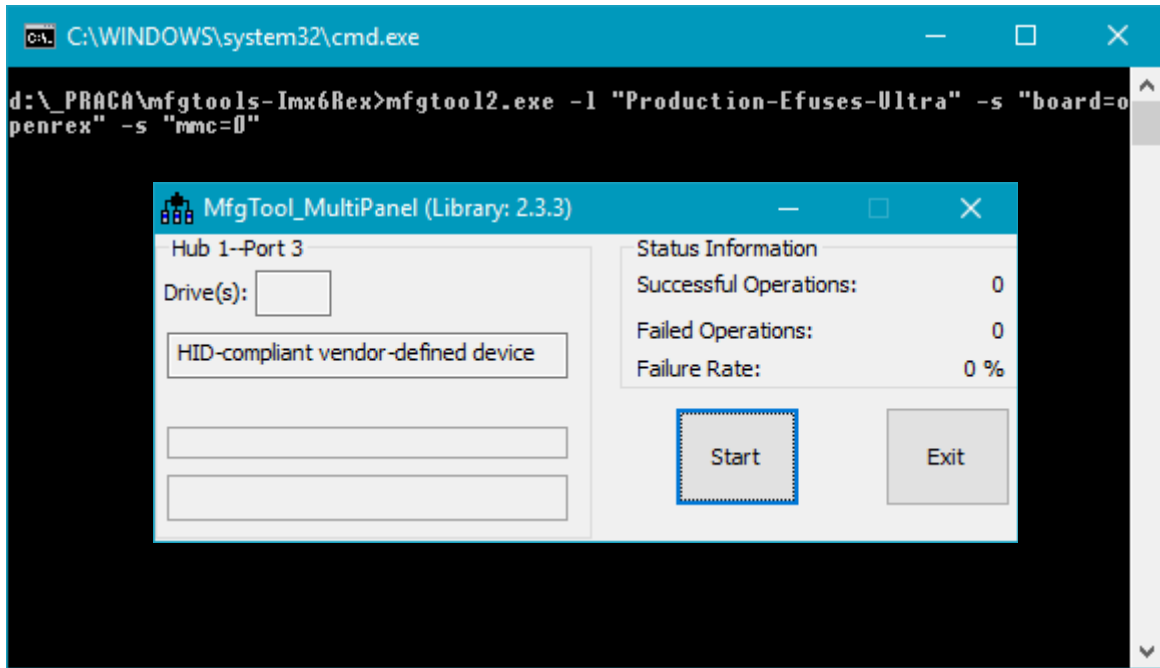
1 **STEP** Connect USB cable to USB port on your computer and OpenRex SBC USB OTG port.

2 **STEP** Short BOOT_MODE jumper JP2 on OpenRex SBC and Power on the board.

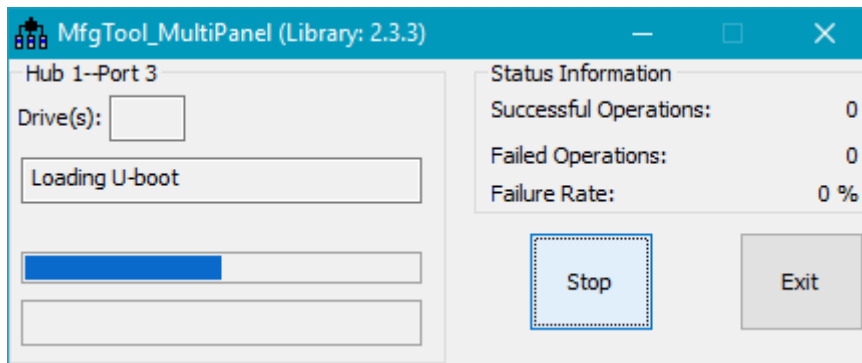


3 **STEP** Execute Manufacturing toolkit at host PC. Open an appropriate BAT file.

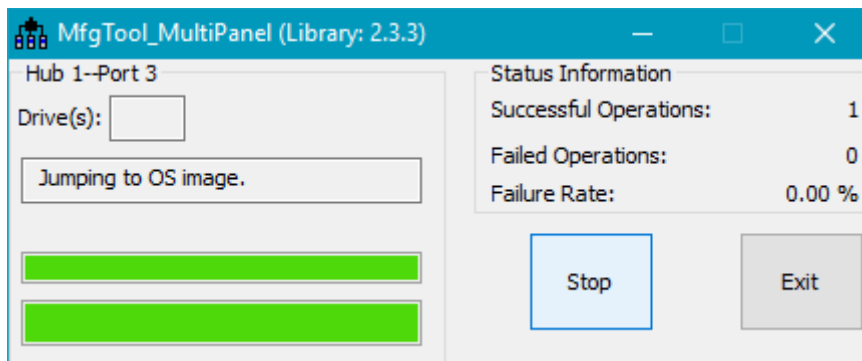




4 **STEP** Press Start button (iMX6 OpenRex SBC will boot firmware loaded over USB OTG).



5 **STEP** Wait until firmware (u-boot) is booted (serial terminal).



```

VT COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
CPU: Freescale i.MX6QP rev1.0 at 792 MHz
CPU: Temperature 48 C
Reset cause: POR
Board: MX6 OpenRex - ultra
I2C: ready
DRAM: 3.8 GiB
PMIC: PFUZE100 ID=0x10
MMC: FSL_SDHC: 0
SF: Detected SST26VF032B with page size 256 Bytes, erase size 4 KiB, total 4 MiB
In: serial
Out: serial
Err: serial
Net: FEC
Boot from USB for mfgtools
Use default environment for mfgtools
Run bootcmd_mfg: <NULL>
OpenRex U-Boot >

```



6 STEP Burn efuses over serial terminal. **Only for “VIRGIN” OpenRex SBC !**

Efuses Boot From SPI:

```

fuse prog 0 5 0x2A000030
fuse prog 0 6 0x00000010

```

MAC Address (For example 00:0D:15:00:D1:75):

```

fuse prog 4 3 0x000d
fuse prog 4 2 0x1500d175

```

```

VT COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
Normal Boot
Hit any key to stop autoboot: 0
OpenRex U-Boot > fuse prog 0 5 0x2A000030
Programming bank 0 word 0x00000005 to 0x2a000030...
Warning: Programming fuses is an irreversible operation!
        This may brick your system.
        Use this command only if you are sure of what you are doing!

Really perform this fuse programming? <y/N>
y
OpenRex U-Boot > fuse prog 0 6 0x00000010
Programming bank 0 word 0x00000006 to 0x00000010...
Warning: Programming fuses is an irreversible operation!
        This may brick your system.
        Use this command only if you are sure of what you are doing!

Really perform this fuse programming? <y/N>
y
OpenRex U-Boot > █

```




This operation is not reversible and should be executed carefully. The iMX6 OpenRex SBC must be replaced in the case of error.



**BE AWARE THAT E-FUSES PROGRAMING IS A NON REVERSAL PROCESS !
WARRANTY CLAIM CAUSED BY IMPROPER E-FUSES PROGRAMMING WILL
NOT BE ACCEPTED !**

7
STEP

Power off iMX6 OpenRex SBC.

8
STEP

Remove BOOT_MODE jumper.

SPI Bootloader

How to flash SPI bootloader (u-boot-imx6-openrex.imx)*

This part of QuickGuide shows how to flash u-boot and configure the module to run, in addition to the SD card, from iMX6 OpenRex SBC SPI flash. Updating of existing modules with burned efuses possible.

Recommended HW:

- a) PC with USB port
- b) Voipac iMX6 OpenRex SBC
- c) USB to Micro-USB cable

Recommended SW:

- [MfgTool](#) (only for "VIRGIN" modules)
- Serial line terminal
- [Appropriate files](#)

* Select appropriate file for specified configuration:

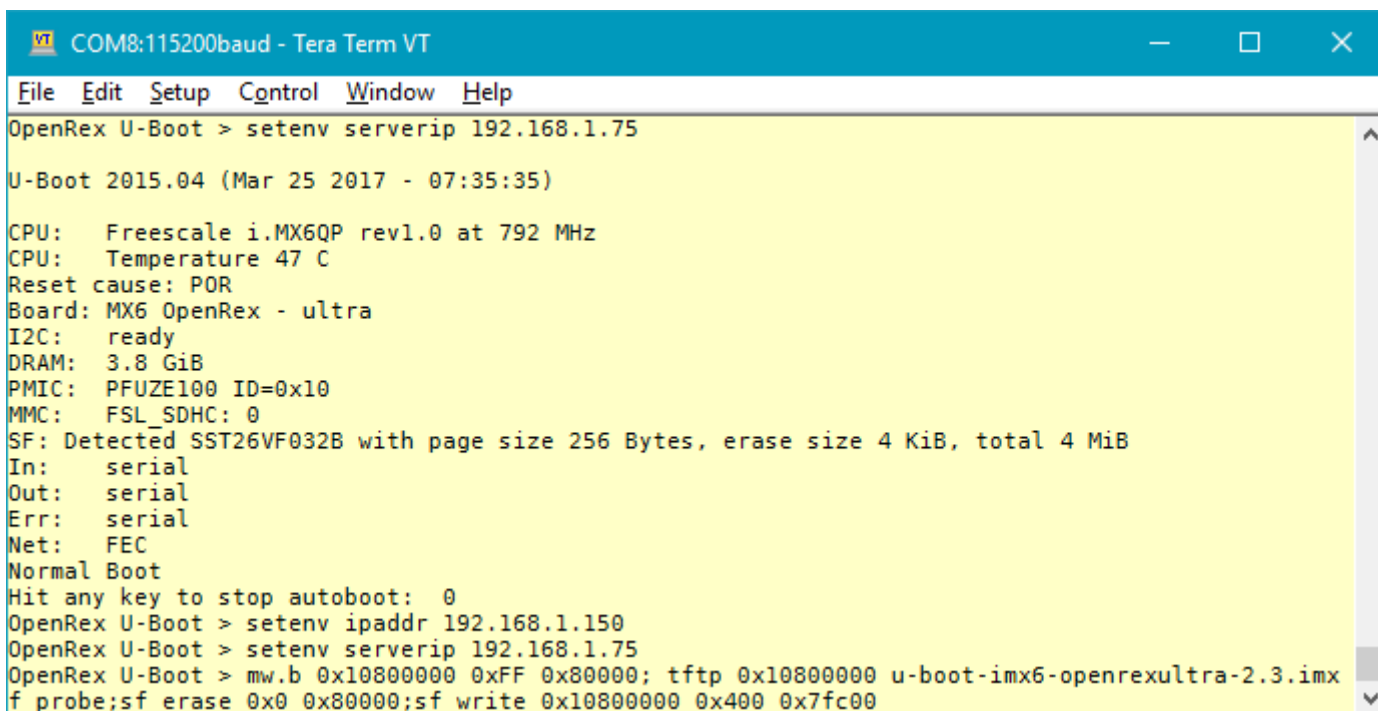
- | | |
|---------------------------|------------------------------|
| - iMX6 OpenRex SBC Ultra: | u-boot-imx6-openrexultra.imx |
| - iMX6 OpenRex SBC Max: | u-boot-imx6-openrexmax.imx |
| - iMX6 OpenRex SBC Basic: | u-boot-imx6-openrexbasic.imx |

1
STEP

Open MfgTool appropriate .bat file to load bootloader over USB OTG port. Use this step only for "VIRGIN" SBC as described in the above [MfgTool Chapter](#) of this document.

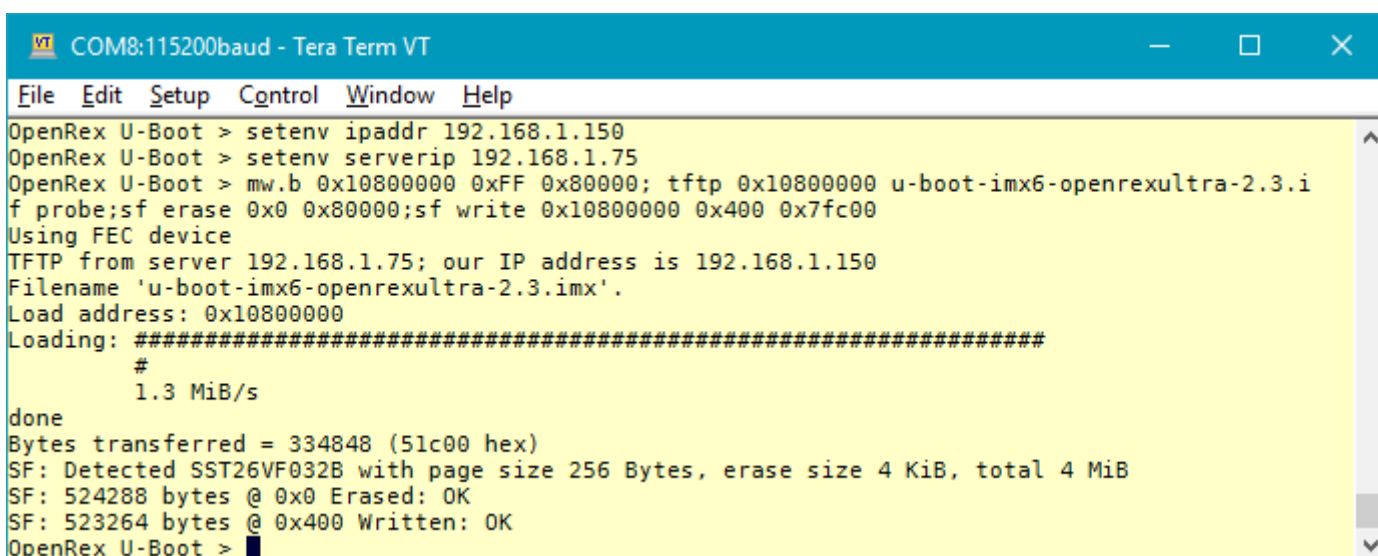
2 **STEP** Stop autoboot in your serial line terminal. Type or paste commands separately to download appropriate bootloader file from TFTP server where the bootloader file is located. Following example is for iMX6 OpenRex SBC in Ultra configuration.

```
setenv ipaddr 192.168.1.150
setenv serverip 192.168.1.75
mw.b 0x10800000 0xFF 0x80000
tftp 0x10800000 u-boot-imx6-openrexmltra-2.3.imx; sf probe;sf erase 0x0 0x80000
sf write 0x10800000 0x400 0x7fc00
```



```
COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
OpenRex U-Boot > setenv serverip 192.168.1.75
U-Boot 2015.04 (Mar 25 2017 - 07:35:35)
CPU: Freescale i.MX6QP rev1.0 at 792 MHz
CPU: Temperature 47 C
Reset cause: POR
Board: MX6 OpenRex - ultra
I2C: ready
DRAM: 3.8 GiB
PMIC: PFUZE100 ID=0x10
MMC: FSL_SDHC: 0
SF: Detected SST26VF032B with page size 256 Bytes, erase size 4 KiB, total 4 MiB
In: serial
Out: serial
Err: serial
Net: FEC
Normal Boot
Hit any key to stop autoboot: 0
OpenRex U-Boot > setenv ipaddr 192.168.1.150
OpenRex U-Boot > setenv serverip 192.168.1.75
OpenRex U-Boot > mw.b 0x10800000 0xFF 0x80000; tftp 0x10800000 u-boot-imx6-openrexmltra-2.3.imx
f probe;sf erase 0x0 0x80000;sf write 0x10800000 0x400 0x7fc00
```

The bootloader is written to iMX6 OpenRex SBC SPI Flash after automatic download from the TFTP Server.



```
COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
OpenRex U-Boot > setenv ipaddr 192.168.1.150
OpenRex U-Boot > setenv serverip 192.168.1.75
OpenRex U-Boot > mw.b 0x10800000 0xFF 0x80000; tftp 0x10800000 u-boot-imx6-openrexmltra-2.3.i
f probe;sf erase 0x0 0x80000;sf write 0x10800000 0x400 0x7fc00
Using FEC device
TFTP from server 192.168.1.75; our IP address is 192.168.1.150
Filename 'u-boot-imx6-openrexmltra-2.3.imx'.
Load address: 0x10800000
Loading: #####
#
1.3 MiB/s
done
Bytes transferred = 334848 (51c00 hex)
SF: Detected SST26VF032B with page size 256 Bytes, erase size 4 KiB, total 4 MiB
SF: 524288 bytes @ 0x0 Erased: OK
SF: 523264 bytes @ 0x400 Written: OK
OpenRex U-Boot >
```

- 3** **STEP** Reset the board. iMX6 OpenRex SBC will start booting from SPI Flash. The bootloader will defaultly start to download Image from TFTP Server. To change bootloader environment, stop autobooting.

```
COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
U-Boot 2015.04 (Mar 25 2017 - 07:35:35)

CPU: Freescale i.MX6QP rev1.0 at 792 MHz
CPU: Temperature 48 C
Reset cause: POR
Board: MX6 OpenRex - ultra
I2C: ready
DRAM: 3.8 GiB
PMIC: PFUZE100 ID=0x10
MMC: FSL_SDHC: 0
SF: Detected SST26VF032B with page size 256 Bytes, erase size 4 KiB, total 4 MiB
In: serial
Out: serial
Err: serial
Net: FEC
Normal Boot
Hit any key to stop autoboot: 0
MMC: no card present
MMC: no card present
Booting from net ...
FEC Waiting for PHY auto negotiation to complete.. done
Using FEC device
TFTP from server 192.168.1.75; our IP address is 192.168.1.150
Filename 'imx6/zImage'.
Load address: 0x10800000
Loading: T
```

```
COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
U-Boot 2015.04 (Mar 25 2017 - 07:35:35)

CPU: Freescale i.MX6QP rev1.0 at 792 MHz
CPU: Temperature 51 C
Reset cause: POR
Board: MX6 OpenRex - ultra
I2C: ready
DRAM: 3.8 GiB
PMIC: PFUZE100 ID=0x10
MMC: FSL_SDHC: 0
SF: Detected SST26VF032B with page size 256 Bytes, erase size 4 KiB, total 4 MiB
In: serial
Out: serial
Err: serial
Net: FEC
Normal Boot
Hit any key to stop autoboot: 0
OpenRex U-Boot >
```

Creating Bootable microSD card

USB Writer

Following example is for iMX6 OpenRex SBC in Ultra configuration.

Recommended HW:

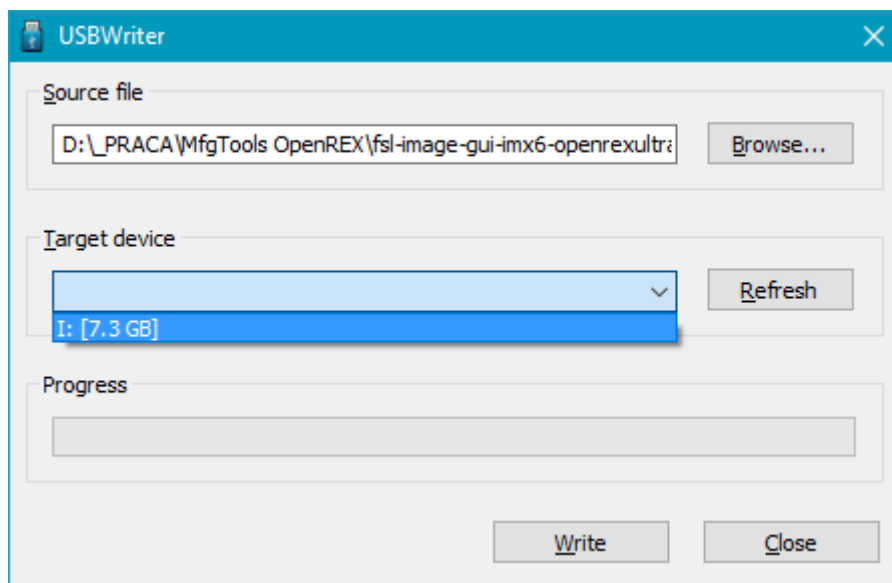
- a) PC with microSD port
- b) microSD card

Recommended SW:

- [USBWriter](#)
- [Appropriate Image files](#)

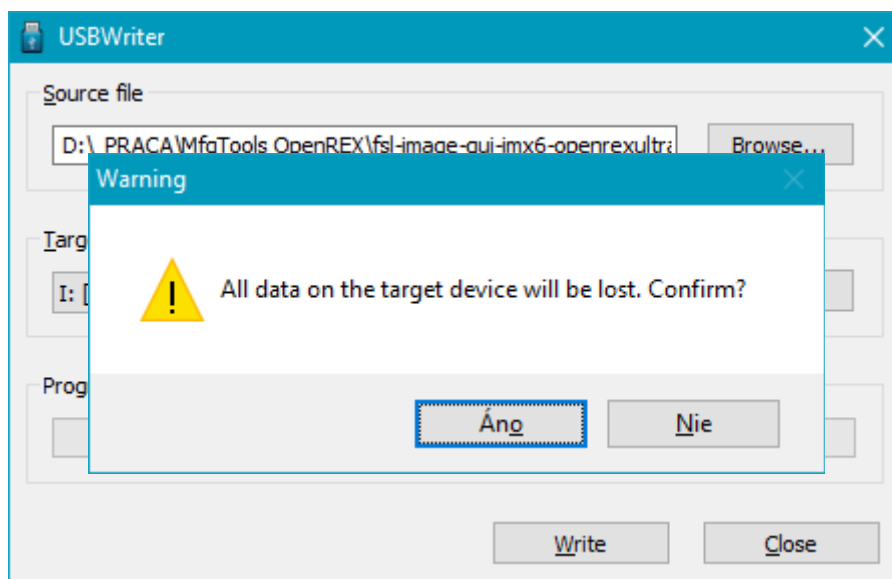
1
STEP

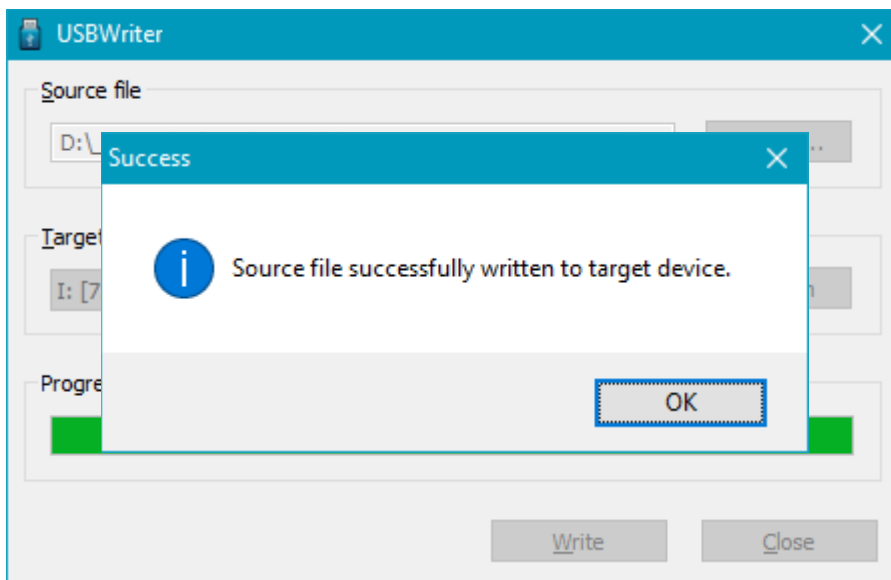
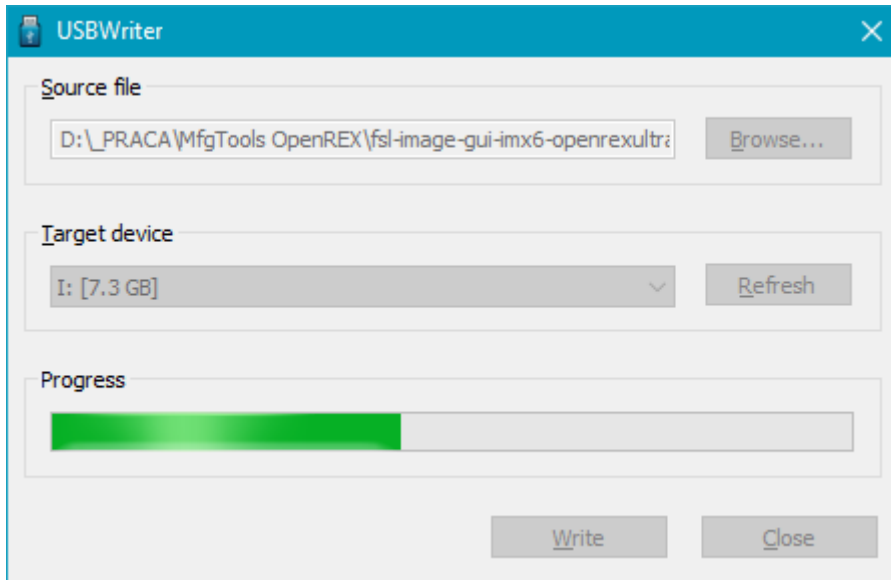
Open USBWriter. Browse source file (appropriate fsl-image). Select target device.



2
STEP

Click on Write button and confirm a procedure.





Bootable microSD Card is now created and prepared for use.

Notes

Important and Usefull Information

Products` Life Cycle Phase

Voipac products are divided into 4 phases:

- **INTRODUCTION PHASE**, approximately the first 6-12 months.
The last software issues are still being resolved.
Product in this stage is the most suitable for new designs.
- **ACTIVE PHASE**, the first 1-3 years following the product introduction.
Product software packages are stable, additional functions, OS and GUI are being released.
Product in this stage is suitable for new designs.
- **MATURITY PHASE**, approximately the first 4-6 years after the introduction.
Products are shipped in volumes, additional functions additions declines.
Product in this stage is no longer recommended for new designs.
- **EOL PHASE**, approximately 7-10 years after the introduction.
Used components availability decreases, although product may still be purchased under specific circumstances.
The Last Time Buy notification is send to all product users app. 6 months prior to product discontinuation.
Components stocking service for discontinued products and manufacturing of further production batches is available.

To find out the specific product life cycle phase, visit its [product](#) page and check the title color.

CE compliance of Voipac products

The CE label is a mandatory conformity mark for complex electronic devices placed on the market in the European Economic Area and each product sold within the EU needs a CE Certificate of Conformance that ensures that the product conforms to the essential requirements of the applicable EC directives.

However, if such complex electronic devices are produced for further processing by the industry, skilled development teams or system integrators, they do not need to observe the above mentioned CE requirements and consequently do not need any identification either. This applies to the Voipac Computers On Module (COM) and Single Board Computers (SBC), because these are not used as stand-alone devices by the general public.

To make sure that Voipac COMs and SBCs can be used in CE marked devices, they are designed to obey the EC directives and the standard configuration COMs and SBCs manufactured by Voipac are tested for Electromagnetic Interference and operating temperature ranges.

TECHNICAL SUPPORT

HW & SW support: support@voipac.com

Warranty claims: warranty.claim@voipac.com

All of the relevant communication between the customer and Voipac should be executed via e-mails preferably.

Response time is up to 48 hours, except state holidays and weekends.

Voipac working hours are: 8:00 - 17:00, Monday - Friday.

Before contacting support, please read the following for the basic information about how to work with your SBC:

www.voipac.com/#Downloads

http://www.voipac.com/downloads/imx/iMX6_OpenRex/

<http://wiki.voipac.com/xwiki/bin/view/imx6+openrex/>

<http://www.imx6rex.com>

We provide paid support for your new designs when it comes to the special drivers for the peripherals not included in the Voipac standard COMs and SBCs, design of your own base boards, prototyping, or even new products development.

Please contact: support@voipac.com for more info.

Warranty:

VOIPAC TECHNOLOGIES s.r.o. Does Not Bear Responsibility for the Following:

- Failure of a product resulting from misuse, accident, modification, unsuitable operating environment, or improper maintenance by user
- Unless otherwise agreed in written, a product does not include technical support and the customer may be able to purchase technical support under separate agreement
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