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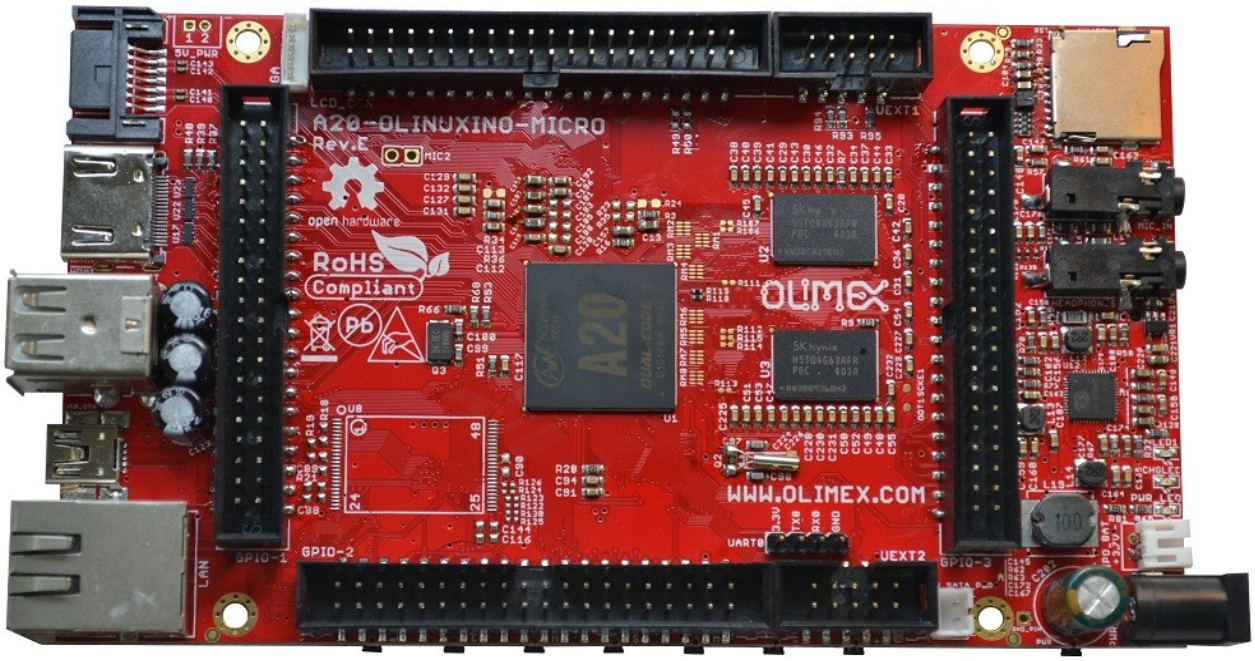

A20-OLinuXino-MICRO

Open-source single-board Android/Linux mini-computer

USER'S MANUAL

Document revision P, December 2015
Designed by OLIMEX Ltd, 2015

lead-free

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Table of Contents

CHAPTER 1: OVERVIEW

1. Introduction to the chapter

Thank you for choosing this OLinuXino single board computer from Olimex! This document provides a user's guide for the Olimex A20-OLinuXino board. As an overview, this chapter gives the scope of this document and lists the board's features. The document's organization is then detailed.

The A20-OLinuXino-MICRO development board enables code development of applications running on the A20 microcontroller, manufactured by Allwinner Technology from China.

OLinuXino is an open-source, open-hardware project and all documentation is available to the customer.

1.1 Features

The board has the following set of features (please note the difference between the two versions of the board):

- A20 Cortex-A7 dual-core ARM Cortex-A7 CPU and dual-core Mali 400 GPU
- 1GB DDR3 RAM memory
- **4GB NAND FLASH memory (available only on the 4GB version of the board)**
- SATA connector with 5V SATA power jack
- Capable of FullHD (1080p) video playback
- Native HDMI connector
- 2 x USB High-speed host with power control and current limiter
- USB-OTG with power control and current limiter
- VGA output on 6-pin 1.25mm (0.05") step connector
- 100MBit native Ethernet
- Battery connector with battery-charging capabilities
- Audio headphones output on connector
- Microphone input on connector
- 2 x UEXT connectors
- LCD connector compatible with with 4.3", 7.0", 10.1" LCD modules from Olimex
- 160 GPIOs on three GPIO connectors
- MicroSD card connector
- SD/MMC card connector
- DEBUG-UART connector for console debug with USB-SERIAL-CABLE-F
- GPIO LED
- Battery charge status LED
- 2KB EEPROM for MAC address storage and more
- 10 BUTTONS with ANDROID functionality + RESET button
- 4 mount holes
- 6-16V input power supply, noise immune design
- PCB dimensions: (5600×3250) mils ~ (142.24×82.55) mm

1.2 Target market and purpose of the board

The boards from the OLinuXino family are easy to setup and powerful. It is possible to use them in almost any application as a host board. They are suitable for embedded programming enthusiasts, Linux and Android gadget fans (they can just use the board as a media center or fully functional Linux-PC, for instance) and also professionals (since its low cost makes it very good solution for application-orientated embedded systems). The main usage of the board is software embedded development without the urge of understanding perfectly the hardware.

The strong points of the boards are the processor speed, the small form factor and the low price-to-productivity ratio.

Customers have full access to the technical documentation of the board. The software is released under General Purpose License and the board is considered open-hardware – all schematics and board design files are available to the customer under the Creative Commons Attribution-ShareAlike 3.0 Unported License.

1.3 Board variants

There are two major board variants named: A20-OLinuXino-MICRO and A20-OLinuXino-MICRO-4GB. The 4GB version has a built-in NAND memory suitable for the storage of an operating system without the need of a SD card. The 4GB version comes with already programmed Android 4.2.2 image.

The other Olimex boards with close characteristics are the ones with A13 and A10 microcontrollers. The A13 boards feature a generation older processor but since they have been longer on the market they have better Linux and Android support. The A10 boards feature single (than A20) processor core but they are more energy efficient making them better choices for handheld devices and devices requiring power efficiency.

For projects and designs that require smaller form factor good alternatives to A20-OLinuXino-MICRO are: A20-OLinuXino-LIME2, A20-OLinuXino-LIME and A20-SOM-EVB.

1.4 Board version used in the manual

Boards from revisions E and F were used while writing this document. It is possible that they are outdated so it is always recommended to download the latest sources from the GitHub page of the board.

1.5 Organization

Each section in this document covers a separate topic, organized as follows:

- Chapter 1 is an overview of the board usage and features
- Chapter 2 provides a guide for quickly setting up the board and software notes
- Chapter 3 contains the general board diagram and layout
- Chapter 4 describes the component that is the heart of the board: the A20 – Allwinner processor
- Chapter 5 is an explanation of the control circuitry associated with the microcontroller
- Chapter 6 covers the connector pinout, peripherals and jumper description
- Chapter 7 provides the schematics and the dimensions of the board
- Chapter 8 contains the revision history, useful links and support information

CHAPTER 2: SETTING UP THE OLINUXINO BOARD

2. Introduction to the chapter

This section helps you set up the OLinuXino development board for the first time. Please consider first the electrostatic warning to avoid damaging the board, then discover the hardware and software required to operate the board.

The procedure to power up the board is given, and a description of the default board behavior is detailed.

2.1 Electrostatic and electrical polarity warning

OLinuXino is shipped in a protective anti-static package. The board must not be exposed to high electrostatic potentials. A grounding strap or similar protective device should be worn when handling the board. Avoid touching the component pins or any other metallic element.

Ensure that your development board gets attached to properly working hardware. For example, it is common for cheap HDMI monitors to lack grounding. Avoid TVs which have no grounding on their power supply cable! If you can't avoid them try to add the grounding yourself, if this is not possible please use USB-ISO to save your development board from potential over voltage.

If you connect other electrical devices to the A20 board make sure that they have equal electrical polarity. For example, when you connect an HDMI cable between a TV and the board it is a good idea to have them both connected to the same electrical source (to the same utility power socket). This might be said for a serial cable connected between a PC and the board's DEBUG port.
In rare cases different polarity might cause hardware damage to the board.

2.2 Requirements

In order to set up the A20-OLinuXino-MICRO optimally one or more additional items may be used. They might be generally placed in three categories:

Required – items that are needed in order to achieve minimum functionality;
Recommended – items that is good to have in order to be able to interact with the most important of the features of the board;
Additional – items that provide access to additional features or expand the features of the board.

Required items:
- USB type A to USB mini cable – to connect to a personal computer; used for powering the board and uploading new Android image to the NAND memory (if your board has 4GB NAND)
- Input device – either a mouse/keyboard or touchscreen LCD
- Output device – either HDMI cable + native HDMI monitor/screen/projector; or USB-SERIAL-CABLE-F + personal computer (for Linux and/or Android debugging); or OLIMEX LCD (TS) display + 40-pin CABLE-IDC40-15cm; or A20-VGA-CABLE + VGA monitor/screen/projector
- SD card with compatible image – if you have the board version with NO additional NAND memory you will need it to use one of the images available.

Recommended items:
- External USB hub – to split the USB_HOST mounted on the board; you need that to connect more USB devices
- External power supply unit – 6-16V DC, 5W required (10V @ 0.5A) – for optimal power
- USB-SERIAL-CABLE-F – for Android/Linux debugging on UART0
- CABLE-IDC40-15cm – cable used for LCD_CON ↔ Olimex LCD display
- Adapter cable for the 6-pin VGA connector to standard VGA 15-pin connector

Additional items include:
- Audio device for HEADPHONES jack
- Ethernet cable for wired Ethernet
- A number of extension modules that can add functionality or interface to the board on the UEXT connector; these can be explored here: https://www.olimex.com/Products/Modules/

Some of the above-suggested items can be purchased by Olimex, for instance:

SY0612E – reliable power supply adapter 50Hz (for EU) 12V/0.5A for A20-OLinuXino-MICRO
SY0612E-CHINA – cheaper power supply adapter 50Hz (for EU) 12V/0.5A for A20-OLinuXino-MICRO
A20-Android-SD – a tested class 10 micro SD card with the latest (by the time of leaving the Olimex facilities) official Android release
A20-Debian-SD – a tested class 10 micro SD card with the latest (by the time of leaving Olimex facilities) official Debian Linux release
USB-SERIAL-CABLE-F – USB serial console cable female
USB-MINI-CABLE – standard USB type A to USB type mini cable
A20-VGA-CABLE – adapter from 6-pin connector to 15-pin one
CABLE-IDC40-15cm – cable for LCD to LCD_CON connection
LCD-OLinuXino-4.3TS – low-cost 4.3" LCD display with touchscreen component – 480×272
LCD-OLinuXino-7TS – low-cost 7" LCD display with touchscreen component – 800×480
LCD-OLinuXino-10TS – low-cost 10.1" LCD display with touchscreen component – 1024×600
LCD-OLinuXino-15.6 – low-cost 15.6" LCD display with touchscreen component – 1024×600
LCD-OLinuXino-15.6FHD – low-cost 15.6" LCD display with touchscreen component – 1920×1080
SATA-HDD-2.5-500GB – 5GB 2.5" SATA hard disk
SATA-CABLE-SET – cables that allow the connection of a 2.5" hard disk to the board
ALUMINIUM-HEATSINK-20×20×6MM – heatsink radiator for better processor heat dissipation

2.3 Powering the board

There are three possible ways of powering A20-OLinuXino-MICRO-4GB – via external supply providing 6-16V DC at the power jack, from 5V USB port via USB_OTG connector or from 3.7V Li-Po battery via the LIPO_BAT. Note that the board consumes around 300mA of current at 12V when there are no peripherals connected to the USB hosts, so make sure the power supply is able to provide at least 500mA before plugging. Depending on your preferred way of powering you might need additional hardware.

Important: Not all USB ports would be able to provide enough power for the board. Try using another USB port/USB hub or a cable of higher quality. The best practice is not to count on the mini USB-OTG as a single power source!

The preferred way of powering the board is via the PWR jack with 6-16V DC with a power of 5W (e.g. 6Vx0.8A; 16Vx0.3A). This will make the board fully powered and able to power all the peripherals connected to it.

Note that when powering the board from the USB_OTG, the power provided might be insufficient to also power a bigger LCD connected to the LCD_con. However, this power option is capable of driving the board when using external display connected to the HDMI connector.
The typical consumption of A20-OLinuXino-MICRO-4GB is between 100mA and 320mA depending on the current load and the power voltage applied.

If the board has entered power-down state you can bring it back without restart using the PWR_BUT. The PWR_BUT is also used to start the board when powered from a Li-Po battery on the battery connector.

Sometimes when starting Android it is possible the board to enter battery save mode even before booting fully. Especially, if you have turned off the board without quick boot mode enabled. In this case you should press the PWR_BUT for at least 5 seconds which would allow the board to start.

For the European customers we sell two power supply adapters, please check chapter 2.2. We also sell USB OTG to USB type A cables if you lack such.

The default username/password combination for the default Linux image on the SD card (if purchased) is: root/olimex.

Note that it is normal that when the board is powered some integrated circuits might appear hotter than others. This is perfectly normal for some chips – for instance – voltage regulators and the main processor.

2.4 Prebuilt software

The 4GB board-variant comes with Android 4.2.2 ready to use. The default settings of the software are followed. The default image works with HDMI monitor and 7" display.

How we have installed the software? Detailed information might be found in chapter *6.1.1 USB-OTG communication (NAND firmware repair/update).*

2.5 Button functions

The bellow three buttons usually are supported under both Android and Debian:

PWR_BUT – used to perform software turn off, software turn on; used to turn on board when powered by battery – has to be held down for at least couple of seconds to perform each action
RESET – used for hardware reset of the board – it is not recommended
RECOVERY – used to wake up the board from sleep

The following buttons represent functions in the Android (it is possible that not all Android applications take advantage of the buttons, in such case the button would serve no purpose for that application):

VOL+ – increases the volume
VOL- – lowers the volume
MENU – brings up the main menu
SEARCH – brings up search feature
HOME – shows the home screen; note that HOME is also used to enter bootloader mode for firmware update
ESC – used to navigate away of a menu
ENTER – to select a choice

It is not recommended to disconnect the power supply (either the USB or the power jack) before turning off the Android from the either the menus or by holding PWR_BUT system written on the NAND.

How to restore the Android image might be found in chapter "6.1.1 USB-OTG communication (NAND firmware repair/update)".

2.6 Interacting with the board

The typical and recommended way of interacting with a stand-alone A20-OLinuXino-MICRO board is via a serial cable connected to a personal computer. You would probably need a cable suitable for such a connection due to the fact that most personal computers lack a serial port nowadays. We distribute such a cable. Even if you already have such a cable or you decide to purchase it elsewhere it is advisable to check this product page for a reference: https://www.olimex.com/Products/Components/Cables/USB-Serial-Cable/USB-Serial-Cable-F/

You need to connect the serial cable lines as follows: RX line to UART0-TX pin; TX line to UART0-RX pin; GND to GND. Make sure that the serial cable is connected to your personal computer and recognized properly after driver installation.

Then open a terminal program on the serial (COM) port which the cable is associated with.

After everything else is set, you would need to power the board as explained in "2.3 Powering the board".

In addition to the serial communication, you might also use one or more of the following mediums to interact with the board:

1. a monitor via HDMI connector
2. a monitor via the VGA connector and a VGA adapter
3. SSH via the mini USB connector trough a mini USB cable
4. SSH with a remote computer via LAN connector
5. a display via LCD_CON connector

More details on each of the connections might be found in the consequent sub-chapters.

Note that not all interface options are available for all images. Furthermore, some of the ways of interaction are (obviously) not suitable for Android OS. The official Debian image should give you the most possible options of interfacing the board!

Using HDMI, LCD_CON or LAN might require additional configurations. Furthermore, it is possible to corrupt the output settings over those interfaces and, thus, lose the output. In such cases, you can always use the serial cable USB-SERIAL-CABLE-F as a reliable way to establish connection to the board.

2.6.1 HDMI monitor

All official Debian and Android images for A20-OLinuXino-MICRO have HDMI output by default. The board would work out-of-the-box with a native HDMI monitor.

Make sure to use a tested HMDI cable.

The default HDMI resolution in the official images is 720p60 (1280×720p at 60Hz). In order to change that setting the video output on the LCD display you would need to run a configuration script (if you use Debian Linux) or download a suitable image (if you use Android). Video output settings are hard-coded in Android images.

More information about the video output settings and the usage of video settings script might be found in the next chapter “2.7 Changing the default image resolution”.

2.6.2 VGA monitor

All official Debian images for A20-OLinuXino-MICRO have the option to for VGA video output via the 6-pin VGA connector. If you wish to transform the custom 6-pin connector to a standard 15-pin VGA connector you can either use wires or get a ready adapter called “A20-VGA-CABLE”.

More information about the video output settings and the usage of video settings script might be found in the next chapter “2.7 Changing the default image resolution”.

2.6.3 SSH via mini USB cable in Debian

The latest official Debian Linux image allows the use the USB_OTG connector for SSH connection without the need of a LAN cable or a serial cable. You can use a mini USB cable connected between your host PC and the on-board mini USB connector. For connection convenience there is a DHCP server running specifically for USB0 interface. The DHCP server should give IP address to the new USB0 interface of your host PC so you can make SSH connection from your PC to the default board IP address of the USB0 interface – 192.168.2.1.

You can connect to the board using a mini USB cable and an SSH client (if you use Windows you might use "puTTY", for example) at address 192.168.2.1.

For Windows operating system – upon connection, the board should show up in "Windows Device Manager" as "RNDIS Ethernet Gadget". You might be asked to install a driver. The drivers can be found online as "RNDIS driver" (Remote Network Driver Interface Specification). The drivers are provided by Microsoft and they should be available for every Windows distribution – refer to the respective files and articles provided by Microsoft on how to install the required drivers.

2.6.4 SSH via Ethernet

By default the board IP address is 192.168.1.254. This allows you to connect to the board using an SSH client (for example “puTTY”) then you have to use this address. You can change this address

from /etc/network/interface file.

Note that for internet connection you have to set your gateway address in /etc/network/interfaces file and you have to set your DNS server in /etc/resolv.conf (for example “nameserver 192.168.1.1”)

2.6.5 LCD display

One of the ways to interact with the board is via an external display (with or without touchscreen component). The 40-pin male connector LCD_CON has the typical 0.1" pin step. All Olimex displays have corresponding 40-pin male connector. You would only need a 0.1" female-female cable for the hardware connection.

In order to get the video output on the LCD display you might need either to run at least once a configuration script (if you use Debian Linux) or download a suitable image (if you use Android). Video output settings are hard-coded in Android images

More information about the video output settings and the usage of video settings script might be found in the next chapter “2.7 Changing the default image resolution”.

2.7 Changing the default image resolution

Depending on the display or the screen you want to use with the A20-OlinuXino-MICRO, you might need to apply software changes to the prebuilt Android or Linux image.

The typical OlinuXino user would not need to edit the files, however.

To ease the process of changing the resolution we have compiled a number of Android images for the Android users (with hard-coded video output settings). Alternatively, for Debian Linux users, we have provided a shell script that can be executed in order to set preferred video output and resolution.

For Android that you boot from the NAND memory you would need an image suitable for the specific resolution. Download locations to such images might be found at the wiki article for the A20 board here: https://www.olimex.com/wiki/A20-OlinuXino-MICRO.

For Linux Debian you would need to execute a shell script to be able to change the resolution. It is very good idea to use a serial cable for connection to the board from a personal computer since in this case you are dependent on a video resolution (a cable like USB-SERIAL-CABLE-F). When the board boots type:

./change_display*

or

./change_display_A20_OLinuXino.sh

and choose the resolution and the interface (LCD, HDMI or VGA).

The supported resolutions are:

For LCD:

1. 4.3" (480×272)
2. 7" (800×480)
3. 10" (1024×600)

For HDMI:

0. 480i
1. 576i
2. 480p
3. 576p
4. 720p50
5. 720p60
6. 1080i50
7. 1080i60
8. 1080p24
9. 1080p50
10. 1080p60

For VGA: (note that the VGA signals are routed to custom 6 pin connector and you need to from adapter to standard VGA connector, Olimex also sells such adapter cables)

0. 1680×1050
1. 1440×900
2. 1360×768
3. 1280×1024
4. 1024×768
5. 800×600
6. 640×480
7. 1920×1080
8. 1280×720

If you decide to edit the configurations yourself the easiest way would be to do it on the board. This can be done offline too (manipulating the image located on the microSD card via a microSD card reader).

The tools for script.bin changing are located in /opt/sunxi-tools directory:

```
#cd /opt/sunxi-tools
#./chscr.sh
```

This will convert script.bin file from sdcard to script.fex file and the file will be opened using nano editor. Now you can change the board modules and parameters, save the changes ("CTRL"+"X"; confirm with "Y") and exit ("CTRL"+"X" again) from nano editor.

```
#./wrscr.sh
```

this will convert script.fex to script.bin and the script.bin file will be written to the microSD card.

```
reboot
```

Reboot the board and the new settings would be enabled.
Alternatively, you can do the changes on the microSD card off the board. You would need to remove the microSD card and explore it in a microSD card reader. You would need to edit the configuration file script.bin and edit the settings inside. This file is usually located in Script.bin can't be opened in the binary format so you would need to convert it to .fex file format first. There are ready-to-use tools that convert script.bin <-> script.fex. Note that script.bin/fex contains configuration settings and definitions not only for the video output but also for the pin descriptions and names; power setting and much more. If you really want to modify and customize the default images (to change port functions, port names, to disable specific peripherals) you would need to be able to edit the script files. Please refer to the following web page for more information:
http://linux-sunxi.org/Fex_Guide

2.8 Connecting and calibrating a display

One of the ways to interact with the board is via an external display (with or without touchscreen component). The 40-pin male connector LCD_CON has the typical 0.1" pin step. All Olimex displays have corresponding 40-pin male connector. You would only need a 0.1" female-female cable for the hardware connection.

All LCD displays made by Olimex have at least a 0.1" LCD connector. Going for an LCD output you would also need need and a cable to attach the display to the board. The cable is sold separately.

The displays recommended for the board at the moment of writing might be found in the table below:

Display name	Size of display in inches	Native resolution in pixels	Official Debian image support	Official Android image support	Link to product page
LCD-OlinuXino-4.3TS	4.3	480×272	Yes	No	Product page
LCD-OLinuXino-7	7	800×480	Yes	Yes	Product page
LCD-OLinuXino-7TS	7	800×480	Yes	Yes	Product page
LCD-OLinuXino-10	10.1	1024×600	Yes	Yes	Product page
LCD-OLinuXino-10TS	10.1	1024×600	Yes	Yes	Product page
LCD-OLinuXino-15.6	15.6	1366×768	Yes	No	Product page
LCD-OlinuXino-15.6FHD	15.6	1920×1080	Yes	No	Product page

The displays whose names contain “TS” - include a resistive touch screen component.

The cable used for connection depends on the specific board you are using and more specifically it depends on the pitch of the LCD connector of the board. We have two cables – both 40-pins ones but one for the bigger pitch (0.1") and the other for the smaller one (0.05"). Each of the displays listed in the table above has two connectors suitable for both cables:

CABLE-IDC40-15cm – 15cm long cable suitable for 0.1" step connectors – Product page
CABLE-40-40-10CM – 10cm long cable suitable for 0.05" step connectors – Product page

2.8.1 Android calibration

Calibrating a display under Android is pretty straightforward from the Android application.

Important: initially the boards are calibrated for a specific display and resolution. If you re-write the image (no matter whether the SD card or the NAND memory) you might need to use a mouse to calibrate the display initially. It might be impossible to calibrate it only by using the touch component over the display.

2.8.2 Debian calibration

The command that allows calibrating in Debian Linux is:

ts_calibrate

The default Debian setup is made with settings for HDMI 720p/60Hz. If you want to change some other LCD, VGA or HDMI resolution then you have to start script file in /root directory.

If the problem is under Debian Linux make sure you are properly logged in the LXDE interface! Else applying calibration would not happen for the current user – if you are calibrating from the X graphical interface make sure that you are logged as user “olimex” (if calibrating without the X, the user is “root”).

#su olimex

enter the password: olimex

calibrate the touch screen and reboot the board

#sudo reboot

2.9 GPIO under Debian

You can read data from a given GPIO port. The logical ranges are usually as follows:

0V-1V for LOW (or 0)

2.4V-3.3V for HIGH (or 1)

All voltages are measured against ground (GND).

If the input signal is to high, you will at least destroy the port!

The algorithms for writing a value to a GPIO port and reading such a value are pretty similar. The usage of GPIO ports follows the algorithm (we would use GPIO #49 for demonstration purposes):

1. Export GPIO 49:

```
echo 49 > /sys/class/gpio/export
```

Note that you can export GPIOs in range with:

```
for i in `seq 1 1 230`; do echo $i > /sys/class/gpio/export; done
```

2. Set input/output GPIO 49

2.1 Set input:

```
echo "in" > /sys/class/gpio/gpio49_ph9/direction
```

2.2 Set output:

```
echo "out" > /sys/class/gpio/gpio49_ph9/direction
```

3. Set value or read value GPIO 49

3.1 Set value:

```
echo 0 > /sys/class/gpio/gpio49_ph9/value
echo 1 > /sys/class/gpio/gpio49_ph9/value
```

3.2 Read input:

```
cat /sys/class/gpio/gpio49_ph9/value
```

4. Unexport GPIO 49 when finished

```
echo 49 > /sys/class/gpio/unexport
```

A very good document on GPIO usage might be found here:
http://www.py6zgp.com/download/A20-GPIO.pdf – the document was created by Dr. Guido Pelz.

2.10 I2C and SPI under Debian

I2C and SPI are both supported in the latest Debian releases. There is respective kernel support for both. There is a python module called pyA20 might be found here:
https://pypi.python.org/pypi/pyA20

At the same web address you would also find a set of examples on how module is used.

2.11 Software support

We maintain Linux and Android images for SD card which might be downloaded for free and modified as the user wishes. The latest images and updates are featured at the wiki article of the device: https://www.olimex.com/wiki/A20-OLinuXino-MICRO.

We usually try to provide details on how to build the Linux and the Android images at our wordpress page: http://olimex.wordpress.com/.

Another useful place is the Olimex forums where a lot of people share their experience and advice:
https://www.olimex.com/forum/

Additional Android and Linux support and features are added overtime. The Linux support is a work-in-progress and you should not expect full Linux support after the initial volume of such boards have become available on the market. If you are in a hurry consider the older OLinuXino designs (which have almost everything supported, have examples available and so on).

You are more than welcome to send or share your suggestions and ideas at our e-mail, the public forums or irc channel. We would attempt to help in almost every case. We listen to the feedback and if the majority of users suggest a software change or update we try to implement such. Customer feedback is very important for the overall state of the software support. However, do not expect full Linux or Android software support.

We can share our experience. We can give you full details for things we have tried. We can point you to a resource or a guide. We can give you general directions to solving a specific problem or places to look for more information. However, we won’t install a piece of software for you or write custom program for you. We won't provide a specific software solution to a specific software problem.

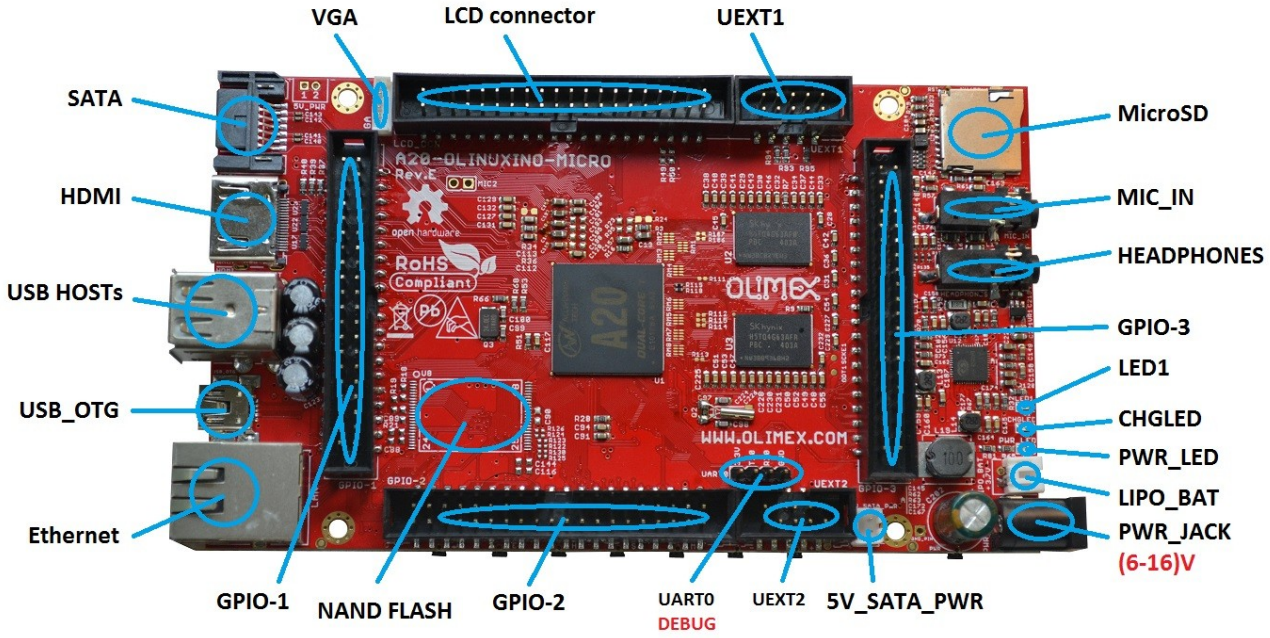
CHAPTER 3: A20-OLINUXINO-MICRO BOARD DESCRIPTION

3. Introduction to the chapter

Here you get acquainted with the main parts of the board. Note the names used on the board might differ from the names used below to describe them. For the actual names check the A20-OLinuXino-MICRO board itself.

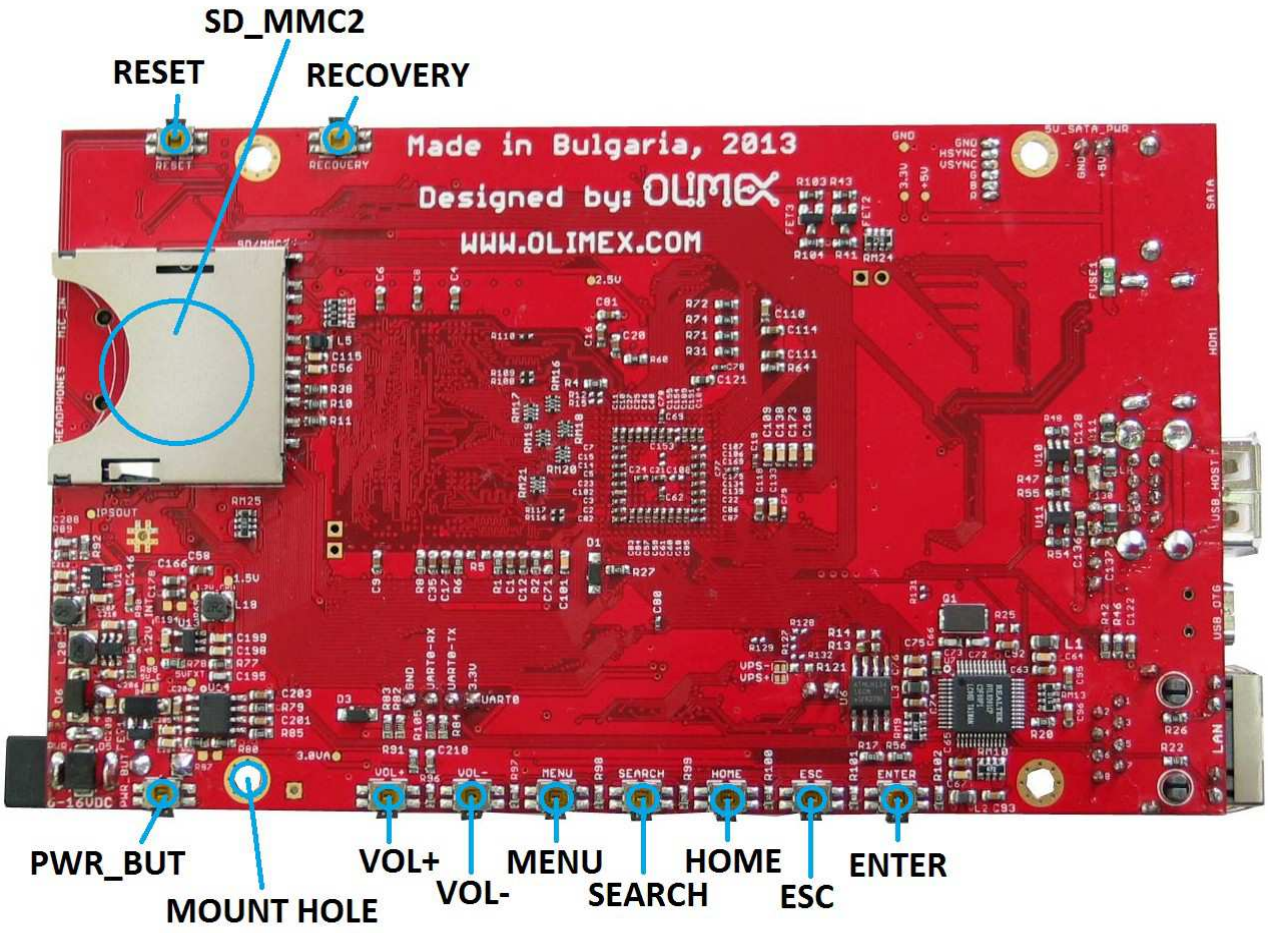
3.1 Layout (top view)

The picture below shows the initial revision of A20-OLinuXino-MICRO. Please note that the NAND memory is present only in the 4GB version of the board.



3.2 Layout (bottom view)

At the bottom of the board there are mainly buttons and the large SD/MMC connector.



CHAPTER 4: THE ALLWINNER A20 EMBEDDED PROCESSOR

4. Introduction to the chapter

In this chapter is located the information about the heart of OLinuXino – its microcontroller. The information is a modified version of the datasheet provided by its manufacturers.

4.1 The processor

The main feature of the A20 processor is the sheer computing power that allows FullHD video playback. The graphical processing unit is also pretty powerful and supported by the default software packages that come with the OlinuXino boards. The software support for the features in the processor is at pretty good state thanks to the efforts of the community and Allwinner themselves.

The full list of features might be found below:

- CPU
  - ARM® Cortex™-A7 Dual-Core

- GPU
  - ARM® Mali400MP2
  - Complies with OpenGL ES 2.0/1.1

- VIDEO
  - HD H.264 2160p video decoding
  - Multi-format FHD video decoding, including Mpeg1/2, Mpeg4 SP/ASP GMC, H.263, H.264,
  - VP6/8, AVS jizun, Jpeg/Mjpeg, etc.
  - H.264 High Profile 1080p@30fps or 720p@60fps encoding
  - 3840×1080@30fps 3D decoding, BD/SBS/TAB/FP supported
  - Complies with RTSP, HTTP, HLS, RTMP, MMS streaming media protocols

- DISPLAY
  - Supports multi-channel HD display
  - Integrated HDMI 1.4 transmitter with HDCP support
  - CPU/RGB/LVDS LCD interface
  - Supports CVBS/YPbPr/VGA
  - Integrated TV decoder

- CAMERA
  - Integrated parallel 8-bit I/F YUV sensor
  - Integrated 24-bit parallel YUV 444 I/F
  - Supports 5M CMOS sensor
  - Supports dual sensors

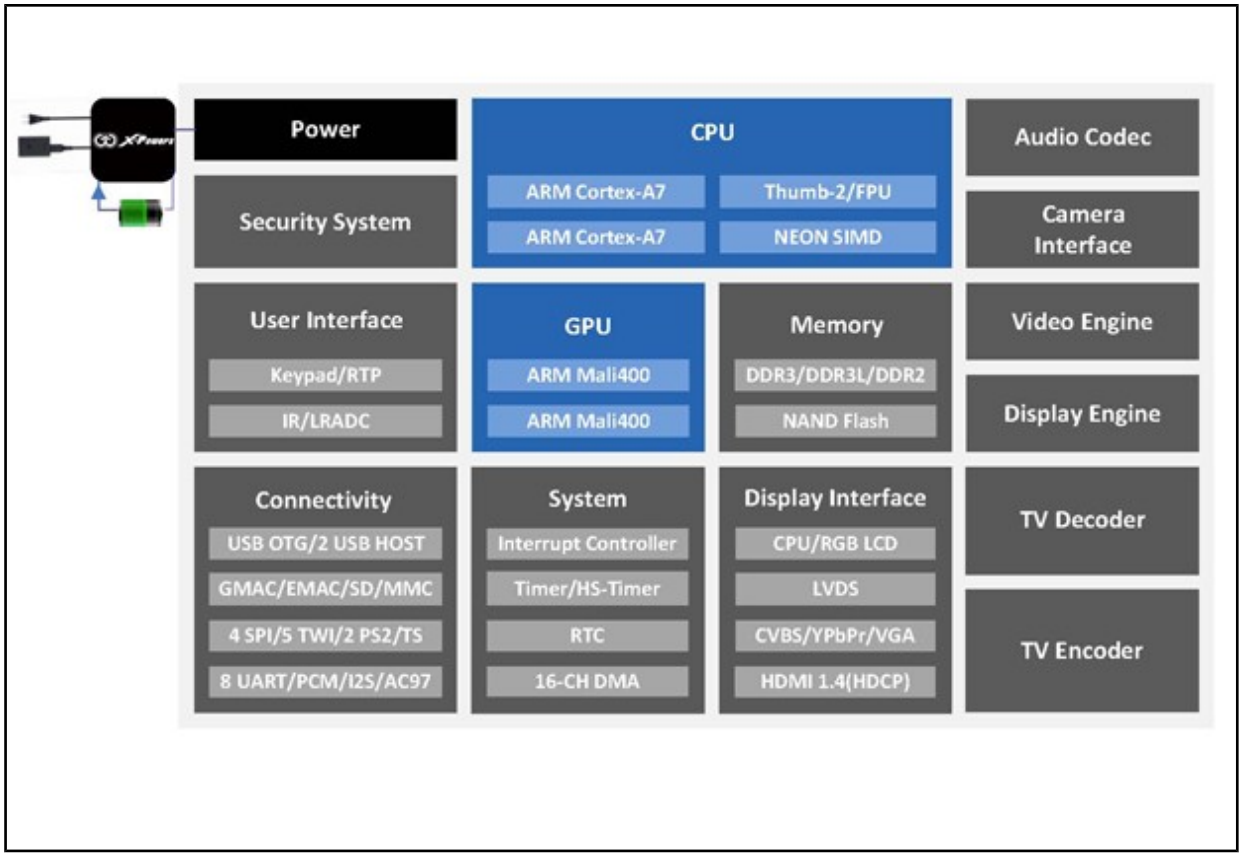
- MEMORY
  - DDR2/DDR3/DDR3L controller
  - NAND Flash controller with 64-bit ECC

- AUDIO
  - Integrated HI-FI 100dB Audio Codec
  - Dual analog mic amplifiers

More information can be found on Allwinner's web site at the following web-address:
http://www.allwinnertech.com/en/product/A20.html

4.2 Block diagram

The block diagram is taken from Allwinner's web-site.



CHAPTER 5: CONTROL CIRCUITY

5. Introduction to the chapter

Here you can find information about reset circuit and quartz crystals locations, the power supply circuit is discussed.

5.1 Reset

The board has hardware reset controlled by the AXP209 power system management IC.

The board should be turned off the standard OS menu (that might be invoked by holding POWER button or “poweroff” command under Debian) and after the choice is confirmed it is safe to be disconnected from the power supply unit.

5.2 Clocks

25 MHz quartz crystal Q1 is connected to pins X1 and X2 of the RTL8201CP Ethernet controller.

32 768 Hz (RTC) quartz crystal Q2 is found at pins F1 and F2 of the A20 microcontroller.

24 MHz quartz crystal Q3 is found at pins N22 and N23 of the A20 microcontroller.

5.3 Power supply circuit

The power supply is handled mainly by AXP209 power management system, an Allwinner chip that goes together with the A20 processor. It is mounted on the board but since it is relatively hard to find we also sell it separately.

The power supply circuit of A20-OLinuXino-MICRO requires input supply of 6-16V. The minimum wattage is 5W, and this threshold may raise if using a lot of devices on the USB-HOST (via external hub), a lot of GPIOs and the LCD_CON.

CHAPTER 6: CONNECTORS AND PINOUT

6. Introduction to the chapter

In this chapter are presented the connectors that can be found on the board all together with their pinout and notes about them. Jumpers functions are described. Notes and info on specific peripherals are presented. Notes regarding the interfaces are given.

6.1 Communication with the A20

The direct communication method is via the serial interface. Such interface is the UART0 connector (five male pins pointing towards the edge of the board) capable of delivering some information on the COM port of your computer – and then use your favorite terminal program (puTTy, teraterm, etc) to receive the data/send commands. You can use USB-SERIAL-CABLE-F to interface UART0 – that allows you to debug the board with a personal computer with a free USB port.

If you decide to make your own cable you would need to consider that the levels at board's UART0 are in CMOS level (3.3V) and you would need a convertor to bring them to the TTL level of your computer or cable! That is true for the RX and TX also!

It is highly recommended to own a USB-SERIAL-CABLE-F (or similar product) at hand when debugging – the video output is not always reliable and if you set wrong display settings you might be unable to recover the settings without a proper UART0 connection.

The more indirect ways of communicating with the board are via peripheral devices – mouse and keyboard, via a touch screen LCD that is connected on LCD_CON connector and others.

6.1.1 USB-OTG communication (NAND firmware repair/update)

The main way of changing the firmware image located on the NAND of A20-OLinuXino-MICRO-4GB is via the USB-OTG connector.

We have configured an Android image with settings suitable for A20-OLinuXino-MICRO. You can upload it to the board with PhoenixSuit software via the USB-OTG. The image is available for users to try and tweak the settings. The images can be downloaded from the wiki article at: https://www.olimex.com/wiki/A20-OLinuXino-MICRO.

The board variant without NAND needs an SD card with bootable OS – Android or Linux. There are ready images available for download at the above-linked A20 wiki article.

To repair the image on NAND re-upload it following these easy steps:

1. Install and run PhoenixSuit (can be found in the wiki article for A20).

2. Go to firmware tab of the program and point to a valid Android image (the latest official one may also be downloaded from the A20 wiki article).

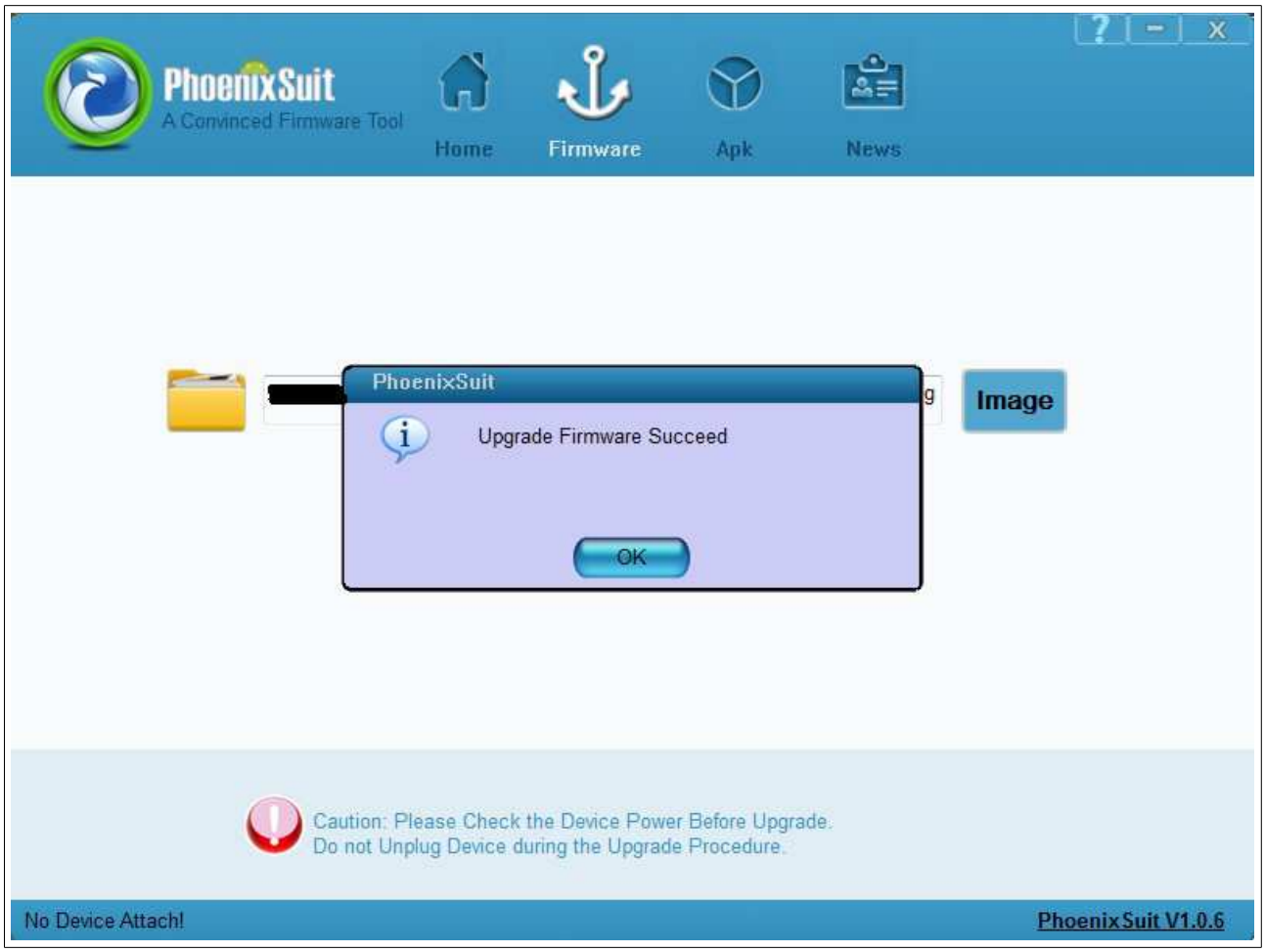
3. Disconnect the power supply and USB cable from the A20 board.
4. Press and hold RECOVERY button, apply power supply (6-16)V, release RECOVERY button.

5. Connect USB cable to the mini USB connector

6. You will be asked for drivers for the bootloader. Navigate to the folder where you extracted the PhoenixSuit and install the drivers from the respective executables (or manually point the installer to the drivers folder in the PhoenixSuit installation path).

7. PhoenixSuit will detect the board and would ask for the method of writing the image. Choose method of writing the image and confirm your wish to write the image.

8. Wait till upgrade succeeds as shown below:



There are different flavors of the Android and Linux distributions depending on whether you want to use 50Hz HDMI or 60Hz HDMI or VGA or 7" display or 10" display etc. You might need to change the configuration files inside (depending on your desirable output medium). How to do it is explained in chapter 2.6 Calibrating a display.

Those images, the software required and further instructions might be found at the wiki page: https://www.olimex.com/wiki/A20-OLinuXino-MICRO.