

# Quest/Marlin How-to

## Things you need

1. A MinnowMax development board and a 5V power supply
2. An FTDI serial cable
3. An SD card
4. A spare keyboard
5. A micro HDMI cable

## UEFI Firmware

Before going further, you should make sure that the UEFI firmware on your Minnowboard is compatible with the grub bootloader and Quest OS. You will need to make sure you UEFI firmware is **32-bit**, rather than the default 64-bit. For details on how to check your Minnowboard firmware and reflash it if necessary, please see:

[http://wiki.minnowboard.org/UEFI#Switching\\_from\\_64-bit\\_to\\_32-bit](http://wiki.minnowboard.org/UEFI#Switching_from_64-bit_to_32-bit)

## BIOS Configuration

1. Connect a keyboard to your MinnowMax and connect your MinnowMax to a monitor using the micro HDMI interface beside the ethernet interface.
2. Power up your board and press DEL key to enter the BIOS.
3. Set *Device Manager* -> *System Setup* -> *South Cluster Configuration* -> *LPSS & SCC Configuration* -> *LPSS & SCC Devices Mode to PCI Mode*.
4. Press F10 to save and ESC to exit. Power down your board. Unplug the keyboard and the video cable as we don't need them any more.

## Setup SD Card

**Caution: You will lose all the existing data on your SD Card after this action.**

1. Plug in your SD card and open a terminal
2. In your terminal, run command *dmesg* to find out the device number of your SD card. Make sure you get the device number right. Or it will destroy the data on your other devices.

3. In your terminal, run `sudo fdisk /dev/[your-sd-card-device-id]`
4. You should see fdisk's prompt. Enter `o` to build a new DOS disk label. Then enter `n` to add a new partition. Then enter `p` to select primary partition type. Enter `1` when asked for partition number, `2048` for first section, `+32M` for partition size. Then enter `a` to toggle the boot flag on the newly created partition. Enter `t` to select partition format and to select FAT16, you should enter `6`. Finally, the disk is set up and enter `w` to make the new partition into effect.
5. Run command `sudo mkfs.vfat -F 16 /dev/[your-sd-card-device-id]1` (notice the argument here is your partition id, which is the device id appended by 1) to format your new partition to FAT16 format.
6. Now, when you run command `sudo fdisk -l /dev/[your-sd-card-device-id]`, you should see the output similar to Figure 1:

```

Disk /dev/sdd: 7969 MB, 7969177600 bytes, 15564800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x4346285a

   Device Boot      Start         End      Blocks   Id  System
/dev/sdd1    *          2048        67583     32768    6   FAT16

```

Figure 1: fdisk output

## Build Quest

1. Clone Quest git repo<sup>1</sup> and checkout to the Marlin branch:

```

$git clone https://github.com/QuestOS/Marlin.git
$cd Marlin
$git checkout Marlin

```

2. Install the Git Large File Storage package from:

<https://git-lfs.github.com/>

The given tutorial is actually more than you need. All you need is to download the install package and run the `install.sh` script:

```

$wget https:// ... /git-lfs-linux-amd64-x.y.z.tar.gz
$tar xvzf git-lfs-linux-amd64-x.y.z.tar.gz
$cd git-lfs-x.y.z
$sudo ./install.sh

```

<sup>1</sup><https://github.com/QuestOS/Marlin.git>

3. Clone the Quest/Support repo to get the docker image that contains the toolchain for building Quest:

```
$git-lfs clone https://github.com/QuestOS/Support.git
$cd Support
```

4. Load the docker image:

```
$gunzip pre-built-toolchain.tar.gz
$sudo service docker start
$sudo docker load < ./pre-built-toolchain.tar
```

5. Run the docker image with Quest source code mounted into it. Do not include the backslashes in the command below, but make sure you specify the full path to the Marlin repo that you setup in Step 1, above:

```
sudo docker run --privileged=true \
  -v [/path/to/Marlin]:/quest_src \
  -i -t pre-built-toolchain /bin/bash
```

6. You should be in a new shell as root, cd into `/quest_src` directory. Do `make`. Then do `make ramdisk.img`.
7. When everything is done, enter `exit` to exit from the docker container.
8. Now in your Marlin (Quest) source directory, you should be able to find `ramdisk.img`, `kernel/quest` and `sysprogs/shell`.

## Install bootloader and Quest image

1. Now unplug your SD card and plug it in again. The partition should be automatically mounted. If not, please mount it manually.
2. To meet the required file hierarchy to boot, run command `mkdir -p [path/to/your/mounted/dir]/EFI/BOOT`
3. Copy `grub.cfg` and `mygrub.efi`<sup>2</sup> to `[path/to/your/mounted/dir]/EFI/BOOT`
4. Go to your Quest source code directory. Copy `ramdisk.img`, `kernel/quest`, `sysprogs/shell` to the root directory of your mounted SD card.
5. Umount your SD card.

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<sup>2</sup>Both can be found in <https://github.com/QuestOS/Support.git>

## Boot Quest on MinnowMax

1. Plug in your SD card to the SD card slot on your MinnowMax.
2. Follow the MinnowMax wiki<sup>3</sup> to setup the serial and power the board up.
3. Wait a few seconds, in your terminal emulation program (e.g., minicom), you should see an EFI prompt.
4. Enter your SD card's mapping ID, e.g., *fs0*:. Then cd to *EFI/BOOT* directory and run *mygrub.efi*. As shown in Figure 2.

```
UEFI Interactive Shell v2.1
EDK II
UEFI v2.40 (EDK II, 0x00010000)
Mapping table
  FS0: Alias(s):HD5a1:;BLK1:
      PciRoot(0x0)/Pci(0x12,0x0)/Unit(0x0)/HD(1,MBR,0x4346285A,0x800,0x10000)
  BLK0: Alias(s):
      PciRoot(0x0)/Pci(0x12,0x0)/Unit(0x0)
Press ESC in 5 seconds to skip startup.nsh or any other key to continue.
Shell> fs0:
FS0:\> cd EFI
FS0:\EFI\> cd BOOT
FS0:\EFI\BOOT\> mygrub.efi
```

Figure 2: EFI Shell

5. Now you should see the GRUB menu, as shown in Figure 3.
6. Move the cursor to select quest.
7. Now you should see Quest boot and end up with an shell prompt, as shown in Figure 4.
8. Enter *marlin* in the shell and enjoy your Quest 3D printer control program!

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<sup>3</sup>[http://wiki.minnowboard.org/MinnowBoard\\_MAX](http://wiki.minnowboard.org/MinnowBoard_MAX)

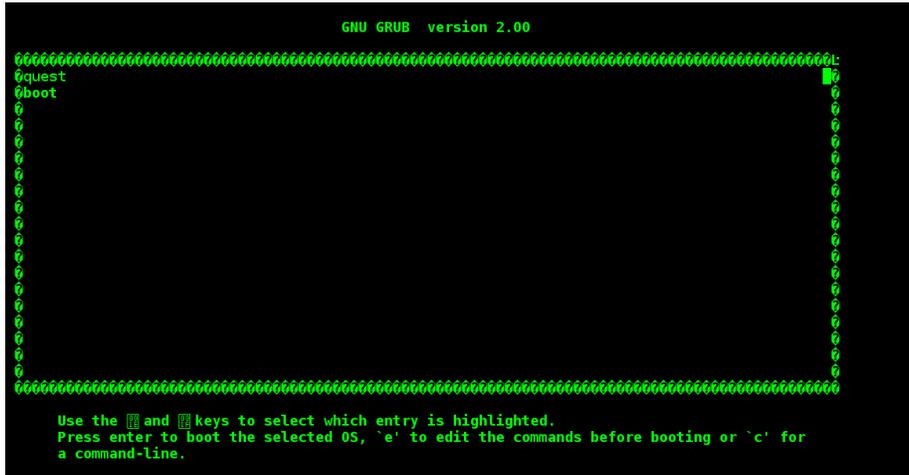


Figure 3: GRUB Menu

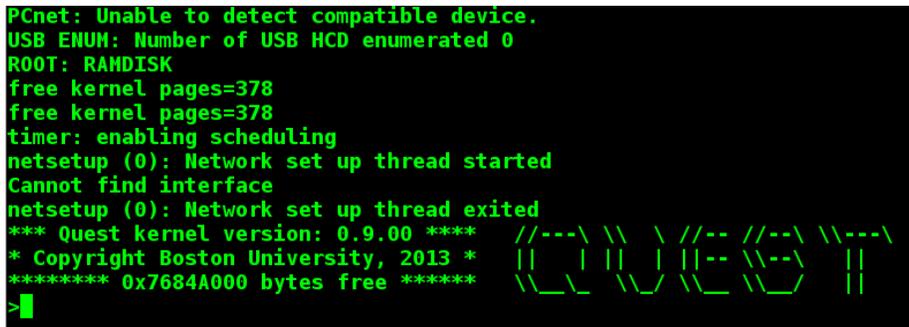


Figure 4: Quest Shell