HOWTO: Prepare and boot S32V234 EVB from eMMC

S32V234 EVB has 32GB of eMMC memory. This memory can be used as OS drive.In text bellow is RED color used for important notes, GREEN for console commands and BLUE for filenames. `Courier font` family is used for code/configuration data.

Requirements

- Prepared SD Card with linux image (HOWTO: Prepare A SD Card For Linux Boot Of S32V234-EVB Using BSP From VSDK, https://community.nxp.com/docs/DOC-335023) and with **u-boot.s32** file in boot partition.
- Host PC machine with Linux OS, NFS, TFTP server and network connectivity with EVB • NFS shared folder with BSP Linux root file system (the root.tar file located in [S32DS_Vision]\s32v234_sdk\os\build_content.tar\build_content\v234_linux_build\ )
- tftp server with **Image**, **s32v234-evb.dtb** and **u-boot.s32** files
- putty or other terminal connected to s32v234 EVB (tested with minicom on Linux)

Procedure

Setup NFS share and TFTP server. Please look at internet for more details about NFS and TFTP

- https://www.digitalocean.com/community/tutorials/how-to-set-up-an-nfs-mount-on-ubuntu-16-04
- How do I install and run a TFTP server? - Ask Ubuntu (https://askubuntu.com/questions/201505/how-do-i-install-and-run-a-tftp-server)

Don't forget add into root file system files **Image**, **s32v234-evb.dtb** and **rootfs.tar** - we will need them later for boot and rootfs partitions. Also make sure that all rootfs files are owned by root.

Here is my entry for **/etc/exports** file for NFS:

```
/rfs    192.168.1.0/24(rw,no_root_squash,sync)
```

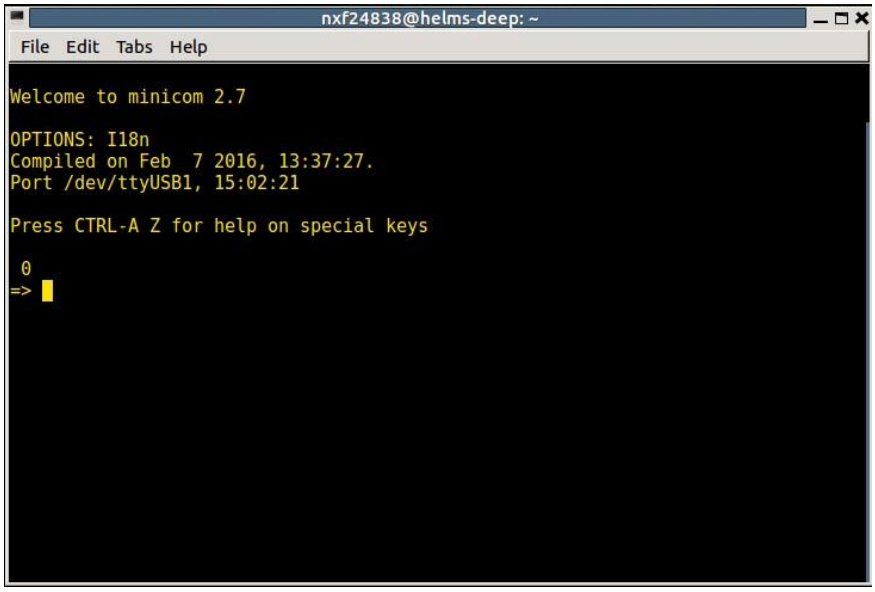
and here **/etc/xinetd.d/tftp** file:

```
service tftp
{
	protocol = udp
	port = 69
	socket_type = dgram
	wait = yes
	user = nobody
	server = /usr/sbin/in.tftpd
	server_args = /tftpboot
	disable = no
}
```

It looks like that in ubuntu is some bug and I have to move tftp files location from /tftpboot to /svr/tftp The tftp file in /etc/xined.d/ remain unchanged. This issue is probably related only to ubuntu.

Make sure that both servers (nfs,tftp) are accessible from other machine (you can use S32V234 EVB started from SD card for that).

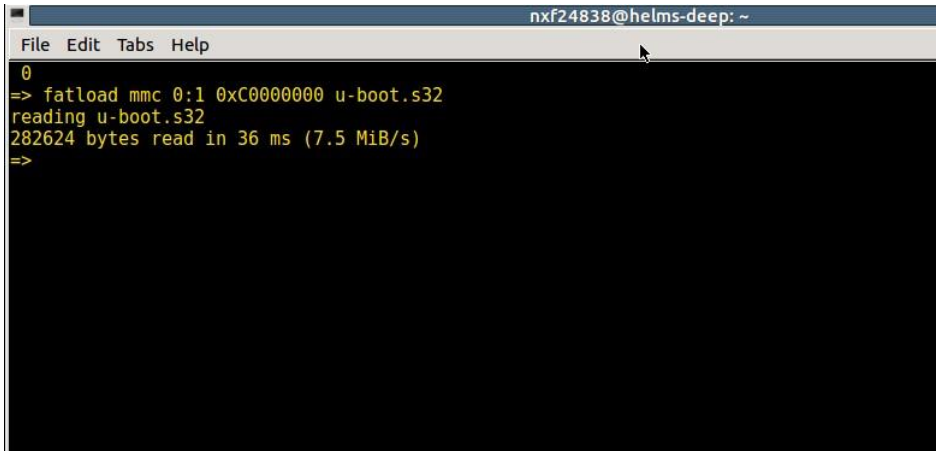
I used static IP addresses on PC Host side and EVB. In my case PC has address 192.168.1.1 and EVB 192.168.1.10. You can also use DHCP server - but this is not part of this document. Boot from SD card and stop booting by pressing any key when you see first numbers on terminal window. You can get list of commands by help command.



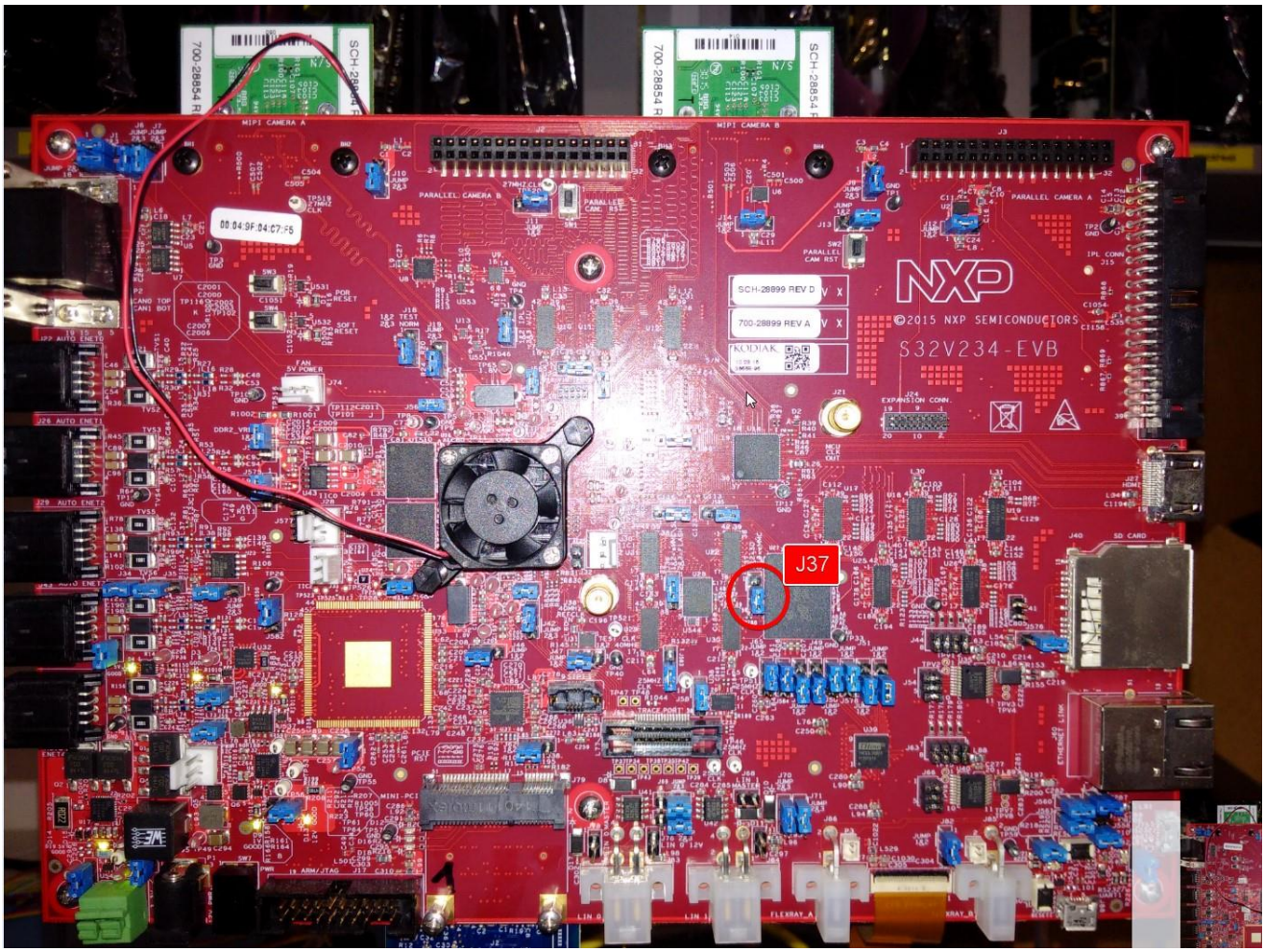
First - we need to write u-boot.s32 file to eMMC. Unfortunately - there can be active only one storage SD Card or eMMC. We need to copy u-boot.s32 from SD Card to RAM (use RAM address 0xC0000000), deactivate SD Card and connect eMMC. In u-boot console use

fatload mmc 0:1 0xC0000000 u-boot.s32

command. Write down the size of loaded file - you will need it later for counting number of sectors. In my case the file size is 282624 (0x45000).



Once is u-boot.s32 in the RAM, we can disconnect SD card and connect eMMC by switching J37 jumper from 1-2 to 2-3 (there may be different name for other board versions - but the location is same).

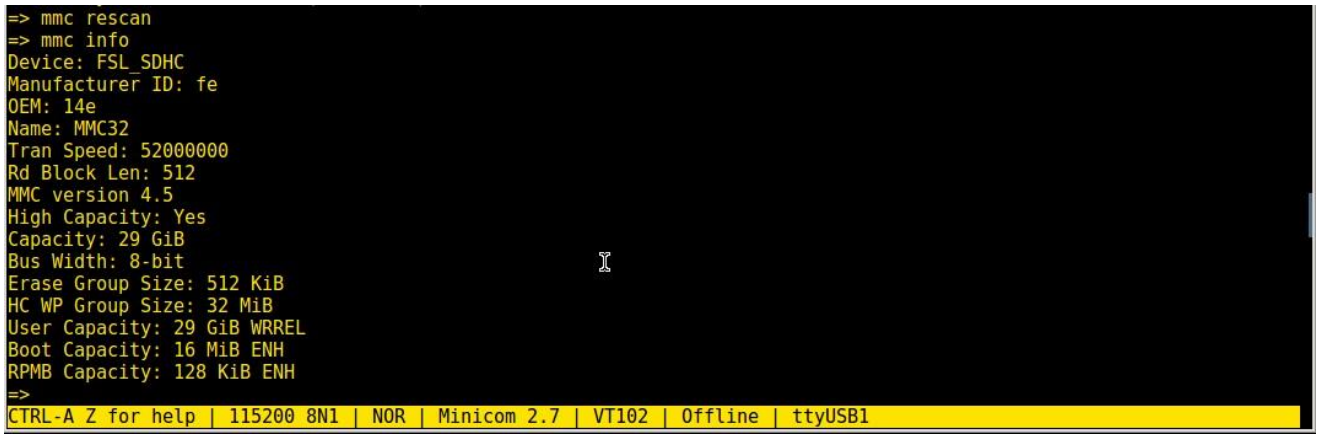


After switching from SD to eMMC you need to rescan mmc device by command:

mmc rescan

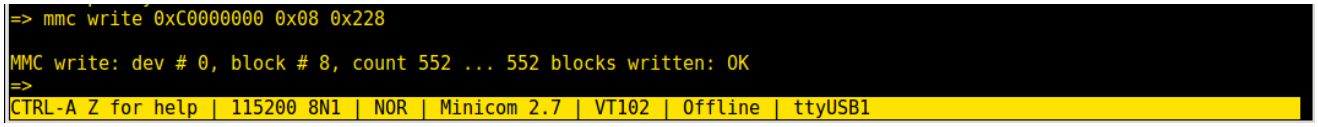
You can verify if eMMC is mapped correctly by

mmc info

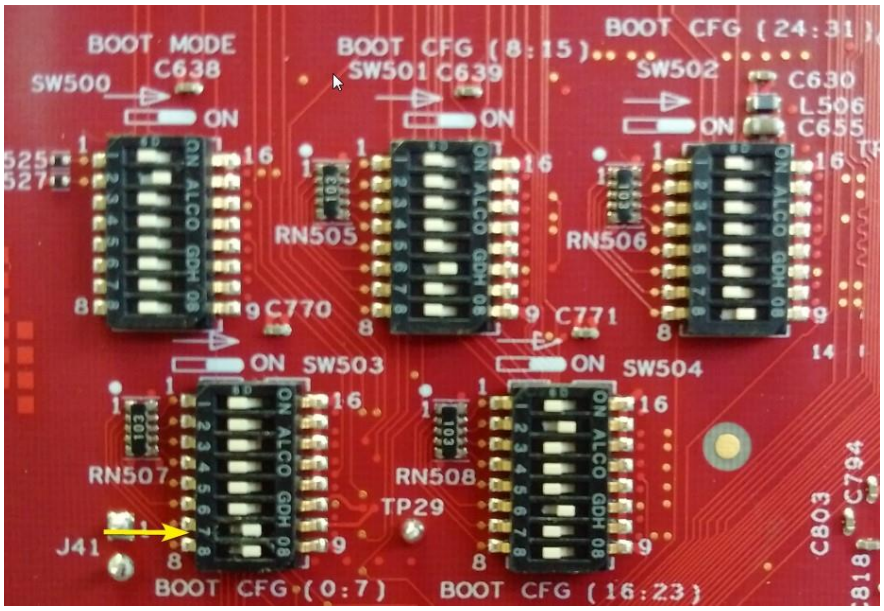


Now we copy u-boot from RAM to emmc. eMMC is located on address 0x1000 - but it is addressed by 512 (0x200) bytes sector size. In this case mmc device address starts on 0x1000/0x200 = 0x08. Number of sectors is (u-boot.s32 filesize) / (sector size) - 0x45000/0x200=0x228. Write u-boot from RAM to eMMC by:

mmc write 0xC0000000 0x08 0x228



Now we can switch boot source from SD to eMMC by switches located on rear side of EVB. The switch name may vary across board version but location is again the same. Turn OFF EVB and remove SD card. For booting from eMMC switch SW503 - BOOT CFG (0:7) 7'th switch from OFF to ON. Switches position for eMMC boot:



Turn ON EVB and stop again boot in u-boot console. Now we need to configure u-boot for booting from NFS. You can check u-boot variables by

printenv

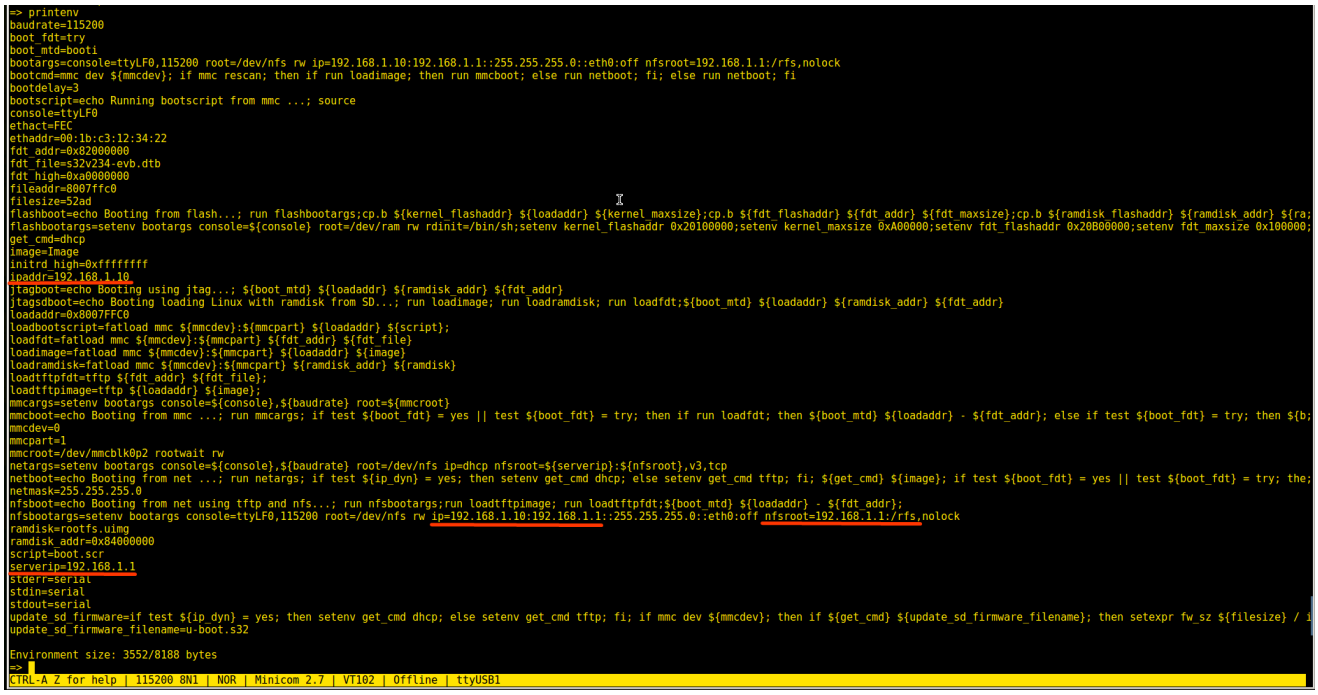
command.

Make sure that nfsbootargs has correct EVB ip address, NFS server IP address and path to root file system. In my case - EVB IP is 192.168.1.10, NFS server is 192.168.1.1 and root file system on host PC machine is located in /rfs directory. You can also test network connectivity to PC Host machie by **ping** command.

You can change any of system variables by setenv command. For example - IP address can be changed by:

setenv ipaddr -f ipaddr 192.168.1.10

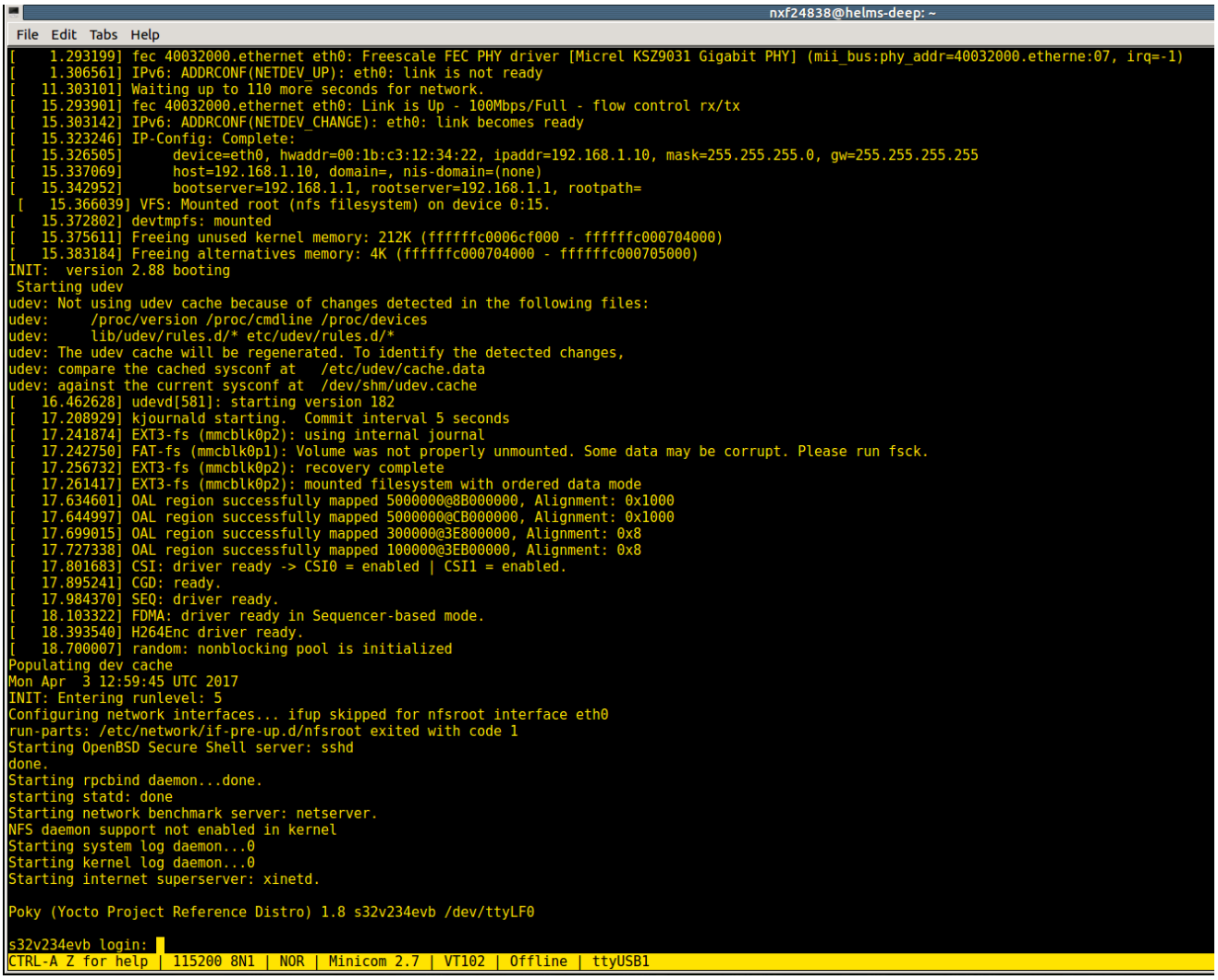
Here is printenv output on my EVB:



We are done with configuration - let's boot from NFS by:

run nfsboot

It takes a while. At the end you can see login prompt:



Login as root user. Now we need create boot and root file system partition on eMMC by fdisk.

Boot partition

fdisk /dev/mmcblk0

check if there are already some partitions by

p

command in fdisk. If there are partitions - delete all of them by

d

command. If done - let's create new boot partition with 255 MB size:

n

p

1

[ENTER] key for default selection

+255M

```
Command (m for help): p
Disk /dev/mmcblk0: 29 GiB, 31138512896 bytes, 60817408 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
Disklabel type: dos
Disk identifier: 0x18950f33

Device         Boot  Start      End  Sectors  Size Id Type
/dev/mmcblk0p1        2048   524287   522240  255M  c W95 FAT32 (LBA)
/dev/mmcblk0p2      524288 60817407 60293120 28.8G 83 Linux


Command (m for help): d
Partition number (1,2, default 2):

Partition 2 has been deleted.

Command (m for help): d
Selected partition 1
Partition 1 has been deleted.

Command (m for help): d
No partition is defined yet!
Could not delete partition 4481025

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-60817407, default 2048):
Last sector, +sectors or +size{K,M,G,T,P} (2048-60817407, default 60817407): +255M

Created a new partition 1 of type 'Linux' and of size 255 MiB.

Command (m for help):
CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.7 | VT102 | Offline | ttyUSB1
```

Root FS partition

in fdisk continue with:

n

p

[ENTER] key for default selection

[ENTER] key for default selection

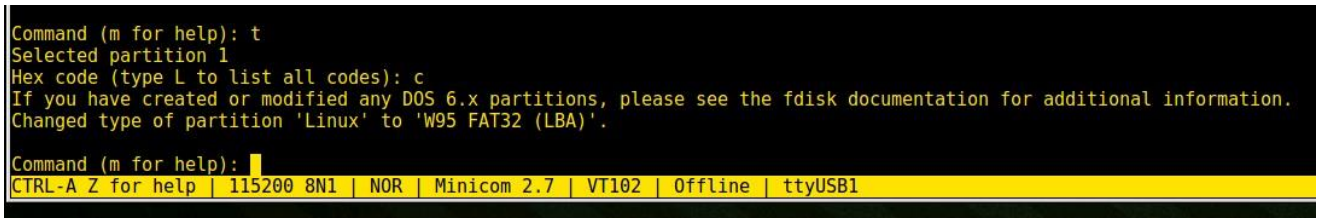
[ENTER] key for default selection

Change boot partition type from Linux to FAT32.

t

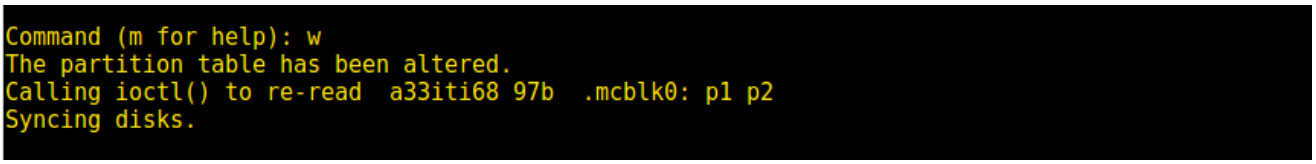
1

c



Write all changes by

w



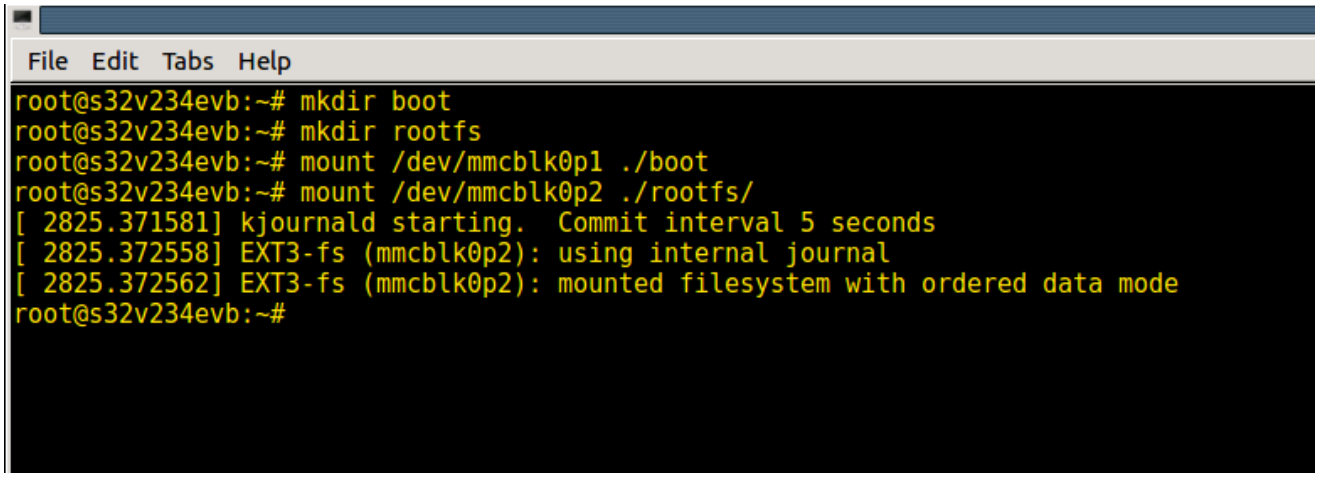
Create filesystem for boot (vfat) and root fs (ext3) partition:

mkfs.vfat -n boot /dev/mmcblk0p1

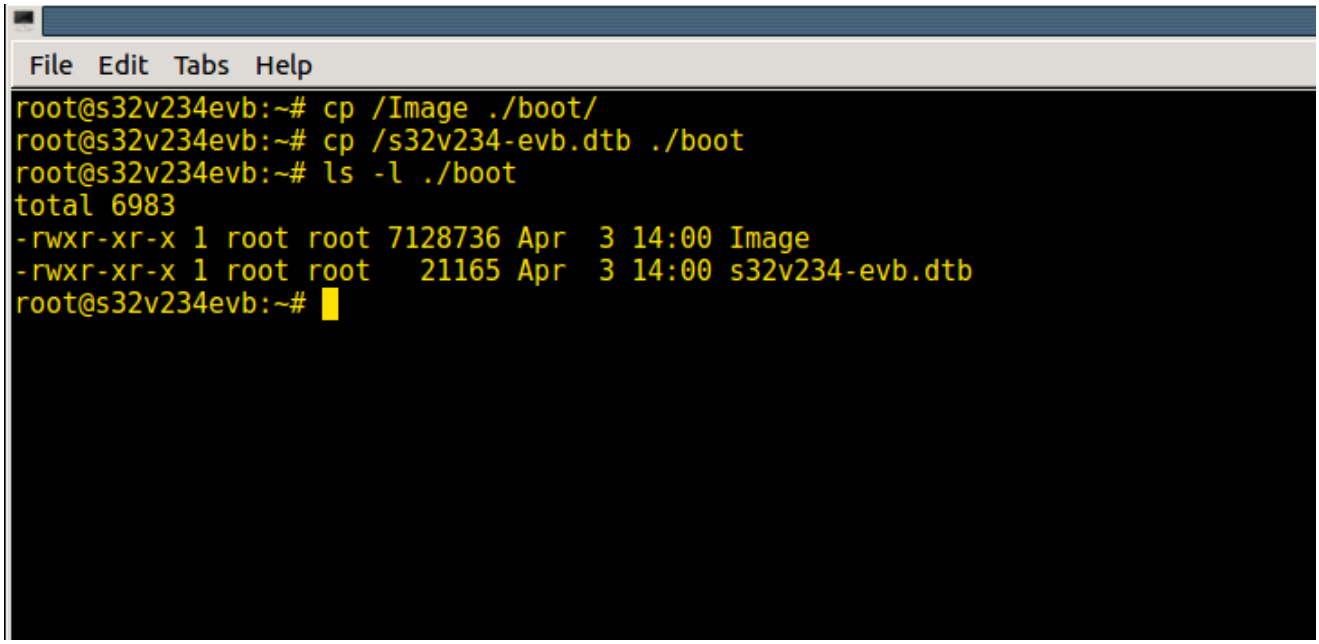
mkfs.ext3 -L rootfs /dev/mmcblk0p2

Now is time for copy some files in new partitions. I created in root home directory boot and rootfs folders:

cd
mkdir boot
mkdir rootfs
mount /dev/mmcblk0p1 ./boot
mount /dev/mmcblk0p2 ./rootfs



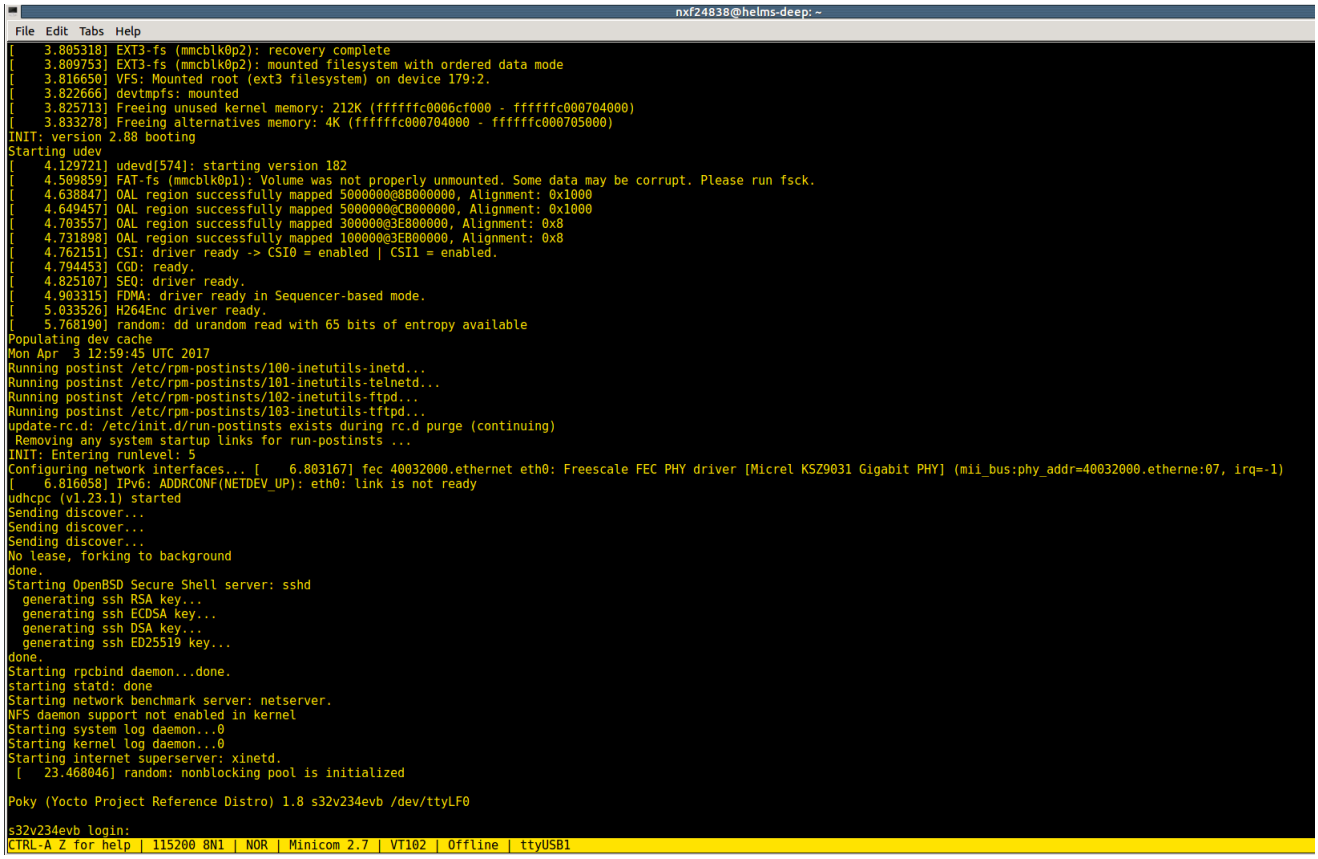
Copy **Image** and **s32v234-evb.dtb** files from root to already mounted mmcblk0p1 partition: **cp /Image ./boot**
cp /s32v234-evb.dtb /boot



And now - the final step - untar root file system to mmcblk0p2:
tar -xf /rootfs.tar -C ./rootfs

```
root@s32v234evb:~# tar -xf /rootfs.tar -C ./rootfs/
root@s32v234evb:~# ls -l ./rootfs/
total 80
drwxr-xr-x  2 root root  4096 Apr  3 14:05 bin
drwxr-xr-x  2 root root  4096 Apr  3 14:05 boot
drwxr-xr-x  2 root root  4096 Aug  4  2016 dev
drwxr-xr-x 31 root root  4096 Apr  3 14:05 etc
drwxr-xr-x  3 root root  4096 Apr  3 14:05 home
drwxr-xr-x  6 root root  4096 Apr  3 14:05 lib
lrwxrwxrwx  1 root root    19 Apr  3 14:05 linuxrc -> /bin/busybox.nosuid
drwx------  2 root root 16384 Apr  3 13:44 lost+found
drwxr-xr-x  2 root root  4096 Aug  4  2016 media
drwxr-xr-x  2 root root  4096 Aug  4  2016 mnt
drwxr-xr-x  2 root root  4096 Aug  4  2016 proc
drwxr-xr-x  2 root root  4096 Aug  4  2016 run
drwxr-xr-x  2 root root  4096 Apr  3 14:05 s32v234
drwxr-xr-x  2 root root  4096 Apr  3 14:05 sbin
drwxr-xr-x  2 root root  4096 Aug  4  2016 sys
drwxrwxrwt  2 root root  4096 Aug  4  2016 tmp
drwxr-xr-x  9 root root  4096 Apr  3 14:05 usr
drwxr-xr-x  8 root root  4096 Apr  3 14:05 var
root@s32v234evb:~#
```

We are done. Disconnect Ethernet cable, reboot and wait for login prompt:



Troubleshooting

Can't start u-boot console:

You have only about two seconds from power up to interrupt regular boot by pressing key to jump in u-boot console. So - keep trying. Best time for pressing any key is when numbers 2 1 are shown up.

Can't perform NFS boot:

- check network connectivity between EVB and host PC.
- Try ping host PC from u-boot console. If it doesn't work - check EVB ipaddress by **echo $ipaddr** or **printenv** u-boot command.
- check that nfsbootargs contain corect path/ip address to NFS root file system.
- Check again if your NFS directory is accessible from other machine and it is really s32v234 BSP Linux rootfs. Root fs must not be inside some subfolder.
- check if you can get files from tftp server from other machine. for example **tftp 192.168.1.1 ... get Image**

Can't perform partitioning of eMMC:

Make sure that /dev/mmcblk0 is unmounted (in case that there was already some partitions).

Can't mount partitions on /dev/mmcblk0:

Make sure that all files on NFS root file system belongs to root. You can also check boot messages for mount errors related to /proc file system.