

# i.MX7: Flashing Images to eMMC

The phyBOARD-Zeta is delivered with a pre-flashed bootloader. The following instructions for flashing images from SD card will be useful if you want to:

- Flash images because eMMC is empty
- Upgrade to a new release
- Use custom built images

Pre-built images are available on [PHYTEC's Artifactory](#). If you have built your own images, then the images are located in: `$YOCTO_DIR/build/tmp/deploy/images/<MACHINE NAME>/`

Note that the names of the images differ between releases. YOCTO\_IMAGE in the instructions below refers to the Yocto image name that was used to build the image, and YOCTO\_MACHINE refers to the machine that was selected to build the image. Refer to the "Built Images" section of the Quickstart pertaining to the specific release you are using for clarification on image names.

## Configure SD Card for Flashing

The SD card image "<YOCTO\_IMAGE>-<YOCTO MACHINE>.sdcard" can be flashed to eMMC. This image will need to be copied to the *boot* partition of a properly formatted SD card as described in [Create a Bootable SD Card](#).



Due to the UUIDs of the partitions in the sdcard image, it is recommended that you manually format the SD card if you plan on using it after flashing the image to eMMC, otherwise if using the sdcard image for both eMMC and SD, mmcblk0p1 and mmcblk1p1 as well as mmcblk0p2 and mmcblk1p2 will have the same UUID.

1. Due to the size of the image, a new partition is required on the SD card to hold it. To create an additional partition that extends to the rest of the SD card, execute the following from your host machine:

```
sudo fdisk /dev/sd<X>
p                                print partition table. *Note end of partition /dev
/sd<x>2*
n                                new partition
p                                primary
3                                partition number
<start>                         enter value after end of partition 2 (from partition table). This is the
first sector of partition 3
<enter>                         Use default value for last sector
t                                Change partition system id
3                                Partition number
c                                FAT32
w                                write table to disk and exit

sudo mkfs.vfat -n "data" /dev/sd<X>3
```

2. Copy the sdcard image to the new "data" partition:

```
cp <YOCTO_IMAGE>-<YOCTO MACHINE>.sdcard /media/user/data/; sync
```

## Option 1: Flash eMMC from Linux

1. Configure the boot switch to boot from SD Card as described in [i.MX7 Boot Configurations](#). Power on the board and boot into Linux.
2. Flash <YOCTO\_IMAGE>-<YOCTO MACHINE>.sdcard from the SD card to eMMC. This will partition the card and copy U-Boot, zImage, dtb, and root filesystem to eMMC.

Unmount existing partitions (if any) and write the image to flash.

```
umount /run/media/mmcblk2p*
dd if=/run/media/mmcblk0p3/<YOCTO_IMAGE>-<YOCTO MACHINE>.sdcard of=/dev/mmcblk2 bs=1MB; sync
```

## Option 2: Flash eMMC from U-Boot



The default <YOCTO\_IMAGE>-<YOCTO MACHINE>.sdcard image is larger than the DDR3 so cannot be loaded into memory from U-Boot. Use Option 1 for flashing eMMC.

1. Configure the boot switch to boot from SD Card as described in [i.MX7 Boot Configurations](#). Power on the board and stop in U-Boot.
2. Flash <YOCTO\_IMAGE>-<YOCTO MACHINE>.sdcard from the SD card to eMMC. This will partition the card and copy U-Boot, zImage, dtb, and root filesystem to eMMC.

```
=> fatload mmc 0:3 ${loadaddr} <YOCTO_IMAGE>-<YOCTO MACHINE>.sdcard
reading <YOCTO_IMAGE>-<YOCTO MACHINE>.sdcard
935329792 bytes read in 41164 ms (21.7 MiB/s)

=> mmc dev 1
switch to partitions #0, OK
mmc1(part 0) is current device
=> mmc write ${loadaddr} 0x0 <number of blocks to write. In this case 0x1BF000>

MMC write: dev # 1, block # 0, count 1830912 ... 1830912 blocks written: OK
```

3. Reset the board. Stop in U-Boot again and check that the partition table for eMMC is as expected.

```
=> reset

...

=> mmc dev 1
switch to partitions #0, OK
mmc1(part 0) is current device
=> mmc part

Partition Map for MMC device 1 -- Partition Type: DOS

Part      Start Sector    Num Sectors      UUID              Type
  1         8192             16384             ef3963c1-01       0c
  2        24576             1794048           ef3963c1-02       83
```

## Updating Individual Images

### U-Boot

Flash U-Boot to eMMC. The i.MX7 expects an Image Vector Table offset of 0x400 bytes for SD/MMC boot device type. Type the following in U-Boot (alternatively, use dd command in Linux):

```
fatload mmc 0:1 ${loadaddr} u-boot.imx
mmc dev 1
mmc write ${loadaddr} 0x2 <u-boot image size in blocks>
```

### Linux/DTB

From Linux, copy the kernel and device tree file to eMMC:

```
# The eMMC partitions will mount to /run/media/ on boot. If you just partitioned eMMC, you may manually mount the partition:
mkdir /run/media/mmcblk2p1
mount /dev/mmcblk2p1 /run/media/mmcblk2p1

cp /run/media/mmcblk0p1/zImage /run/media/mmcblk2p1/; sync
cp /run/media/mmcblk0p1/zImage-<YOCTO_MACHINE>.dtb /run/media/mmcblk2p1/oftree; sync
```

## Root Filesystem

From Linux, flash the root filesystem to eMMC, partition 2.

```
dd if=/run/media/mmcblk0p3/<YOCTO_IMAGE>-<YOCTO_MACHINE>.ext4 of=/dev/mmcblk2p2 bs=1M
```

## Boot Options in U-Boot

The target can be booted from on-board media. In our standard configuration, this BSP release loads the kernel and root filesystem from MMC if an SD card is inserted in the micro SD card slot. If no SD card is present, it will boot from eMMC.

### Stand Alone SD/MMC Card Boot

This is the default boot configuration. Simply type the following:

```
boot
```

### Stand-Alone eMMC Boot

By default, the U-Boot environment is configured to autodetect which mmc interface U-boot was booted from (See [i.MX7: Boot Configurations](#)) and boot the kernel and root file system from the same device. However, if you would like to boot Linux from eMMC regardless of the boot source for U-Boot, then disable auto-detection and set the mmc boot device to mmc1 by modifying the environment as follows:

```
=> setenv mmcautodetect no
=> setenv mmcdev 1
=> saveenv
```

Reset the board and let it boot fully into Linux, or use the "boot" command within U-boot:

```
=> boot
```