

# Jetson/TX2 SPI

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## < Jetson

This how-to enables SPI in the kernel for Jetson TX2 with L4T R28.1 (JetPack 3.1). For the previous version see, Jetson/TX1 SPI.

DevTalk Thread – see <https://devtalk.nvidia.com/default/topic/1024806/how-to-enable-spi-spidev-on-28-1-on-target-/> (<https://devtalk.nvidia.com/default/topic/1024806/how-to-enable-spi-spidev-on-28-1-on-target-/>)

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## Locating the SPI Pins

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First, in the Jetson TX2 Developer Kit, the SPI pins are located on the J21 header - <http://www.jetsonhacks.com/nvidia-jetson-tx2-j21-header-pinout/>

- Pin 19 - SPI(3) MOSI
- Pin 21 - SPI(3) MISO
- Pin 23 - SPI(3) CLK
- Pin 24 - SPI(3) CS#0

## Building SPIDev Module

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It's suggested to enable support for SPIDev (<https://www.kernel.org/doc/Documentation/spi/spidev>) (userspace API).

To do that, we'll download the L4T kernel sources, enable SPIDev module in the kernel configuration, build and install the module.

### Downloading the Kernel Sources

L4T source tarball available here: <https://developer.nvidia.com/embedded/dlc/l4t-sources-28-1>

JetsonHacks also has a script (<https://github.com/jetsonhacks/buildJetsonTX2Kernel>). This script is for L4T 28.2, and will need some editing for 28.1 or earlier.

```
$ git clone http://github.com/jetsonhacks/buildJetsonTX2Kernel.git
$ cd buildJetsonTX2Kernel
$ ./getKernelSources.sh
```

The JetsonHacks script should have downloaded the kernel sources to the `/usr/src/` folder.

### Configuring the Kernel

Edit the `tegra18_defconfig` file:

```
$ cd /usr/src
$ cd /kernel/kernel-4.4/
$ cd /arch/arm64/configs/
$ sudo gedit tegra18_defconfig
```

Add the following to just below `CONFIG_SPI_TEGRA114_SPI=y`

```
CONFIG_SPI=y
CONFIG_SPI_TEGRA114=y
CONFIG_SPI_SPIDEV=m
CONFIG_QSPI_TEGRA186=y
```

## Building the Kernel

Generate the new `.conf` file after the changes to `tegra18_defconfig`

```
$ cd /usr/src/kernel/kernel-4.4
$ sudo make tegra18_defconfig
```

Build the kernel modules:

```
$ cd ~/buildJetsonTX2Kernel
$ sudo ./makeKernel.sh
```

Ensure the SPIDEv Kernel module is copied to `/lib/modules`

```
$ sudo cp /usr/src/kernel/kernel-4.4/drivers/spi/spidev.ko /lib/modules/$(uname -r)/kernel/drivers/
```

Update module dependencies and kernel image:

```
$ sudo depmod
$ sudo ./copyImage.sh
```

Reboot to new config:

```
$ sudo reboot
```

## Verifying SPIDEv Module

To verify the SPIDEv kernel module that we built is enabled, navigate to `/lib/modules/$(uname -r)`

```
$ cd /lib/modules/$(uname -r)
$ cat modules.dep
# print the contents of modules.dep to the screen, and ensure spidev.ko is in there
# e.g. @line 23
# kernel/drivers/spi/spidev.ko
```

## Modifying the Device Tree

Next, we must enable the SPI device in the Jetson's device tree.

To do this, we'll install the device tree compiler (DTC), modify the device tree source (DTS), and re-build the device tree binary (DTB).

## Installing DTC Tool

First we need the device-tree-compiler

```
$ sudo apt-get update
$ sudo apt-get install device-tree-compiler
```

## Decompiling Device Tree

To obtain the device tree source (DTS) that we'll edit, first we need to decompile the current device tree binary (DTB) back to source:

```
$ cd /boot/dtb/
$ sudo dtc -I fs -O dts -o extracted_proc.dts /proc/device-tree
```

## Update The Device-Tree

Use your text editor of choice to update the DTS that we decompiled above:

```
$ sudo gedit myTX2DeviceTreeSource.dts
```

Make the following patches:

```
spi@3240000{
    compatible = "nvidia,tegra186-spi";
    reg = <0x0 0x3240000 0x0 0x10000>;
    ....
    ....
    linux,phandle = <0x80>;
    spi@0 {
        compatible = "spidev";
        reg = <0x0>;
        spi-max-frequency = <0x1312D00>;
        nvidia,enable-hw-based-cs;
        nvidia,cs-setup-clk-count = <0x1e>;
        nvidia,cs-hold-clk-count = <0x1e>;
        nvidia,rx-clk-tap-delay = <0x1f>;
        nvidia,tx-clk-tap-delay = <0x0>;
    };
};
```

## Recompiling the Device Tree

Use DTC again to recompile the modifying DTS back into the new DTB:

```
$ cd /boot/dtb/
$ sudo dtc -I dts -O dtb -o tegra186-quill-p3310-1000-c03-00-base.dtb extracted_proc.dts
```

## Enabling the New DTB

It's better flash the DTB by flash command instead of modify the extlinux due plugin manager will broken may cause unknow problem like break the network interface. Below is the command flash the DTB only.

```
sudo ./flash.sh -r -k kernel-dtb jetson-tx2 mmcblk0p1
```

As in [Jetson/TX2 DTB](#), enable **FDT** in `/boot/extlinux.conf`

```
TIMEOUT 30
DEFAULT PRIMARY
MENU TITLE p2771-0000 eMMC boot options
LABEL primary
    MENU LABEL primary kernel
    LINUX /boot/Image
    FDT /boot/dtb/tegra186-quill-p3310-1000-c03-00-base.dtb
    APPEND ${cbootargs} root=/dev/mmcblk0p1 rw rootwait rootfstype=ext4
```

Reboot for the changes to take effect:

```
$ sudo reboot
```

## Verifying SPIDev Device

To confirm the SPIDev module has loaded and created the SPI device, check if SPIDev is available in your `/dev` folder:

```
$ ls /dev/spi*  
$ /dev/spidev.3.0
```

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