
Linux on Marvell MMP

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OLPC XO-1.75 is a MMP2-based laptop. It's reasonably well supported by the mainline kernel.

This page mostly applies to OLPC XO-4, a similar laptop based on MMP3, as well. Consult the [OLPC XO-4](#) page for details about differences.

1.1 Hardware Support

Hardware	Model	Status	Notes
Game Keys	gpio-keys	Mainline	
Camera	ov7670	Mainline	
Wi-Fi	sd8686	Mainline	
Keyboard	AP SP	Mainline	
Embedded Controller	xo1.75-ec	Mainline	
Audio Codec	rt5631	Mainline	Needs the SoC I2C to work
Video Encoder	hx8837	In progress	
LCD Panel	ls075at011	In progress	

1.2 Firmware security

Most OLPC machines were shipped with the security system that disallows booting unsigned software. If this is the case with your machine, in order to run the OS images other than OLPC OS you'll need to get a developer key and deactivate the security system.

The procedure is described in the OLPC wiki: http://wiki.laptop.org/go/Activation_and_Developer_Keys

1.3 Firmware upgrade

It is always preferable to use an up to date firmware. The firmware images are available at <http://wiki.laptop.org/go/Firmware>. For the XO-1.75 laptop to boot the mainline kernel a firmware Q4E00JA or newer is needed. You can get it at <http://dev.laptop.org/~quozl/q4e00ja.rom>.

To update the firmware, place the .rom file on to your bootable media, connect a charged battery pack and a wall adapter, and enter the Open Firmware prompt by pressing ESC during the early boot (needs an unlocked laptop – see “Firmware security” above). Then use the “flash” command to update the firmware:

```
ok flash ext:\q4e00ja.rom    \ Flash the "q4e00ja.rom" from the SD card
ok flash u:\q4e00ja.rom     \ Flash the "q4e00ja.rom" from USB stick
```

1.4 Installing Fedora

Installing Fedora is very straightforward, since arm-image-installer supports it out-of-box. You can install it to a USB flash stick or a SD card.

The process destroys all data on the target volume, so make sure you pick the right one. Substitute sdx in command below for your actual volume. lsblk command might help you identify which one is it. Once you know the device name, you’re ready to install Fedora:

```
# arm-image-installer --resizefs --target=olpc_xo175 --media=/dev/sdx \
  --image=Fedora-Minimal-armhfp-32-1.6-sda.raw.xz

=====
= Selected Image:
= Fedora-Minimal-armhfp-32-1.6-sda.raw.xz
= Selected Media : /dev/sdx
= U-Boot Target : olpc_xo175
=====

*****
*****
***** WARNING! ALL DATA WILL BE DESTROYED *****
*****
*****

Type 'YES' to proceed, anything else to exit now

= Proceed? YES
= Writing:
= Fedora-Minimal-armhfp-32-1.6-sda.raw.xz
= To: /dev/sdx ....
2066571264 bytes (2.1 GB, 1.9 GiB) copied, 91 s, 22.7 MB/s
0+233502 records in
0+233502 records out
2088763392 bytes (2.1 GB, 1.9 GiB) copied, 91.554 s, 22.8 MB/s
= Writing image complete!
= Copying loader scripts to boot partition

= Installation Complete! Insert into the olpc_xo175 and boot.
#
```

Once your machine is unlocked, it will automatically boot from your media wherever it will detect it attached to the USB bus or the SD card slot.

1.5 Installing Debian

Starting with December 2020 debian-installer nightlies, Debian produces install images for the OLPC XO-1.75 laptops. Debian installer can be started from a USB device or a SD card that can be prepared in the usual way. The target you install Debian to can also be a USB device, a SD card, or the internal eMMC.

If you haven't installed Debian before you may find the full installation manual at [https://d-i.debian.org/manual/en.armhf/index.html](https://d-i.debian.org/manual/en/armhf/index.html) helpful.

For a network installation you'll need a USB ethernet adapter and some files from [netboot/SD-card-images/](#). Apparently, you can also do an offline image by placing an appropriate Debian ISO image on the install media and the installation using files from [hd-media/SD-card-images/](#). I'm going to assume you're doing a network install because ISO images of Arm nightlies don't seem to be produced and an online installation is probably more convenient anyway.

Basically you just need to get [firmware.OLPC_XO.img.gz](#) and [partition.img.gz](#), uncompress them and concatenate them to your install media. You can read more on that in [README.concatenateable_images](#).

Here's how you'd go about doing it, assuming your install media is `sdx`. The process destroys all data on the target volume, so make sure you pick the right one. `lsblk` command might help you identify the right volume:

```
# wget http://ftp.debian.org/debian/dists/sid/main/installer-armhf/current/images/hd-
↳media/SD-card-images/firmware.OLPC_XO.img.gz
# gunzip firmware.OLPC_XO.img.gz
# wget http://ftp.debian.org/debian/dists/sid/main/installer-armhf/current/images/
↳netboot/SD-card-images/partition.img.gz
# gunzip partition.img.gz
# cat firmware.OLPC_XO.img partition.img >/dev/sdx
#
```

That's it, really. Once your machine is unlocked, it will automatically boot from your install media wherever it will detect it attached to the USB bus or the SD card slot.

Once Debian is installed, it will be booted automatically as well.

CHAPTER 2

OLPC XO-4

OLPC XO-4 is a MMP3-based laptop. It's reasonably well supported by the mainline kernel.

Most of what applies to *OLPC XO-1.75* applies to XO-4 as well. This page deals with the differences.

2.1 Pin Assignment

Certain signals are assigned differently on XO-4, mostly due to extra peripherals on XO-4 laptop (such as touch screen and HDMI port) as well as MMP3 SoC (extra pins for MMC5 controller used for internal SD card slot).

Here's the summary:

Signal	Function		Note
	XO-1.75	XO-4	
BOOT_DEV_SEL	GPIO_56	GPIO_2	eMMC or Internal SD select
CAM_SCL	GPIO_108	GPIO_165	OV7670 I2C
CAM_SDA	GPIO_109	GPIO_166	OV7670 I2C
DCON_IRQ#	GPIO_124	GPIO_126	HX8837
DCON_SCL	GPIO_161	GPIO_168	HX8837 I2C
DCON_SDA	GPIO_110	GPIO_167	HX8837 I2C
EB_MODE#	GPIO_128	GPIO_130	Display rotated in e-book mode
EC_SPI_ACK	GPIO_125	GPIO_113	To Embedded Controller
HP_PLUG	GPIO_97	GPIO_13	Headphone
HUB_RESET#	GPIO_146	GPIO_148	USB Hub Reset
VID2	GPIO_11	GPIO_123	Vcore voltage control
WLAN_PD#	GPIO_57	GPIO_35	Wi-Fi Power Down
WLAN_RESET#	GPIO_58	GPIO_36	Wi-Fi Reset
eMMC_RST#	GPIO_149	GPIO_144	eMMC Reset
I2S_SYSCLK	I2S_SYSCLK	APPMU_SYSCLK	Different I2S sysclk. Why?
SD1_CLK	MMC3_CLK	MMC5_CLK	eMMC and Internal SD share
SD1_CMD	MMC3_CMD	MMC5_CMD	

Table 1 – continued from previous page

Signal	Function		Note
	XO-1.75	XO-4	
SD1_DATA0	MMC3_DATA0	MMC5_DATA_0	
SD1_DATA1	MMC3_DATA1	MMC5_DATA_1	
SD1_DATA2	MMC3_DATA2	MMC5_DATA_2	
SD1_DATA3	MMC3_DATA3	MMC5_DATA_3	
EN_eMMC_PWR#		GPIO_97	eMMC power off on XO-4 c
SOC_SEL		GPIO_3	MMP3 CPU Speed: 1 - 1GH
MEM_SZ0		GPIO_0	Memory size: 0 - 1GB, 1 - 2
MEM_SZ1		GPIO_1	Memory size: always 0
HDMI_HP_DET		GPIO_14	HDMI port only on XO-4
HDMI_SCL		GPIO_4	
HDMI_DAT		GPIO_5	
TOUCH_BSL_RXD		UART4_TXD	Touch only on XO-4
TOUCH_BSL_TXD		UART4_RXD	
TOUCH_HD		GPIO_12	
TOUCH_RST#		GPIO_98	
TOUCH_TCK		GPIO_139	
CONSOLE_RXD	UART3_RXD	UART2_RXD	OFW/Linux Console (XO-1.
CONSOLE_TXD	UART3_RXD	UART2_TXD	OFW/Linux Console (XO-1.

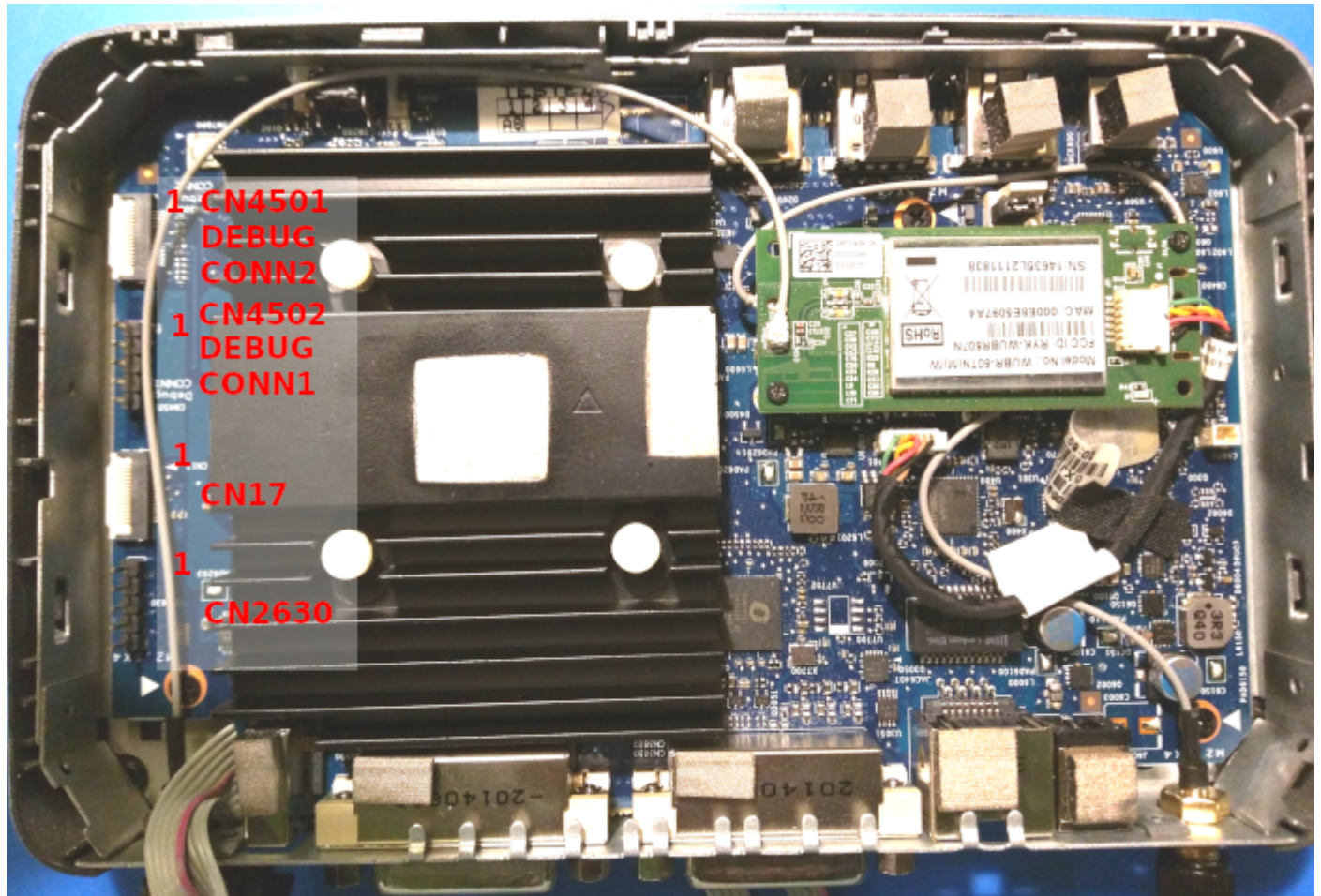
Dell Wyse 3020

Dell Wyse 3020 is a MMP3-based thin client, sometimes referred to as “Ariel”, “Tx0D”, “T10D”, “T20D”, etc. It’s reasonably well supported by the mainline kernel.

It comes with “WLoader” firmware, but can be flashed with Open Firmware. Open Firmware is 100% free software and provides better Device Tree support than WLoader.

3.1 Connectors

There’s a handful of connectors on the Dell Wyse 3020 board.



The UART1 serial port can be easily accessed via 0.1" pitch pin header on CN4502. UART3 and UART4 could possibly be accessed by connecting a 0.05" pitch 16-pin flat cable to CN17 but the pin controller needs to be told to route the UART functions there (it defaults to GPIO). Probably not worth it.

JTAG can be accessed via CN4501.

Some of the pins have not been identified, but there can hardly be anything too useful.

3.1.1 CN4501

Connector near the front. Pin 1 also faces front of the machine. Marked on the PCB as follows:

CN4501 DEBUG CONN2

Pin Number	Function
1	GPIO_52
2	GPIO_51
3	GND
4	
5	JTAG_TDI
6	JTAG_TMS
7	JTAG_TCK
8	JTAG_TCK
9	JTAG_TDO
10	RESET#
11	GND
12	
13	
14	+3V
15	GPIO_64
16	

3.1.2 CN4502

Pin 1 faces front of the machine. Marked on the PCB as follows:

CN4502
DEBUG
CONN1

Pin Number	Function
1	
2	GPIO_69
3	GND
4	UART1_RX
5	UART1_TX

3.1.3 CN17

Pin 1 faces front of the machine.

Pin Number	Function
1	GPIO_115
2	GPIO_116
3	
4	GPIO_117
5	GPIO_118
6	GPIO_119
7	GPIO_120
8	GPIO_121
9	GPIO_122
10	
11	
12	
13	
14	
15	
16	

3.2 Hardware Support

Hardware	Model	Status
Embedded Controller	ene-kb3930	Mainline (5.9)
Power Button	ariel-pwrbutton	Mainline (5.11)
Status LEDs	leds-ariel	Mainline (5.8)
Video Encoder	ch7033	Mainline (5.8)
Power Regulator	88pm867	Mainline
RTC	ds1338	Mainline
Firmware Flash	w25q32	Mainline
Audio Codec	ce506	Not started

3.3 Connecting the console

Connecting to the board's console serial port is a good idea for initial installation and at least until the DRM driver is mainlined.

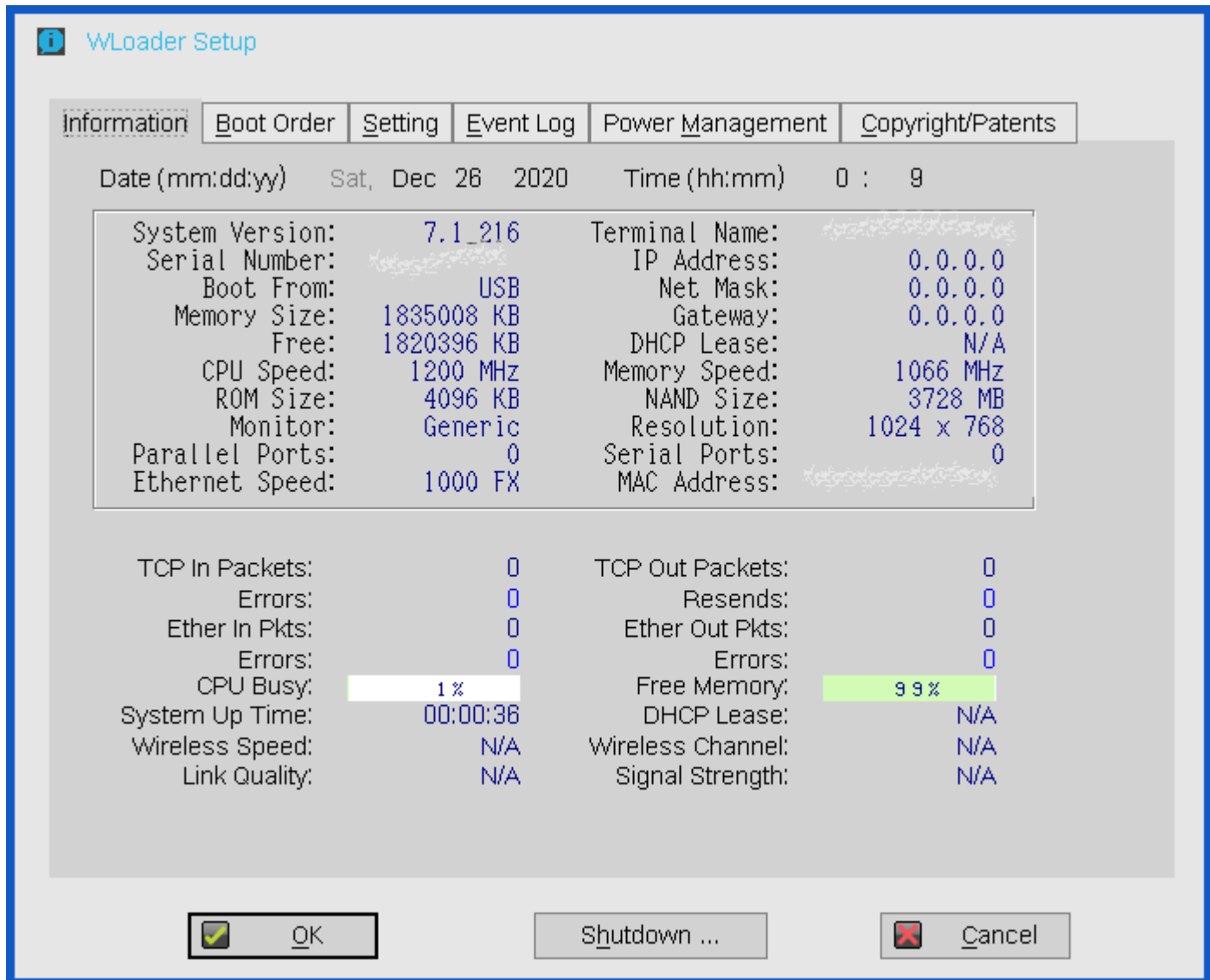
The UART serial port is located on the CN4502 connector with the following pinout (with the pins on the right side, the silk screen marking on the left of it):

	—	
CN4502	o	TX
Debug	o	RX
Conn1	o	GND
	o	
B	o	
	—	

Configure your favorite terminal programs with 115200 baud, 8 bits, no parity and stop bits (115200 8N1) and you're good to go.

3.4 Booting with WLoader

The device comes with a boot loader called WLoader. It's apparently is a stripped down version of Wyse's ThinOS, with GUI, USB and Network support, capable of loading ELF images of ThinkOS as well as Linux U-Boot-style uImages. There's basically zero configuration for it, but apparently it reads a file called wloader.conf, which tells it which kernel and initrd to load.



To start Linux on the machine, you need to prepare an USB flash stick with a Linux installation. The process destroys all data on the target volume, so make sure you pick the right one. Substitute `sdx` in command below for your actual volume. `lsblk` command might help you identify which one is it. Once you know the device name, you're ready to install your favourite distro. Fedora for OLPC XO-1.75 machine is fine:

```
# arm-image-installer --resizefs --target=olpc_xo175 --media=/dev/sdx \
--image=Fedora-Minimal-armhfp-32-1.6-sda.raw.xz

=====
= Selected Image:
```

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```
= Fedora-Minimal-armhfp-32-1.6-sda.raw.xz
= Selected Media : /dev/sdx
= U-Boot Target : olpc_xo175
=====

*****
*****
***** WARNING! ALL DATA WILL BE DESTROYED *****
*****
*****

Type 'YES' to proceed, anything else to exit now

= Proceed? YES
= Writing:
= Fedora-Minimal-armhfp-32-1.6-sda.raw.xz
= To: /dev/sdx ....
2066571264 bytes (2.1 GB, 1.9 GiB) copied, 91 s, 22.7 MB/s
0+233502 records in
0+233502 records out
2088763392 bytes (2.1 GB, 1.9 GiB) copied, 91.554 s, 22.8 MB/s
= Writing image complete!
= Copying loader scripts to boot partition

= Installation Complete! Insert into the olpc_xo175 and boot.
#
```

Mount the boot partitions and make some room:

```
# mount /dev/sdx2 /mnt
# mount /dev/sdx1 /mnt/efi/
# rm -rf /mnt/efi/*
#
```

Create the uImages:

```
# cat /mnt/vmlinuz-* /mnt/dtb-*/mmp3-dell-ariel.dtb >/mnt/zImage
# mkimage -A arm -O linux -C none -T kernel -a 0x00008000 -e 0x00008000 -d /mnt/
↪zImage /mnt/efi/uImage
Image Name:
Created: Tue May 12 13:24:10 2020
Image Type: ARM Linux Kernel Image (uncompressed)
Data Size: 7654917 Bytes = 7475.50 KiB = 7.30 MiB
Load Address: 00008000
Entry Point: 00008000
# mkimage -A arm -O linux -C none -T ramdisk -d /mnt/efi/initramfs-* /mnt/efi/uInitrd
Image Name:
Created: Tue May 12 12:45:09 2020
Image Type: ARM Linux RAMDisk Image (uncompressed)
Data Size: 51619027 Bytes = 50409.21 KiB = 49.23 MiB
Load Address: 00000000
Entry Point: 00000000
```

And write the boot loader configuration:

```
# cat >/mnt/efi/wloader.cfg <<EOF
> <TXOD_START>
```

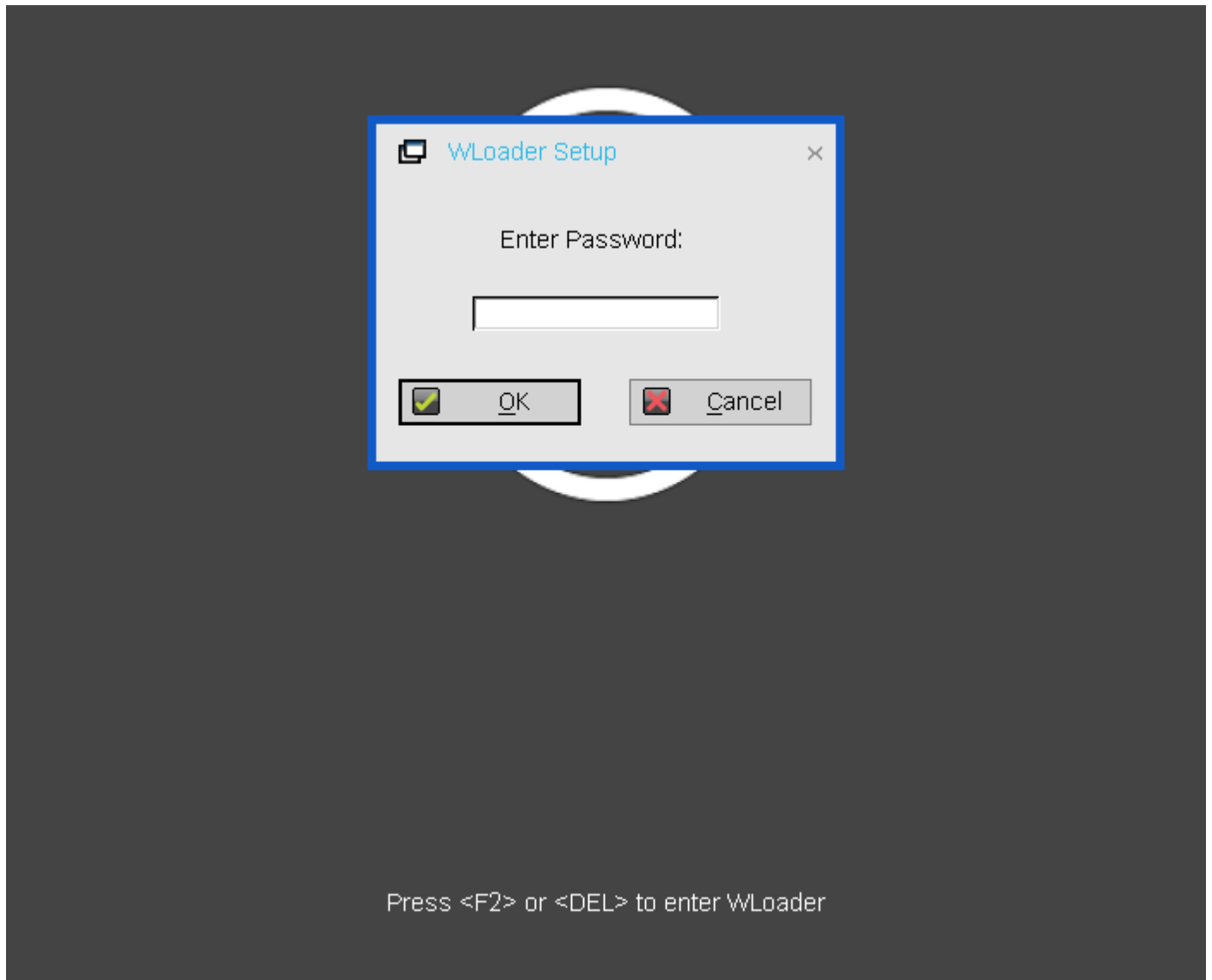
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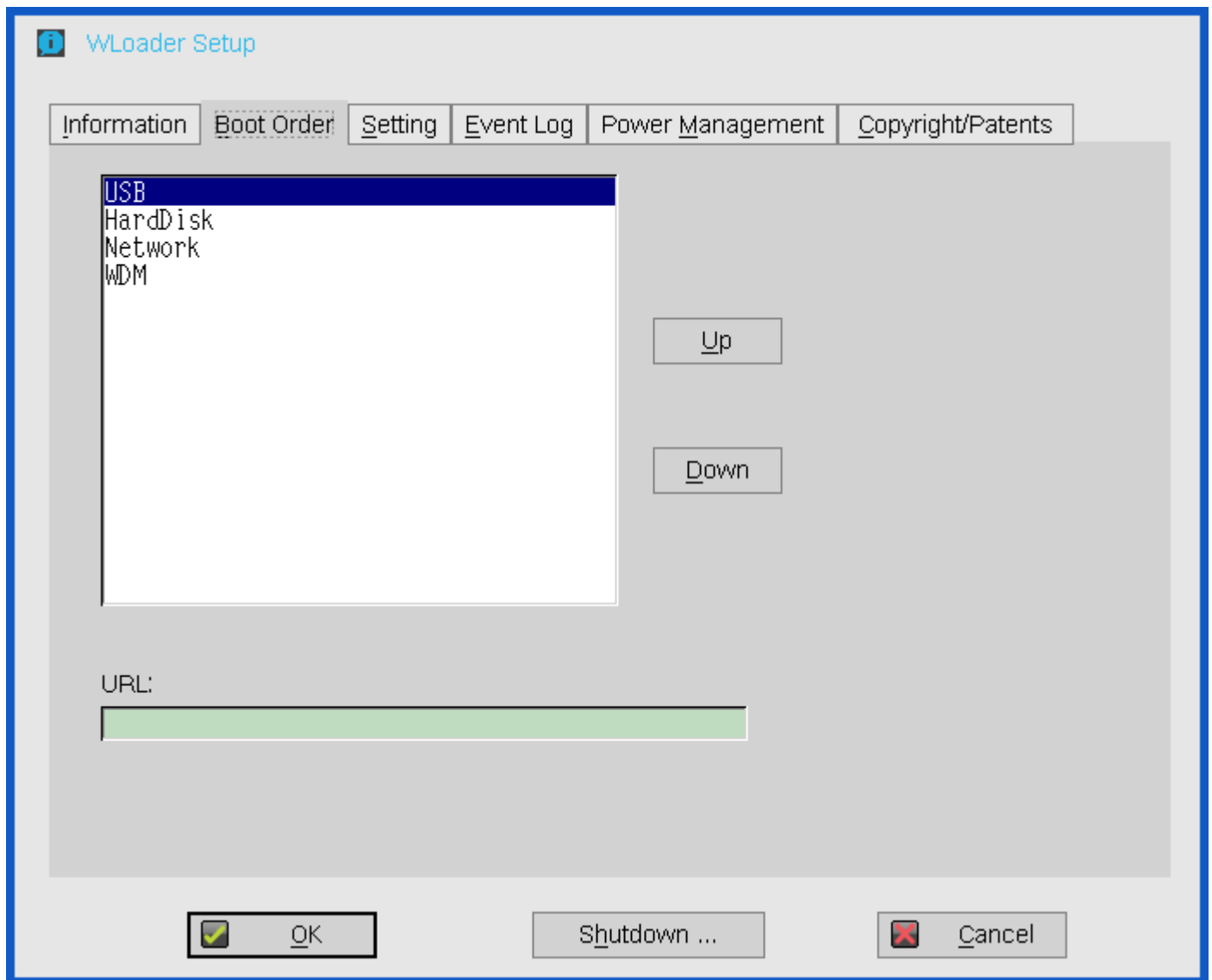
(continued from previous page)

```
>
> kernel=./uImage
> initrd=./uInitrd
> param="$(sed -n 's/^[\\t ]*append //p' /mnt/extlinux/extlinux.conf)"
>
> <TX0D_END>
> EOF
# umount /mnt/efi /mnt
#
```

Plug in the driver in any of the machine's USB ports and you're ready to boot it:

1. Hold power button until the LED turns Green
2. Keep pressing "P", default password is "Fireport"
3. Choose boot from USB





3.5 Installing Open Firmware

Flash Open Firmware:

```
# echo spidev >/sys/devices/platform/soc/d4000000.apb/d4035000.spi/spi_master/spi1/
↪spi1.0/driver_override
# echo spi1.0 >/sys/devices/platform/soc/d4000000.apb/d4035000.spi/spi_master/spi1/
↪spi1.0/driver/unbind
# echo spi1.0 >/sys/bus/spi/drivers/spidev/bind
# echo spi1.0 >/sys/bus/spi/drivers/spidev/bind
# flashrom -p linux_spi:dev=/dev/spidev1.0 -w q7c07.rom
#
```

CHAPTER 4

MMP SoC Hardware Documentation

4.1 MMP3/MMP2 Pins

Register	Pin	Function 0	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
0xd401e000	D19	USIM	GPIO_102	FSIC	KP_DK	LCD		
0xd401e004	C19	USIM	GPIO_103	FSIC	KP_DK	LCD		
0xd401e008	B19	USIM	GPIO_142	FSIC	KP_DK			
0xd401e00c	A20	GPIO_124	MMC1	LCD	MMC3	NAND		
0xd401e010	E20	GPIO_125	MMC1	LCD	MMC3	NAND		
0xd401e014	AF11	GPIO_126	MMC1	LCD	MMC3	NAND		
0xd401e018	AE10	GPIO_127		LCD	MMC3	NAND		
0xd401e01c	AH11	GPIO_128		LCD	MMC3	NAND		
0xd401e020	AF10	GPIO_129	MMC1	LCD	MMC3	NAND		
0xd401e024	AD10	GPIO_130	MMC1	LCD	MMC3	NAND		
0xd401e028	D20	GPIO_131	MMC1		MSP			
0xd401e02c	B20	GPIO_132	MMC1	PRI_JTAG	MSP	SSP3	AAS_JTAG	
0xd401e030	A21	GPIO_133	MMC1	PRI_JTAG	MSP	SSP3	AAS_JTAG	
0xd401e034	B21	GPIO_134	MMC1	PRI_JTAG	MSP	SSP3	AAS_JTAG	
0xd401e038	F20	GPIO_135		LCD	MMC3	NAND		
0xd401e03c	C21	GPIO_136	MMC1	PRI_JTAG	MSP	SSP3	AAS_JTAG	
0xd401e040	D21	GPIO_137	HDMI	LCD	MSP			
0xd401e044	B22	GPIO_138		LCD	MMC3	SMC		
0xd401e048	AC10	GPIO_139	MMC1	PRI_JTAG	MSP		AAS_JTAG	
0xd401e04c	A22	GPIO_140	MMC1	LCD			UART2	U
0xd401e050	C22	GPIO_141	MMC1	LCD			UART2	U
0xd401e054	G21	GPIO_0	KP_MK		SPI			
0xd401e058	G22	GPIO_1	KP_MK		SPI			
0xd401e05c	B23	GPIO_2	KP_MK		SPI			
0xd401e060	D22	GPIO_3	KP_MK		SPI			
0xd401e064	A23	GPIO_4	KP_MK					

Table 1 – continued from previous page

Register	Pin	Function 0	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
0xd401e068	C23	GPIO_5	KP_MK		SPI			
0xd401e06c	E23	GPIO_6	KP_MK		SPI			
0xd401e070	H22	GPIO_7	KP_MK		SPI			
0xd401e074	F23	GPIO_8	KP_MK					
0xd401e078	A24	GPIO_9	KP_MK					
0xd401e07c	D23	GPIO_10	KP_MK					
0xd401e080	B24	GPIO_11	KP_MK					
0xd401e084	D24	GPIO_12	KP_MK		CCIC1			
0xd401e088	G23	GPIO_13	KP_MK		CCIC1			
0xd401e08c	J22	GPIO_14	KP_MK		CCIC1			
0xd401e090	E24	GPIO_15	KP_MK	KP_DK	CCIC1			
0xd401e094	G24	GPIO_16	KP_DK	ROT	CCIC1			
0xd401e098	F24	GPIO_17	KP_DK	ROT	CCIC1			
0xd401e09c	H23	GPIO_18	KP_DK	ROT	CCIC1			
0xd401e0a0	A25	GPIO_19	KP_DK	ROT	CCIC1			
0xd401e0a4	B25	GPIO_20	KP_DK	TB	CCIC1			
0xd401e0a8	K22	GPIO_21	KP_DK	TB	CCIC1			
0xd401e0ac	C25	GPIO_22	KP_DK	TB	CCIC1			
0xd401e0b0	D25	GPIO_23	KP_DK	TB	CCIC1			
0xd401e0b4	E25	GPIO_24	I2S	VCXO_OUT				
0xd401e0b8	G25	GPIO_25	I2S	HDMI	SSPA2			
0xd401e0bc	J23	GPIO_26	I2S	HDMI	SSPA2			
0xd401e0c0	H24	GPIO_27	I2S	HDMI	SSPA2			
0xd401e0c4	L22	GPIO_28	I2S		SSPA2			
0xd401e0c8	A26	GPIO_29	UART1	KP_MK				A
0xd401e0cc	B26	GPIO_30	UART1	KP_MK				A
0xd401e0d0	K23	GPIO_31	UART1	KP_MK				A
0xd401e0d4	C26	GPIO_32	UART1	KP_MK				A
0xd401e0d8	D26	GPIO_33	SSPA2	I2S				
0xd401e0dc	B27	GPIO_34	SSPA2	I2S				
0xd401e0e0	J24	GPIO_35	SSPA2	I2S				
0xd401e0e4	M22	GPIO_36	SSPA2	I2S				
0xd401e0e8	H25	GPIO_37	MMC2	SSP1	TWSI2	UART2	UART3	A
0xd401e0ec	C27	GPIO_38	MMC2	SSP1	TWSI2	UART2	UART3	A
0xd401e0f0	L23	GPIO_39	MMC2	SSP1	TWSI2	UART2	UART3	A
0xd401e0f4	C28	GPIO_40	MMC2	SSP1	TWSI2	UART2	UART3	A
0xd401e0f8	N21	GPIO_41	MMC2	TWSI5				
0xd401e0fc	D27	GPIO_42	MMC2	TWSI5				
0xd401e100	F26	GPIO_43	TWSI2	UART4	SSP1	UART2	UART3	
0xd401e104	G26	GPIO_44	TWSI2	UART4	SSP1	UART2	UART3	
0xd401e108	E27	GPIO_45	UART1	UART4	SSP1	UART2	UART3	
0xd401e10c	K24	GPIO_46	UART1	UART4	SSP1	UART2	UART3	
0xd401e110	H26	GPIO_47	UART2	SSP2	TWSI6	CAM2	AAS_SPI	A
0xd401e114	N22	GPIO_48	UART2	SSP2	TWSI6	CAM2	AAS_SPI	A
0xd401e118	M23	GPIO_49	UART2	SSP2	PWM	CCIC2	AAS_SPI	
0xd401e11c	F27	GPIO_50	UART2	SSP2	PWM	CCIC2	AAS_SPI	
0xd401e120	J25	GPIO_51	UART3	ROT	AAS_GPIO	PWM		
0xd401e124	D28	GPIO_52	UART3	ROT	AAS_GPIO	PWM		
0xd401e128	E28	GPIO_53	UART3	TWSI2	VCXO_REQ		PWM	

Table 1 – continued from previous page

Register	Pin	Function 0	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
0xd401e12c	L24	GPIO_54	UART3	TWSI2	VCXO_OUT	HDMI	PWM	
0xd401e130	F28	GPIO_55	SSP2	SSP1	UART2	ROT	TWSI2	SSP2
0xd401e134	G27	GPIO_56	SSP2	SSP1	UART2	ROT	TWSI2	K28
0xd401e138	P22	GPIO_57	SSP2_RX	SSP1_TXRX	SSP2_FRM	SSP1_RX	VCXO_REQ	K28
0xd401e13c	G28	GPIO_58	SSP2	SSP1_RX	SSP1_FRM	SSP1_TXRX	VCXO_REQ	K28
0xd401e140	L26	TWSI1						
0xd401e144	K28	TWSI1						
0xd401e148	R23	GPIO_123	SLEEP_IND	ONE_WIRE	32K_CLKOUT			
0xd401e14c	L28	PRI_JTAG	GPIO_156	PWM				
0xd401e150	N25	PRI_JTAG	GPIO_157	PWM				
0xd401e154	M27	PRI_JTAG	GPIO_158	PWM				
0xd401e158	N26	PRI_JTAG	GPIO_159	PWM				
0xd401e15c	M28	PRI_JTAG						
0xd401e160	L27	G_CLKREQ	ONE_WIRE					
0xd401e164	U21	G_CLKOUT	32K_CLKOUT	HDMI				
0xd401e168	N27	VCXO_REQ	ONE_WIRE	PLL				
0xd401e16c	T24	VCXO_OUT	32K_CLKOUT					
0xd401e170	W23	GPIO_74	LCD	SMC	MMC4	SSP3	UART2	U21
0xd401e174	V25	GPIO_75	LCD	SMC	MMC4	SSP3	UART2	U21
0xd401e178	W22	GPIO_76	LCD	SMC	MMC4	SSP3	UART2	U21
0xd401e17c	Y25	GPIO_77	LCD	SMC	MMC4	SSP3	UART2	U21
0xd401e180	W24	GPIO_78	LCD	HDMI	MMC4		SSP4	A23
0xd401e184	Y22	GPIO_79	LCD	AAS_GPIO	MMC4		SSP4	A23
0xd401e188	Y23	GPIO_80	LCD	AAS_GPIO	MMC4		SSP4	A23
0xd401e18c	Y24	GPIO_81	LCD	AAS_GPIO	MMC4		SSP4	A23
0xd401e190	AA20	GPIO_82	LCD		MMC4			C24
0xd401e194	AA24	GPIO_83	LCD		MMC4			C24
0xd401e198	AA23	GPIO_84	LCD	SMC	MMC2		TWSI5	A23
0xd401e19c	AB21	GPIO_85	LCD	SMC	MMC2		TWSI5	A23
0xd401e1a0	AB24	GPIO_86	LCD	SMC	MMC2		TWSI6	C24
0xd401e1a4	AA25	GPIO_87	LCD	SMC	MMC2		TWSI6	C24
0xd401e1a8	AB22	GPIO_88	LCD	AAS_GPIO	MMC2			C24
0xd401e1ac	AB25	GPIO_89	LCD	AAS_GPIO	MMC2			C24
0xd401e1b0	AB23	GPIO_90	LCD	AAS_GPIO	MMC2			C24
0xd401e1b4	AB27	GPIO_91	LCD	AAS_GPIO	MMC2			C24
0xd401e1b8	AB28	GPIO_92	LCD	AAS_GPIO	MMC2			C24
0xd401e1bc	AB20	GPIO_93	LCD	AAS_GPIO	MMC2			C24
0xd401e1c0	AC24	GPIO_94	LCD	AAS_GPIO	SPI		AAS_SPI	C24
0xd401e1c4	AC21	GPIO_95	LCD	TWSI3	SPI	AAS_DEU_EX	AAS_SPI	C24
0xd401e1c8	AC23	GPIO_96	LCD	TWSI3	SPI	AAS_DEU_EX	AAS_SPI	
0xd401e1cc	AA19	GPIO_97	LCD	TWSI6	SPI	AAS_DEU_EX	AAS_SPI	
0xd401e1d0	EC25	GPIO_98	LCD	TWSI6	SPI	ONE_WIRE		
0xd401e1d4	AC27	GPIO_99	LCD	SMC	SPI	TWSI5		
0xd401e1d8	AC26	GPIO_100	LCD	SMC	SPI	TWSI5		
0xd401e1dc	AB19	GPIO_101	LCD	SMC	SPI			
0xd401e1e0	AF28	NAND	GPIO_168	MMC3				
0xd401e1e4	AF25	NAND	GPIO_167	MMC3				
0xd401e1e8	AF26	NAND	GPIO_166	MMC3				
0xd401e1ec	AE23	NAND	GPIO_165	MMC3				

Table 1 – continued from previous page

Register	Pin	Function 0	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
0xd401e1f0	AE21	NAND	GPIO_107			NAND		
0xd401e1f4	AF27	NAND	GPIO_106			NAND		
0xd401e1f8	AE22	NAND	GPIO_105			NAND		
0xd401e1fc	AE25	NAND	GPIO_104			NAND		
0xd401e200	AE26	NAND	GPIO_111	MMC3				
0xd401e204	AD25	NAND	GPIO_164	MMC3				
0xd401e208	AD28	NAND	GPIO_163	MMC3				
0xd401e20c	AD24	NAND	GPIO_162	MMC3				
0xd401e210	AD26	NAND	GPIO_161			NAND		
0xd401e214	AD25	NAND	GPIO_110			NAND		
0xd401e218	AD24	NAND	GPIO_109			NAND		
0xd401e21c	AD23	NAND	GPIO_108			NAND		
0xd401e220	AF23	NAND	GPIO_143	SMC		NAND		
0xd401e224	AF24	NAND	GPIO_144	SMC_INT	SMC	NAND		
0xd401e228	AC19	SMC	GPIO_145			SMC		
0xd401e22c	AC20	SMC	GPIO_146			SMC		
0xd401e230	AG25	NAND	GPIO_147			NAND		
0xd401e234	AG26	NAND	GPIO_148			NAND		
0xd401e238	AA16	NAND	GPIO_149					
0xd401e23c	AH26	NAND	GPIO_150			NAND		
0xd401e240	AG24	SMC	GPIO_151	MMC3				
0xd401e244	AH25	NAND	GPIO_112	MMC3	SMC			
0xd401e248	AC18	SMC	GPIO_152			SMC		
0xd401e24c	AD18	SMC	GPIO_153			SMC		
0xd401e250	AH24	NAND	GPIO_160	SMC		NAND		
0xd401e254	AB17	SMC_INT	GPIO_154	SMC		NAND		
0xd401e258	AE19	EXT_DMA	GPIO_155	SMC		EXT_DMA		
0xd401e25c	AC17	SMC	GPIO_113	EXT_DMA	MMC3	SMC	HDMI	
0xd401e260	N23	GPIO_115		AC	UART4	UART3	SSP1	
0xd401e264	H27	GPIO_116		AC	UART4	UART3	SSP1	
0xd401e268	H28	GPIO_117		AC	UART4	UART3	SSP1	
0xd401e26c	J28	GPIO_118		AC	UART4	UART3	SSP1	
0xd401e270	M24	GPIO_119		CA	SSP3			
0xd401e274	J27	GPIO_120		CA	SSP3			
0xd401e278	K26	GPIO_121		CA	SSP3			
0xd401e27c	L25	GPIO_122		CA	SSP3			
0xd401e280	AD13	GPIO_59	CCIC1	ULPI	MMC3	CCIC2	UART3	U
0xd401e284	AE13	GPIO_60	CCIC1	ULPI	MMC3	CCIC2	UART3	U
0xd401e288	AF13	GPIO_61	CCIC1	ULPI	MMC3	CCIC2	UART3	F
0xd401e28c	AH13	GPIO_62	CCIC1	ULPI	MMC3	CCIC2	UART3	
0xd401e290	AG13	GPIO_63	CCIC1	ULPI	MMC3	CCIC2	MSP	U
0xd401e294	AC12	GPIO_64	CCIC1	ULPI	MMC3	CCIC2	MSP	U
0xd401e298	AD12	GPIO_65	CCIC1	ULPI	MMC3	CCIC2	MSP	U
0xd401e29c	AE12	GPIO_66	CCIC1	ULPI	MMC3	CCIC2	MSP	U
0xd401e2a0	AF12	GPIO_67	CCIC1	ULPI	MMC3	CCIC2	MSP	
0xd401e2a4	AG12	GPIO_68	CCIC1	ULPI	MMC3	CCIC2	MSP	L
0xd401e2a8	AH12	GPIO_69	CCIC1	ULPI	MMC3	CCIC2		L
0xd401e2ac	AC11	GPIO_70	CCIC1	ULPI	MMC3	CCIC2	MSP	L
0xd401e2b0	AD11	GPIO_71	TWSI3		PWM			L

Table 1 – continued from previous page

Register	Pin	Function 0	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
0xd401e2b4	AG11	GPIO_72	TWSI3	HDMI	PWM			
0xd401e2b8	AE11	GPIO_73	VCXO_REQ	32K_CLKOUT	PWM	VCXO_OUT		
0xd401e2bc	D18	TWSI4	LCD					
0xd401e2c0	A19	TWSI4	LCD					

CHAPTER 5

Hardware Support

Hardware	Model	Status	Notes
SMP (mmp3)	mmp3-smp	Mainline	
L2 Cache (mmp2)	tauros2	Mainline	
L2 Cache (mmp3)	tauros3	Mainline	
USB 2.0	pxau2o-ehci	Mainline	
USB 2.0 PHY (mmp2)	mmp2-usb-phy	Mainline	
USB 2.0 PHY (mmp3)	mmp3-usb-phy	Mainline	
MMC	pxav3-mmc	Mainline	
Camera Controller	mmp2-ccic	Mainline	
Audio DMA	adma-1.0	Mainline	
Peripheral DMA	pdma-1.0	Mainline	
UART	xscale-uart	Mainline	
GPIO	mmp2-gpio	Mainline	
I2S	mmp-twsi	Mainline	
RTC	mmp-rtc	Mainline	
SPI	mmp2-ssp	Mainline	
Audio SRAM	mmio-sram	Mainline	
3D GPU (mmp2)	gc860	Mainline	Needs power domains (In progress)
3D GPU (mmp3)	gc2000	Mainline	Needs power domains (In progress)
3D GPU (mmp3)	gc320	Mainline	Needs power domains (In progress)
MMP3 Thermal	mmp3-thermal	In progress	
Display Controller	armada-lcdc	In progress	
USB HSIC PHY (mmp3)	mmp3-hsic-phy	In progress	
Audio Clocks	mmp2-audio-clock	In progress	
Audio I2S	mmp-sspa	In progress	
Randomness Source	mmp2-rng	In progress	