

# **OxPCle95x**

## **Linux Driver User Manual**

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## 1. Introduction

This document describes the software driver installation procedure for Oxford PCIe95x PCIe to Serial / Parallel products or other manufacturer's product based on Oxford PCIe95x series on Linux OS.

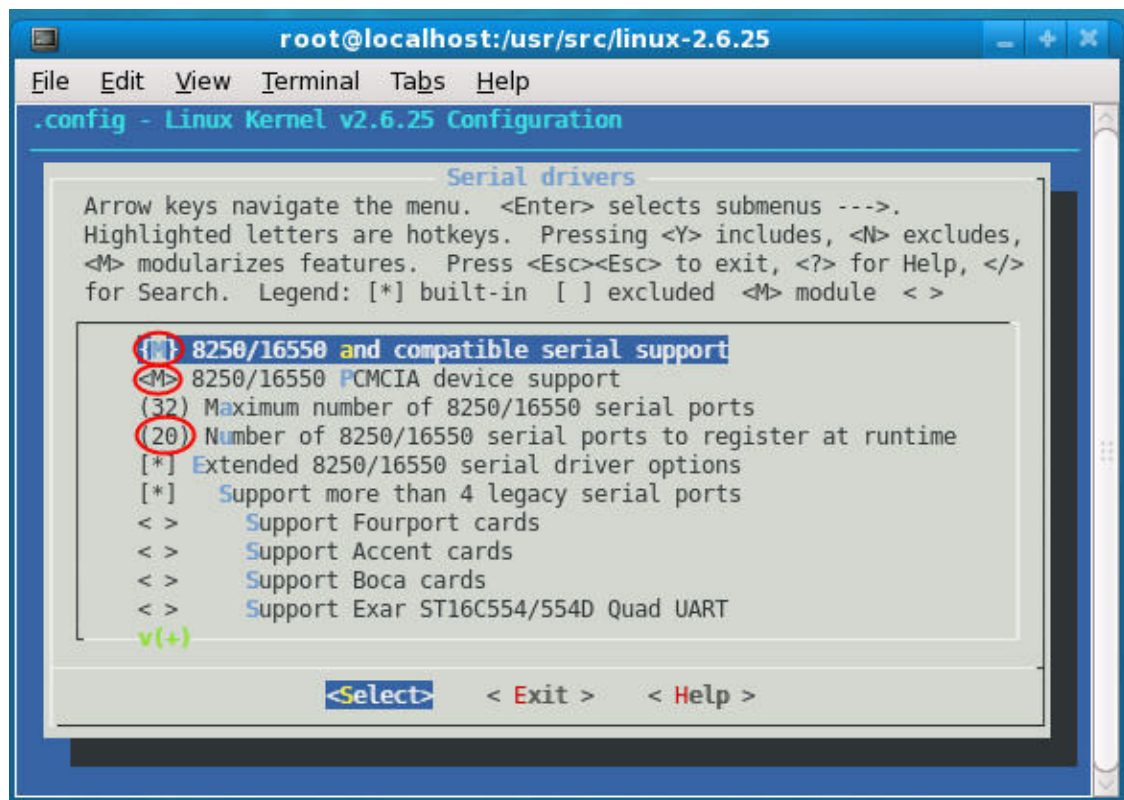
## 2. Serial Port

### A) Kernel Preparation

- Go into the kernel source directory you have, for example, /usr/src/linux-2.6.25
- Typing "make menuconfig"
- Choose 'Device Drivers' -> 'Character devices' -> 'Serial drivers', and configure the settings as shown below.

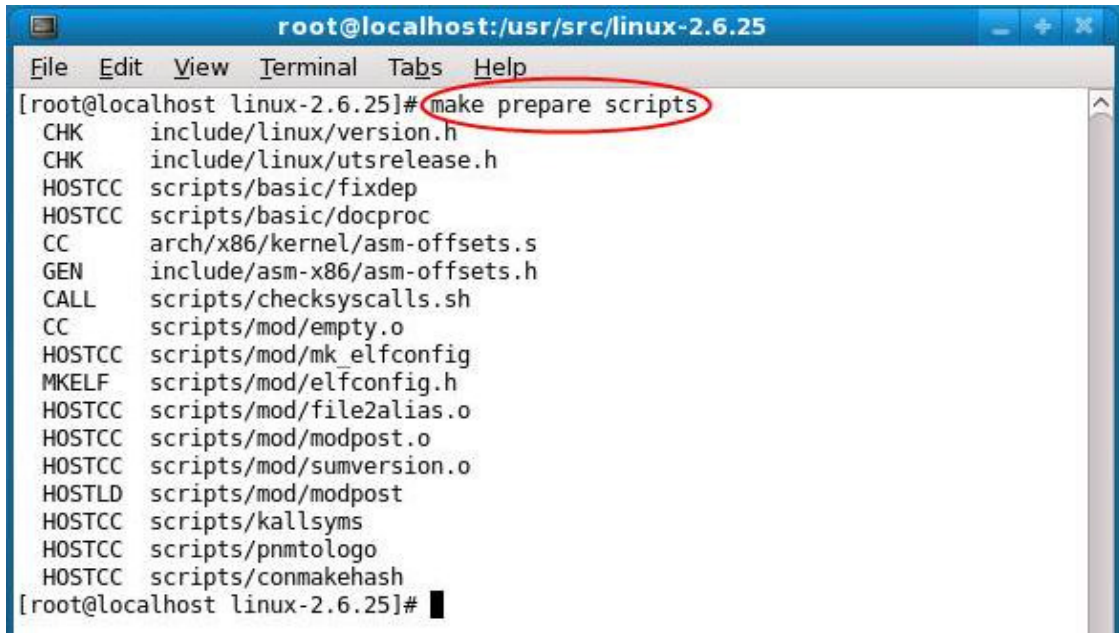
From built-in modules (\*) -> loadable modules (M):

- 1) 8250/16550 and compatible serial support
- 2) Console on 8250/16550 and compatible serial port.
- 3) If you would like to use more than 2 serial ports, please modify "Number of 8250/16550 serial ports to register at runtime" from the default '4' to the number of ports you like. For example, you can see '20' as shown below.



- 4) Use "Exit" back and Choose "Yes" to save the above configurations to .config

- Type "make prepare scripts" as shown below.



```
root@localhost:/usr/src/linux-2.6.25
File Edit View Terminal Tabs Help
[root@localhost linux-2.6.25]# make prepare scripts
CHK    include/linux/version.h
CHK    include/linux/utsrelease.h
HOSTCC scripts/basic/fixdep
HOSTCC scripts/basic/docproc
CC      arch/x86/kernel/asm-offsets.s
GEN     include/asm-x86/asm-offsets.h
CALL    scripts/checksyscalls.sh
CC      scripts/mod/empty.o
HOSTCC  scripts/mod/mk_elfconfig
MKELF   scripts/mod/elfconfig.h
HOSTCC  scripts/mod/file2alias.o
HOSTCC  scripts/mod/modpost.o
HOSTCC  scripts/mod/sunversion.o
HOSTLD  scripts/mod/modpost
HOSTCC  scripts/kallsyms
HOSTCC  scripts/pnmtologo
HOSTCC  scripts/conmakehash
[root@localhost linux-2.6.25]#
```

Now you have finished all the kernel preparations.

Because you have changed some kernel configurations as shown above, you have to finish all the kernel and modules re-compilation processes by typing the following commands:

```
# make bzImage
# make modules
```

Note that if you have old installed modules in `/lib/modules/2.6.25`(your kernel version, in my case now it is 2.6.25), you have to move the old modules to a new directory to prevent future conflicts by typing the following command:

```
# cd /lib/modules
# mv 2.6.25 2.6.25.old
```

Then, you may change your working directory back to `/usr/src/linux-2.6.25` and install the freshly-compiled modules:

```
# make modules_install
```

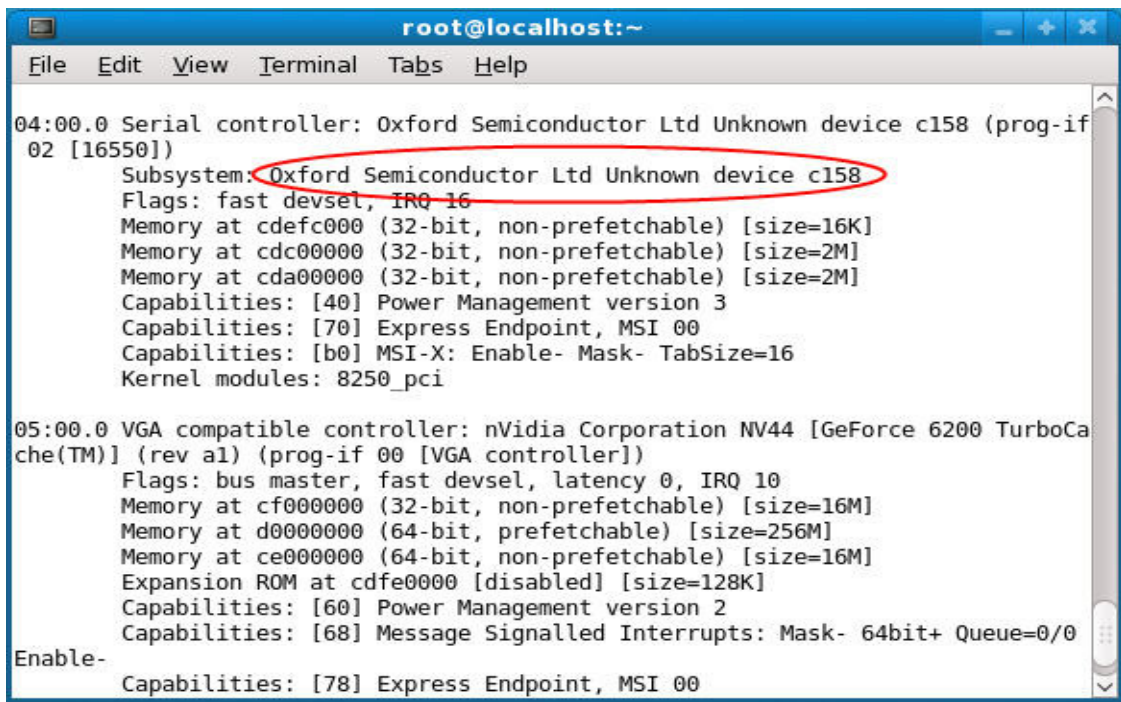
Do not forget `initrd` & copy the new kernel image and new system map to `/boot` directory by typing the following commands:

```
# mkinitrd /boot/initrd-2.6.25.img 2.6.25
# cp /usr/src/linux-2.6.25/arch/i386/boot/bzImage /boot/vmlinuz-2.6.25
# cp /usr/src/linux-2.6.25/System.map /boot/System.map-2.6.25
```

Then reboot your system to continue the following "Serial Port Installation".

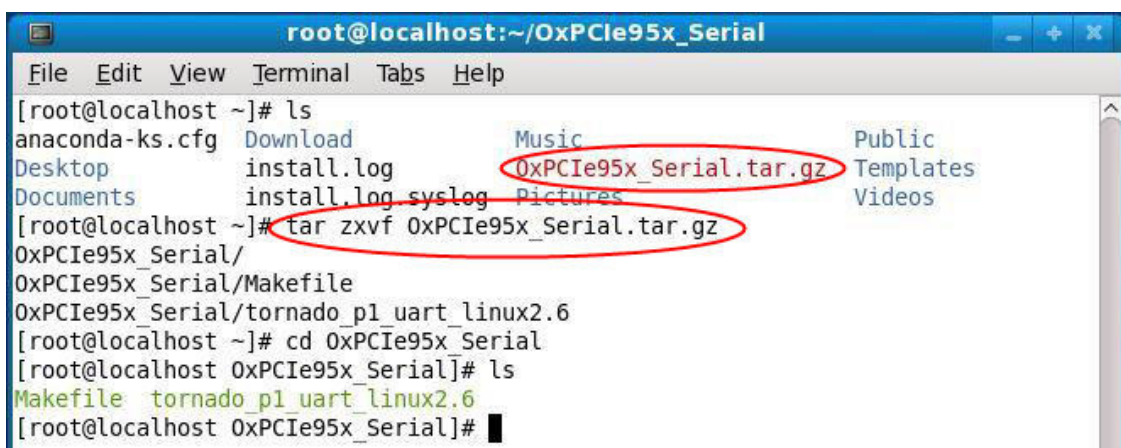
## B) Serial Port Installation

- Copy the downloaded driver disk to the desktop.
- Shutdown the PC, insert the Oxford Semiconductor Ltd PCIe95x based PCI express card into PCIe Slot and then Switch ON the PC.
- Check for the Oxford PCIe Card detection by typing the following command in terminal window. **lspci -v**. This will show the list of all PCIe ports. Check for the Oxford Semiconductor Ltd serial device as shown below.



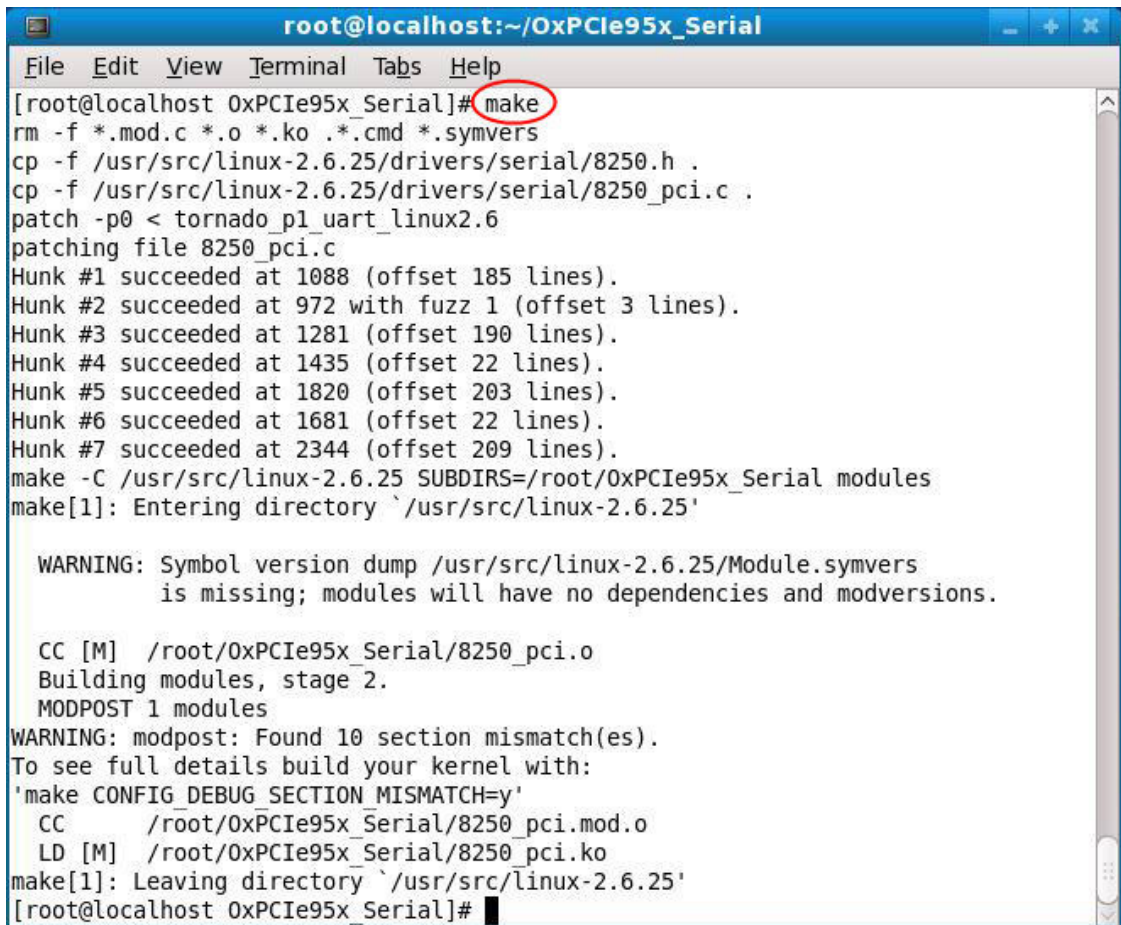
```
root@localhost:~  
File Edit View Terminal Tabs Help  
04:00.0 Serial controller: Oxford Semiconductor Ltd Unknown device c158 (prog-if 02 [16550])  
    Subsystem: Oxford Semiconductor Ltd Unknown device c158  
    Flags: fast devsel, IRQ 16  
    Memory at cdefc000 (32-bit, non-prefetchable) [size=16K]  
    Memory at cdc00000 (32-bit, non-prefetchable) [size=2M]  
    Memory at cda00000 (32-bit, non-prefetchable) [size=2M]  
    Capabilities: [40] Power Management version 3  
    Capabilities: [70] Express Endpoint, MSI 00  
    Capabilities: [b0] MSI-X: Enable- Mask- TabSize=16  
    Kernel modules: 8250_pci  
05:00.0 VGA compatible controller: nVidia Corporation NV44 [GeForce 6200 TurboCache(TM)] (rev a1) (prog-if 00 [VGA controller])  
    Flags: bus master, fast devsel, latency 0, IRQ 10  
    Memory at cf000000 (32-bit, non-prefetchable) [size=16M]  
    Memory at d0000000 (64-bit, prefetchable) [size=256M]  
    Memory at ce000000 (64-bit, non-prefetchable) [size=16M]  
    Expansion ROM at cdfc0000 [disabled] [size=128K]  
    Capabilities: [60] Power Management version 2  
    Capabilities: [68] Message Signalled Interrupts: Mask- 64bit+ Queue=0/0 Enable-  
    Capabilities: [78] Express Endpoint, MSI 00
```

- Uncompress the driver disk copied to the root directory by using following command. Make sure that you change the path of terminal on to the root directory.
- Change the path of the terminal to the path of extracted files. **# cd OxPCIe95x\_Serial**



```
root@localhost:~/OxPCIe95x_Serial  
File Edit View Terminal Tabs Help  
[root@localhost ~]# ls  
anaconda-ks.cfg  Download  Music  Public  
Desktop          install.log  OxPCIe95x_Serial.tar.gz  Templates  
Documents        install.log syslog Pictures  Videos  
[root@localhost ~]# tar zxvf OxPCIe95x_Serial.tar.gz  
OxPCIe95x_Serial/  
OxPCIe95x_Serial/Makefile  
OxPCIe95x_Serial/tornado_p1 uart_linux2.6  
[root@localhost ~]# cd OxPCIe95x_Serial  
[root@localhost OxPCIe95x_Serial]# ls  
Makefile tornado_p1 uart_linux2.6  
[root@localhost OxPCIe95x_Serial]#
```

- Compile the driver using the command “**make**”.

A terminal window titled 'root@localhost:~/OxPCIe95x\_Serial' with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal shows the execution of the 'make' command. It starts with cleaning old files, copying source files from the Linux 2.6.25 drivers directory, and applying a patch. The patching process shows seven hunks succeeding. Then, 'make' is run with the SUBDIRS parameter. The output shows a warning about a missing symbol version dump, followed by the compilation of 8250\_pci.o and 8250\_pci.ko. Another warning about section mismatches is shown, along with instructions on how to build with debug information. The process ends with the terminal returning to the shell prompt.

```
root@localhost:~/OxPCIe95x_Serial
File Edit View Terminal Tabs Help
[root@localhost OxPCIe95x_Serial]# make
rm -f *.mod.c *.o *.ko *.cmd *.symvers
cp -f /usr/src/linux-2.6.25/drivers/serial/8250.h .
cp -f /usr/src/linux-2.6.25/drivers/serial/8250_pci.c .
patch -p0 < tornado_pl_uart_linux2.6
patching file 8250_pci.c
Hunk #1 succeeded at 1088 (offset 185 lines).
Hunk #2 succeeded at 972 with fuzz 1 (offset 3 lines).
Hunk #3 succeeded at 1281 (offset 190 lines).
Hunk #4 succeeded at 1435 (offset 22 lines).
Hunk #5 succeeded at 1820 (offset 203 lines).
Hunk #6 succeeded at 1681 (offset 22 lines).
Hunk #7 succeeded at 2344 (offset 209 lines).
make -C /usr/src/linux-2.6.25 SUBDIRS=/root/OxPCIe95x_Serial modules
make[1]: Entering directory `/usr/src/linux-2.6.25'

WARNING: Symbol version dump /usr/src/linux-2.6.25/Module.symvers
        is missing; modules will have no dependencies and modversions.

CC [M] /root/OxPCIe95x_Serial/8250_pci.o
Building modules, stage 2.
MODPOST 1 modules
WARNING: modpost: Found 10 section mismatch(es).
To see full details build your kernel with:
'make CONFIG_DEBUG_SECTION_MISMATCH=y'
CC      /root/OxPCIe95x_Serial/8250_pci.mod.o
LD [M] /root/OxPCIe95x_Serial/8250_pci.ko
make[1]: Leaving directory `/usr/src/linux-2.6.25'
[root@localhost OxPCIe95x_Serial]#
```

- Install the driver using the following commands:  
# **make install**
- Check if the driver properly installed using the following commands:  
# **dmesg | grep “ttyS”**

Now you can see the dual UART ports are mounted on **ttyS4** and **ttyS5** as shown below.



```
root@localhost:~/OxPCIe95x_Serial
File Edit View Terminal Tabs Help
[root@localhost OxPCIe95x_Serial]# make install
rmmod 8250_pci.ko
insmod 8250_pci.ko
[root@localhost OxPCIe95x_Serial]# dmesg | grep "ttyS"
serial8250: ttyS1 at I/O 0x2f8 (irq = 3) is a 16550A
ttyS4: detected caps 00000700 should be 00000100
0000:02:00.0: ttyS4 at MMIO 0x8c401000 (irq = 16) is a 16C950/954
ttyS5: detected caps 00000700 should be 00000100
0000:02:00.0: ttyS5 at MMIO 0x8c401200 (irq = 16) is a 16C950/954
[root@localhost OxPCIe95x_Serial]# lsmod | grep "8250"
8250_pci                29184  0
8250                    30616  1 8250_pci
serial_core             19840  1 8250
[root@localhost OxPCIe95x_Serial]#
```

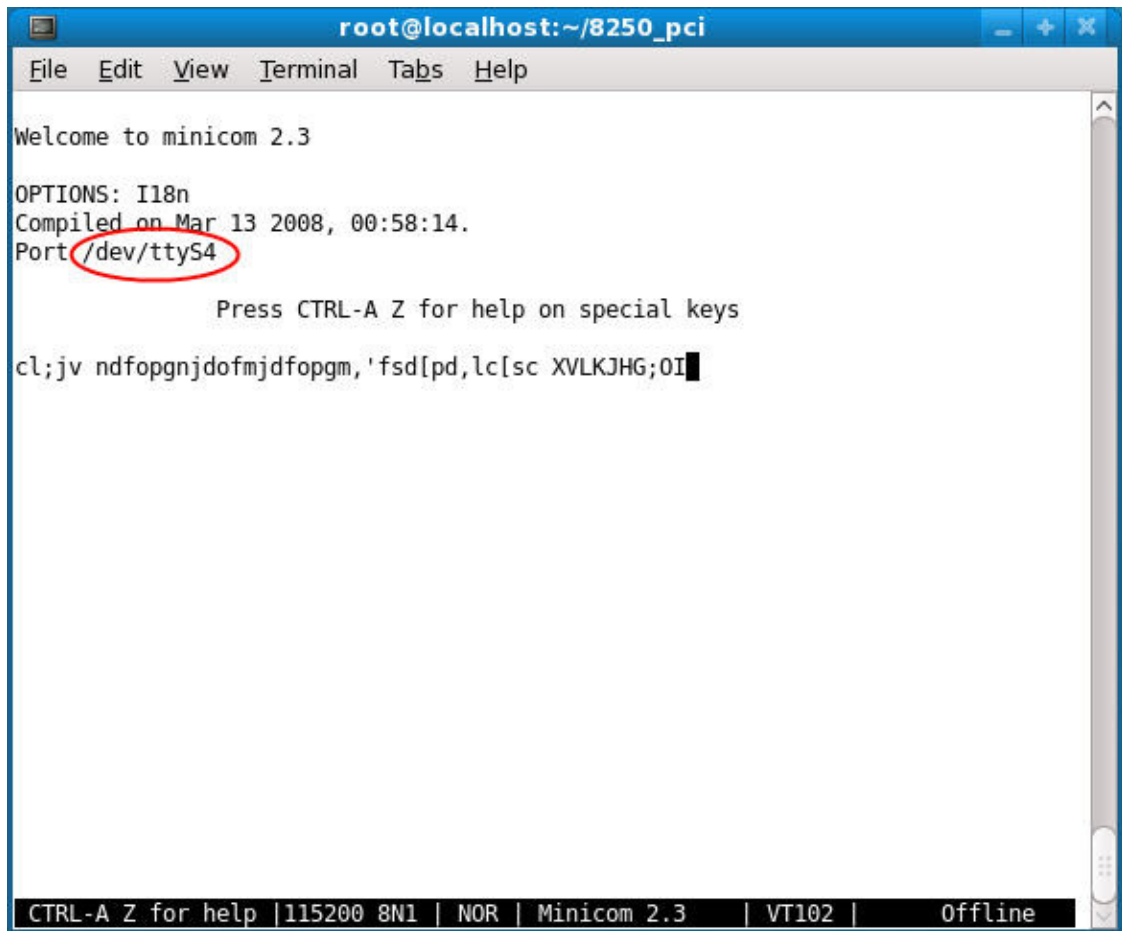
### C) Loopback Test using Minicom

- First, set the serial port you would like to test with minicom using “**minicom -s**” as shown below.

```
root@localhost:~/8250_pci
File Edit View Terminal Tabs Help

+-----+
| A -   Serial Device       : /dev/ttyS4 |
| B -   Lockfile Location   : /var/lock  |
| C -   Callin Program      :            |
| D -   Callout Program     :            |
| E -   Bps/Par/Bits        : 115200 8N1 |
| F -   Hardware Flow Control : No       |
| G -   Software Flow Control: No       |
+-----+
| Change which setting?    |
+-----+
| Screen and keyboard     |
| Save setup as dfl       |
| Save setup as..        |
| Exit                    |
| Exit from Minicom       |
+-----+
```

- Save the above setting using “Save setup as dfl”.
- For example, ttyS4 working properly with loopback test as shown below.



```
root@localhost:~/8250_pci
File Edit View Terminal Tabs Help

Welcome to minicom 2.3

OPTIONS: I18n
Compiled on Mar 13 2008, 00:58:14.
Port /dev/ttyS4

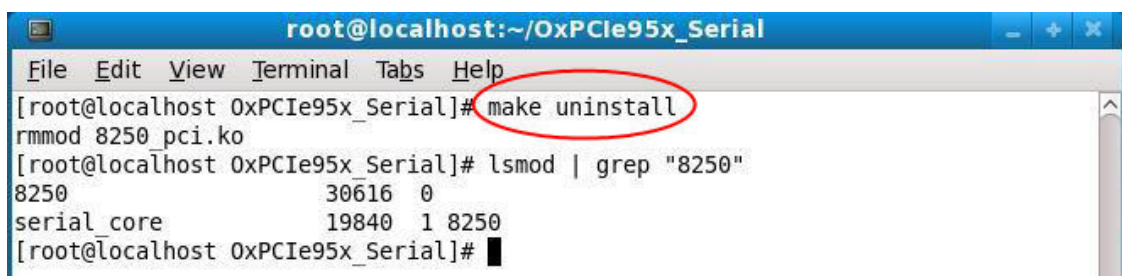
Press CTRL-A Z for help on special keys

cl;jv ndfopgnjdofmjdfopgm,'fsd[pd,lc[sc XVLKJHG;OI
CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.3 | VT102 | Offline
```

#### D) Un-installation of the Drivers

To un-install the driver, use the following command:

**# make uninstall**



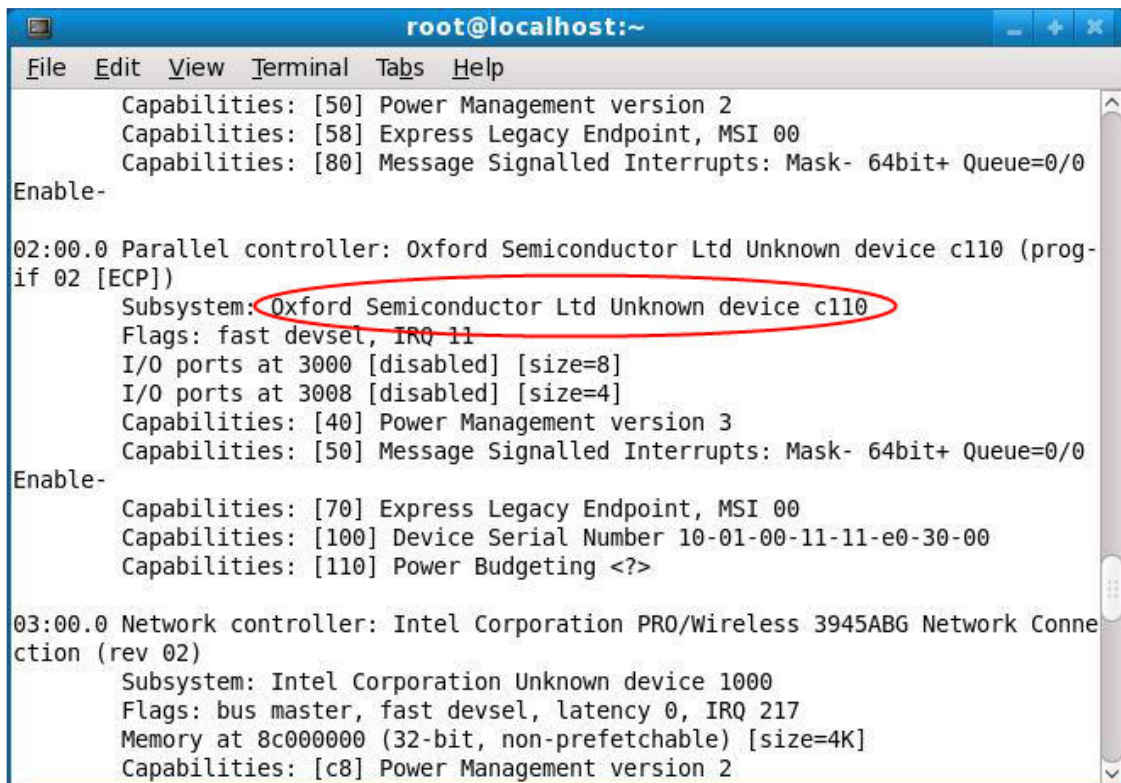
```
root@localhost:~/OxPCIe95x_Serial
File Edit View Terminal Tabs Help

[root@localhost OxPCIe95x_Serial]# make uninstall
rmmod 8250_pci.ko
[root@localhost OxPCIe95x_Serial]# lsmod | grep "8250"
8250                30616  0
serial_core         19840  1 8250
[root@localhost OxPCIe95x_Serial]#
```

### 3. Parallel Port

#### A) Parallel Port Installation

- No need for doing any kernel preparations for OxPCle95x parallel products.
- Copy the downloaded driver disk to the desktop.
- Shutdown the PC, insert the Oxford Semiconductor Ltd PCle95x based PCI express card into PCIe Slot and then Switch ON the PC.
- Check for the Oxford PCIe Card detection by typing the following command in terminal window. "**lspci -v**". This will show the list of all PCIe ports. Check for the Oxford Semiconductor Ltd parallel device as shown below.



```
root@localhost:~  
File Edit View Terminal Tabs Help  
Capabilities: [50] Power Management version 2  
Capabilities: [58] Express Legacy Endpoint, MSI 00  
Capabilities: [80] Message Signalled Interrupts: Mask- 64bit+ Queue=0/0  
Enable-  
02:00.0 Parallel controller: Oxford Semiconductor Ltd Unknown device c110 (prog-  
if 02 [ECP])  
Subsystem: Oxford Semiconductor Ltd Unknown device c110  
Flags: fast devsel, IRQ 11  
I/O ports at 3000 [disabled] [size=8]  
I/O ports at 3008 [disabled] [size=4]  
Capabilities: [40] Power Management version 3  
Capabilities: [50] Message Signalled Interrupts: Mask- 64bit+ Queue=0/0  
Enable-  
Capabilities: [70] Express Legacy Endpoint, MSI 00  
Capabilities: [100] Device Serial Number 10-01-00-11-11-e0-30-00  
Capabilities: [110] Power Budgeting <?>  
03:00.0 Network controller: Intel Corporation PRO/Wireless 3945ABG Network Conne-  
ction (rev 02)  
Subsystem: Intel Corporation Unknown device 1000  
Flags: bus master, fast devsel, latency 0, IRQ 217  
Memory at 8c000000 (32-bit, non-prefetchable) [size=4K]  
Capabilities: [c8] Power Management version 2
```

- Uncompress the driver disk copied to the root directory by using following command. Make sure that you change the path of terminal on to the root directory.
- Change the path of the terminal to the path of extracted files. # **cd OxPCle95x\_Parallel**



```
root@localhost:~/OxPCIe95x_Parallel
File Edit View Terminal Tabs Help
[root@localhost ~]# ls
anaconda-ks.cfg  Download  Music  Public
Desktop          install.log  OxPCIe95x_Parallel.tar.gz  Templates
Documents        install.log.syslog  Pictures  Videos
[root@localhost ~]# tar zxvf OxPCIe95x_Parallel.tar.gz
OxPCIe95x_Parallel/
OxPCIe95x_Parallel/tornado_pport_linux2.6.patch
OxPCIe95x_Parallel/Makefile
OxPCIe95x_Parallel/.tmp_versions/
OxPCIe95x_Parallel/.tmp_versions/parport_pc.mod
[root@localhost ~]# ls
anaconda-ks.cfg  install.log  OxPCIe95x_Parallel.tar.gz  Videos
Desktop          install.log.syslog  Pictures
Documents        Music  Public
Download         OxPCIe95x_Parallel  Templates
[root@localhost ~]# cd OxPCIe95x_Parallel
[root@localhost OxPCIe95x_Parallel]# ls
Makefile  tornado_pport  linux2.6.patch
[root@localhost OxPCIe95x_Parallel]#
```

- Compile the driver using the command “make”.

```
root@localhost:~/OxPCIe95x_Parallel
File Edit View Terminal Tabs Help
[root@localhost OxPCIe95x_Parallel]# make
rm -f *.mod.c *.o *.ko *.cmd *.symvers
cp -f /usr/src/linux-2.6.25/include/linux/pci_ids.h .
cp -f /usr/src/linux-2.6.25/drivers/parport/parport_pc.c .
patch -p3 < tornado_pport_linux2.6.patch
patching file pci_ids.h
Hunk #1 succeeded at 1894 (offset 87 lines).
patching file parport_pc.c
make -C /usr/src/linux-2.6.25 SUBDIRS=/root/OxPCIe95x_Parallel modules
make[1]: Entering directory `/usr/src/linux-2.6.25'

WARNING: Symbol version dump /usr/src/linux-2.6.25/Module.symvers
         is missing; modules will have no dependencies and modversions.

CC [M] /root/OxPCIe95x_Parallel/parport_pc.o
Building modules, stage 2.
MODPOST 1 modules
CC      /root/OxPCIe95x_Parallel/parport_pc.mod.o
LD [M]  /root/OxPCIe95x_Parallel/parport_pc.ko
make[1]: Leaving directory `/usr/src/linux-2.6.25'
[root@localhost OxPCIe95x_Parallel]#
```

- Install the driver using the following commands:  
**# make install**
- Check if the driver properly installed using the following commands:  
**# dmesg | grep “parport”**

Now you can see the parallel port is mounted on **parport0** as shown below.

```
root@localhost:~/OxPCIe95x_Parallel
File Edit View Terminal Tabs Help
[root@localhost OxPCIe95x_Parallel]# make install
modprobe parport
insmod parport_pc.ko
[root@localhost OxPCIe95x_Parallel]# dmesg | grep "parport"
parport0: PC-style at 0x3000 (0x3008) [PCSP,TRISTATE,EPP]
[root@localhost OxPCIe95x_Parallel]# lsmod | grep "parport"
parport_pc          27044  0
parport             32212  2 ppdev,parport_pc
[root@localhost OxPCIe95x_Parallel]#
```

## B) Un-installation of the Drivers

To un-install the driver, use the following command:

**# make uninstall**

```
root@localhost:~/OxPCIe95x_Parallel
File Edit View Terminal Tabs Help
[root@localhost OxPCIe95x_Parallel]# make uninstall
rmmod parport_pc.ko
[root@localhost OxPCIe95x_Parallel]#
```