



## Installing and Testing a PCI / PCIe UART Serial Port Using a Custom MaxLinear Driver in Linux

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### Introduction

This Application Note covers how to load custom PCI/PCIe UART drivers, and install and run the Minicom test utility to test the UART ports using an Ubuntu Linux distribution. Custom drivers can be downloaded from [www.exar.com/design-tools/software-drivers](http://www.exar.com/design-tools/software-drivers).

The following steps are required for the setting up and using Minicom:

1. Unbind the native serial driver.
2. Make and install the custom (MaxLinear) Linux driver.
3. Install Minicom.
4. Configure Minicom.
5. Using Minicom / test the serial port.

### Step 1: Unbind the native serial driver

#### Step 1.1: Enable Root Mode

Enable the root mode by typing in the following command and the root password:

```
exar@exar-desktop:~$ sudo -i
```

#### Step 1.2: Native Serial Driver

In recent Linux kernels, there is a native "serial" driver built in. This driver is loaded by default. It can be determined if it is loaded by using `lspci`:

```
lspci -vd 13a8:*
```

Upon running the above command, something like this will be displayed if an XR17xxx device is present:

```
03:00.0 Serial controller: Exar Corp. Device 0358 (rev 03) (prog-if 02 [16550])
```

```
Flags: fast devsel, IRQ 30
```

```
Memory at f3ffc000 (32-bit, non-prefetchable) [size=16K]
```

```
Capabilities: [50] MSI: Enable- Count=1/1 Maskable- 64bit+
```

```
Capabilities: [78] Power Management version 3
```

```
Capabilities: [80] Express Endpoint, MSI 01
```

```
Capabilities: [100] Virtual Channel
```

```
Kernel driver in use: serial (See Note 1)
```

#### NOTE:

1. In newer kernels, "exar\_serial" may be seen and need to be used instead of "serial".

The native serial driver should be sufficient for basic operation (transmitting and receiving data). When the serial driver is loaded, the ports in the XR17V35x device will be listed in `/dev` as `tySn`.

### Step 1.3: Unbind Native Serial Driver

To use the custom driver, the easiest mechanism is to unbind the serial driver by entering:

```
ls /sys/bus/pci/drivers/serial/(1)
```

This command returns something like:

```
0000:03:00.0 bind new_id remove_id uevent unbind
```

Use:

```
echo -n "0000:03:00.0" > /sys/bus/pci/drivers/serial/unbind(1)
```

(replacing value in quotes with value from `ls /sys/bus/pci/drivers/serial/`)<sup>(1)</sup>

NOTE:

1. In newer kernels, "exar\_serial" may be seen and need to be used instead of "serial".

## Step 2: Make and install the custom (MaxLinear) Linux driver

### Step 2.1: Make and Install Driver

Make and install the driver per the readme file included with the driver.

With the custom driver, the ports in the XR17V35x device will be listed in /dev as ttyXRn.

### Step 2.2: List TTY Devices

List all of the tty devices by typing in the following command. See Figure 1 as an example:

```
root@exar-desktop:~# ls /dev/tty*
```

```
root@exar-desktop:~# ls /dev/tty*
/dev/tty      /dev/tty23  /dev/tty39  /dev/tty54  /dev/ttyS10 /dev/ttyS26
/dev/tty0     /dev/tty24  /dev/tty4   /dev/tty55  /dev/ttyS11 /dev/ttyS27
/dev/tty1     /dev/tty25  /dev/tty40  /dev/tty56  /dev/ttyS12 /dev/ttyS28
/dev/tty10    /dev/tty26  /dev/tty41  /dev/tty57  /dev/ttyS13 /dev/ttyS29
/dev/tty11    /dev/tty27  /dev/tty42  /dev/tty58  /dev/ttyS14 /dev/ttyS3
/dev/tty12    /dev/tty28  /dev/tty43  /dev/tty59  /dev/ttyS15 /dev/ttyS30
/dev/tty13    /dev/tty29  /dev/tty44  /dev/tty6   /dev/ttyS16 /dev/ttyS31
/dev/tty14    /dev/tty3   /dev/tty45  /dev/tty60  /dev/ttyS17 /dev/ttyS4
/dev/tty15    /dev/tty30  /dev/tty46  /dev/tty61  /dev/ttyS18 /dev/ttyS5
/dev/tty16    /dev/tty31  /dev/tty47  /dev/tty62  /dev/ttyS19 /dev/ttyS6
/dev/tty17    /dev/tty32  /dev/tty48  /dev/tty63  /dev/ttyS2  /dev/ttyS7
/dev/tty18    /dev/tty33  /dev/tty49  /dev/tty7   /dev/ttyS20 /dev/ttyS8
/dev/tty19    /dev/tty34  /dev/tty5   /dev/tty8   /dev/ttyS21 /dev/ttyS9
/dev/tty2     /dev/tty35  /dev/tty50  /dev/tty9   /dev/ttyS22
/dev/tty20    /dev/tty36  /dev/tty51  /dev/ttyprintk /dev/ttyS23
/dev/tty21    /dev/tty37  /dev/tty52  /dev/ttyS0  /dev/ttyS24
/dev/tty22    /dev/tty38  /dev/tty53  /dev/ttyS1  /dev/ttyS25
root@exar-desktop:~#
```

Figure 1: Example List of TTY Devices

### Step 2.3: Compiling and Installing Drivers

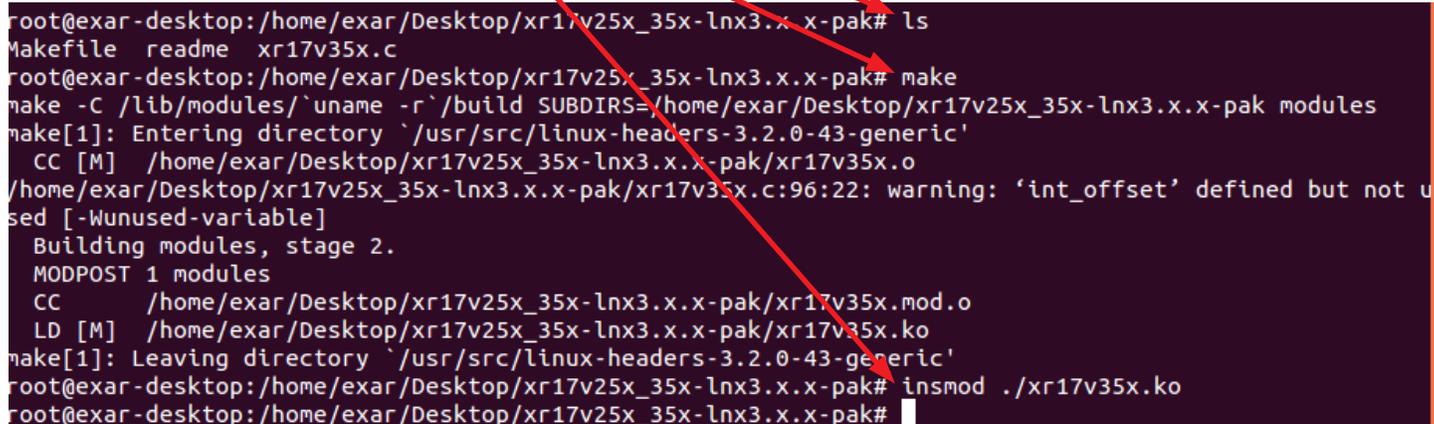
Compile the XR17V35x drivers from the directory containing the driver files and install them using the insmod command:

In Figure 2 below:

'ls' lists the driver folder contents

'make' makes the driver

'insmod ./xr17v35x.ko' installs the driver



```

root@exar-desktop:/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak# ls
Makefile  readme  xr17v35x.c
root@exar-desktop:/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak# make
make -C /lib/modules/`uname -r`/build SUBDIRS=/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak modules
make[1]: Entering directory `/usr/src/linux-headers-3.2.0-43-generic'
  CC [M]  /home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak/xr17v35x.o
/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak/xr17v35x.c:96:22: warning: 'int_offset' defined but not used [-Wunused-variable]
  Building modules, stage 2.
  MODPOST 1 modules
  CC      /home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak/xr17v35x.mod.o
  LD [M]  /home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak/xr17v35x.ko
make[1]: Leaving directory `/usr/src/linux-headers-3.2.0-43-generic'
root@exar-desktop:/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak# insmod ./xr17v35x.ko
root@exar-desktop:/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak#

```

Figure 2: Driver Installation

### Step 2.4: XR17v35x devices in /dev/tty\*

Confirm that the driver is loaded for the XR17V35x by running ls /dev/ttyX\* as shown in Figure 3:



```

root@exar-desktop:/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak# ls /dev/ttyX*
/dev/ttyXR0  /dev/ttyXR11  /dev/ttyXR14  /dev/ttyXR3  /dev/ttyXR6  /dev/ttyXR9
/dev/ttyXR1  /dev/ttyXR12  /dev/ttyXR15  /dev/ttyXR4  /dev/ttyXR7
/dev/ttyXR10 /dev/ttyXR13  /dev/ttyXR2   /dev/ttyXR5  /dev/ttyXR8
root@exar-desktop:/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak#

```

Figure 3: Searching for XR Devices

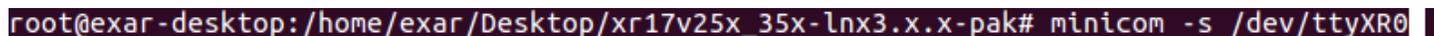
## Step 3: Install and Run Minicom

### Step 3.1: Install Minicom

```
sudo apt-get install minicom
```

### Step 3.2: Run Minicom Utility

To test the first PCIe UART port, type in the Minicom command per Figure 4.



```

root@exar-desktop:/home/exar/Desktop/xr17v25x_35x-lnx3.x.x-pak# minicom -s /dev/ttyXR0

```

Figure 4: Running the Minicom Utility

## Step 4: Configure Minicom

### Step 4.1: Serial Port Set Up

In the Minicom configuration menu shown in Figure 5, scroll to “Serial port setup” using the ↓ or ↑ keys and then press enter.

```

-----[configuration]-----
Filenames and paths
File transfer protocols
Serial port setup
Modem and dialing
Screen and keyboard
Save setup as _dev_ttyXR0
Save setup as..
Exit
Exit from Minicom

```

Figure 5: Configuration Menu

### Step 4.2: Settings

The settings can be changed as desired by typing the corresponding letter on the left as shown in Figure 6. For example, to select the desired serial port, select ‘a’ or ‘A’ (not case-sensitive) or to change the baud rate, select ‘e’ or ‘E’. After the selection, ‘Enter’ must be pressed.

```

A - Serial Device      : /dev/ttyXR0
B - Lockfile Location  : /var/lock
C - Callin Program    :
D - Callout Program   :
E - Bps/Par/Bits      : 115200 8N1
F - Hardware Flow Control : Yes
G - Software Flow Control : No

Change which setting?

```

Figure 6: Settings Menu

Note in Figure 6 that port 0, 115200 bps, 8-bit character, no parity, 1 stop bit, hardware flow and no software flow control are selected. For an example of changing these settings, press F to disable Hardware Flow Control. Then see that the Hardware Flow Control is automatically disabled as shown in Figure 7. Press ‘Enter’ to exit this menu and return to the configuration menu.

```

A - Serial Device      : /dev/ttyXR0
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?

```

Figure 7: Hardware Flow Control (F) Disabled

**Step 4.3: Saving the Settings (optional)**

To save the settings, now scroll to Save setup as shown in Figure 8.

```

+-----[configuration]-----
| Filenames and paths
| File transfer protocols
| Serial port setup
| Modem and dialing
| Screen and keyboard
| Save setup as dev ttyXR0
| Save setup as..
| Exit
| Exit from Minicom

```

Figure 8: Saving the Settings

**Step 4.4: Opening the Port**

Once the settings are saved, select 'Exit' from the menu. The port has been successfully configured and opened, and is ready to send and receive data.

```

Welcome to minicom 2.5

OPTIONS: I18n
Compiled on May  2 2011, 10:05:24.
Port /dev/ttyXR0

Press CTRL-A Z for help on special keys

AT S7=45 S0=0 L1 V1 X4 &c1 E1 Q0

```

Figure 9: Welcome to Minicom

Note that CTRL A Z for the help menu can be used. For example:

- A sets the line wrap
- X exits from Minicom

**Step 5: Using Minicom / Test Serial Port****Serial Port Testing Examples:**

Example 1: Loopback testing on a single port

With a loopback connector on a serial port, typed / transmitted data is echoed back in the same Minicom window.

Example 2: Testing between different ports

With a null modem connection between two serial ports, typed / transmitted data in one Minicom window is received in a second Minicom window and vice versa.

Example 3: Testing with a remote UART

With a null modem connection between one of the local serial ports and a remote serial port, typed / transmitted data in the Minicom window will be transmitted to the remote UART. Data received from the remote UART will be displayed in the Minicom window.

## Revision History

Revision	Date	Description
1A	5/1/18	Initial release
1B	7/31/18	Updated title to include PCI.


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