



OX16C95x

OX16PCI954

HIGH-PERFORMANCE UART FAMILY

ADVANCED TOPICS

This document describes the use of advanced features of the Oxford Semiconductor reference drivers for the OX16C95x high performance UART family, including the OX16PCI954 Quad UART with PCI interface.

Version 1.0 (08 February 2001)

1 OVERVIEW

Reference drivers and utilities for the Oxford Semiconductor UART products are supplied to demonstrate functionality under Windows 95/98, Windows NT4 and Windows 2000. These drivers have been tested using Oxford Semiconductor development boards in a range of PC systems.

This document describes the use of certain advanced features provided by the UART driver set.

2 LICENCE AGREEMENT

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4 DATA RATE CONFIGURATION

4.1 Windows 2000 drivers

Baud Rates

Baud rates generated by the UART hardware are derived with the use the following formula (see also the Data Sheet for the UART being used):

$$\text{BaudRate} = \frac{\text{InputClock}}{\text{SC} * \text{Divisor} * \text{prescaler}}$$

Equation 4-1

The default InputClock is a crystal of 1.8432MHz, the default prescaler is 1, and the default SC (Sampling Clock) is 16.

Ports speeds are usually requested by an application with a desired BaudRate (as opposed to a desired Divisor). The formula for calculating the Divisor is shown below:

$$\text{Divisor} = \frac{\text{InputClock}}{\text{SC} * \text{BaudRate} * \text{prescaler}}$$

Equation 4-2

For example, to obtain a baud rate of 57.6Kbps, with default clock and prescaler, a Divisor of 2 is required ($2 = 1.8432\text{MHz} / 16 * 57600 * 1$).

The following sections explain in detail the use and adjustment of these parameters in order to obtain a variety of baud rates with the use of various crystals.

Data Rate Overview

To perform advanced baud rate adjustments select the **Properties** for a port from the Device Manager. Selecting the Data rate tab should result in a dialog box similar to that shown in Figure 4-1.

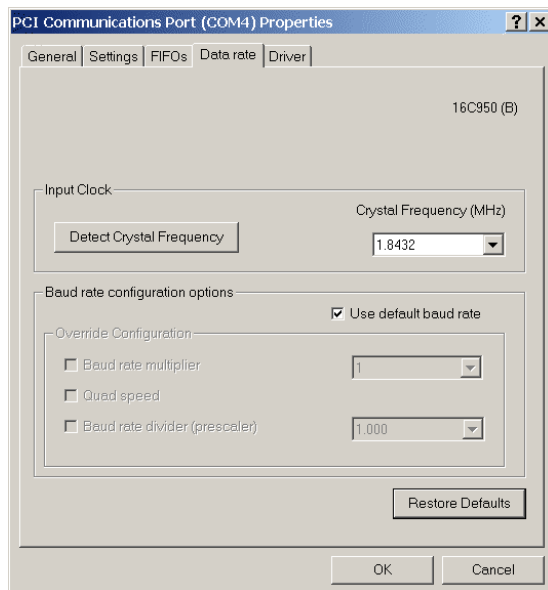


Figure 4-1

Crystal frequencies from 1.8432MHz-60MHz may be used with the OX16C95x UART family, and if not known, the crystal speed can be detected using the 'Detect Crystal Frequency' button.

Regardless of the crystal frequency the UART software driver will always attempt to provide the baud rate requested by an application. Thus a request for a baud rate of 115.2Kbps with a crystal frequency of 14.7456MHz would result in a Divisor of 8 being used. With a crystal frequency of 1.8432MHz the Divisor generated would be 1. This is transparent to the application level, and as long as the 'Use default baud rate' box is ticked, the driver will behave in this manner (i.e. baud rates will be as requested).

A disadvantage of this is that baud rates are limited by what the application can request – typically a maximum of 115.2Kbps.

Advanced Baud Rate Selection

Generating non-standard baud rates can be achieved by clearing the 'Use default baud rate' box, which allows the Override Configuration controls to be modified.

The Override Configuration controls are as follows (Figure 4-2 shows the controls in use):

- Baud rate multiplier – when selected, a multiplication factor can be applied to baud rates (1, 2, 4, 8, 10 and 16x are available). This option has the effect of asking the driver to provide a baud rate n times that of the rate requested by the application. Custom applications can request the driver to provide high baud rates; this option merely allows an application with no concept of the baud rate capability of the OX19PCI954 to be used to open a port with a high baud rate.

For example, setting 115.2Kbps in the application with a multiplier of 8 will result in a true baud rate of 921.6Kbps.

- Quad speed – when ticked, the true baud rate will be 4x that of the rate requested by the application. Quad speed uses a different method than the Baud rate multiplier. The **Caveats** section explains this difference and why this setting may be required.
- Baud rate divider (prescaler) – when selected, a new prescaler can be set (1 to 31.875 in steps of 0.125 are available). As can be seen from Equation 4-2, higher prescalers will cause the baud rate to drop accordingly. For instance, an application requested baud rate of 38.4Kbps with a prescaler of 2 would result in a true baud rate of 19.2Kbps. Because it can be set in steps of 0.125 the prescaler can be used to make minor adjustments to baud rates in order to achieve non-standard rates. This is useful because Divisor values must always be integers and thus are limited in effecting minor baud rate steps – especially when a high frequency crystal is in use.

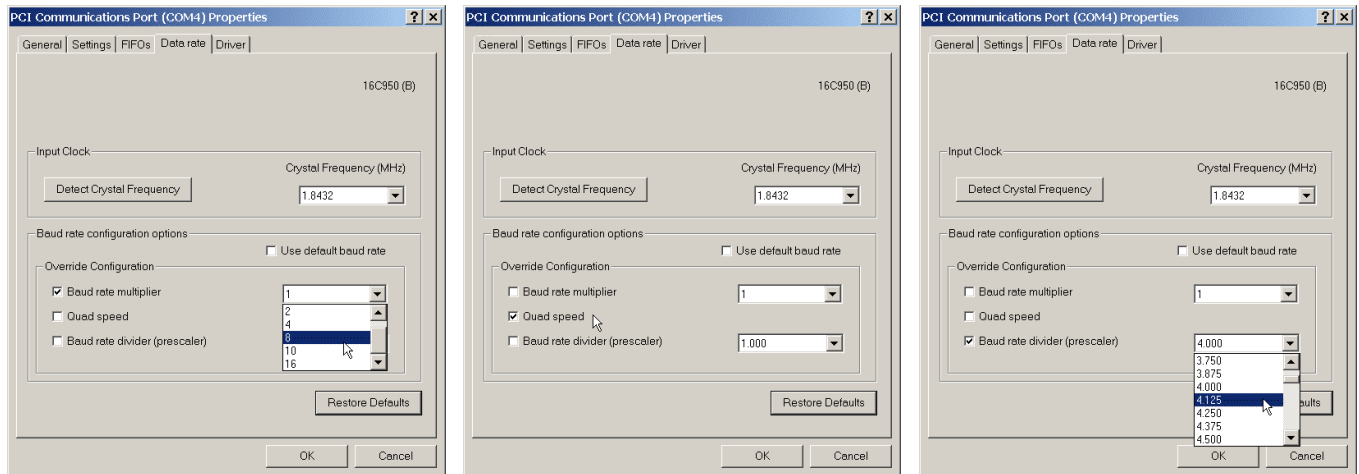


Figure 4-2

The second method for adjusting baud rates is to modify the reported speed of the crystal. The value in the Crystal Frequency (MHz) list box can be modified – even though the true crystal speed remains unchanged. This has the effect of changing the InputClock value used in Equation 4-2.

Setting the crystal frequency to half that of the true speed will result in a Divisor that is half of the 'correct' value. This will result in a true baud rate twice that requested by the application. For instance, reporting a 60MHz crystal as 30MHz will modify a selected baud rate of 57.6Kbps into a true rate of 115.2Kbps. Reporting the same crystal at 20MHz will cause a 2.4Kbps baud rate to become 7.2Kbps.

Reporting a fast crystal as a low speed unit can be used to significantly increase the application requested baud rate and result in very high true baud rates.

Caveats

It can be seen from Equation 4-2 that if a high baud rate is required with the use of a slow crystal the resulting Divisor may be less than 1. For instance, trying to achieve baud rates in excess of 115.2Kbps with a 1.8432MHz crystal will result in an illegal Divisor.

An example of this would be if the Baud rate multiplier was set to 4 and the application software requested a rate of 115.2Kbps (with a 1.8432MHz crystal and all other settings at default). The driver would multiply the requested rate by 4, giving 460.8Kbps, and would calculate a Divisor of 0.25. The driver would subsequently fail to open the required port. If an application was able to directly request a baud rate of 460.8Kbps (thus requiring a default Baud rate multiplier of 1) the result would be the same, as the values used in the Divisor calculation would be identical.

Whilst the Baud rate multiplier is a software step (simply multiplying the requested baud rate before being used to calculate the Divisor) the Quad speed option changes the hardware Sample Clock parameter shown in Equation 4-2 from 16 down to 4. This allows baud rates four times that which would be possible with a chosen crystal.

Finally, remember that the InputClock figure used in Equation 4-2 is the figure shown on the dialog box – *which may be different from the true crystal frequency*. If in any doubt about the figure on the dialog, use the Detect Crystal Frequency button.

If 4 times oversampling is used then there will be a resulting decrease in noise margin. If 4 times oversampling is used high quality transmission media must be used to avoid errors.

It is not possible to drive the device faster than the external clock.

It is not possible to drive the device at speeds that exceed the capacity of the external line driver.

5 CONTACT INFORMATION

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