

## INDEPENDENT TX AND RX BAUD RATE GENERATOR

### 1.0 INTRODUCTION

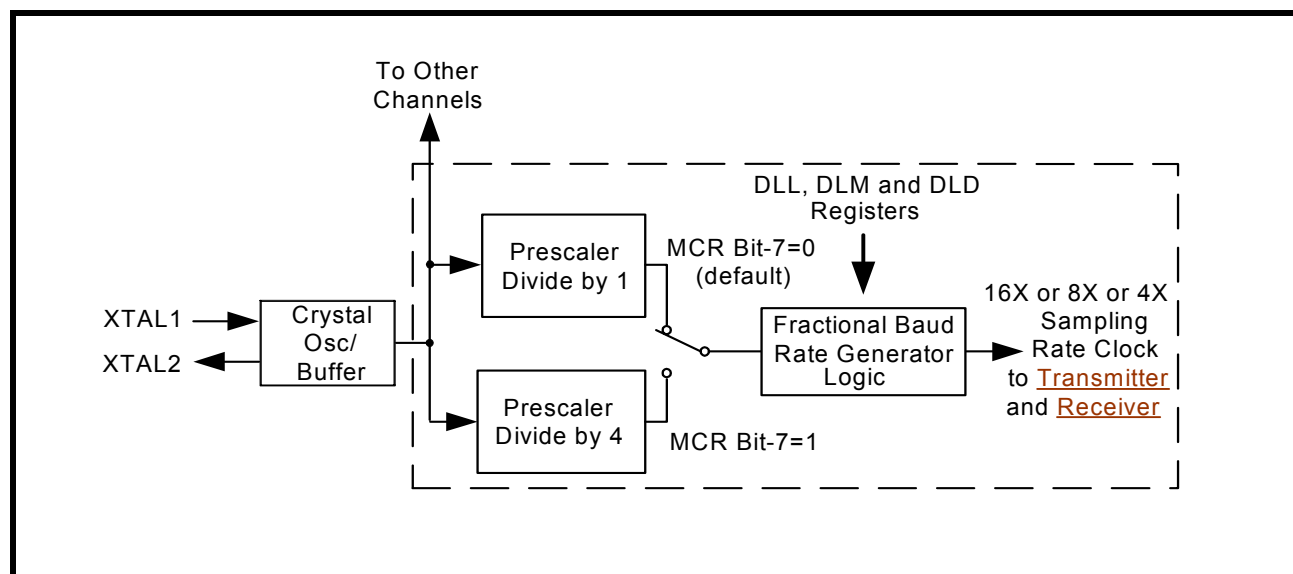
This application note describes the independent TX and RX baud rate generator feature of Exar's new low power and high speed XR16Mxxx single channel UART family.

### 2.0 BAUD RATE GENERATOR (BRG)

#### 2.1 PREVIOUS BAUD RATE GENERATOR ON UARTs

The TX and RX of previous generation UARTs share the same baud rate generator, as shown in **Figure 1**. For the same channel, TX and RX always run at the same baud rate. That is, setting up DLL, DLM & DLD registers (some UARTs don't have DLD register) actually decide the data rate for both TX and RX.

**FIGURE 1. BAUD RATE GENERATOR ON PREVIOUS GENERATION UARTs**

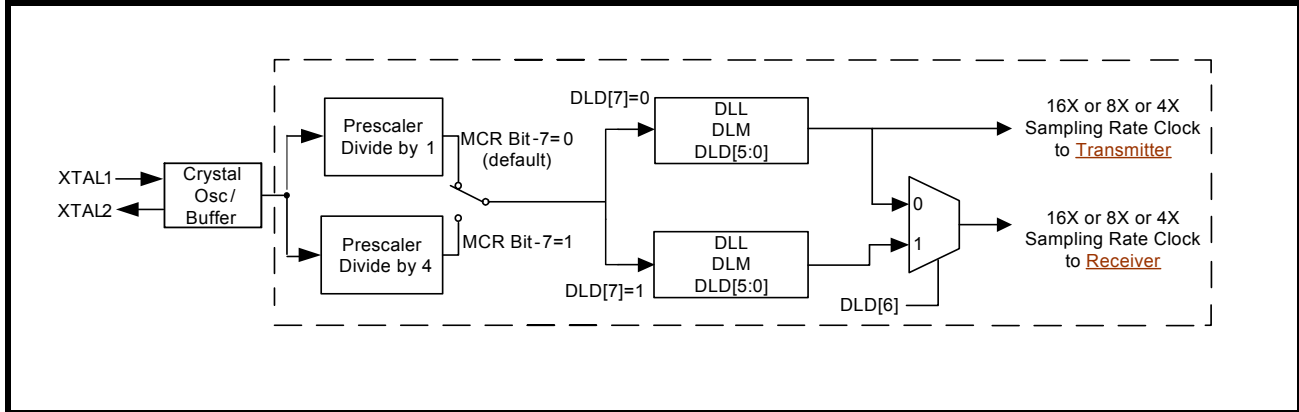


DAN 201

**2.2 BAUD RATE GENERATOR FOR M SINGLE CHANNEL UARTS**

The XR16Mxxx single channel UART family has the independent baud rate generator feature. Thus, the transmitter and receiver can run at different baud rates (see **Figure 2**). DLL, DLM and DLD needs to be initialized for both TX and RX.

**FIGURE 2. BAUD RATE GENERATOR FOR M SINGLE CHANNEL FAMILY UARTS**



By default, the TX and RX uses the same BRG. Different BRGs can be enabled by DLD[6]. While initializing, DLD[7] selects the BRG that is being configured.

**3.0 PROGRAMMING FOR INDEPENDENT TX AND RX BAUD RATE GENERATOR**

By setting DLD, XR16Mxxx single channel UART family can operate transmitter (TX) and receiver (RX) in different baud rate. The following examples show different set-ups. The first 2 examples use the same baud rate generator (BRG) for both TX and RX. Others use different BRGs for TX and RX.

**3.1 TX AND RX BAUD RATES ARE 921.6 KBPS WITH 14.7456 MHZ FREQUENCY**

This example uses the default 16X sampling rate and the default BRG prescaler value 1 for both TX and RX.

```

write(LCR, 0xBF);
write(EFR, 0x10); //EFR[4] = 1 to enable the access of DLD
write(LCR, 0x80);
write(DLD, 0x0); //TX and RX use same BRG
write(DLL, 0x1);
write(DLM, 0x0);
write(LCR, 0x3); //Set data format 8 data bit and 1 stop bit
    
```

**3.2 TX AND RX BAUD RATES ARE 921.6 KBPS WITH 24 MHZ FREQUENCY**

This example uses the 8X sampling rate and the default BRG prescaler value 1 for both TX and RX.

```

write(LCR, 0xBF);
write(EFR, 0x10); //EFR[4] = 1 to enable the access of DLD
write(LCR, 0x80);
write(DLD, 0x14); //TX and RX use same BRG; Enable 8X mode; Set the fractional baud rate
write(DLL, 0x3);
write(DLM, 0x0);
write(LCR, 0x3); //Set data format 8 data bit and 1 stop bit
    
```

**3.3 TX BAUD RATE IS 921.6 Kbps AND RX BAUD RATE IS 9600 BPS WITH 14.7456 MHz FREQUENCY**

This example sets the 4X sampling rate and the default BRG prescaler value 1 for both TX and RX.

```
write(LCR, 0xBF);
write(EFR, 0x10); //EFR[4] = 1 to enable the access of DLD
write(LCR, 0x80);
write(DLD, 0x60); //Select to configure TX baud rate generator; Select 4X sampling rate;
write(DLL, 0x4); //Set TX baud rate to 921.6 kbps
write(DLM, 0x0);
write(DLD, 0xE0); //Select to configure RX baud rate generator; Select 4X sampling rate;
write(DLL, 0x80); //Set RX baud rate to 9600 bps
write(DLM, 0x1);
write(LCR, 0x3); //Set data format 8 data bit and 1 stop bit
```

**3.4 TX BAUD RATE IS 921.6 Kbps AND RX BAUD RATE IS 9600 BPS WITH 24 MHz FREQUENCY**

This example sets the 4X sampling rate and the BRG prescaler value 4 for both TX and RX.

```
write(LCR, 0xBF);
write(EFR, 0x10); //EFR[4] = 1 to enable the access of DLD
write(LCR, 0x80);
write(MCR, 0x80); //Set prescaler to 4
write(DLD, 0x6A); //Select to configure TX baud rate generator; Select 4X sampling rate;
write(DLL, 0x1); //Set TX baud rate to 921.6 Kbps
write(DLM, 0x0);
write(DLD, 0xE0); //Select to configure RX baud rate generator; Select 4X sampling rate;
write(DLL, 0x80); //Set RX baud rate to 9600 bps
write(DLM, 0x1);
write(LCR, 0x3); //Set data format 8 data bit and 1 stop bit
```

**3.5 TX BAUD RATE IS 921.6 Kbps AND RX BAUD RATE IS 9600 BPS WITH 14.7456 MHz FREQUENCY**

This example sets the 4X sampling rate for the TX and 8X sampling rate for the RX while the default BRG prescaler value 1 for both TX and RX.

```
write(LCR, 0xBF);
write(EFR, 0x10); //EFR[4] = 1 to enable the access of DLD
write(LCR, 0x80);
write(DLD, 0x60); //Select to configure TX baud rate generator; Select 4X sampling rate;
write(DLL, 0x4); //Set TX baud rate to 921.6 kbps
write(DLM, 0x0);
write(DLD, 0xD0); //Select to configure RX baud rate generator; Select 4X sampling rate;
write(DLL, 0xC0); //Set RX baud rate to 9600 bps
write(DLM, 0x0);
write(LCR, 0x3); //Set data format 8 data bit and 1 stop bit
```



## DAN 201

---

### 4.0 TECHNICAL SUPPORT

For any questions regarding the independent TX and RX baud rate generator (BRG), send email to [uarttech-support@exar.com](mailto:uarttech-support@exar.com).

### **NOTICE**

EXAR Corporation reserves the right to make changes to the products contained in this publication in order to improve design, performance or reliability. EXAR Corporation assumes no responsibility for the use of any circuits described herein, conveys no license under any patent or other right, and makes no representation that the circuits are free of patent infringement. Charts and schedules contained here in are only for illustration purposes and may vary depending upon a user's specific application. While the information in this publication has been carefully checked; no responsibility, however, is assumed for inaccuracies.

EXAR Corporation does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure of the life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in such applications unless EXAR Corporation receives, in writing, assurances to its satisfaction that: (a) the risk of injury or damage has been minimized; (b) the user assumes all such risks; (c) potential liability of EXAR Corporation is adequately protected under the circumstances.

Copyright 2009 EXAR Corporation

Datasheet April 2009.

Send your UART technical inquiry with technical details to hotline: [uarttechsupport@exar.com](mailto:uarttechsupport@exar.com).

Reproduction, in part or whole, without the prior written consent of EXAR Corporation is prohibited.

---