



Interface Serial Port

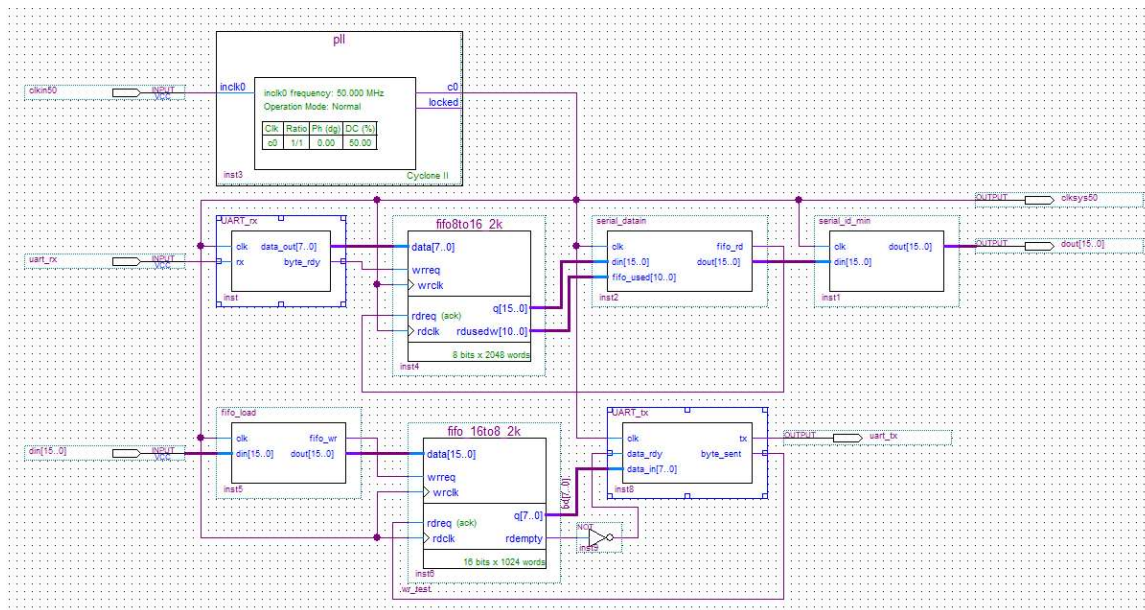
Name	Ident (hex)	Length	Logic Elements	Memory (bits)
Serial I/O	FFF0	4	531	32768

The serial interface acts as a two-way communication hub for the FPGA. It contains all the necessary logic to drive the FPGA magic bus, a four-word identification block, and memory buffering on the RX and TX signals.

The TX input has a 2Kbyte input buffer, allowing for continuous messages to the bus. The input logic waits until all data for a message is in the input memory before sending it to the bus. Since the bus runs faster than the input serial port, the input buffer can never be overrun.

The RX output also has a 2Kbyte output buffer. The output is sent when the first byte arrives in memory. There is no overflow check in the output buffer, so multiple large memory reads may cause this buffer to overflow. If overflow occurs, the extra words are not written into memory and will be lost.

The serial port interface can be used as either a serial port or with a USB-to-serial port converter chip. The FPGA Magic serial port board uses an FTDI FT231X integrated circuit, which works best with baud rates of 115,200 or slower. Direct connection to the FPGA allows for higher baud rates. The data format is fixed in the code at 8 bits, 1 stop bit, and no parity.



Serial Interface Diagram

To change the baud rate in the macro, locate the "uart_TX" and "uart_RX" blocks and open them. Inside both blocks, locate the constant "baud_divide" and modify it with the following hexadecimal values. The divider is calculated from the default system clock of 50 MHz, divided by the baud rate minus one.

Baud Rate	Divider
921600	0x0035
460800	0x006C
230400	0x00D8
115200	0x01B1
57600	0x0363
38400	0x0515
19200	0x0A2B
9600	0x1457

$$\text{Divider} = ((50,000,000)/\text{baud_rate}) - 1$$

The memory map for the serial interface is presented in the table below. All locations are read-only, and any writes to these locations will be ignored.

Address	Read/Write	Value
0x0000	Read	0xFFFF0
0x0001	Read	0x0004
0x0002	Read	0x0629
0x0003	Read	0x2023

Ident
Length
Date
Code

Memory Map

Revisions

June 2023 – Adjusted input state machine to support 511 words, versus 256.