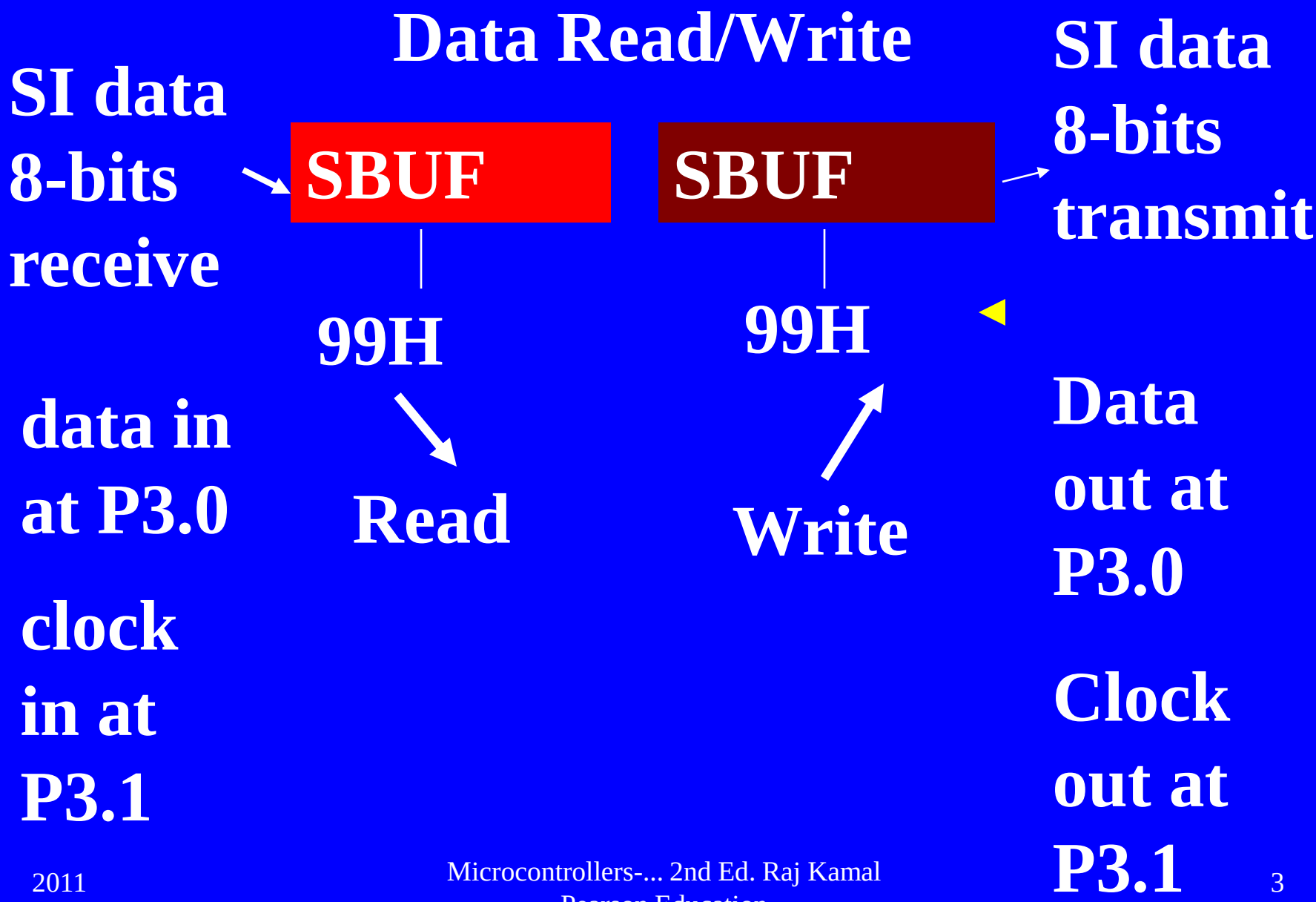
Chapter 3

8051/8031 Family Architecture

Lesson 06

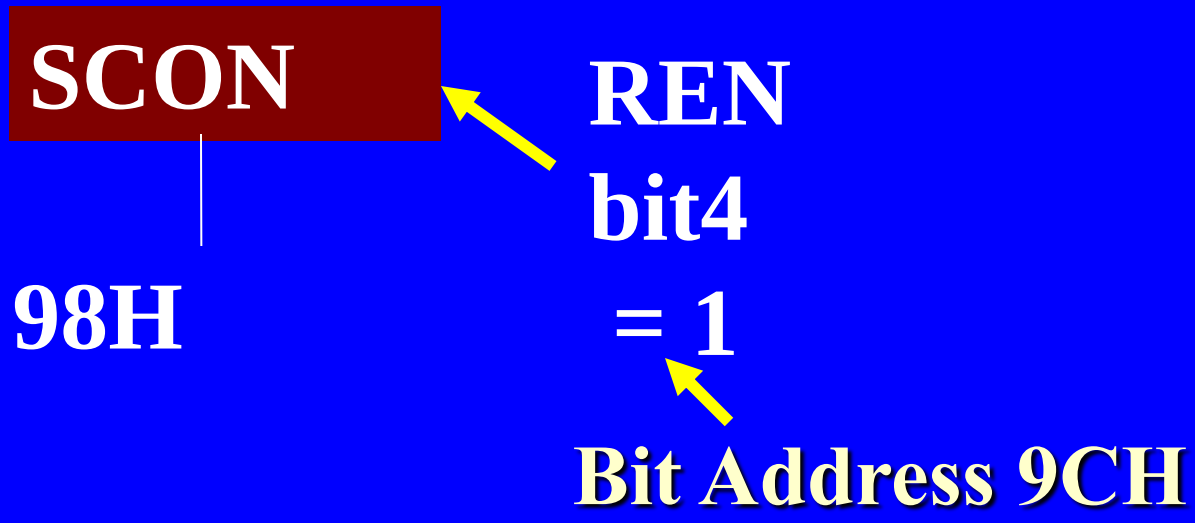
Serial Interface

Synchronous SI Device Data Read/Write

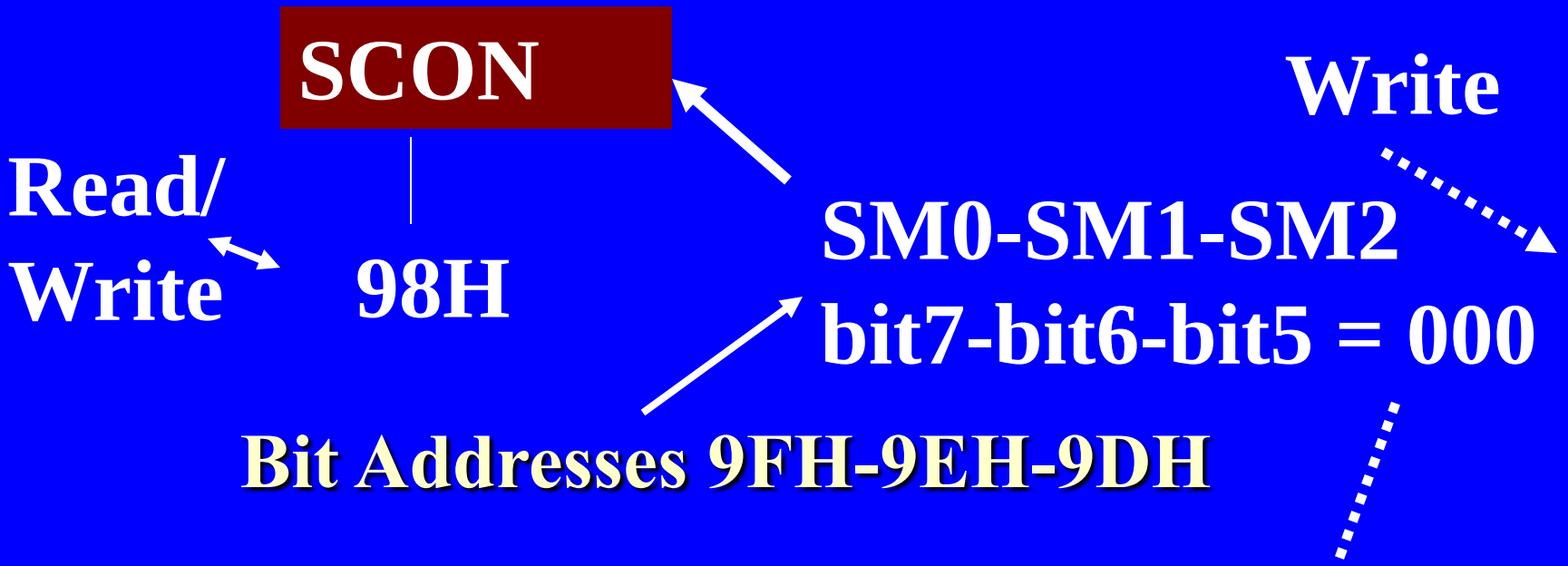


SI Device Receiver mode control Bit

Enabling Receiver of SI device



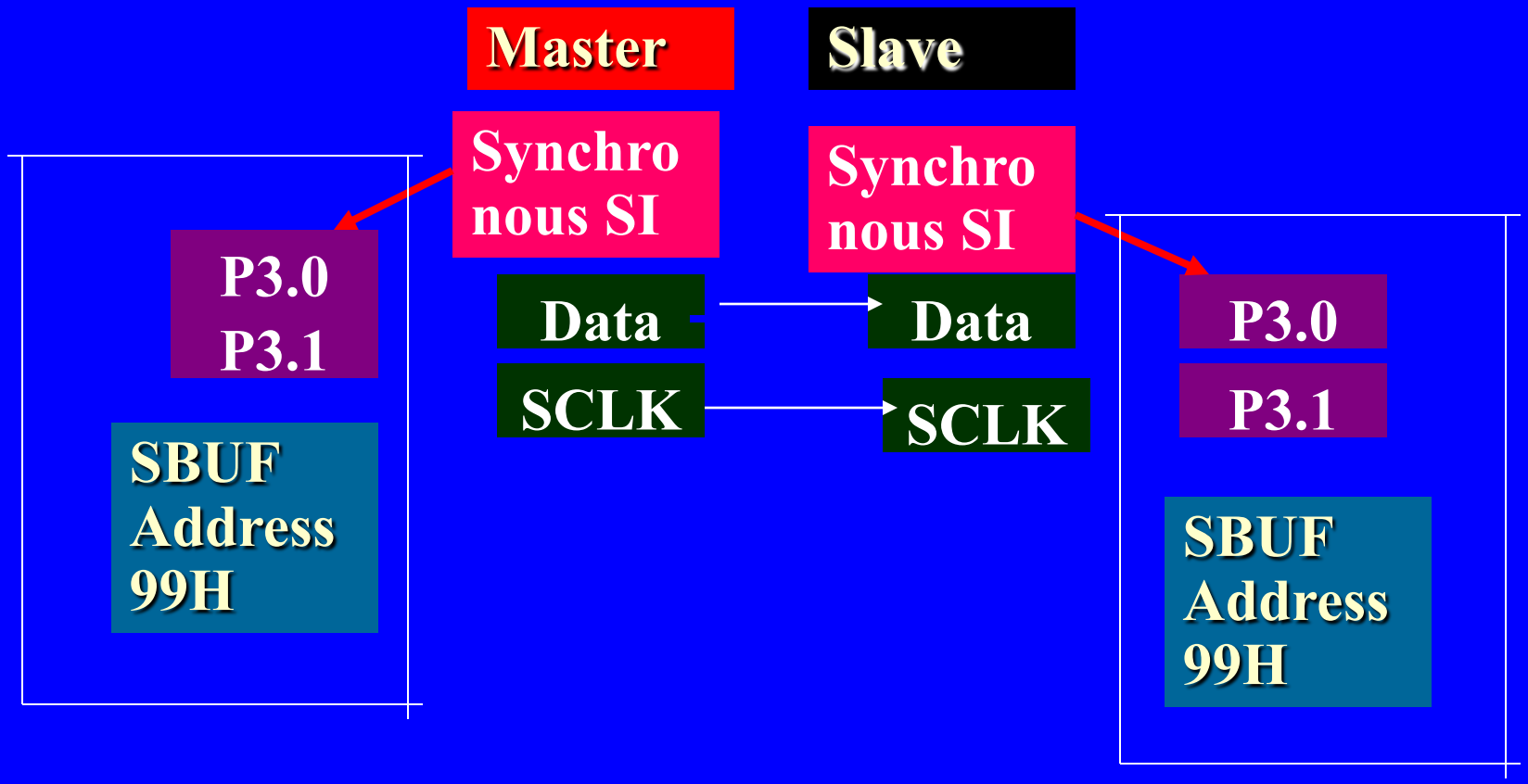
SI Device Synchronous mode control Bits



For Synchronous mode of SI Device

- **Serial bit transmits at data pin and receives at slave data pin**
- **Synchronous SI devices are half duplex connected between the master and slave**
- **Synchronous SI Master device simultaneously transmits serial clock pulses so that slave can synchronize the clocking inputs with the serial data bits.**

Synchronous SI Master- Slave Connection Between Two MCUs



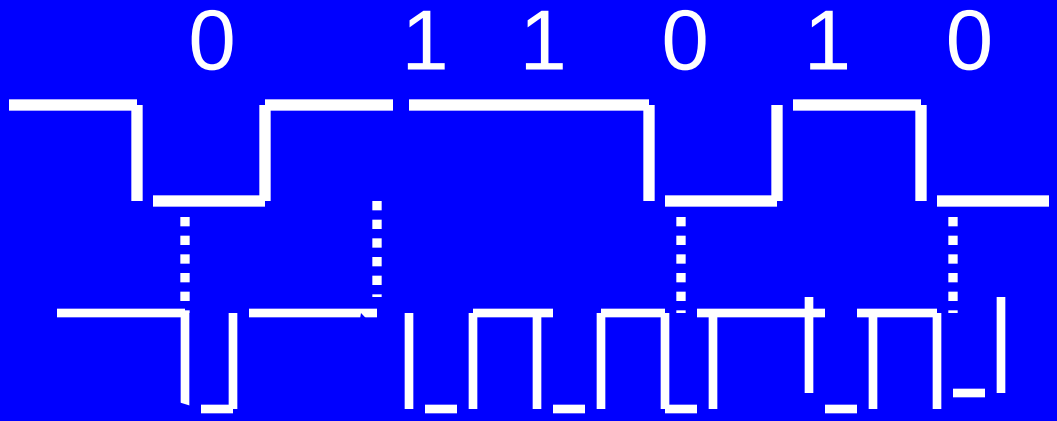
Synchronous SI Device Rate for SYNC Transmission

Serial Bit Rate **1 μs for 12 MHz XTAL**

Synchronous SI Master output 8 bits and 8 Clock pulses

Data

SCLK

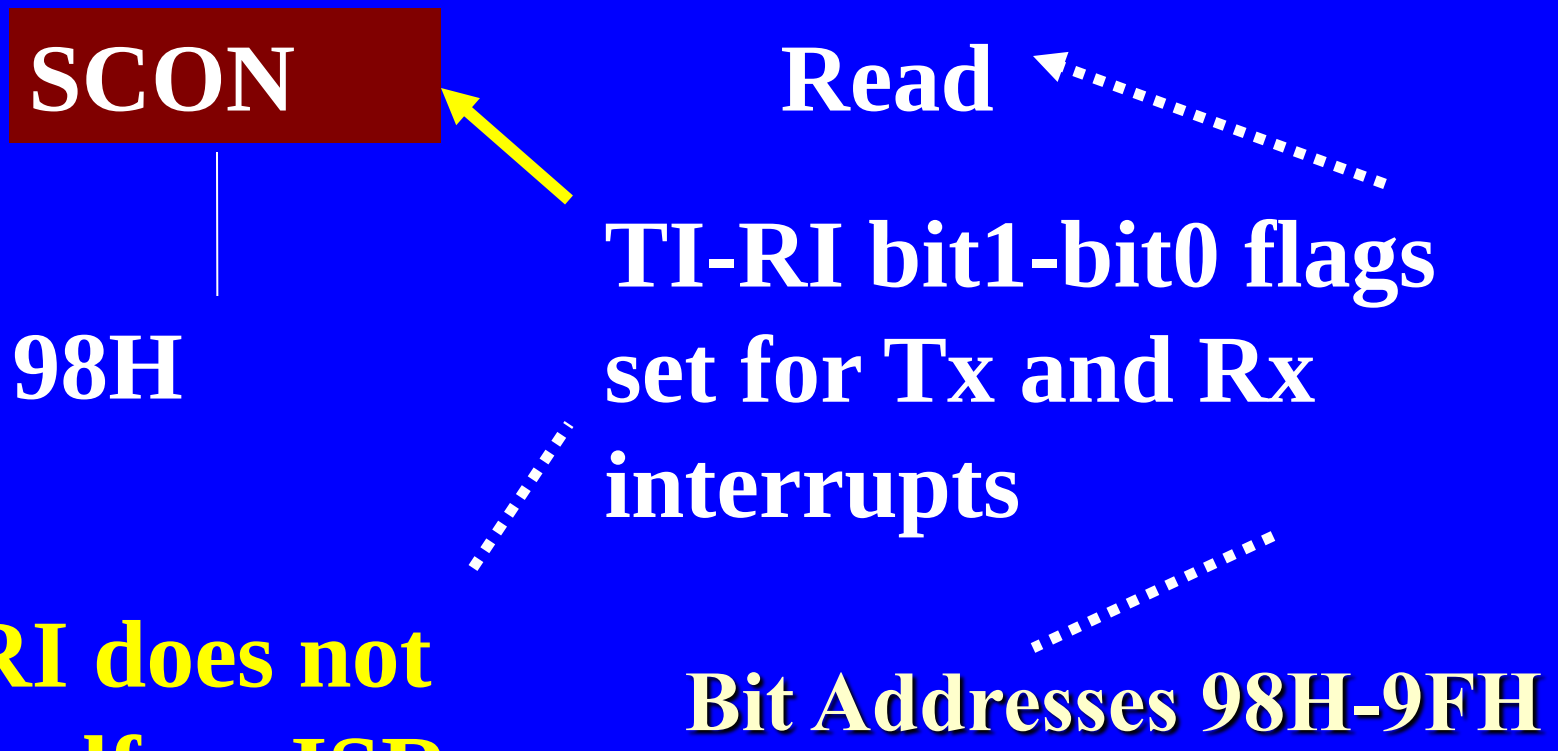


= 0 for 1/12 μs and = 11/12 for 1 μs rate for 12Hz XTAL

lsb serial bit first out from SBUF

Synchronous SI Device Status Bits

Synchronous SI Interrupt flags- TI and RI



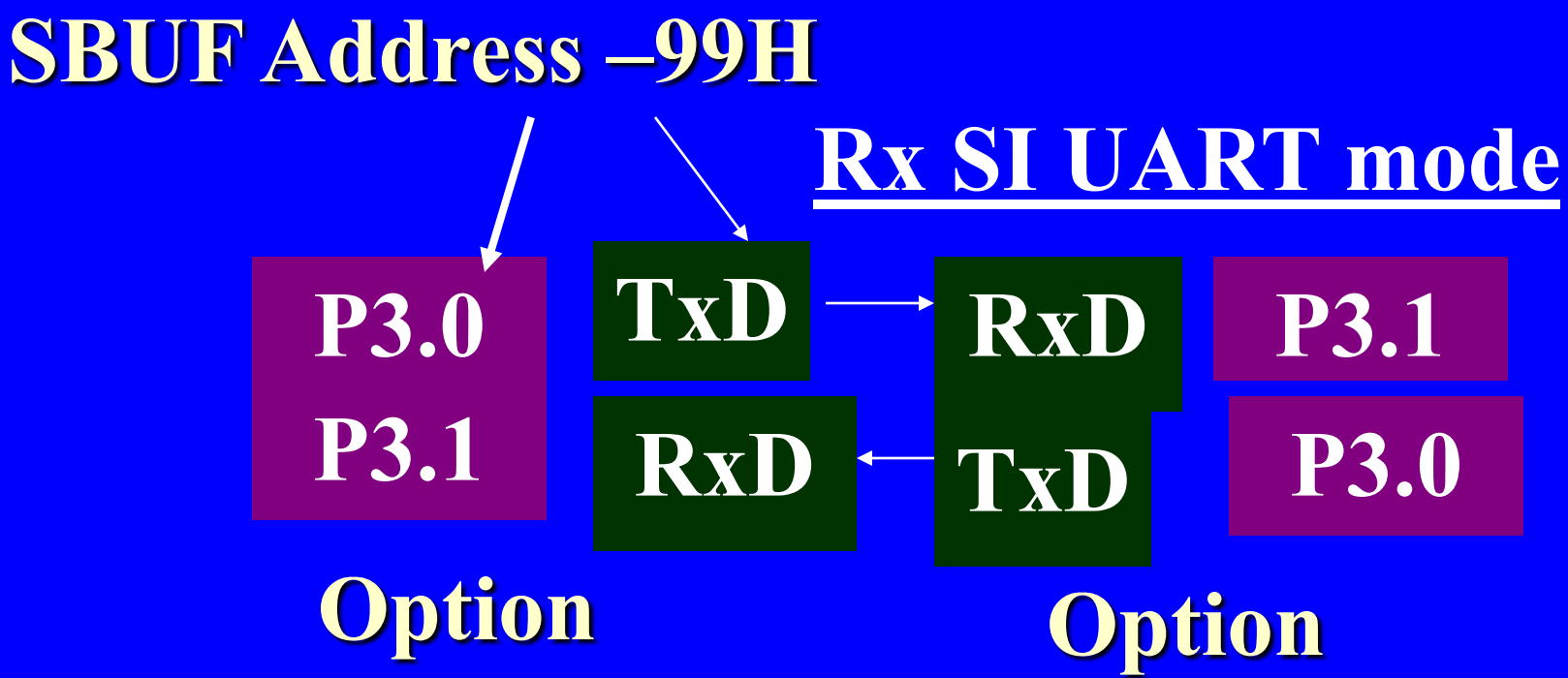
SI UART mode

SI UART mode

- **Serial bit SI UART mode transmits at TxD and reception at RxD pins**
- **SI UART mode devices are duplex connected between the Tx and Rx**

SI UART mode Tx Device and Rx Device - Between the MCUs

Tx SI UART mode



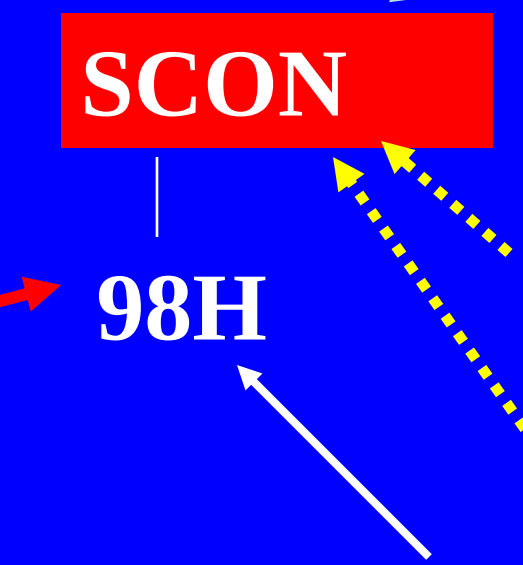
SI UART mode Device Baud control by 8051 Timer

- SI UART mode Tx device does not simultaneously transmit serial clock pulses. Baud is however defined same at Tx SI UART mode and Rx SI UART mode.
- T1 is default baud rate generator. T2 can be used in 8052

SI Device Receiver mode control Bit

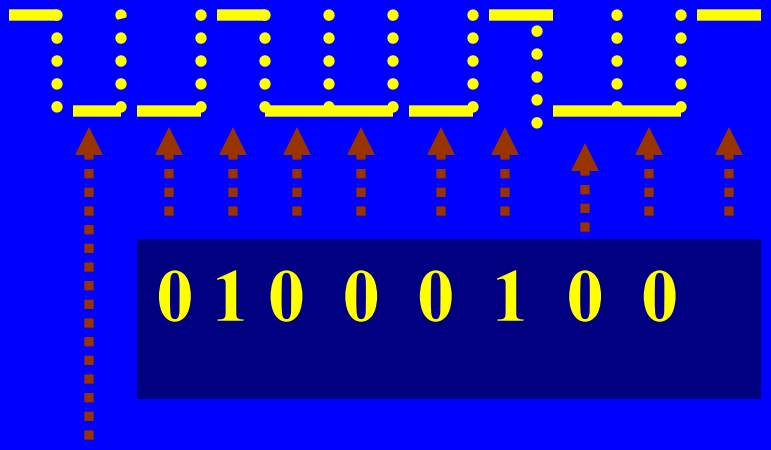
Enabling Receiver of SI device

SI UART mode Device Control/status Register bits



bit7-SM0 bit-6-SM1, SM2-bit 5, Send bit-3(TB8) for transmission in mode 2 and 3. Receives RB8 for reception in mode 2 and 3

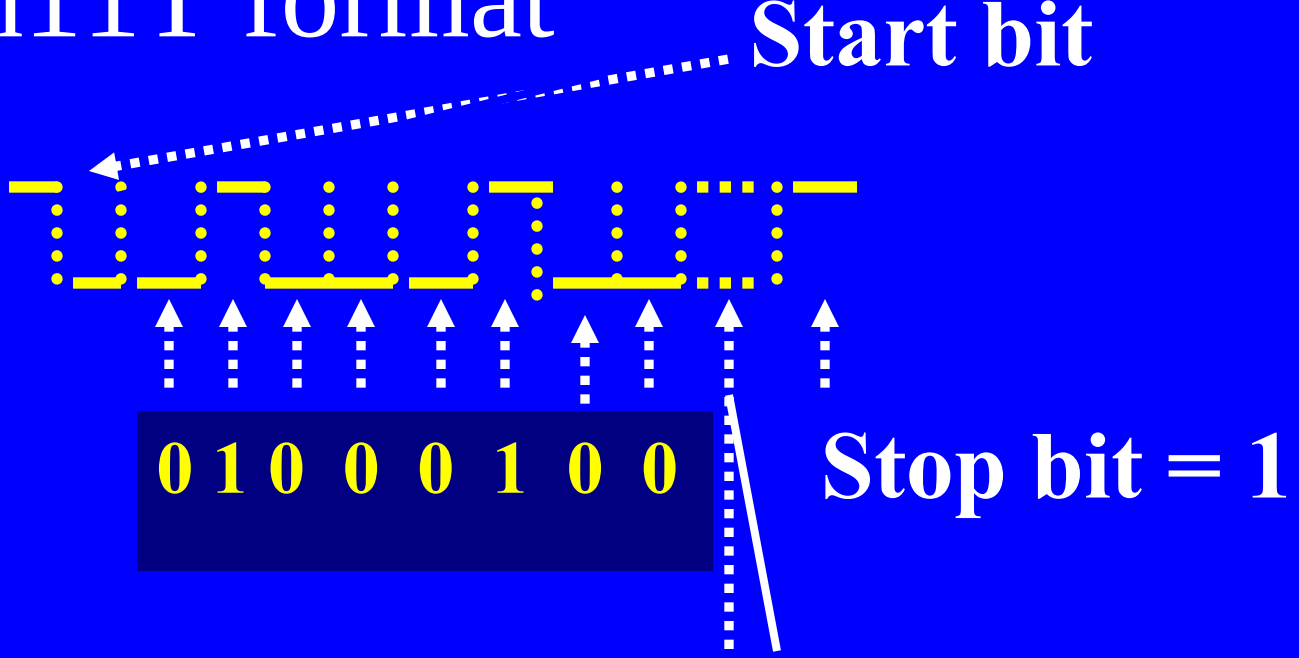
UART SI output 8 bits (01000100) in10T format



Stop bit = 1

Start bit

UART SI output 8 bits (01000100) in11T format



TB8 = 0 or 1 as per 8th bit to be sent to transmitter

Serial Communication Control SM0-SM1 bits for modes 0, 1, 2, 3

00 = means Synchronous mode,
01=UART mode 1- start bit, 8 data bits, stop bit Total 10T per character)
10 =UART mode 2- start bit, 8 data bits, Extra TB8/Parity in 11T)
11=UART mode 3- start bit, 8 data bits, Extra TB8/Parity in 11T)

- $T = baud^{-1}$

Serial Communication Control SM0-SM1 bits for modes

- Mode 1 and 3 variable baud rate by T1 periodic overflows in 8051 and T1 orT2 in 8052
- Mode 2 fixed baud rate by f_{osc} /32 or f_{osc} /64 as per PCON bytes' 7th bit,called SMOD bit. f_{osc} = 12 MHz for 12 MHz XTAL
- $T = baud^{-1}$

Serial Communication UART Control SM2 bit for mode 1

- When SM2 = 1 and Mode is 1(10T mode) then RI at SCON.0 (98H bit address) does not activate and sets to 1 when stop bit is received 0, which is not valid.

- $T = baud^{-1}$

Multi-processors communication in UART SI Modes 2 and 3 using SM2 bit at SCON

Serial Communication UART Control SM2 bit for modes 2 and 3

- When SM2 = 1 and Mode is 2 or 3 (11T mode) then RI at SCON.0 (98H bit address) does not activate and sets to 1 when RB8 bit is received 0.

Serial Communication UART Control SM2 bit application for mode 2 and 3 in multiprocessor communication

First each slave SM2 bit is set to 1. Each slaves activates RI (receiver interrupt flag) when RB8 = 1,therefore reads the 8-bits and check- *does it corresponds to its predefined address*?

Then each slave SM2 bit is kept to 1 *except the one*, which successfully checked its address . That slave SM2 bit is forced = 0, it therefore keeps on activating RI each time whether RB8 = 0 or 1,therefore it reads the 8-bits and receives the data. Whenever it finds RB8 = 1, it again checks its address, if not found same as before, it forces SM2 again = 1.

Summary

We learnt

- Synchronous SI - Mode 0
- SI UART mode - Modes 1, 2, 3, Use of SM2bit for multi processor communication