

Chapter 16

Motorola MC68HC11 Family MCU Architecture

Lesson 9

SPI and SCI serial devices

Port A

Port B

Port C

Port D

Port E

TCNT

Out-compare

In Capture

RTC

PACNT

SCI

SPI

AMUX

S/H

ADC

COP

Internal Devices

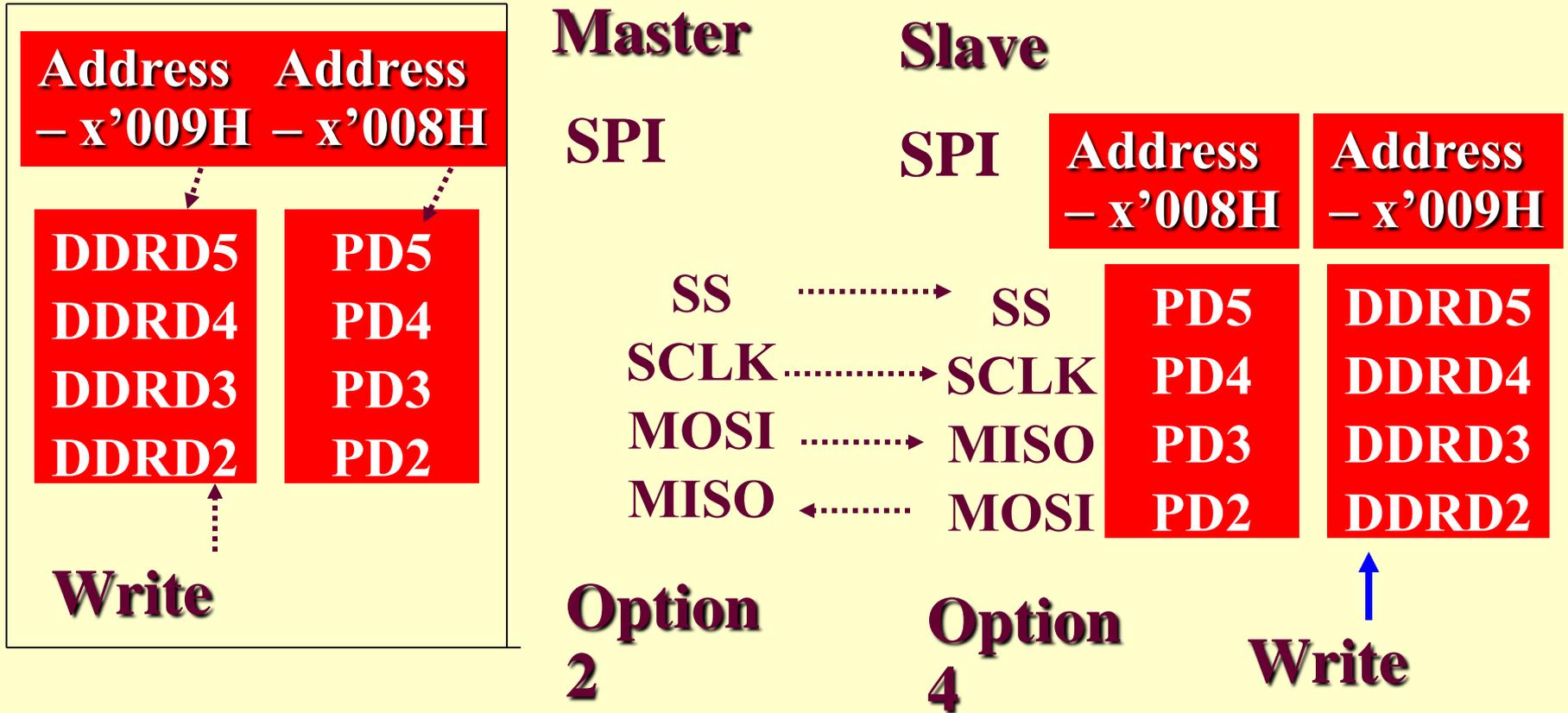
SPI

- Duplex communication in SPI device
- Connected between the master and slave
- Simultaneous communication between master and slave
- SPI Master device simultaneously transmits serial clock pulses so that slave can synchronize the clocking inputs with the serial data bits

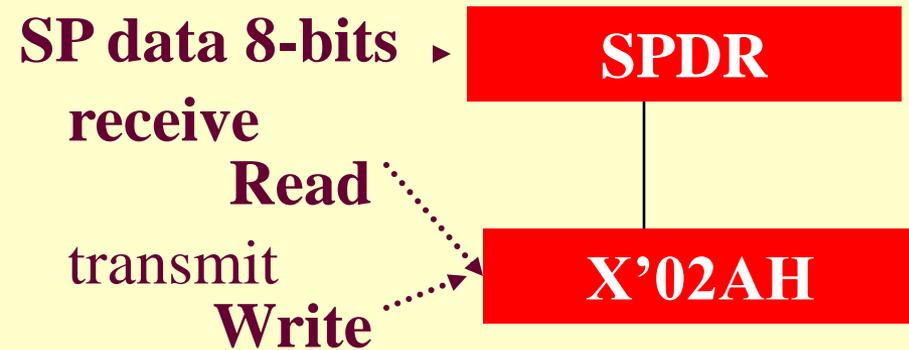
SPI Four pins

- **MOSI and MISO**
- **Serial bit transmits at MOSI (Master Out Serial In) and reception at MISO (Master In Serial Out) pins**
- **CLK**
- **SS (Slave select) If active then SPI function as slave else master**

SPI Master- Slave Connection Between Two MCUs



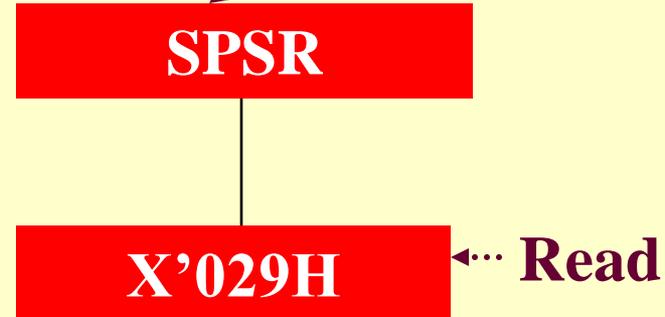
SPI Device Data Receive and transmit Register and the Address



X' four bits are as per init register

SPI Device Status Register and the Address

SP Status bits, MODF, WCOL, SPIF



X' four bits are as per init register

MODF: Mode flag

WCOL: write clock

SPIF: SPI interrupt flag

SPCR Control Bits

Rate select-SPR0, SPR1,

Clock phase, polarity select CPHA,
CPOL

MSTR: Select SPI as a Master or Slave

DWOM: Set for Pull up or Pull down

SPE: SPI device Enable

SPIE: SPI interrupt enable

SPCR Register and the Address

Serial Peripheral Control bits, PR0, SPR1, CPHA, CPOL, MSTR, DWOM, SPE, SPIE at SPCR

Serial Peripheral Control bits, Rate select-SPR0,
SPR1,

00- 1 μ s, 10- 2 μ s,

01- 4 μ s, 11- 16 μ s

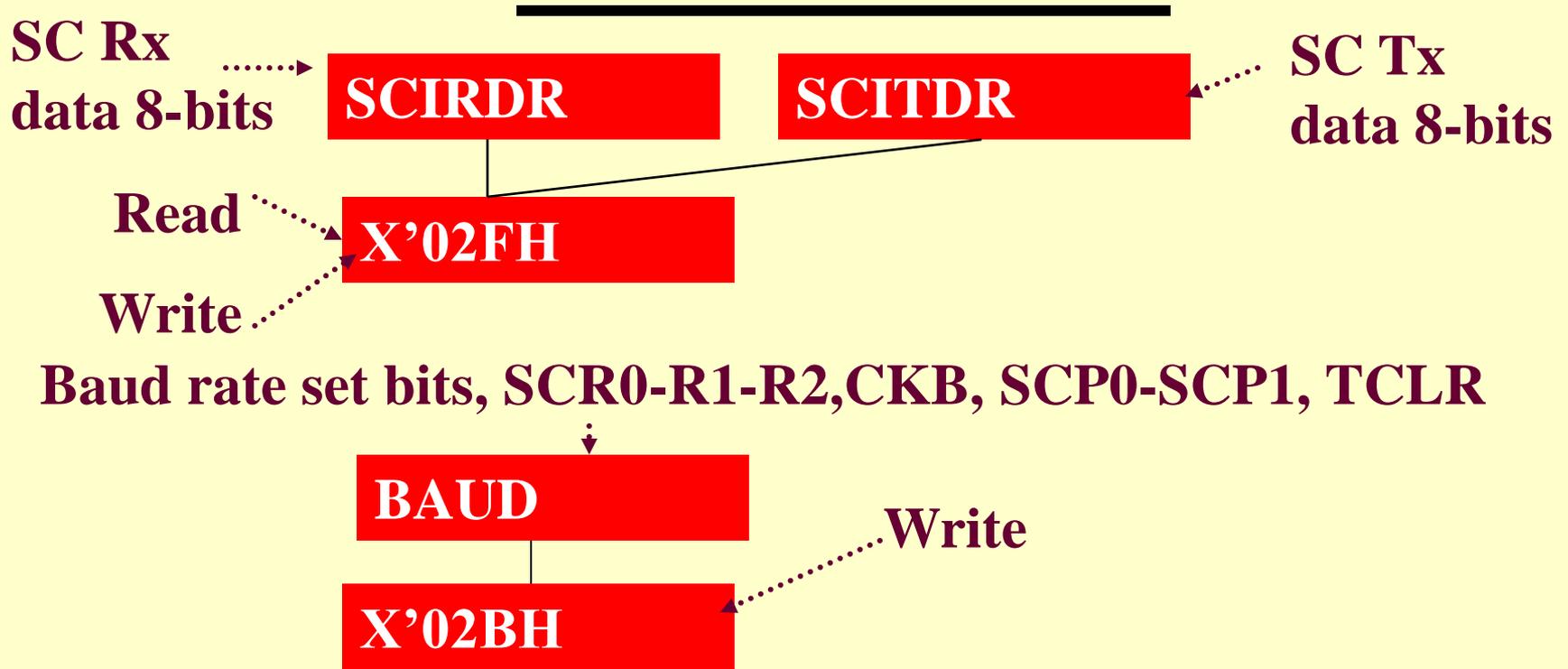
Write

SPCR

X'028H

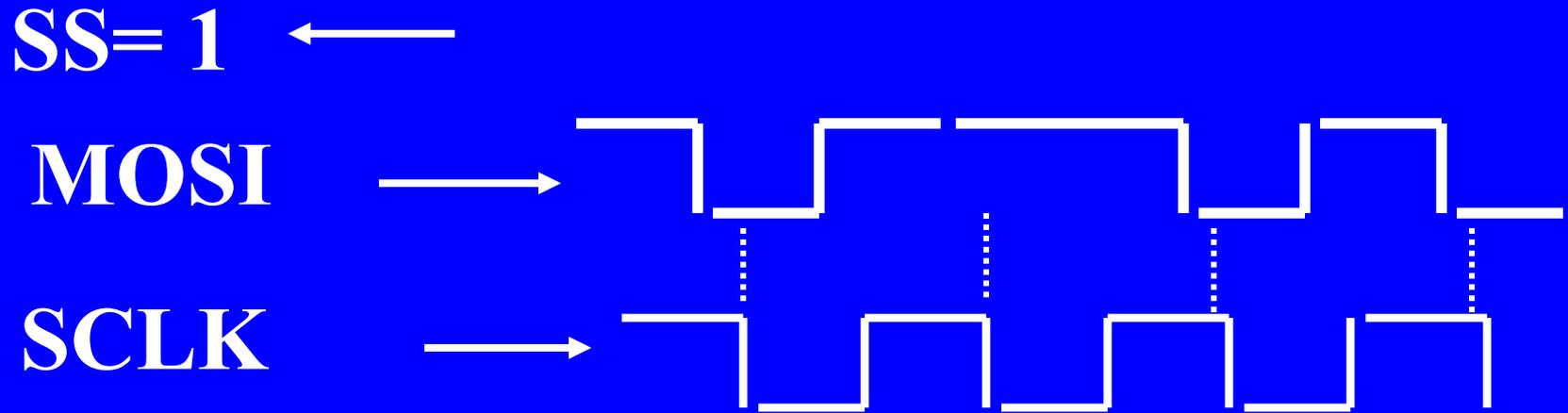
X' four bits are as per init register

SCI Device Baud and SC Tx-data and Rx-Data registers and the addresses



X' four bits are as per init register

SPI Master output 4 bits (0100) and Clock pulses



SCI

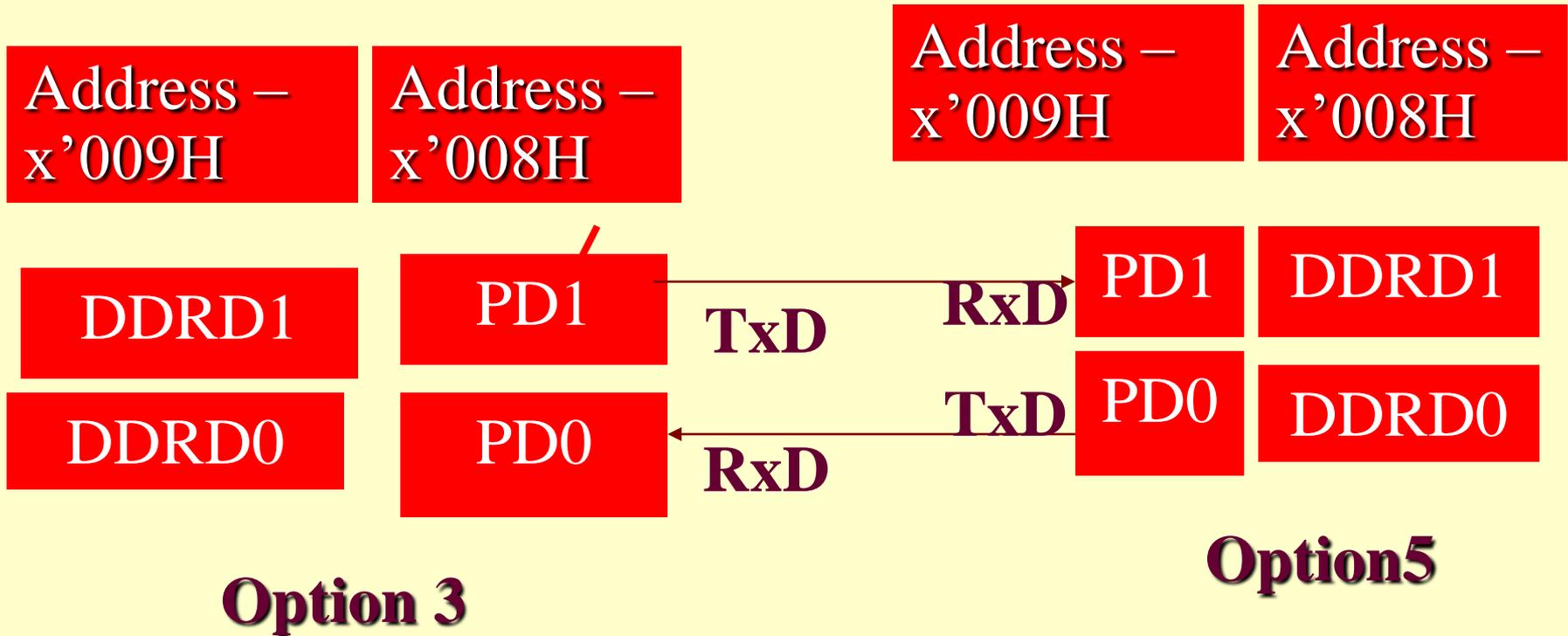
SCI

- **Serial bit SCI transmits at TxD and reception at RxD pins**
- **SCI devices are duplex connected between the Tx and Rx**
- **SCI Tx device does not transmit serial clock pulses**
- **Baud is however defined same at Tx SCI MCU and Rx SCI MCU**

SCI Tx and Rx Devices - Between Two MCUs

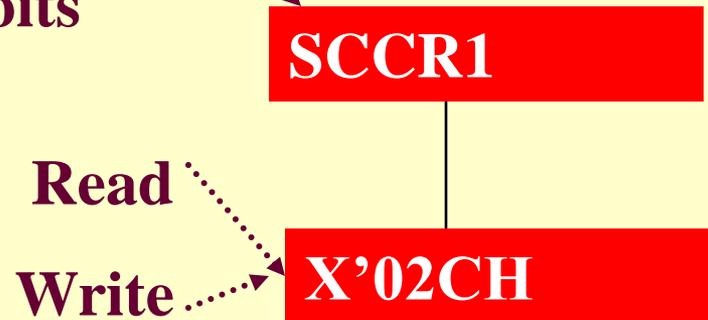
Rx SCI

Tx SCI



SCI Device Control Registers and the Addresses

Wake, M, T8,
R8 bits



Serial Communication Control bits, SBK,RWU,
RE,TE, ILIE, RIE, TCIE, TIE



X' four bits are as per init register

Serial Communication Control bits

SCCR1

Wake: Start SCI

**M= 0 means 10T mode for
SCI,1means 11T mode**

T8: Send b8 bit after Tx data

R8: Receive b8 bit after Tx data

Serial Communication Control bits SCCR2

SBK:Serial Break

RWU:Receiver Wake-up enable ,

RE:Rx SCI enable,TE:Tx SCI enable,

ILIE: Rx Idle Interrupt enable

RIE: Rx Error Interrupt enable

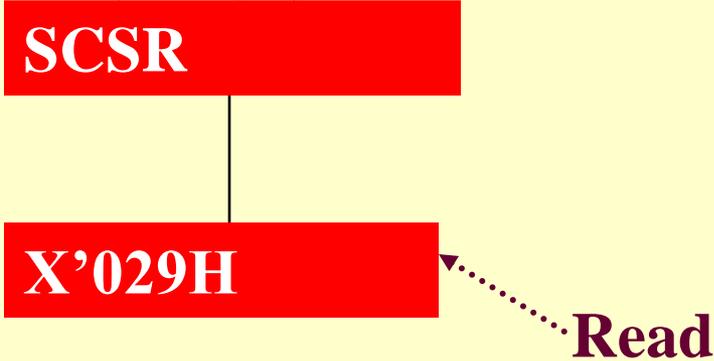
TCIE: Tx Complete Interrupt enable

TIE:TX Empty Interrupt enable

SCI Device Status Register and the Address

SC Status bits, FE,NF, OR, IDLE,
RDRE, TC,TDRE

SCSR



X'029H

Read

X' four bits are as per init register

SCI Device Status Registers bits

TC: Transmitter Complete,

TDRE: Transmitter empty

**FE:Frame Error,NF:Noise No Frame
proper error, OR:Overrun error:**

**IDLE:Line idle, RDRF:Receiver data
ready flag,**

SCI Device Tx-data and Rx-Data register bits

**SC Rx
data
8-bits**

**SC Tx
data
8-bits**

SCIRDR

SCITDR

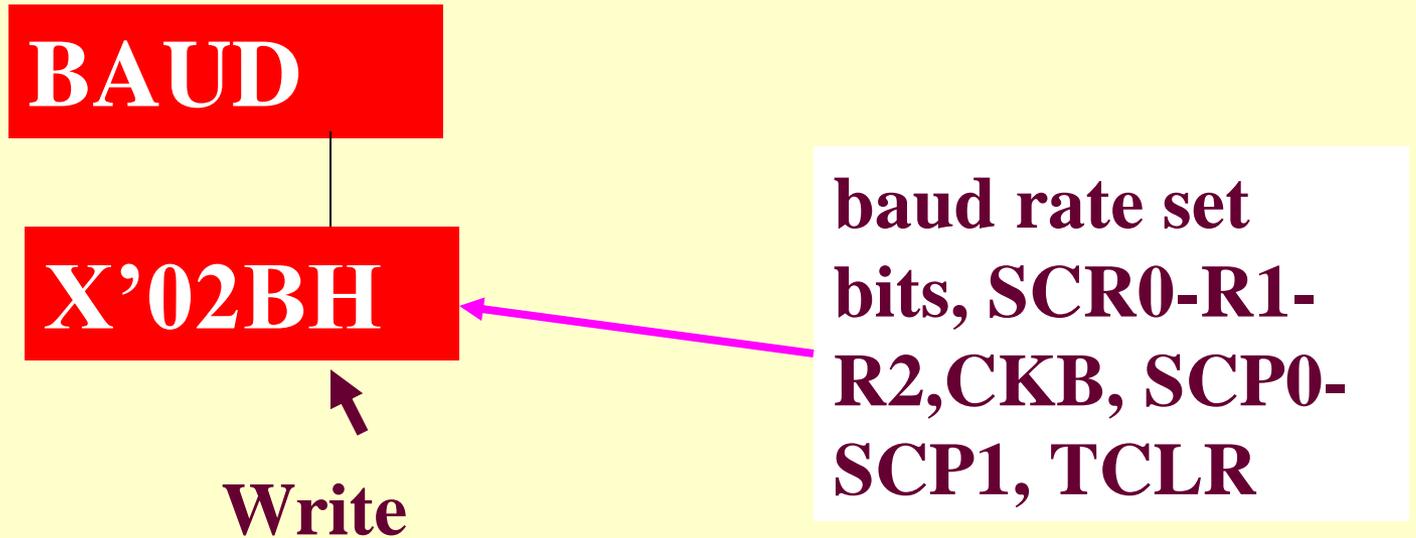
Read

X'02FH

Write

**X' four bits are as per
init register**

SCI Device Baud control bits



**X' four bits are as per
init register**

Summary

We learnt

Serial Devices SPI and SCI registers

- SPCR, SPSR
- SPDR
- BAUD
- SCCR1 and SCCR2
- SCSR
- SCIRDR/SCITDR

End of Lesson 9 on SPI and SCI serial devices