

LSbit gets transmitted/received first

UART Features:

serial, full duplex, asynchronous, short

p-p

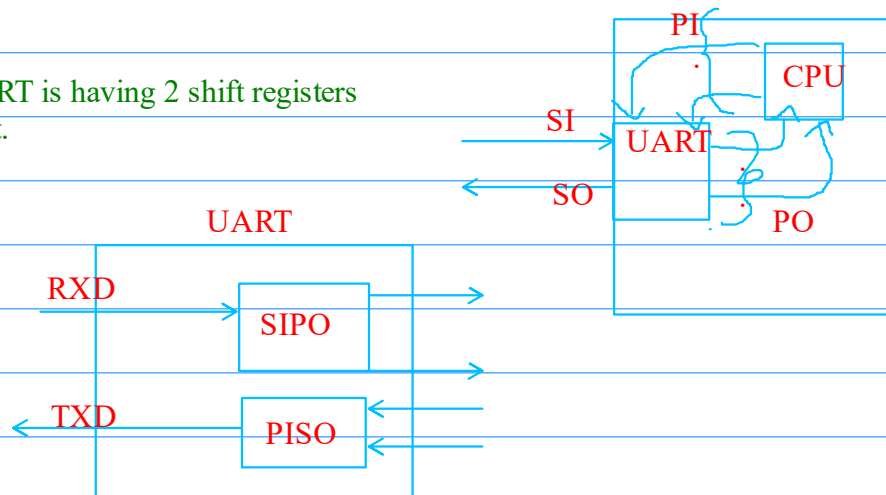
Frame format, Baud rate

start bit + data bits + parity + stop bit

start bit + 8-data bits + stop bit → standard uart frame

8051 UART :

Every UART is having 2 shift registers inbuilt in it.



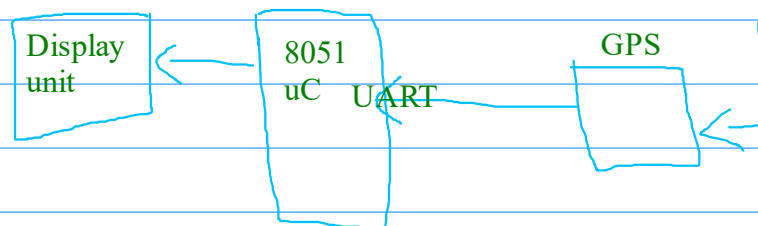
→ P3.0----RXD
← P3.1----Txd

SFRs

SCON, SBUF, PCON, TMOD, TH1, TL1

Used
all the time
with UART

based on the mode
of operation



SCON(serial port control register)

selects the mode
of operation
(frame format is selected)

status information
(Txion/Rxion)

SBUF: To hold data to be transmitted out/data to be received in
Serial buffer

PCON,TMOD,TCON,TL1,TH1

To set the desired baud rate in some of the UART operating modes.

SCON:

SM0,SM1,SM2,TB8---set/cleared by the programmer

RB8---it sets/clears automatically

TI,RI---sets automatically but clearing must be by the programmer.

serial port mode selection bits(SM0,SM1)

Data field size

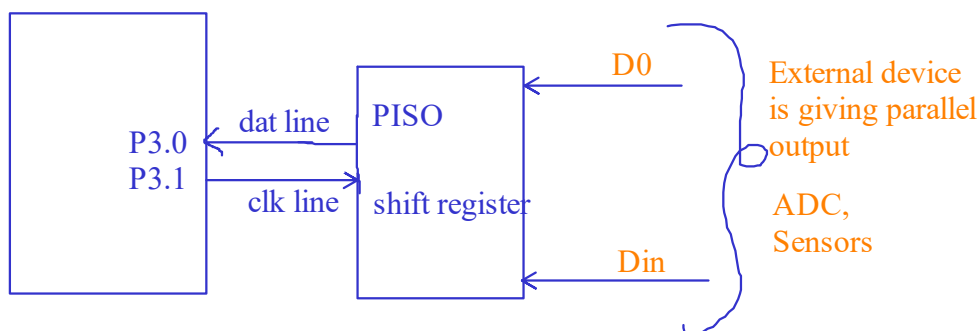
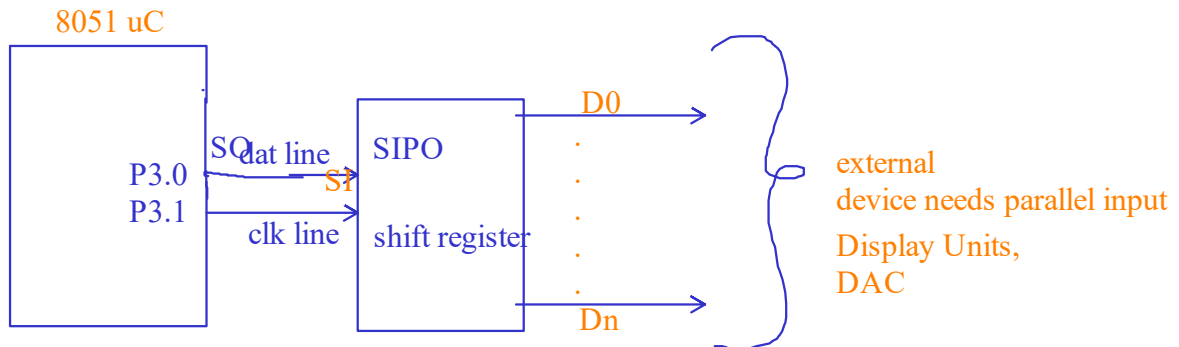
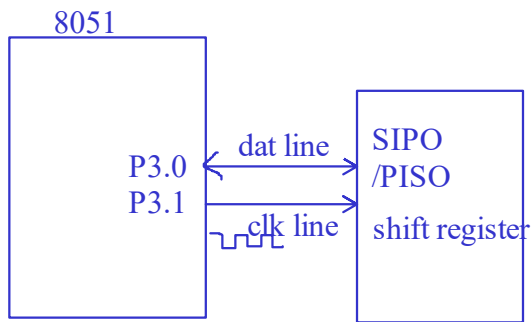
port expansion

SM0	SM1	Mode selected	Description
0	0	0	8-bit shift register mode
0	1	1	8-bit variable bud rate mode
1	0	2	9-bit fixed baud rate mode
1	1	3	9-bit variable baud rate mode

standard
mode
(universal
mode)

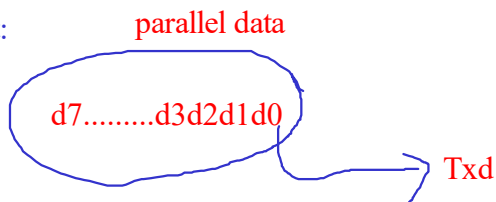
only 8051
UART supports

Mode 0: special mode (half -duplex,synchr)



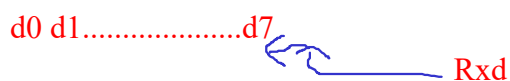
NOTE: When we dont have enough pins available in our microcontroller to connect the external devices then can take support of UART M0 operation to expand the port pins.
Special requirement.

Frame format:



TI---Transmission interrupt flag

In Mode 0, when d7 bit gets transmitted out then TI flag will automatically sets



In Mode 0, RI will set automatically when d7th bit is received.

REN:Receive enable bit

REN=1: Reception is enabled
=0: disabled

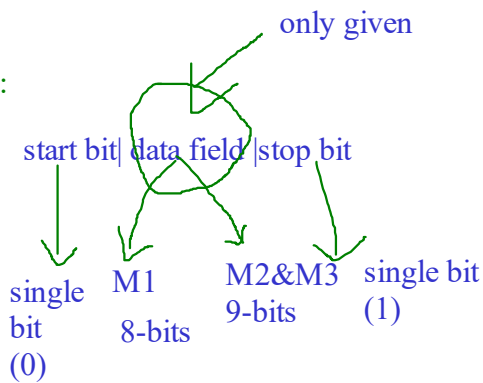
NOTE:1. SM2,TB8,RB8 bits are not used in UART Mode 0.

2. Clk(Fosc/12) shifts through the P3.1 pin

Tx/Rx speed cannot be varied by the programmer--Fixed baud rate mode

Programmer
point of view

M1,M2&M3:



SM0,SM1----mode selection

TI----sets automatically when stop bit gets transmitted out

RI---sets automatically when stop bit is received in

M1 & M3:

Variable baud rate

$$\text{Baud rate} = ((2^{\text{SMOD}}) \times \text{Fosc}) / (12 \times 32 \times (256 - \text{TH1}))$$

Timer 1
in Mode 2
is used to set the baud rate
for UART M1 & M3

PCON.7

(PCON---supports only byte level operations)

SMOD: single bit

TH1---8-bit register

can be varied through the programmer

TH1----- 0 to 255

SMOD=0 or 1

256X2=512 various baud rates

UART M2:

$$\text{Baud Rate} = (2^{\text{SMOD}}) \times \text{Fosc} / 64$$

Fixed baud rate mode