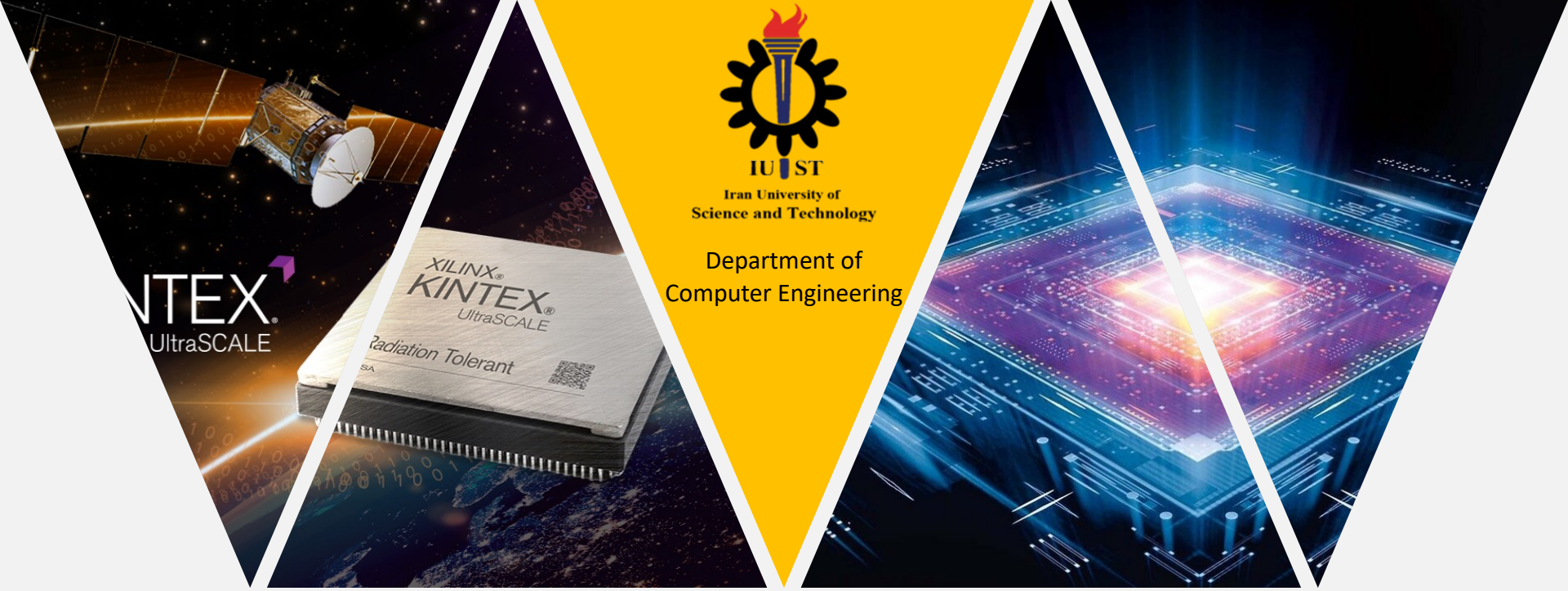


IUST
Iran University of Science and Technology

Department of Computer Engineering

Computer Architecture Laboratory

UART Serial Communication

Lecturer: Ali Javadi

Javadi_ali@comp.iust.ac.ir

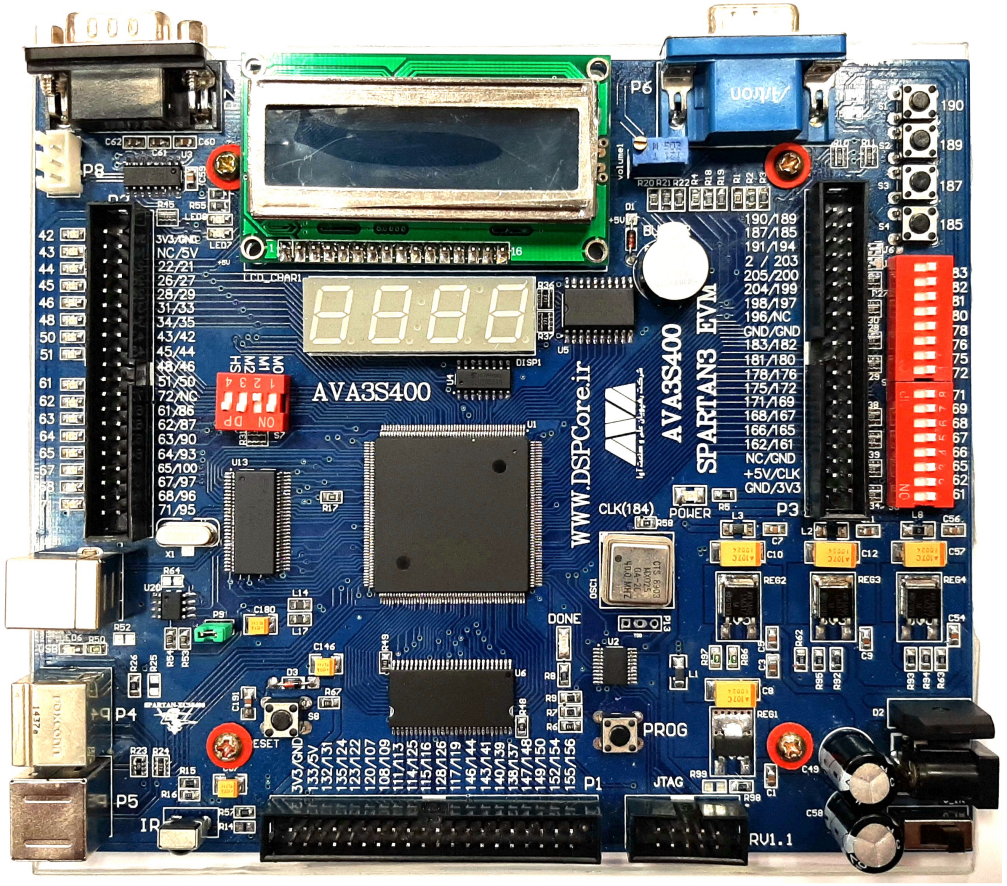
5th session

CPS LAB
IUST
Cyber-Physical Systems Laboratory

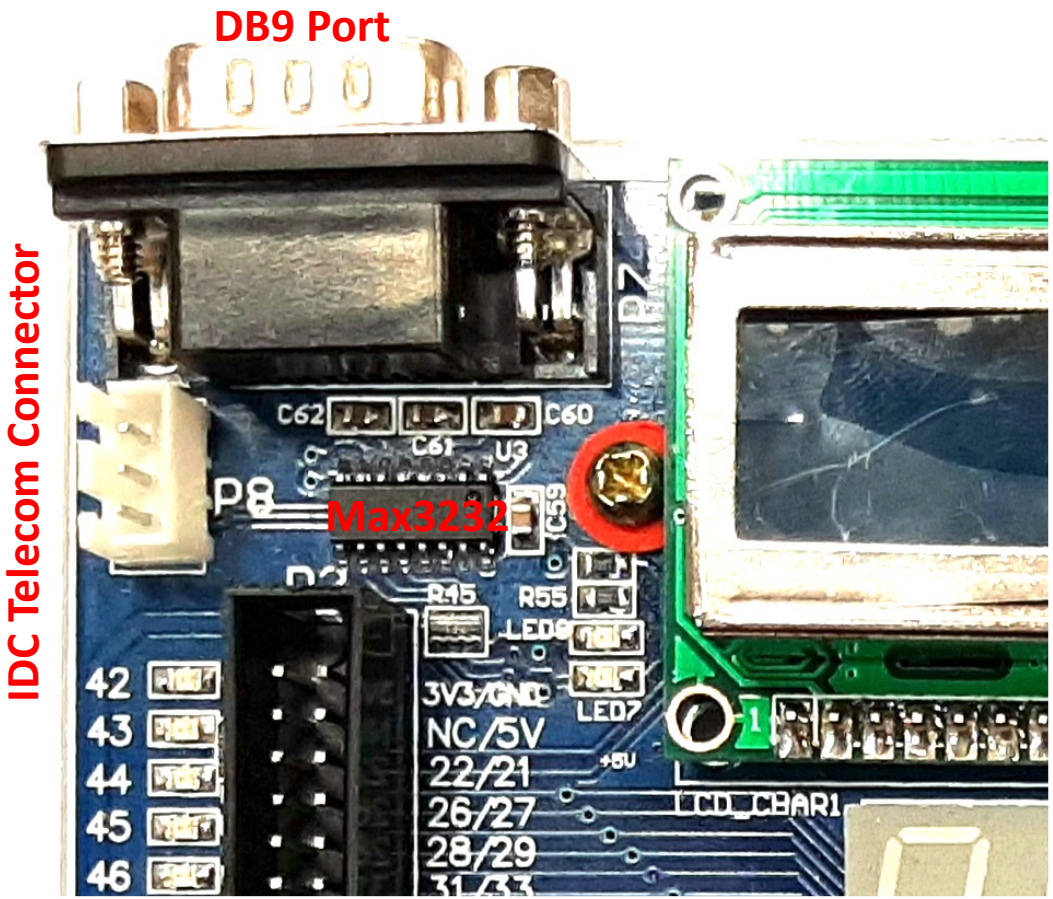
Overview

- RS-232 Physical Layer
- Circuit Schematic
- How the Protocol Works
- Experiment

RS-232
Physical Layer

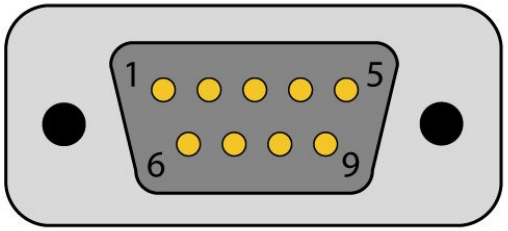


RS-232
Physical Layer



RS-232
Physical Layer

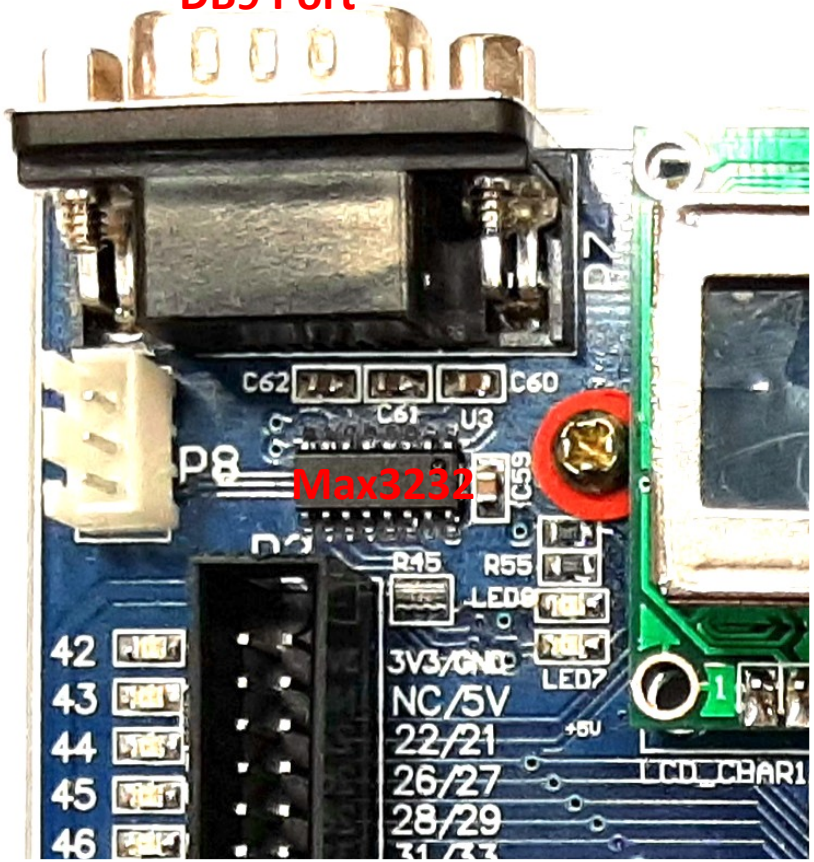
DB9M Connector



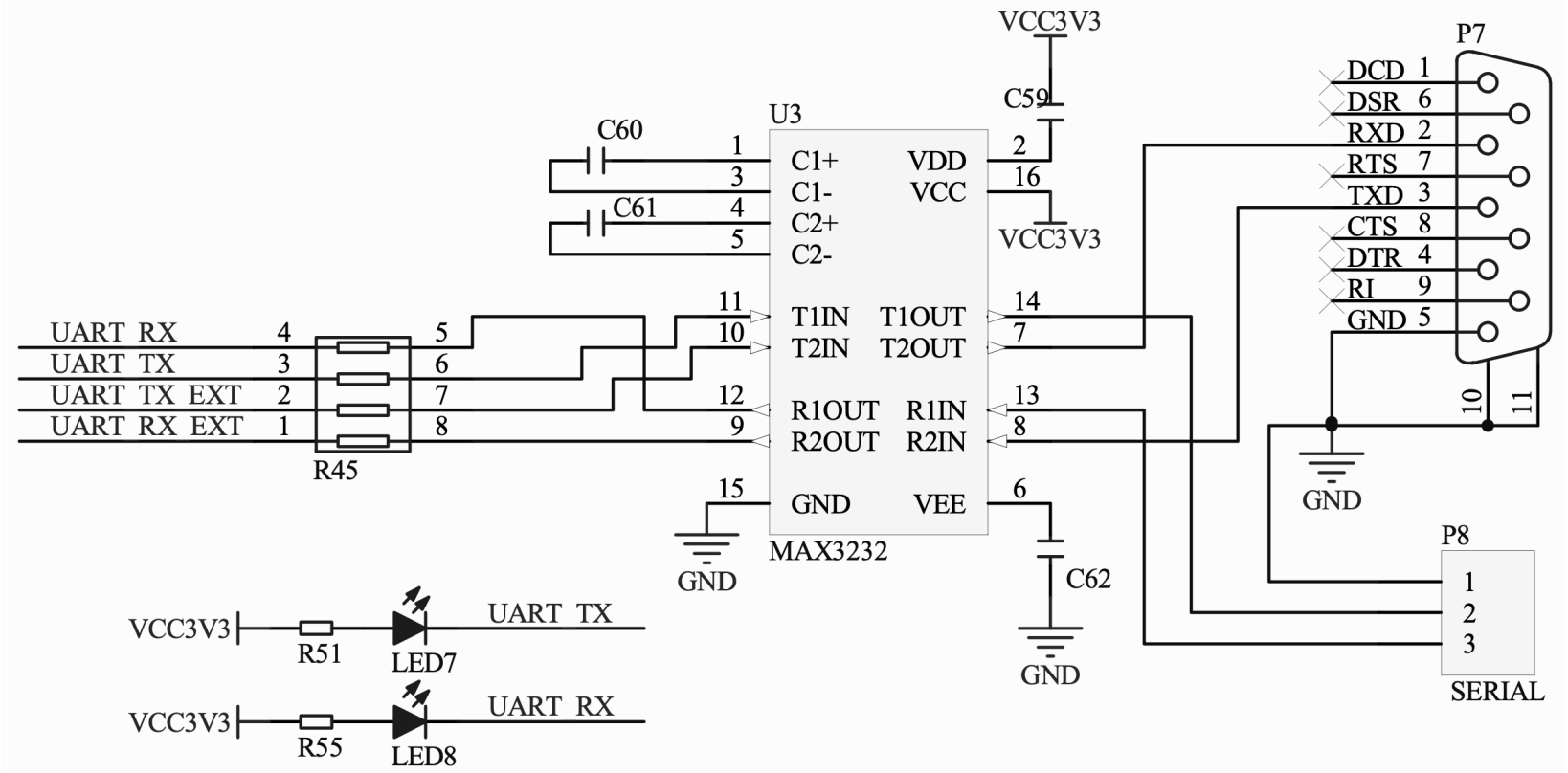
RS232 Pin Out

Pin #	Signal
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

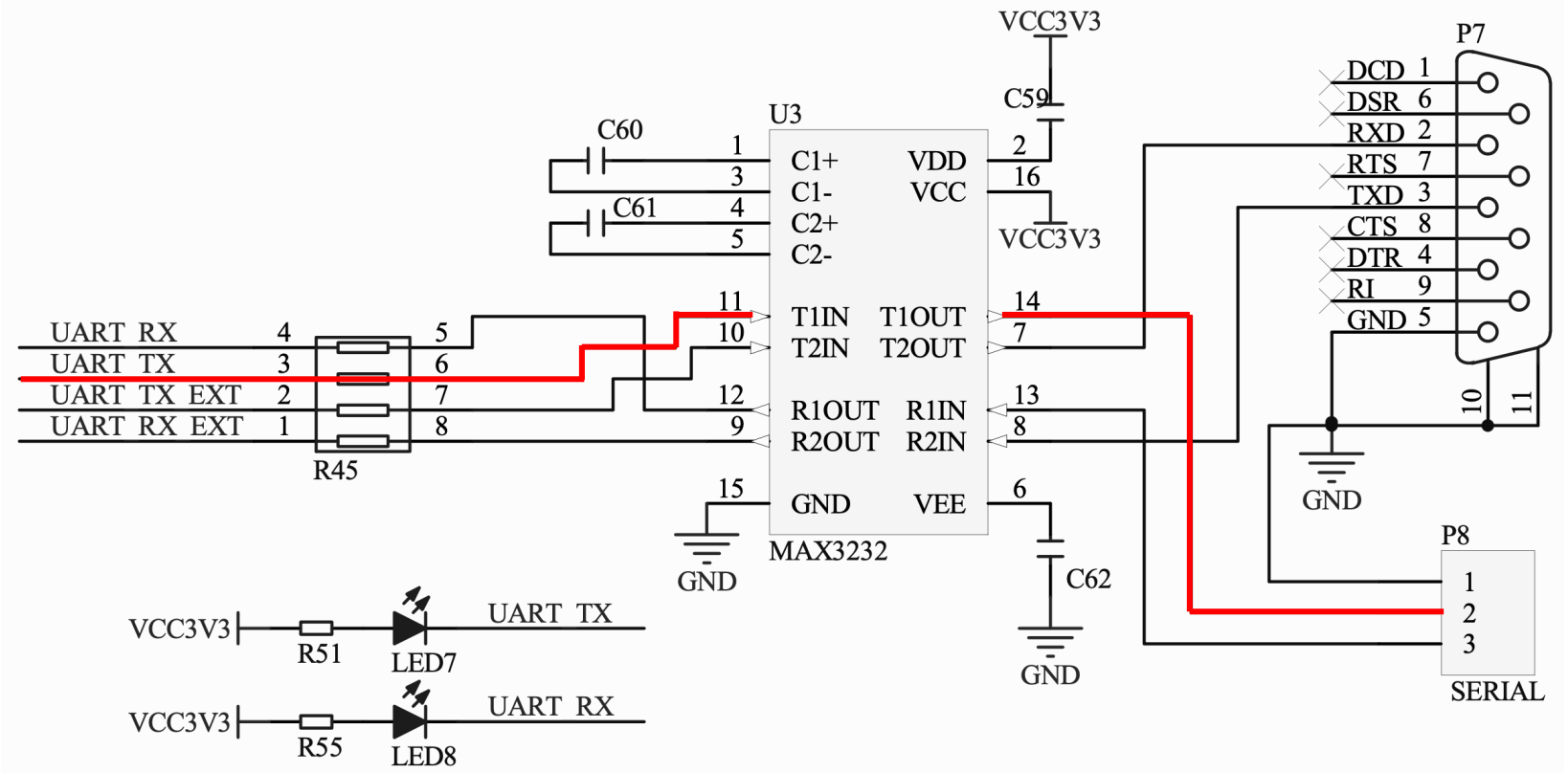
DB9 Port



Schematic


VCC3V3
C59
U3
C60
C61
C1+
C1-
C2+
C2-
VDD
VCC
VCC3V3
T1IN
T2IN
T1OUT
T2OUT
R1OUT
R2OUT
R1IN
R2IN
GND
VEE
MAX3232
C62
GND
P7
DCD 1
DSR 6
RXD 2
RTS 7
TXD 3
CTS 8
DTR 4
RI 9
GND 5
10
11
GND
P8
1
2
3
SERIAL
UART RX
UART TX
UART TX EXT
UART RX EXT
R45
VCC3V3
R51
LED7
UART TX
VCC3V3
R55
LED8
UART RX

Schematic


VCC3V3
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R1IN
R2IN
GND
VEE
MAX3232
C62
GND
GND
P7
DCD 1
DSR 6
RXD 2
RTS 7
TXD 3
CTS 8
DTR 4
RI 9
GND 5
10
11
P8
1
2
3
SERIAL
UART RX
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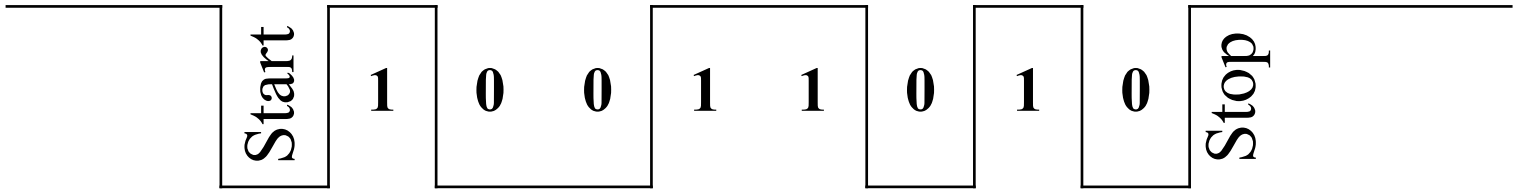
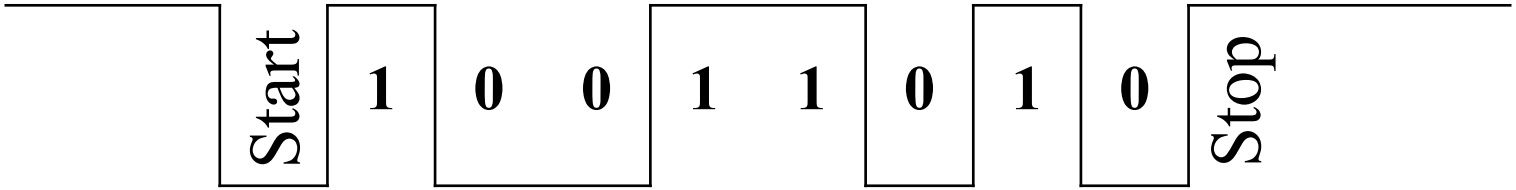
LED7
UART TX
VCC3V3
R55
LED8
UART RX

How the Protocol Works



How the Protocol Works

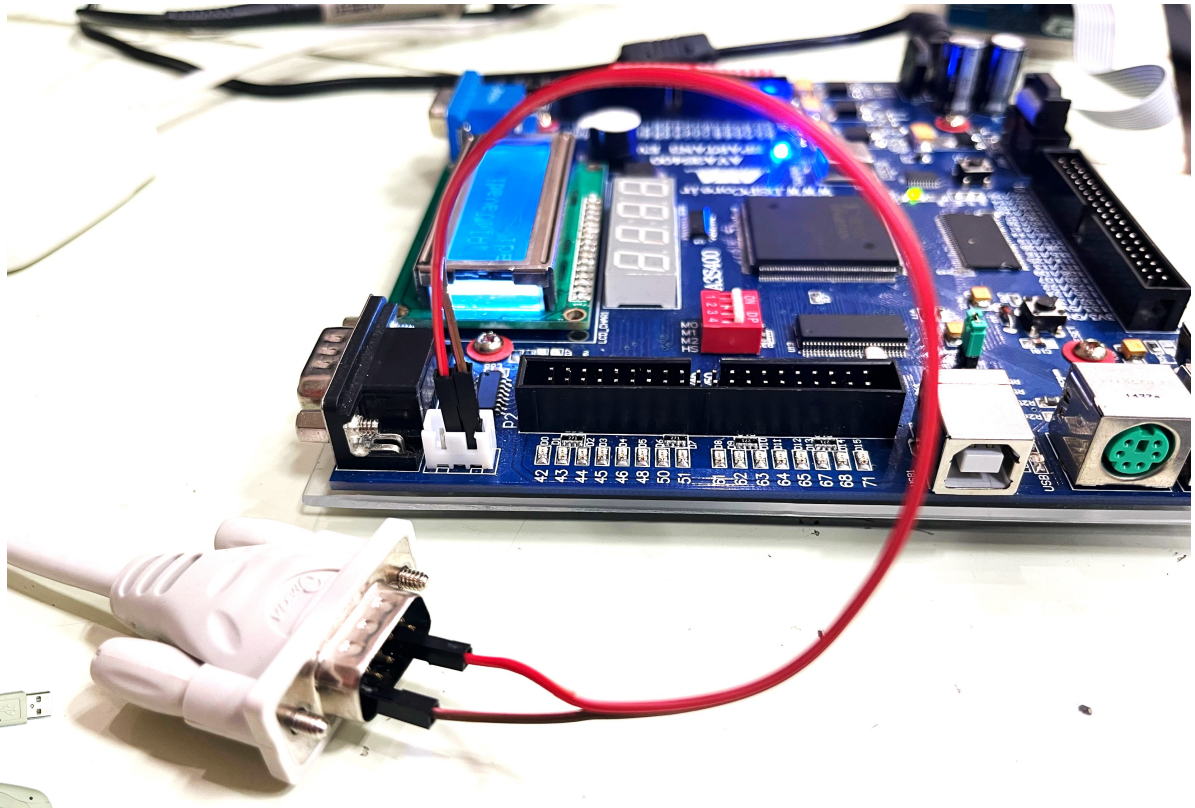


Bauds	Bit duration	Speed
9600 bauds	**104.167 µs**	**1200 bytes/s**
19200 bauds	52.083 µs	2400 bytes/s
28800 bauds	34.722 µs	3600 bytes/s
38400 bauds	26.042 µs	4800 bytes/s
57600 bauds	17.361 µs	7200 bytes/s
76800 bauds	13.021 µs	9600 bytes/s
115200 bauds	**8.681 µs**	**14400 bytes/s**

Experiment

```
entity RS-232 is
Port ( GCLK : in STD_LOGIC;
       TX : out STD_LOGIC;
       DIP : in STD_LOGIC_VECTOR (7 downto 0)
);
end RS-232;

architecture Behavioral of RS-232 is

   process(GCLK)--For Generate UART Clock
   //to do
   end process;

   process(CLKUART)--To Send Bits in The Correct Order
   //to do
   end process;

end Behavioral;
```

Experiment



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THANK YOU

Cyber-Physical Systems Laboratory

cps.iust.ac.ir

+98 (21) 73225350

Javadi_ali@comp.iust.ac.ir

Room 120, Department of Computer Engineering, Iran University of Science and Technology, University Road, Hengam Street, Resalat Square, Narmak, Tehran, IRAN 16846-13114.