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INTERNATIONAL COLLEGE OF ENGINEERING & MANAGEMENT | AFFILIATED TO TRIBHUVAN UNIVERSITY

Lab Manual on Instrumentation-II

BEX/BCT(III/I)

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Marks Distribution:

SN	Particular	Marks Distribution	Remarks
1	Attendance and Lab Discipline	5	Compulsory
2	Lab report	5	Only for Timely Submitted
3	Group Project	7	Compulsory
4	Final lab exam	8	Conducted with Experiments
	Total	**25**	

Lab1: Serial Interfacing with Microprocessor Based System-Null Modem Connection using DB-9 and RS232 Serial Standard

Objectives:

- To become familiar with DB-9 and RS232 standard
- Demonstration of Serial communication between two PCs

Apparatus:

- DB-9 -1pair
- Cat cable
- PCs.

Theory:

The serial port is harder to interface than the parallel port. In most cases, device you connect to the serial port will need the serial transmission converted back to parallel so that it can be used easily. This can be done using the UART. On the software side of things, there are many more registers that you have to attend than a standard parallel port (SPP).

Advantages of serial data transfer over parallel:

1. Serial can be longer than the parallel cables, the serial port transmit '1' as -3 to -25 volts and '0' as +3 to +25 volts whereas parallel port transmits a '0' as 0v and '1' as 5v. Therefore the serial port can have the maximum swing of 50 volts. Therefore cable loss is not going to be as much of a problem for serial cables as they are for parallel.
2. You don't need many wires for communication as of parallel transmission.
3. Microcontrollers have also proven to be quiet popular these days; many of which have built in SCI (Serial communication Interface), which can also be used to talk to outside world. Serial communication reduces the pin counts on these MPU's to only TX and RX, compare to at least 8 pins if you use 8 bit parallel method.

The standard port addresses of Serial port are: Table1: COM port Address in the BIOS Data Areas

Name	Address
COM 1	3F8
COM 2	2F8
COM 3	3E8
COM 4	2E8

Start Address	Function
0000:0400	COM1's base Address
0000:0402	COM2's base Address
0000:0404	COM3's base Address
0000:0406	COM4's base Address

Hardware properties:

Devices which use serial cables for their communication are split into two categories. These are DCE (Data Communication Equipment) and DTE (Data terminal Equipment). DCE are devices as your modem, plotter etc. while DTE is your computer or terminal. The electrical specifications of the serial port are contained in the EIA (Electronic Industry Association) RS232 standard. It states many parameters such as-

1. A “space” (logic 0) will be between +3 and +25 Volts.
2. A “Mark” (logic 1) will be between -3 and -25 Volts.
3. The region between +3 and -3 volts is undefined.

Serial ports come in two “sizes”, there are D-Type 25 pin connector and the D-Type 9 pin connectors both of which are male type in the back of your PC. Thus you need female connector to connect on your device. In this lab we will only concern only about DB-9 connector. Figure below is the pin configuration of DB-9 male connector:

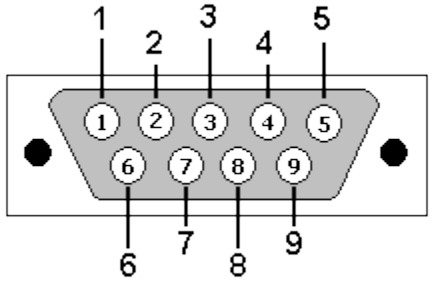

Fig 1: D-sub 9 Connector Pin-out

Table 2: Pin-out and diagram of DB9 connector, commonly used for serial ports (RS-232).

Pin	SIG.	Signal Name	DTE (PC)
1	DCD	Data Carrier Detect	In
2	RXD	Receive Data	In
3	TXD	Transmit Data	Out
4	DTR	Data Terminal Ready	Out
5	GND	Signal Ground	-
6	DSR	Data Set Ready	In

7	RTS	Request to Send	out
8	CTS	Clear to Send	in
9	RI	Ring Indicator	in

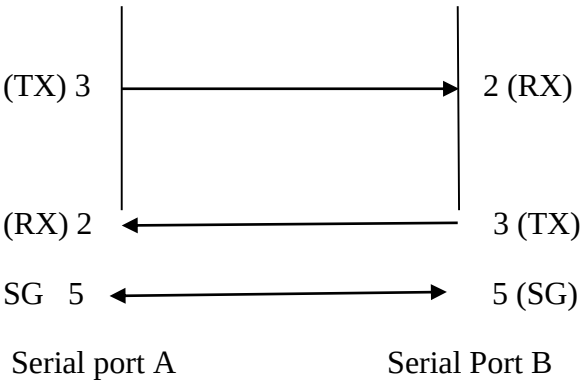

Fig 2: Wiring diagram of Serial communication (Null Modem)

Procedure:

i. Carry the pair of DB-9 (Female), CAT cable, Soldering iron with solder & flux.

ii. Set-up the Null Modem; Connect the wires according to figure 2.

iii. Connect the prepared cable between two PCs. (The assigned address for COM ports(1&2) can be seen by programming in turbo C.)

```
#include  <stdio.h>
#include  <dos.h>
void main(void)
{
 unsigned int far *ptraddr;  //pointer to location of port address
unsigned int address;                    //Address of the port
int a;
ptraddr=(unsigned int  far *)0x00000400;
for(a=0;a<4;a++)
{
 address=*ptraddr;
If(address==0)
printf("No port found for COM%d\n",a+1);
else
printf("Address assigned to COM%d is %Xh\n",a+1,address);
*ptraddr++;
}
}
```

iv. Open the "**Terminal"** desktop application in both PCs and set the following parameters:

- COM port: 1
- Baud rate: 9600
- Data bit: 8 with none parity & handshake

v. Send & Receive the data by typing the data like: Type "Hello" in transmitter (PC1), Receive same in Receiver (PC2).