WEEK 1.6

FILE TRANSFER PROTOCOLS

One of the first and still one of the most important uses of computer networks is the ability to transfer files from one system to another. With this laboratory session you will become familiar with the basic principles of file transfer.

🕛 You have one 2-hour supervised laboratory session to start work on the practical tasks. The remainder must be completed in your own time before next week.

Form **groups of four**

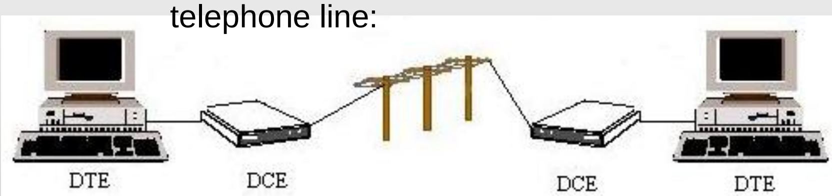
Make sure you have all the components, files and software needed.

- ☐ EIA-232 breakout box
- ☐ Five data files :
  - [800.DAT](),
  - [4000.DAT](),
  - [8000.DAT](),
  - [12000.DAT](),
  - [16000.DAT]()

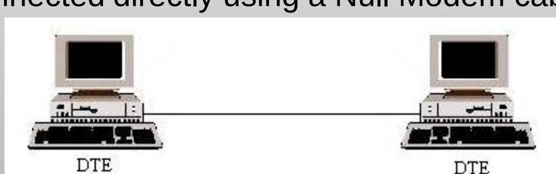
(download each file by right clicking and 'Save As' in D:\PCP).

- ☐ Procom Plus software
- ☐ Stop Watch Software - located on the T drive.
- ☐ Two PCs

Modems can be used to connect PCs via a telephone line:

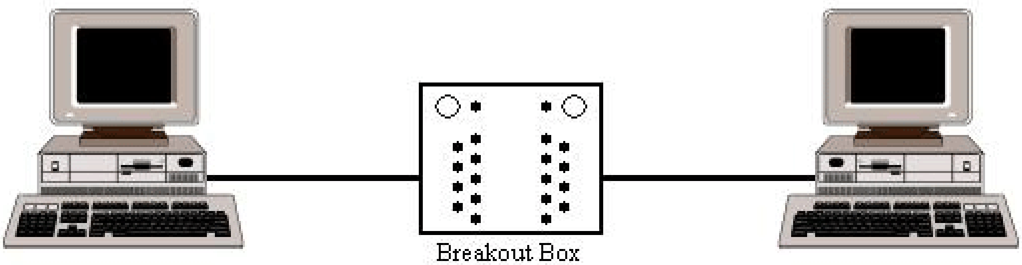


If the distance is short, then the two PCs may be connected directly using a Null Modem cable:

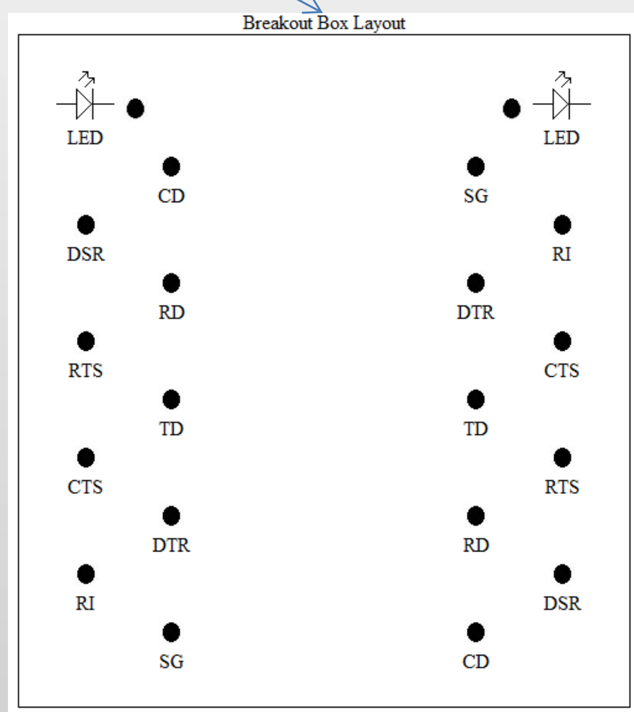


EIA 232: - In 1962, a committee developed a serial interface standard for data transmission between equipment. At the time, it was planned primarily for communications between computer and modem, but has become widely used for communications between the computer and other peripherals. The EIA-232 standard is asymmetrical as to the definitions of the two ends of the communications link, so it assumes that one end is a DTE and the other is a DCE e.g. a modem. With a null modem connection, the transmit and receive lines are cross linked. Depending on the purpose, sometimes also one or more handshake lines are cross linked. EIA 232 data is bi-polar +3 to +12 volts indicates logic 0-state while -3 to -12 volts indicates a logic 1.

Connect the apparatus as shown below:



For your reference in later tasks:



If the LED is “green” then the voltage is negative; if “Red” (or yellow/orange), then it is positive.

Carrier Detect (**CD**): A Signal on this line (change to logic 0) is used to indicate to the DTE that the DCE has received an answer from the remote DCE. In the case of a Modem it indicates that it is receiving a carrier signal from a remote modem.

Receive Data (**RD**): This line is used by the DCE to transfer data to the DTE.

Transmitted Data (**TD**): This line is used to transmit the bit stream of data from the DTE to the DCE. When no data is being transmitted the line is held at logic 1.

Data Set Ready (**DSR**): The signal on this line flows from DCE to DTE. A change to logic 0 (positive voltage) indicates the DCE is ready. In the case of a modem, it serves as a signal to the terminal that the modem is connected to the telephone line and is ready to transmit.

Request to Send (**RTS**): - The signal on this line (change to logic 0) is sent from the DTE to the DCE to prepare the DCE for transmission. Prior to this actually sending the data, the DTE must receive a Clear to Send signal from the DCE.

Clear To Send (**CTS**): The signal on this line (change to logic 0) logic indicates to the DTE that the DCE is ready to receive.

Ring Indicator (**RI**): The signal on this line indicates flows from the DCE to the DTE and indicates to the DTE that the DCE is receiving a ringing signal from the remote DCE. This is used by an auto answer modem to 'wake up' the attached DTE.

Signal Ground (**SG**): Ground reference for all other lines.

Data Terminal Ready (**DTR**): The signal on this line flows from the DTE to the DCE. A change to logic 0 indicates to the other equipment that it wishes to communicate. In the case of a modem, it prepares it to be connected to a telephone line, and once connected, to remain connected.

TASK 1

Restart the PCs and **do NOT load the Procom Plus software**. Place one end of a patch lead in the socket beside a LED and use the other end to probe the interface sockets to determine the initial voltage states of the interface lines on both the left and right sides of the breakout box. Record the initial status of the left and right interfaces to the 'Status Before Wiring' column in Table 1 by recording +, -, or 0 for each interface socket.

- Negative voltage

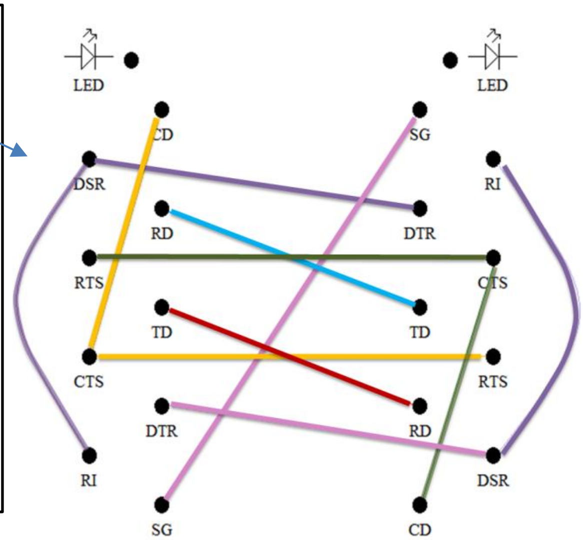
\+ Positive voltage

0 No voltage

TASK 2

Wire the breakout box as a Null Modem. **Again, do NOT load the Procom Plus software.** Place one end of a patch lead in the socket beside a LED and use the other end to probe the interface sockets to determine the voltage states of the interface lines on both the left and right sides of the breakout box. Record the status of the left and right interfaces to the 'Status After Wiring' column in Table 1.

Note: Do not connect the LED to more than one pin



Acronym	Function	Status Before Wiring		Status After Wiring		Final Status with Procom Plus Running	
		Left	Right	Left	Right	Left	Right
CD	Carrier Detect						
RD	Receive Data						
TD	Transmit Data						
DTR	Data Terminal Ready						
SG	System Ground						
DSR	Data Set Ready						
RTS	Request to Send						
CTS	Clear to Send						
RI	Ring Indicator						
		Task 1		Task 2		Task 3	

Table 1

TASK 3
Now, **load the Procom Plus software** and probe the interface sockets again. Record the status of the left and right interfaces to the 'Final Status with Procom Plus Running' column in Table 1 (previous page).

TASK 4
In Procom Plus, change directory to the one where you stored the data files you downloaded (the default is D:\PCP).
Calculate the time to transfer each of the five files over a 1200 bps link and then measure it (with the stopwatch) for each protocol: Kermit, X-modem and ASCII.
The receiving computer should bleep - provided speakers are connected - when the transfer is ended (Kermit and X-Modem) and this can be used as a stopping point for all timings. If no speakers are connected view the 'Download' PC and wait for a 'Transfer Complete' message to appear. With ASCII watch the 'Download' PC and wait for the X's to stop.

Record your results in Table 2. Then, use the data to plot the time versus file size (time on the vertical axis; file size in bits on the horizontal axis) on to a “Graph 1 - Transfer Time” that you will create.

Do not forget to put a proper title above the graph. Label both axes properly (e.g. “Time (s)” on the vertical axis)

The software can only initialise if the correct connections have been made. Ensure that initial settings are set to (1200,E,8,1) [1200 b/s; E = even parity; 8 = data bits; 1 stop bit] for both machines. Make sure you launch it on the computer the box is connected to.

ALT P: change the settings of the serial port.

ALT F7: change the directory

ALT Z: Procom Help menu

ALT X: quit

PgUp: Upload the data files on sender computer

PgDn: Download the data files on the receiving computer

To transfer files:

One of the machines should be set to “Upload” files (by pressing the PgUp key) and the other to “Download” files (by pressing the PgDn Key). From the menu choose the appropriate protocols on both machines (Kermit, X-modem and ASCII).

Remember that size in bits = 8 * size in bytes

File	File Size (**in bits**)	Time (**s**) - Calculated	Time (**s**) - Kermit	Time (**s**) – X-modem	Time (**s**) – X-ASCII
800.DAT					
4000.DAT					
8000.DAT					
12000.DAT					
16000.DAT					

Table 2

You know each filesize and the speed of the line. So, you can calculate the time it should ideally take to transfer each file.

These ones are for the actual time that you measured for each file transfer (use the stopwatch). Convert this into seconds.

TASK 5

a) Determine the data throughput (throughput = (file size * 8) / time taken) achieved for each file size, by each of the protocols, record the results in Table 3 (next page) and plot them on a second graph – “Graph 2 – Throughput” (throughput on the vertical axis in bits per second; file size in bits on the horizontal axis). Plot the line speed and all three protocols’ throughput on to the one graph.

b) Compare the protocol Kermit and X-modem. When do they begin to transmit a file and what information is being exchanged in each case? Explain why Kermit is taking so long before transmission begins? *(Hint: deduce this from the messages displayed)*

c) Comment on the efficiency of the different protocols. Explain the differences in the throughput achieved by the different protocols. Why do the different protocols have different throughputs even if the file sizes are the same, and the line speed (bit rate) and equipment are the same for each protocol?

File	File Size (**in bits**)	Line Speed (bps)	Throughput (bps) – Kermit	Throughput (bps) - X-modem	Throughput (bps) - ASCII
800.DAT		1200			
4000.DAT		1200			
8000.DAT		1200			
12000.DAT		1200			
16000.DAT		1200			

Table 3

TASK 6

Using only Kermit and the 4000.DAT and 16000.DAT files, for varying line speeds, record your results in Table 4, and plot on to a graph 3 (time on the vertical axis, line speed in bits per second on the horizontal axis).

Observe and record any error messages generated at any stages during the experiment. Explain the context of the error message and give the possible reasons for the errors.

As the line speed increases, so the time taken to transfer the file reduces. When the line speed doubles you might expect the time taken to halve – why does this not happen? What line speed you would choose to transmit your files, giving a clear reason for your choice.

File	4000.DAT Time (**s**) - Calculated	4000.DAT Time (**s**) – Kermit	16000.DAT Time (**s**) - Calculated	16000.DAT Time (**s**) – Kermit
300 bps				
1200 bps				
4800 bps				
9600 bps				
19200 bps				

Table 4

TASK 7: REFLECTION (This is a group reflection)

Identify the sections of the laboratory you have understood and demonstrate your understanding - beyond the simple level of completing the laboratory - through cognitive processes such as analysing, explaining, interpreting, and evaluating. Illustrate, by the use of examples how the laboratory contributed towards your understanding and your Degree programme.

For the sections of the laboratory which you struggled with, or were uncertain of, identify why this was the case. Evaluate the effectiveness of your learning strategy, including factors such as, motivation, preparation, commitment, time management, communication, constraints and support. With reflection to past experience, identify how you could improve your learning and performance to overcome the barriers encountered in this laboratory such that they do not infringe upon the next laboratory you undertake.

With relation to the sections of the laboratory you encountered difficulty with, state how, and by when you intend to gain competence in these areas.

Critically appraise the laboratory; identify sections you thought were positive, facilitated your understanding and contributed to your Degree programme; identify sections that require improvement and state how and why would you change the laboratory to improve the laboratory for the next year's students.

Attach the marking scheme on the front of your document, print it and hand it in at the laboratory next week. ONE printout to be handed in per team.
*In addition, **ALL** team members need to individually upload their documents into **week 1.6 (in PDF format)** by midnight the day before their next laboratory.*
Even for your individual uploads, make sure that the marking scheme has the names of all the members of your team.