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**SAIRAM**  
DIGITAL RESOURCES



**EC8394**

**ANALOG AND DIGITAL COMMUNICATION**

**UNIT NO 2**

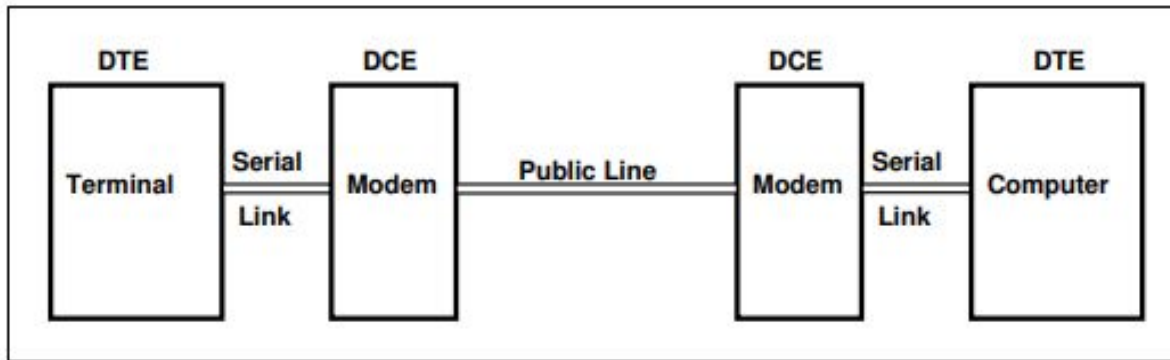
**PULSE AND DATA COMMUNICATION**

**2.5.2 Data Communication Hardware, Serial  
and Parallel Interface**

**ELECTRONICS & COMMUNICATION ENGINEERING**



## Data Communication Hardware



### Data Terminal Equipment (DTE):

- ❖ An end instrument that converts user information into signals or reconverts received signals.
- ❖ The functional unit of a data station that serves as a data source or a data sink and provides for the data communication control function to be performed in accordance with the link protocol.

### Data Communication Equipment (DCE):

- ❖ A device that sits between the data terminal equipment (DTE) and a data transmission circuit.
- ❖ DCE performs functions such as signal conversion, coding, and line clocking and may be a part of the DTE or intermediate equipment.

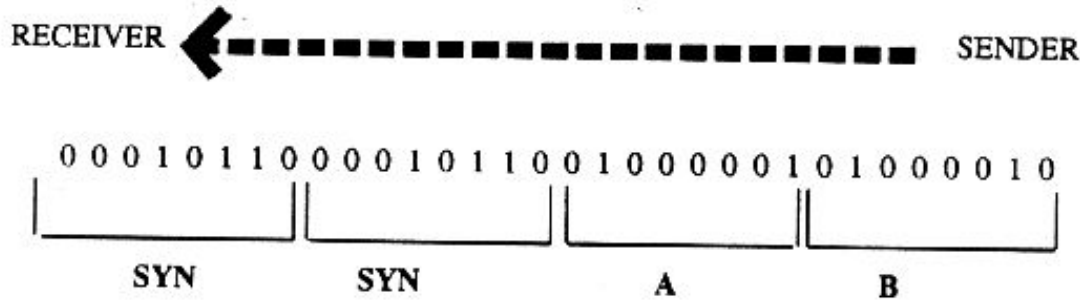
BASIS FOR COMPARISON	DTE	DCE
Basic	A device that is an information source or an information sink.	A device used as an interface between DTEs.
Primary functions	Produces the data and transfers them to a DCE, with essential control characters.	Converts the signals to a format appropriate to the transmission medium and introduces it onto the network line.
Coordination	No coordination is required between DTE devices.	DCE devices must be coordinated in order to communicate.
Included devices	Routers and computers	Modem
Relation	Connected through the help of a DCE network.	DCE network acts as a medium for two DTE networks.

## SERIAL COMMUNICATION

- Serial Communication means sending one bit at a time over a channel



## Synchronous vs. Asynchronous Communication



- Stream of **data is encoded in chunks**
- Various bytes at the beginning of the data provide an embedded clock
- The data stream can also be synchronized by an external clock

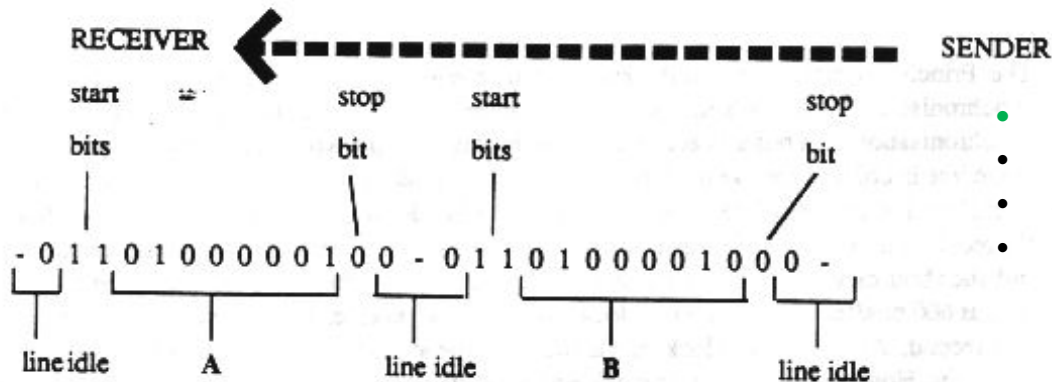
### Advantages

- Amount of transmission information restricted to few characters for each block
- Not prone to distortion
  - Can be used at higher speeds

### Disadvantages

- If error were to occur, whole block of data is lost (100+characters)
- User cannot transmit characters instantaneously
  - Requires storage

## Synchronous vs. Asynchronous Communication



- Data transmitted one character at a time
- Each character contains its own clock
- Start bits and stop bits are used
- Resynchronizes with each character

### Start Bit

- Signals start of transmission of data bits
- Transition from logic 1 to logic 0




### Data Bits

- Typically 8 data bits (not including parity bit)
- Least significant bit is transmitted and received first

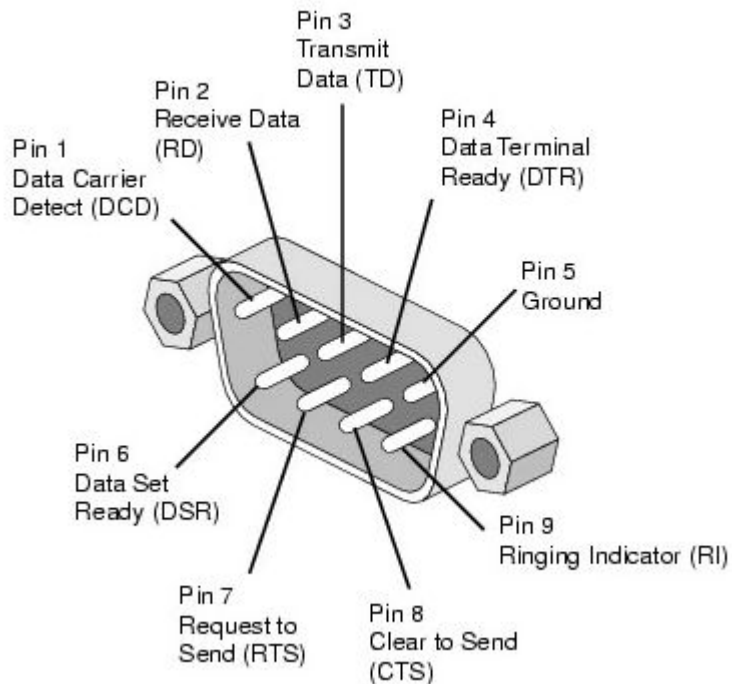
### Stop Bit

- Signals end of data word



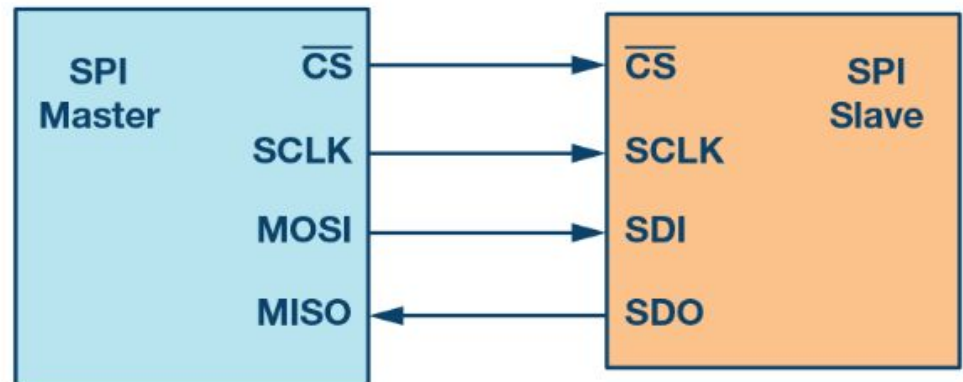
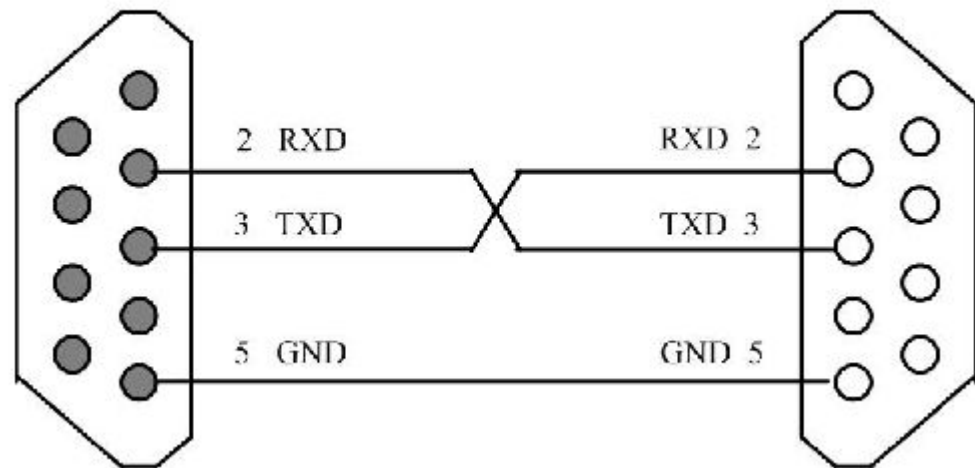
Name	Sync /Async	Type	Duplex	Max devices	Max speed (Kbps)	Max distance (feet)	Pin count (not including ground)
RS-232	async	peer	full	2	115.2	30	2 (or 4 with HW handshake)
RS-422	async	multi-drop	half	10	10000	4,000	1 (unidirectional only, additional pins for each bidirectional comm.)
RS-485	async	multi-point	half	32	10000	4,000	2
I <sup>2</sup> C	sync	multi-master	half	Limitation based on bus capacitance and bit rate	3400	<10	2
SPI	sync	multi-master	full	Limitation based on bus capacitance and bit rate	>1000	<10	3+1 (Additional pins needed for every slave if slave count is more than one)
Microwire	sync	Master / slave	full	Limitation based on bus capacitance and bit rate	>625	<10	3+1 (Additional pins needed for every slave if slave count is more than one)
1-Wire   	async	Master / slave	half	Limitation based on bus capacitance and bit rate	16	1,000	1

# SERIAL COMMUNICATION – RS232 & SPI



Computer port

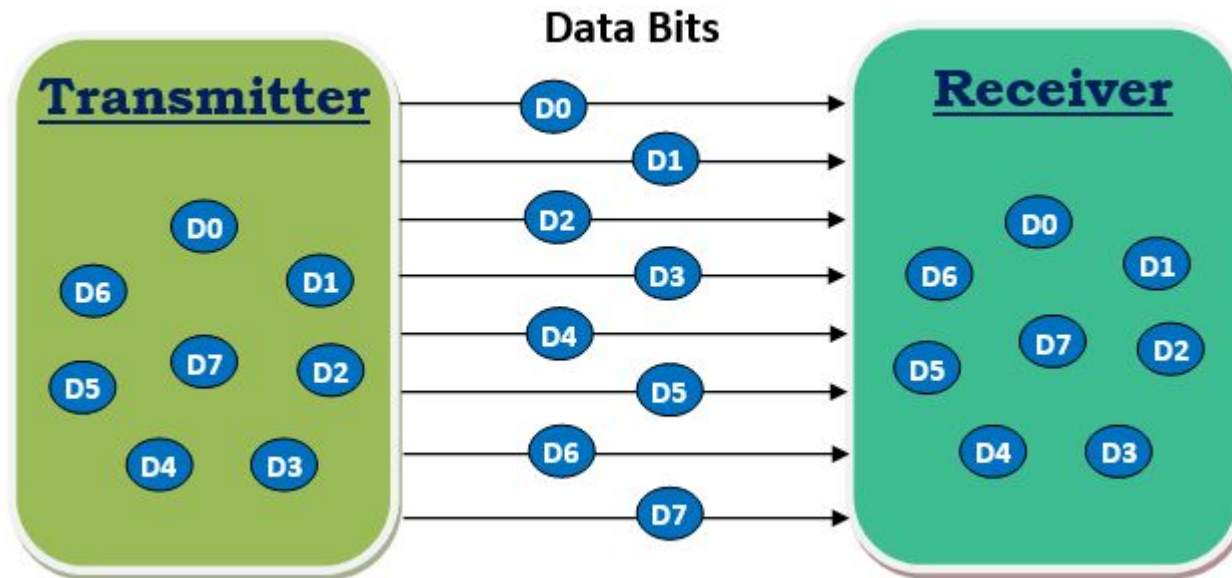
Joint port



SPI configuration with master and a slave.



## PARALLEL COMMUNICATION



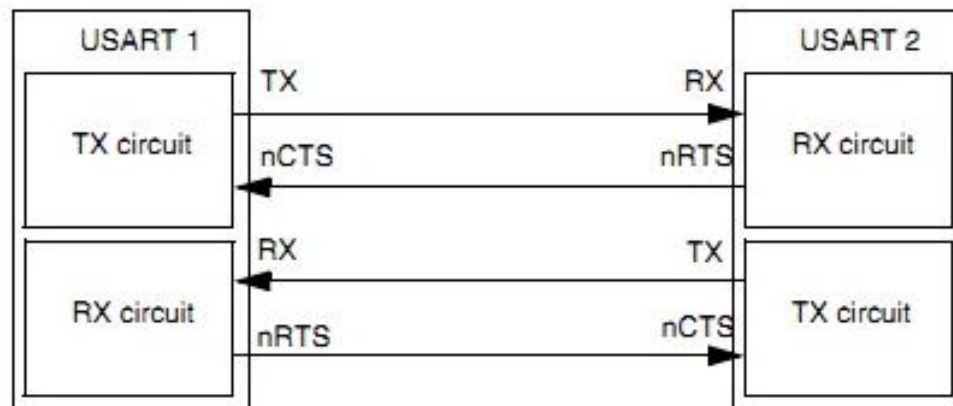
### Advantages

- Faster
- Easy transmission

### Disadvantages

- Costlier
- Preferred for Short distance

# UART & USART



<https://youtu.be/VbROEbqJoq0>

Video link