

King Fahd University of Petroleum & Minerals Computer Engineering Dept

اتصالات و شبكات الحاسب C314

Feb-June 2004

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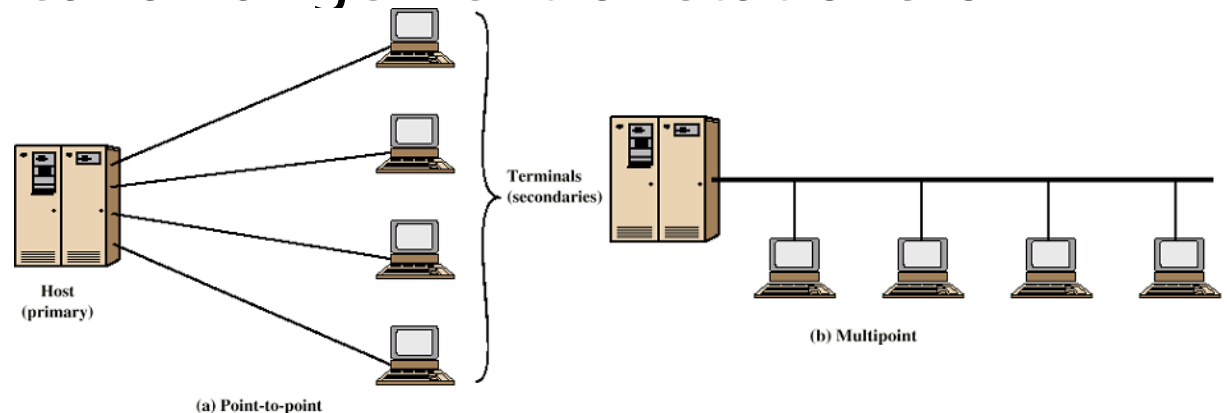
Lecture Contents

1. Line Configuration
 - a. Topology
 - b. Full/Half Duplex
2. Interfacing
 - a. V.24/EIA-232-F
 - b. ISDN Physical Interface

Line Configuration

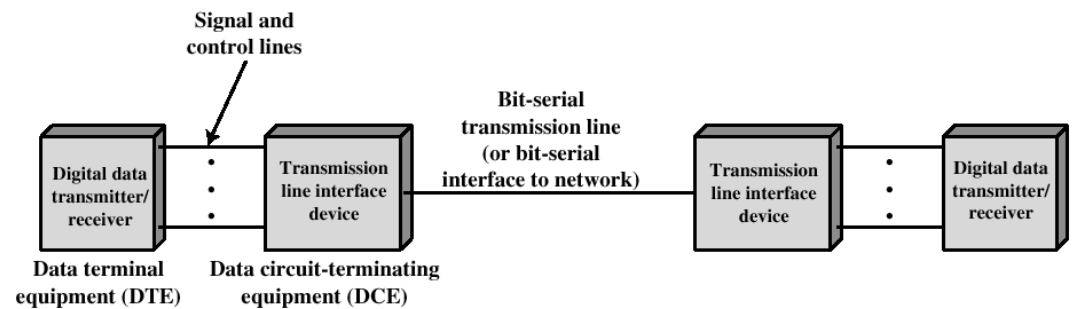
- Full Duplex: Simultaneous transmission and reception
 - Requires two data paths but not necessarily two physical connections or lines
- Half Duplex: one direction active only at any one time
- Topology: Physical arrangement of stations on medium

- Point-to-Point
- Multipoint:



Interfacing

- Data Terminal Equipment (DTE): terminals or computers
- Data Circuit Equipment (DCE): modem
- Two DCEs exchanging data on behalf of DTEs must use exact same protocol



(a) Generic interface to transmission medium



(b) Typical configuration

DTE-DCE Interface Definition

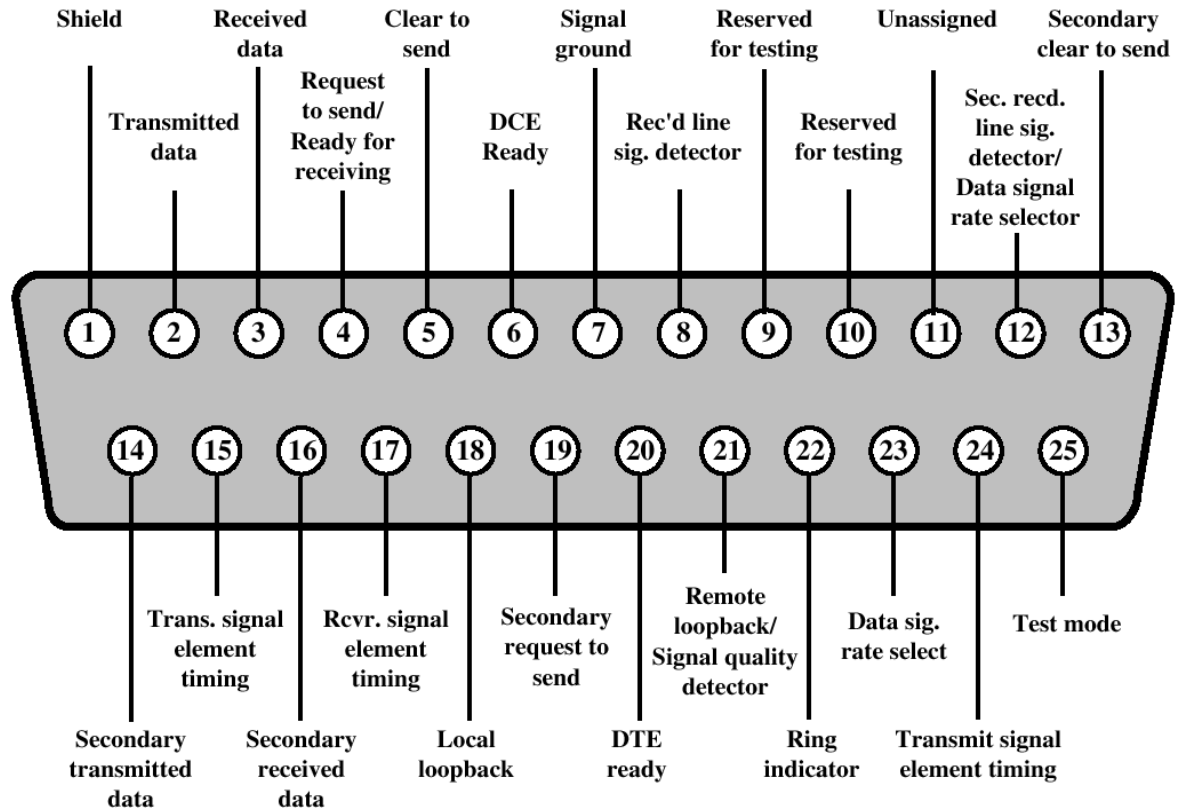
- Mechanical: physical specification of connection
 - type, dimensions, location of pins, etc
- Electrical: voltage levels and timing signals used
- Functional: specify functions that are performed for circuits – rx circuit, tx circuit, etc.
- Procedural: specification of sequence of event for transmitting data based on functional specification
- Two examples:
 - V.24/EIA-232-F, and
 - ISDN physical interface

V.24/EIA-232-F

- Previously known as RS-232
- Used to connection DTE to voice-grade modem
 - This is the connection used to connect a PC to an external modem using the COM port

V.24/EIA-232-F - Mechanical Specification

- 25-pin connector
- In most applications – far less than 25 pins are used
- Pin assignment is shown in figure



V.24/EIA-232-F - Electrical Specification

- Digital signaling is used on all circuits
- Depending on the function of the circuit, electrical value is interpreted as binary data or control signal
- Voltage levels (data/Control):
 - Common ground – 0 volts
 - < -3 Volts – binary 1/OFF signal
 - $> +3$ Volts – binary 0/ON signal
- Assumes NRZ-L signal
- Appropriate for $R < 20$ kb/s and distance < 15 meters

V.24/EIA-232-F - Functional Specification

- Table 6.1
- Circuits:
 - Data
 - Control
 - Timing
 - Ground
- There is one primary data circuit per direction – full duplex is possible
- There are secondary data circuits too

V.24/EIA-232-F - Procedural Specification

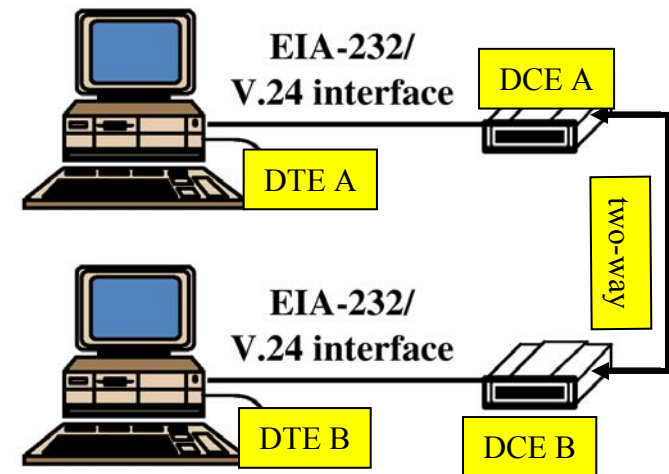
- Defines the sequence in which the various circuits are used for a particular application

V.24/EIA-232-F - Procedural Specification –Examples

- Example 1: Asynchronous private line modem
 - Two terminals (computers) connected back to back through modems (no telephone network)

- **Interchange Circuits Needed:**

- Signal Ground (102)
- Transmitted Data (103)
- Received Data (104)
- Request to Send (105)
- Clear to Send (106)
- DCE Ready (107)
- Received Line Signal Detector (109)



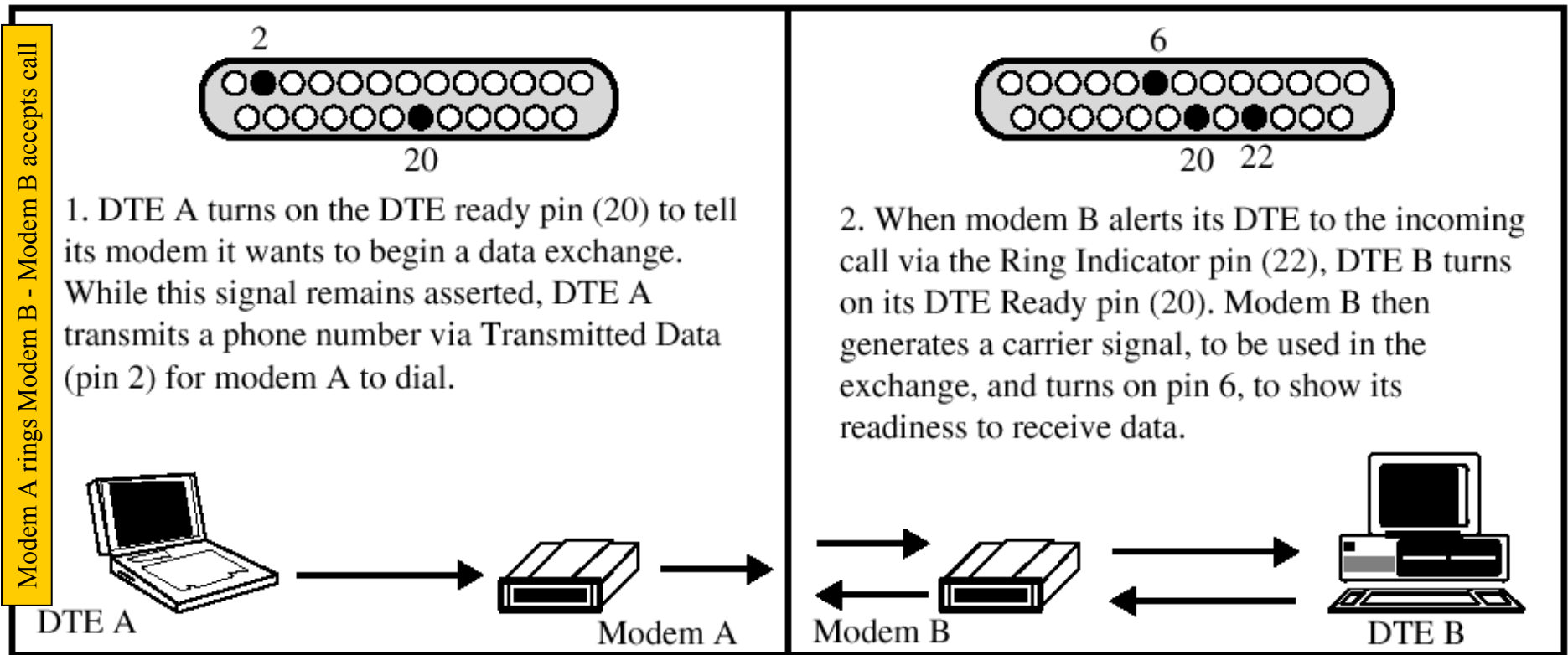
- Sequence:(DTE A sends a character to DTE B)

1. When DCE A is ready (e.g. turned on) → DCE Ready (107) ON
2. When DTE A has data to send → Request to Send (105) ON
3. DCE A responds → Clear to Send (106) ON
4. DTE A now sends data → Transmitted Data (103)
5. When DCE B receives data → Received Line Signal Detector (109)
6. DCE B deliver data to DTE B → Received Data (104)

V.24/EIA-232-F - Procedural Specification – Examples (2)

- Example 2-1: Two terminals exchanging data across a telephone network

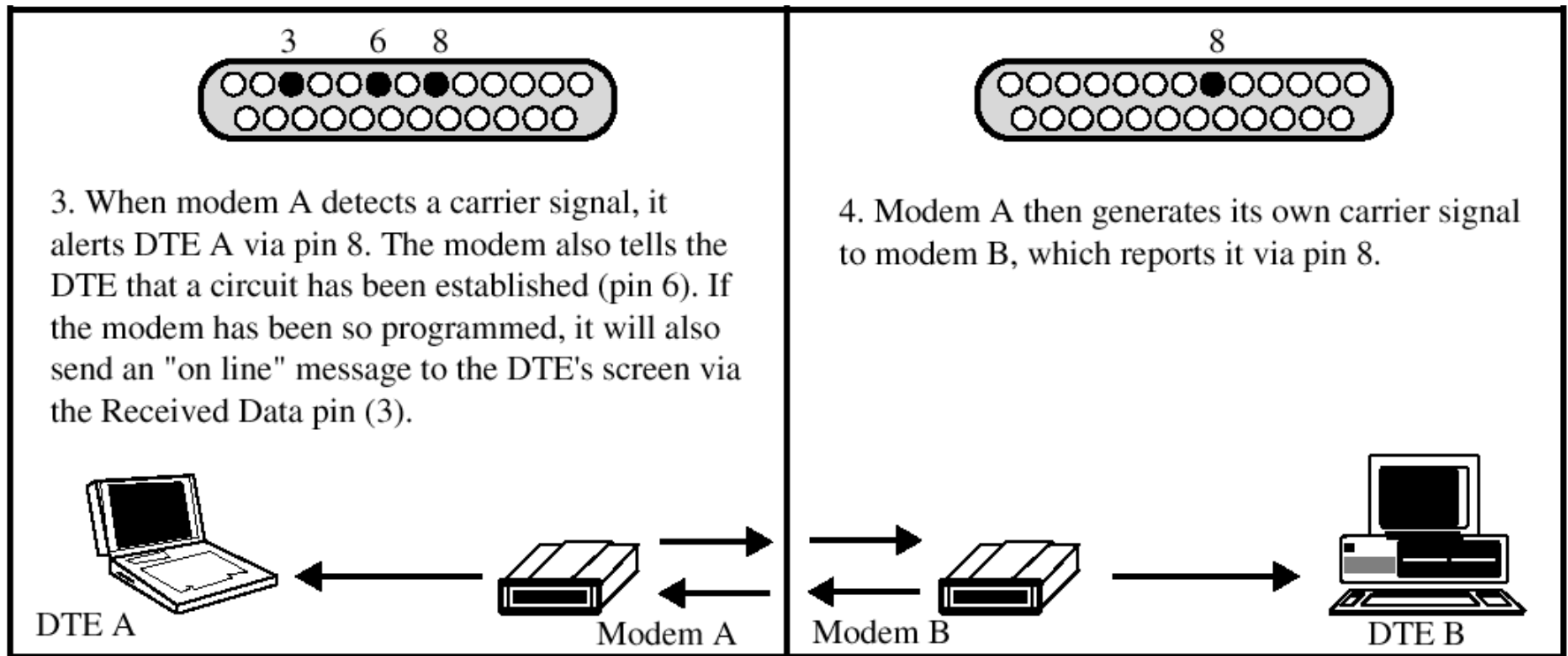
In addition to previous interchange circuits:
-DTE Ready (108.2)
-Ring Indicator (125)



V.24/EIA-232-F - Procedural Specification – Examples (3)

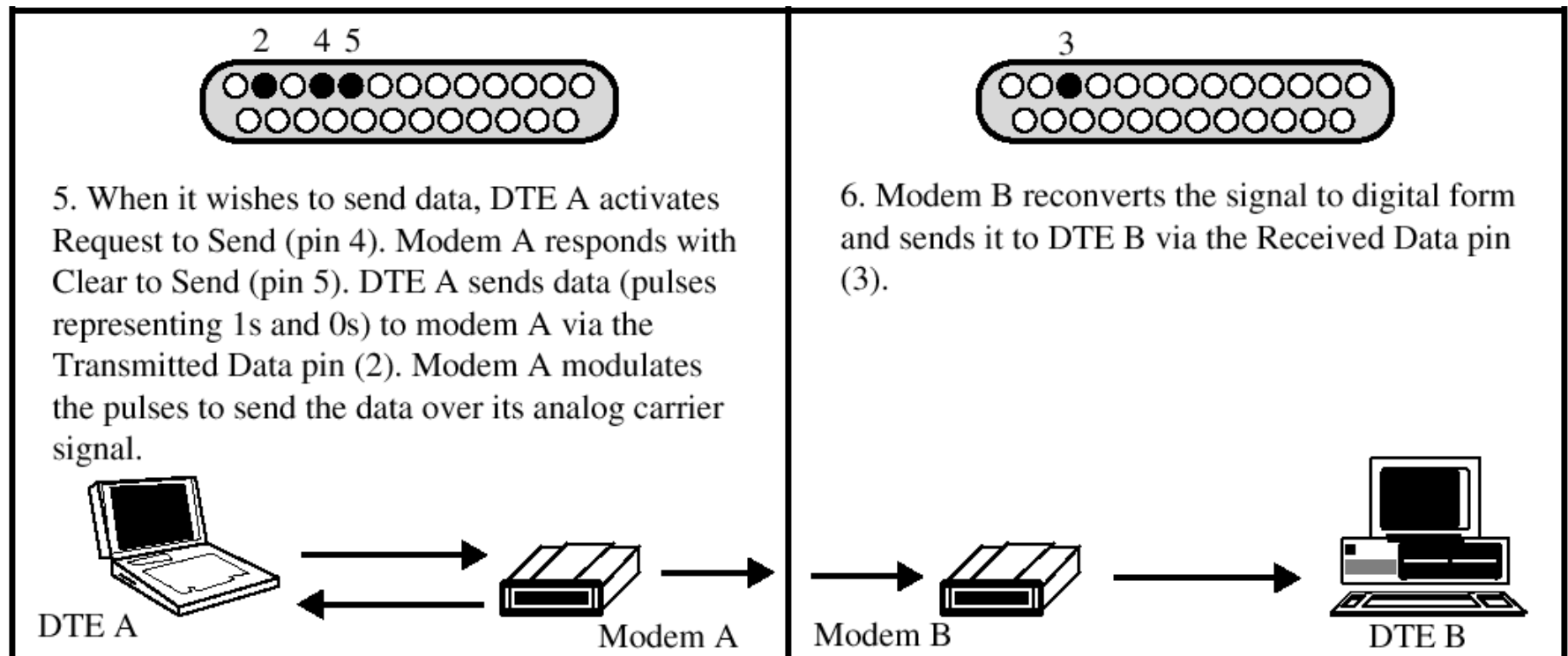
- Example 2-2: Modem A confirms the connection to DTE A and also generates a carrier for Modem B

Pin 8: received line signal detector



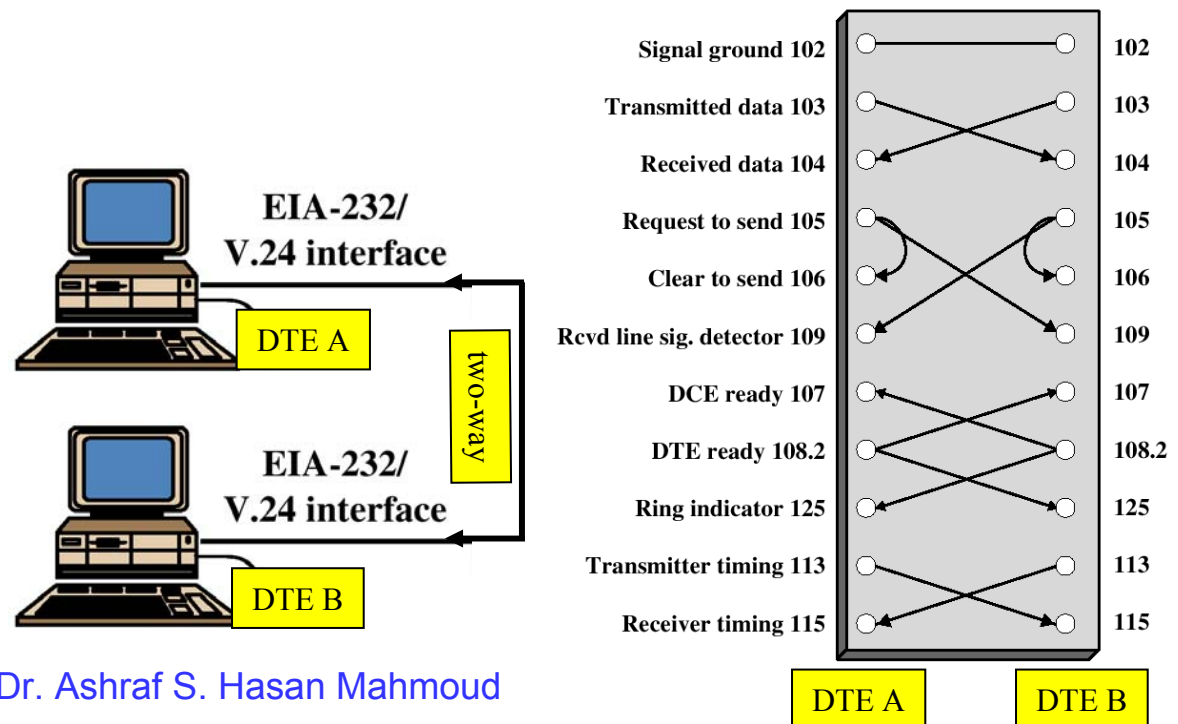
V.24/EIA-232-F - Procedural Specification – Examples (4)

- Example 2-3: Data exchange phase – DTE A sends data to Modem A – Modem A modulate and transmit to Modem B – Modem B recovers data and sends to DTE B



V.24/EIA-232-F - Procedural Specification – Examples (5)

- Example 3: Two terminals connected back-to-back through the V.24 interface BUT with no DCEs
- This is referred to as the NULL modem connection
- For short distance connections

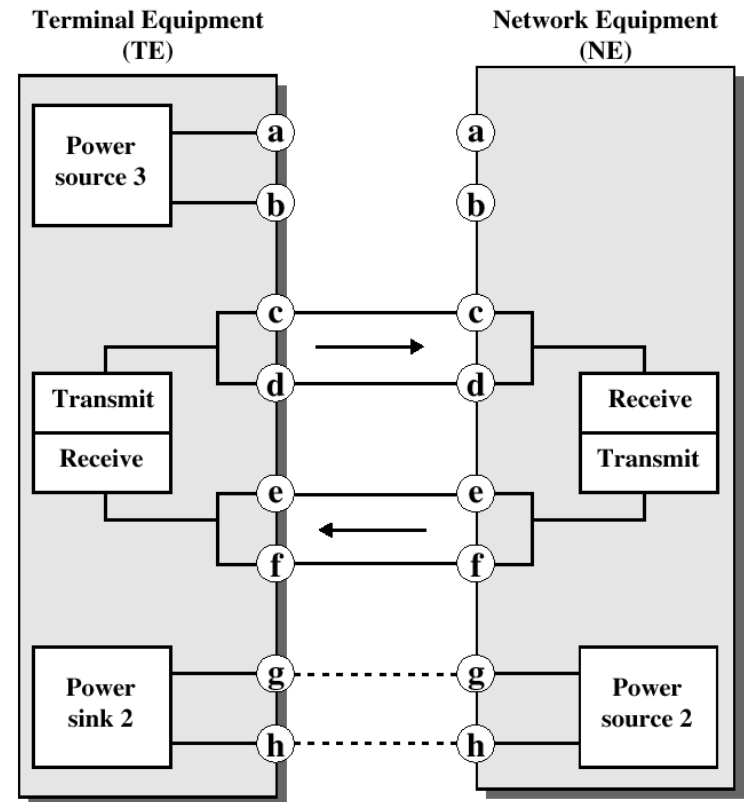


ISDN Physical Interface

- V.24/EIA232-F provides many functionalities using the large number of circuits (expensive)
- Build fewer circuits but more logic into DTE and DCE – Examples:
 - X.21 standard used to interface to public circuit-switched networks uses 15-pin connection)
 - ISND physical interface uses 8-pin connection

ISDN Physical Interface (2)

- ISDN Terminology:
 - TE: Terminal equipment (equivalent to DTE)
 - NE: Network equipment (equivalent to DCE or point of connection to network)
- Two pins for exchanging data and control for each direction (Note TE and NE need to make the right interpretation of signal!)
- May allow to transfer power



ISDN Physical Interface – Electrical Specification

- Balanced Transmission*:
 - Signal transmitted as a current – *Differential Signaling*
 - Binary value – direction of current
- Balanced Transmission is more resistant to interference and produces less noise
- Basic rate of 192 kb/s – Pseudoternary coding: 1 no signal, 0 is +ve/-ve pulse of 750 mV +- 10%
- Primary rate (two options)
 - 1.544 Mb/s – AMI with B8ZS and
 - 2.048 Mb/s – AMI with HDB3

* EIA-232 uses UNBALANCED transmission where a single conductor carries the signal, with ground providing the current return path