

# RS-232

Networks and Embedded Software

Module 5.2.4 (optional)

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# RS-232 (1)

- Design
  - Serial Communication Protocol (cf. Module 4.2.5)
  - Point-to-Point Communication
  - Unidirectional Transmission Lines
    - RxD: Received Data
    - TxD: Transmitted Data
  - Hardware flow control (optional)
    - RTS: Request To Send
    - CTS: Clear To Send

# RS-232 (2)

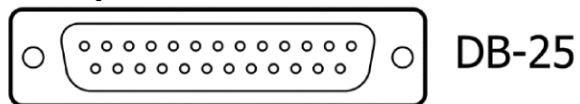
- Design (continued)

- Voltage Levels

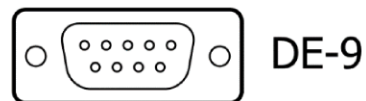
- 0: +3 ... +15 V (space), UART: GND (0 V)
    - 1: -15 ... -3 V (mark), UART: VCC (5.0 V, 3.3 V)

- Connectors

- 25-pin D-subminiature connector (standard recommendation)



- 9-pin D-subminiature connector (widely used)

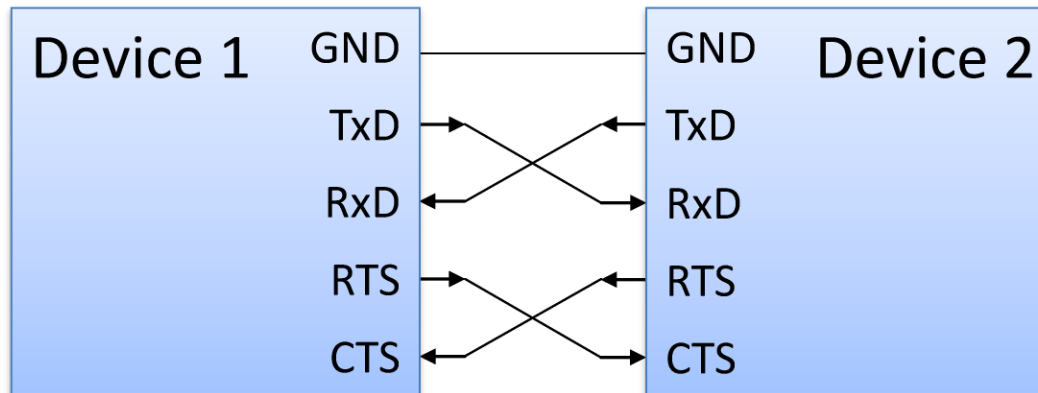


# RS-232 (3)

- Settings
  - Speed
  - Data Bits
  - Parity
  - Stop Bits
  - Flow Control
    - No handshaking
    - Hardware handshaking (RTS and CTS)
    - Software handshaking (XON/XOFF control characters)

# RS-232 (4)

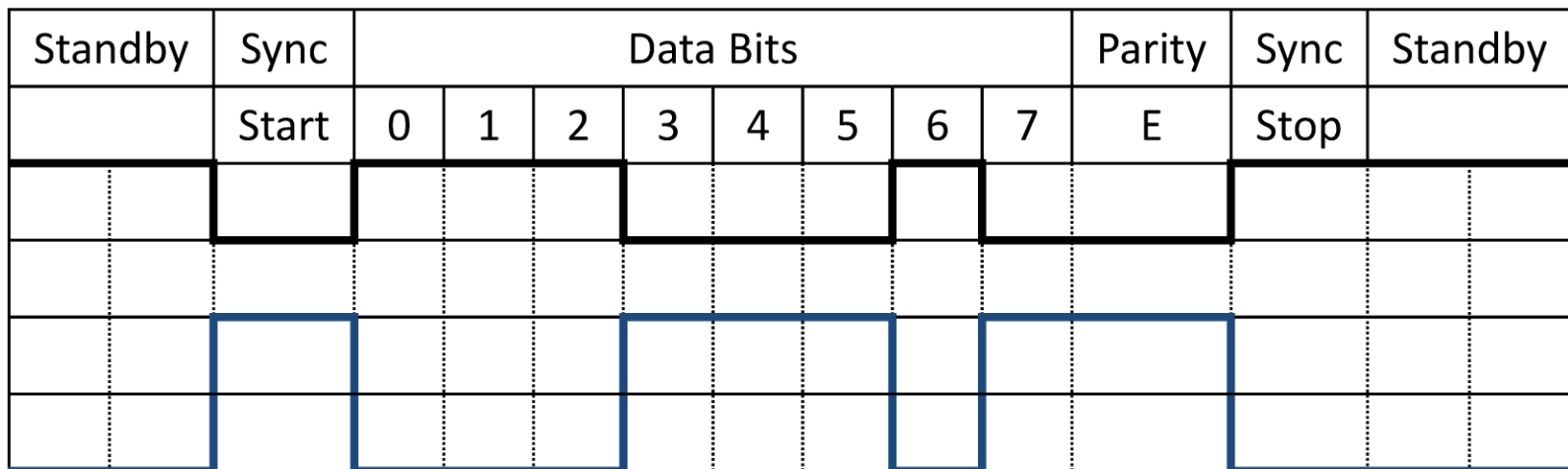
- Connection



# RS-232 (5)

- Transmission

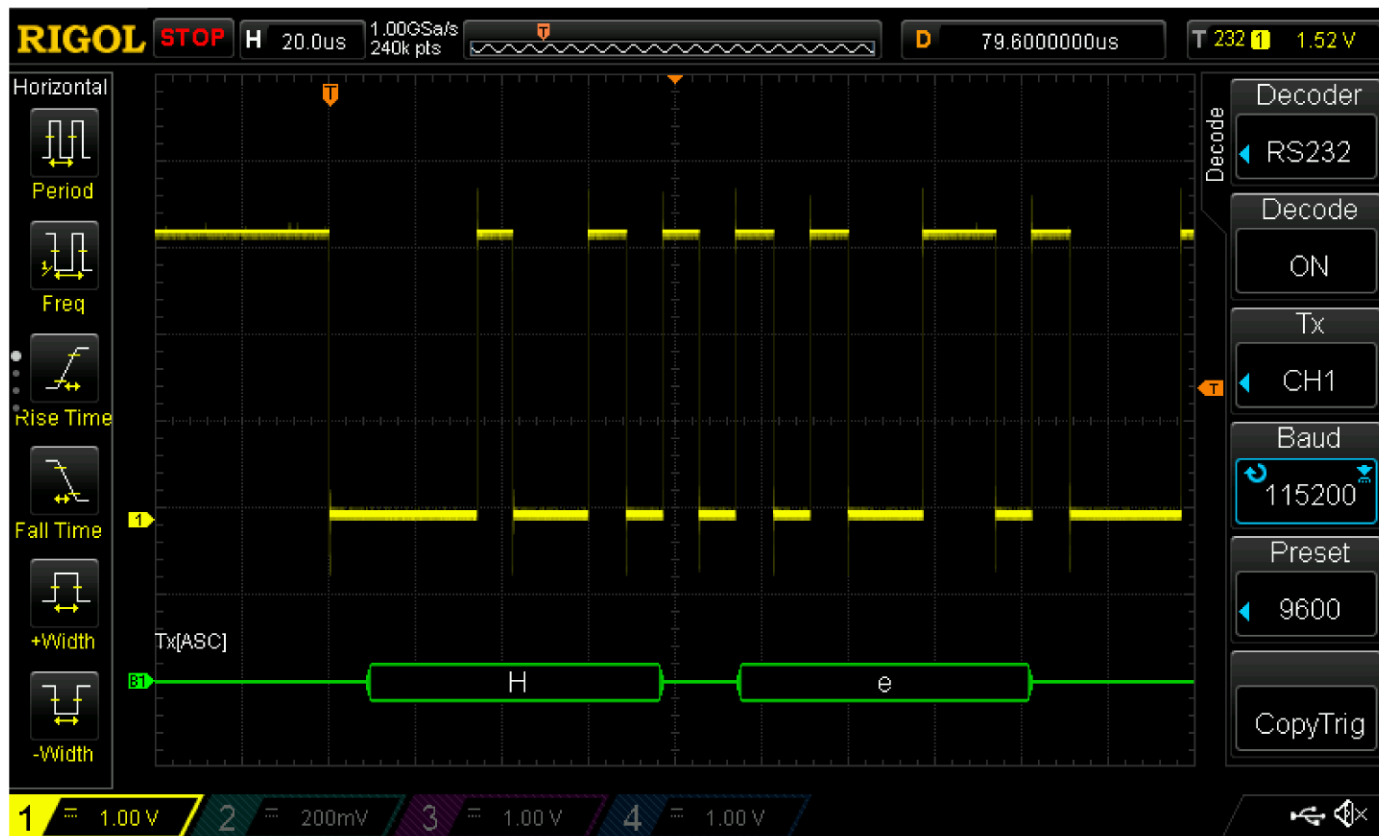
– Example: 8N1, G = 47<sub>hex</sub> = 01000111



— Logical: 0, 1      — Signal: -15 V ... +15 V

# RS-232 (6)

- Real-Life Example (3.3 V positive logic levels)



# RS-232 (7)

- Advantages
  - Simplicity
  - Low cost
  - Easy to implement
  - Widely used
  - Converters and adaptors available



# RS-232 (8)

- Disadvantages
  - Point-to-point
  - No automatic configuration
  - Many configuration settings
  - Requires transceiver chip
    - MAX233 level shifter