

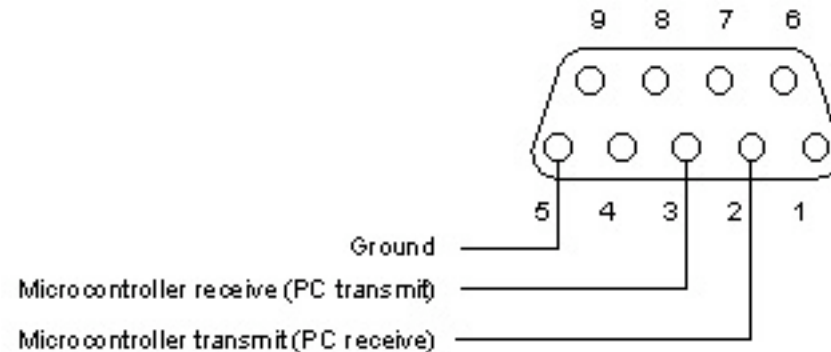
Sociable Objects

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Class 4

Serial

- Common Ground, TX, RX
- True logic: +5 Volts indicates a one, 0 Volts indicates a zero
- Inverted (RS-232): +12 Volts indicates a zero, -12 Volts indicates a one



- What are all the other pins for?

Serial: What are all those pins?

Data Terminal Equipment (DTE)
A "dumb" terminal



Female connector



+15 Volts (logical 0 or false)
-15 Volts (logical 1 or true)

RS-232 Serial Communications (9-Pin)

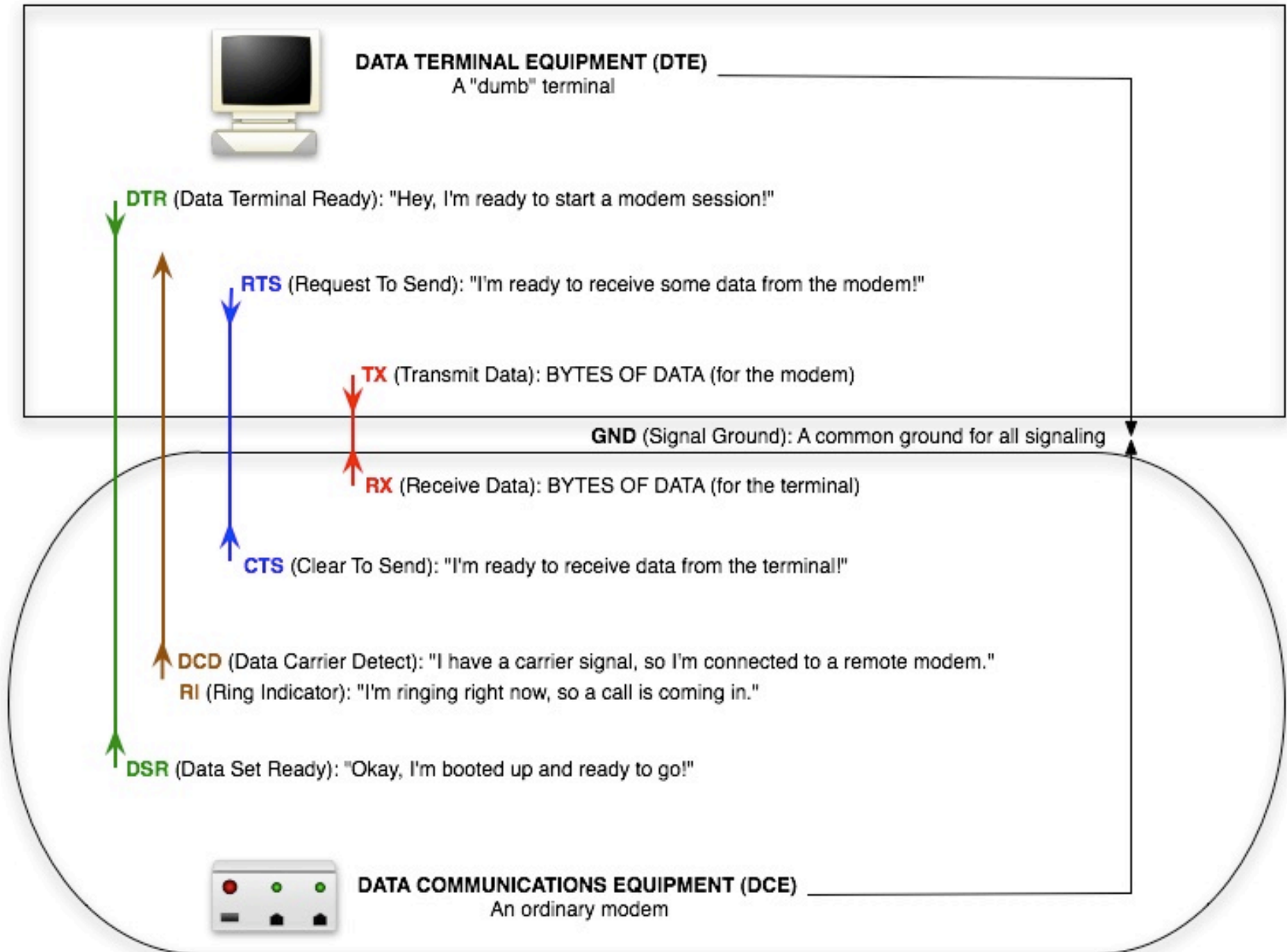
RS-232 was created for communications between a "dumb" terminal and an ordinary modem. Here's what all the pins were designed to do:

1. **DCD** (Data Carrier Detect): The modem turns this on when it has a carrier signal from another modem.
2. **RX** (Receive Data): Information sent *from the modem* to the dumb terminal
3. **TX** (Transmit Data): Information sent *to the modem* from the dumb terminal
4. **DTR** (Data Terminal Ready): The terminal turns this on when it's ready to use the modem.
5. **GND** (Signal Ground): A common ground for all signaling
6. **DSR** (Data Set Ready): The modem turns this on when it's ready to be used
7. **RTS** (Request To Send): The terminal turns this on when it's ready to receive data
8. **CTS** (Clear To Send): The modem turns this on when it is ready to receive data
9. **RI** (Ring Indicator): The modem turns this on when it is receiving a phone call

Data Communications Equipment (DCE)
An ordinary modem



Serial: Managing Communications



Arduino Serial Library

- `Serial.begin(speed)`
- `Serial.available()`
- `Serial.read()`
- `Serial.flush()`
- `Serial.print(data)`

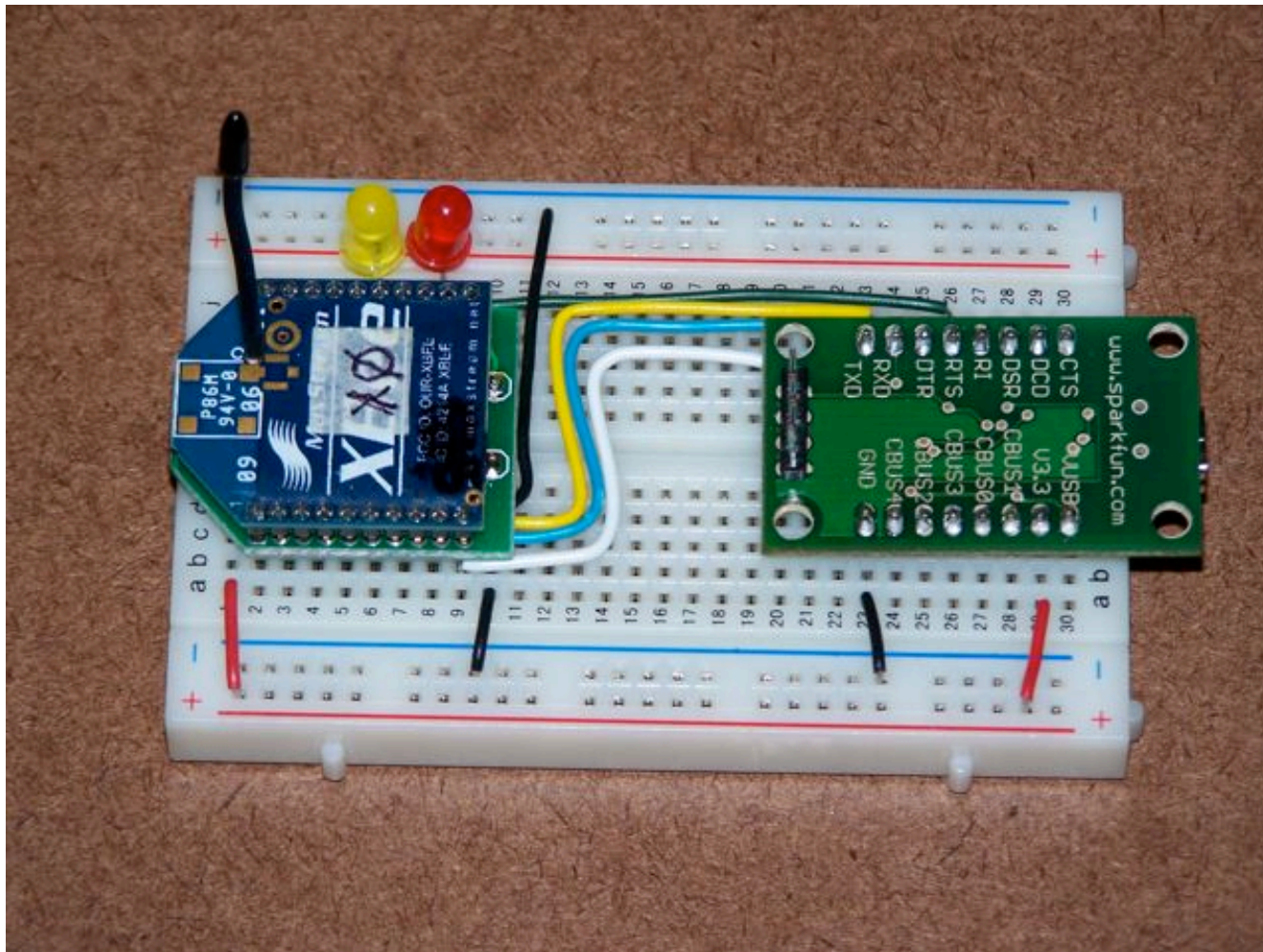
X-CTU

- Features:
 - terminal
 - firmware
 - configuration
 - tests
- Demo: updating firmware

Firmware Upload

- X-CTU Program
- Special circuit, dongle or development board
- Firmware, command interface, test area, terminal all Windows-only

Firmware Upload Board



SparkFun part#PCB-FT232RL, wired to RX, TX, RTS, DTR, 3.3V, Gnd

Protocols

- Sending
- Flow control
- Call / response
- Broadcast
- Start / stop
- Checksums
- Collisions

Readings and Assignments

- Readings

- The Internet of Things: http://rob.faludi.com/classes/sociableobjects/readings/Nature_Everything_Everywhere_2006.pdf
- Vehicle Warning System Trialed: <http://news.bbc.co.uk/2/hi/technology/6461831.stm>
- 'Smart dust' to explore planets: <http://news.bbc.co.uk/2/low/science/nature/6566317.stm>