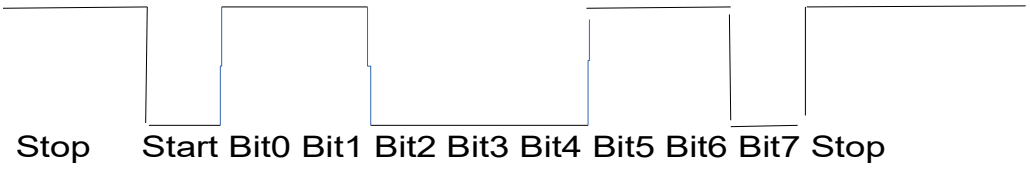
538 Lecture Notes Week 9

Serial Communications

- Parallel ports allow 8 (or 16) bits to be read or written.
- If only one wire (plus ground) is available, one bit is communicated at a time.
- The communication is *asynchronous*.
- Several bits (usually 8) are transmitted one after the other in a "frame".
- One bit time is consumed at the beginning of the frame to synchronize receiver and transmitter. This is called the *Start Bit.*
- The data bits then follow (least significant first).
- The Frame ends with Stop Bits (at least 1 or 2, but more are OK).
- When another frame is ready, the process repeats beginning with a new Start bit.



What might go wrong?

- If the Stop bit(s) are not detected, it is a *Framing Error.*

- Typically, the receiver samples the waveform at several points near the middle of the bit time. If the same digital value is not read, it is a *Noise Error*.
- An extra bit called the *Parity Bit* can be added to the end of the Frame. It's value makes the total number of "1"s even (for Evan Parity) or Odd (for Odd parity).
- When Parity is enabled, the receiver will detect any *Parity Errors*.
- The receiver shifts bits into a shift register. When the complete frame has been received, it is copied to a receive buffer register. The shift register can then shift in the next frame.
- If the receive buffer register is not read before the next frame is complete, it will be overwritten by the next frame and the previous contents lost. This is called an *Overrun Error*.

Serial Communicaton Module on hcs12

- The significant registers are:
  - The receive and transmit buffer registers.
  - Status/flag registers to indicate receive or transmit completion or error conditions.
  - Control registers to set the bit rate, enable interrupts, etc.

- Read the data sheet.
- Note that clearing the Flag register bits does *not* require the usual "write a 1". Rather, the normal programming operations clear the bits. (See, for example, how the Transmit Buffer Empty or Receive Buffer Full bits are clearded.)

RS-232

- The signals described so far use standard digital logic conventions (i.e. logic "1" is 5V, "0" is zero volts.)
- In the RS-232 standard, negative voltages (-5 to -15) indicate "1" and positive voltages (5-15v) indicate "0".
- Additional signals include RTS (request to send), CTS (clear to send), DSR (data set ready) and DTR (Data Terminal Ready).
- These signals mediate the connection between a DTE (Data Terminal Equipment, i.e. a computer) and DCE (Data Communication Equipment, i.e. a modem).