SPI Lab

Example:

**Let’s do SPI communication using AVR family based ATmega328P (Master) and ATmega328P (Slave). Master will send continuous count (from 1 to 100) to Slave. Slave will read data then add 100 on it and send it back to master. Bothe Master and slave will print the received data on serial monitor**

Steps

1. Let’s first program **Master device**
   * **SPI Master Initialization steps**

To initialize as Master, do the following steps

* + - Make MOSI, SCK and SS pins directions as output.
    - Make MISO pin direction as input.
    - Make SS pin High.
    - Enable SPI in Master mode by setting SPE and MSTR bits in SPCR register.
    - Set SPI Clock Rate Bits combination to define SCK frequency.
    - After initialization you need to start SPI slave by set SS pin Low and wait for 1 second to allow slave to up
* **SPI Master Write steps**
  + - Copy data to be transmitted in SPDR register.
    - Wait until transmission is complete i.e. poll SPIF flag to become High.
    - While SPIF flag gets set read SPDR using flush buffer.
    - SPIF bit is cleared by H/W when executing corresponding ISR routine.
    - Note that to clear SPIF bit, need to read SPIF and SPDR registers alternately.
* **SPI Master Read steps**
  + - Since writing to SPDR generates SCK for transmission, write dummy data in SPDR register.
    - Wait until transmission is completed i.e. poll SPIF flag till it becomes High.
    - While SPIF flag gets set, read requested received data in SPDR.

1. Now Program for **Slave device**:

* **SPI Slave Initialization steps**
  + - Make MOSI, SCK and SS pins direction of device as input.
    - Make MISO pin direction of device as output.
    - Enable SPI in slave mode by setting SPE bit and clearing MSTR bit.
* **SPI Slave transmit steps**
  + - It has same function and steps as we do SPI Write in Master mode.
* **SPI Slave Receive steps**
  + - Wait until SPIF becomes High.
    - Read received data from SPDR register

**Notes:**

* **You need to open different Arduino IDE to allow you to open two serial monitors**
* **After program two boards and open serial monitor restart two board at the same time to rerun them again from beginning by press push button on boards**