Infra Red (IR) Remote Control

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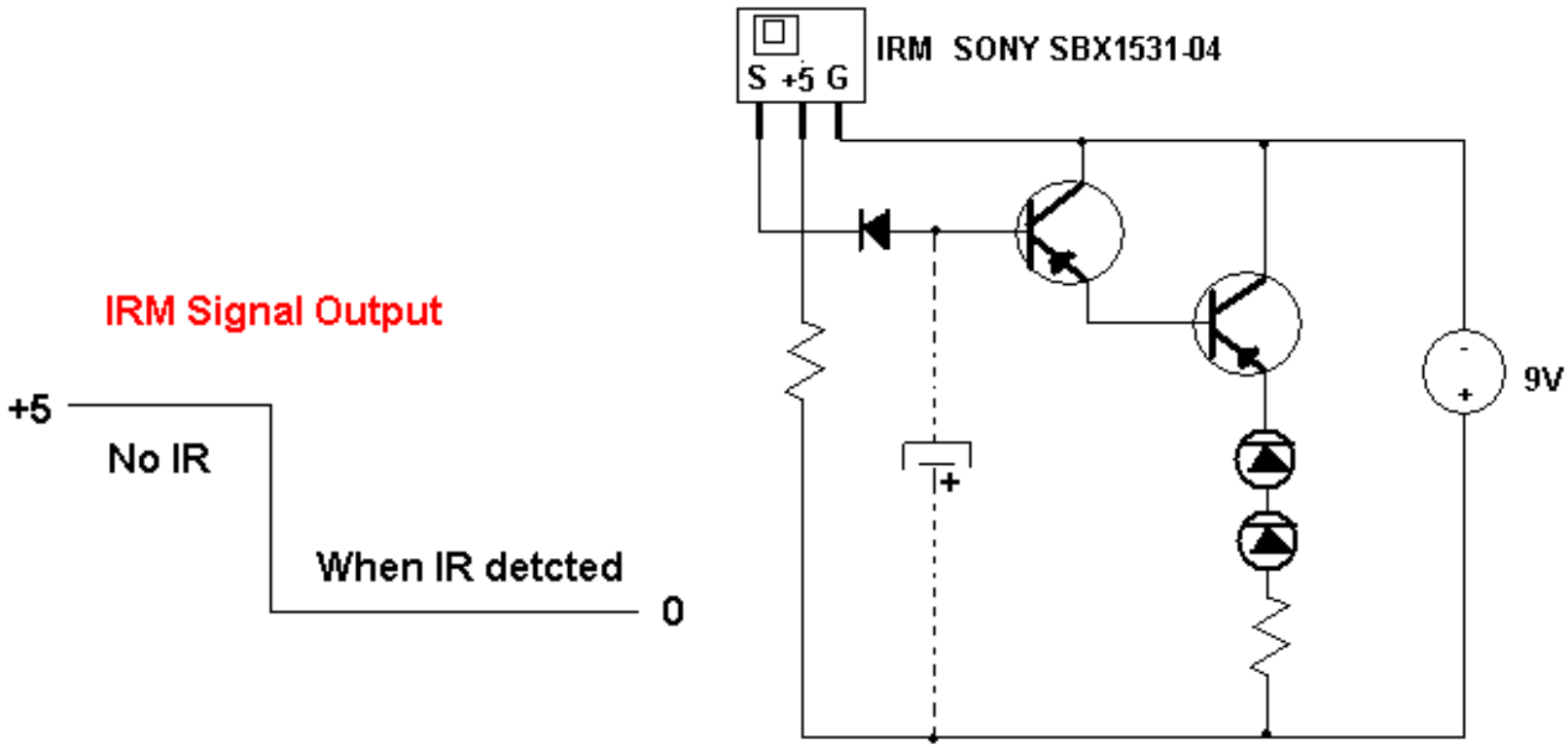
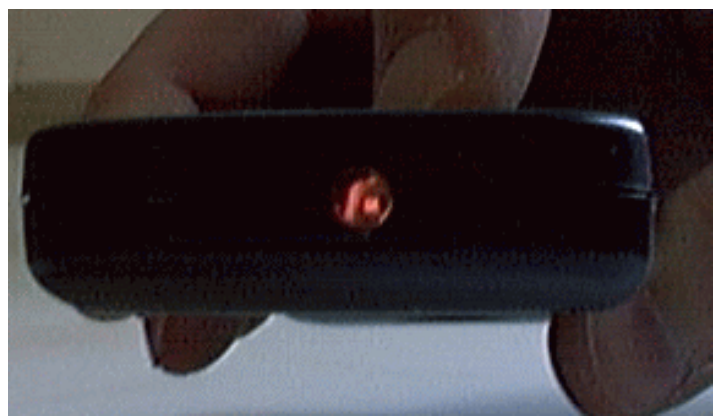
Simple IR Application

- IR Remote Control Night Light



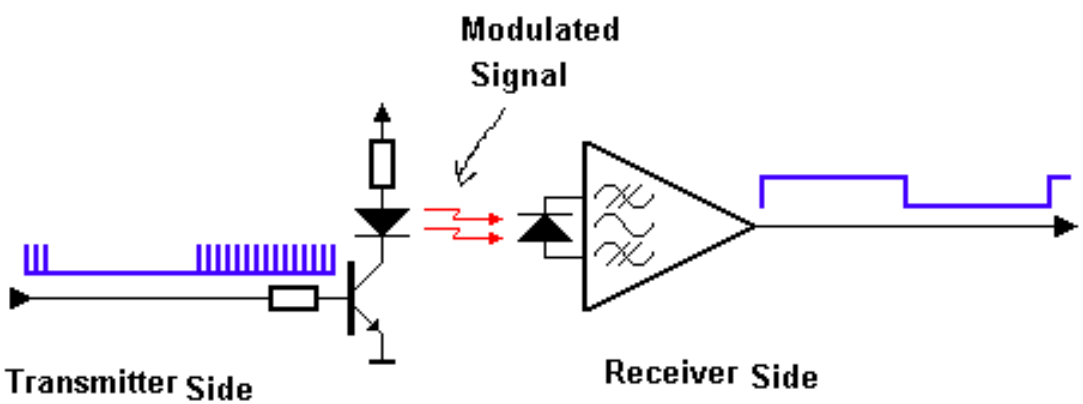
IR Control

- Infra-Red light: cheapest way to remotely control a device within a visible range is via
- Almost all audio and video equipment are now controlled by IR
- IR Protocols
  - Sony
  - Sharp



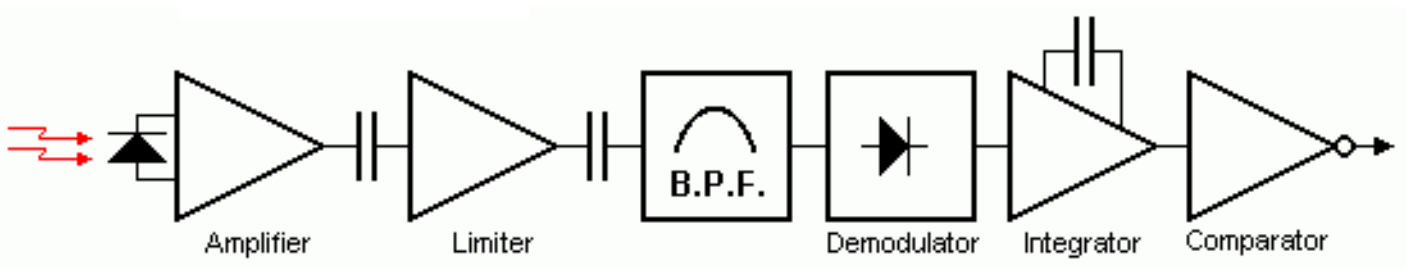
IR Modulation

- Modulation: To make our signal stand out above the noise.
- With modulation we make the IR light source blink in a particular frequency. (30 – 60 KHz)
- The IR receiver will be tuned to that frequency, so it can ignore everything else.

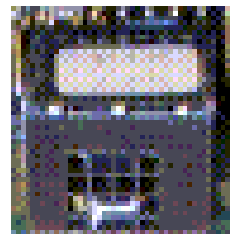


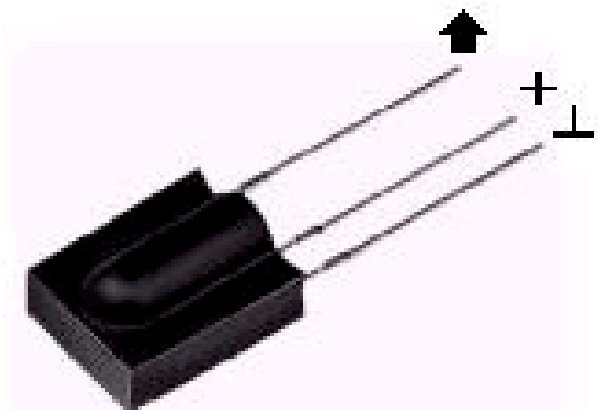
IR Receiver

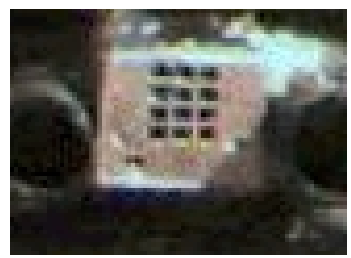
- **Detection Diode**: IR signal is picked up.
- **Amplifier & Limiter**: Signal is amplified and limited by the first 2 stages. The limiter acts as an AGC circuit to get a constant pulse level.
- **Band Pass Filter**: Tuned to the modulation frequency of the handset unit. **Detector, Integrator and Comparator**: To detect the presence of the modulation frequency. If this modulation frequency is present the output of the comparator will be low.



IR Receivers







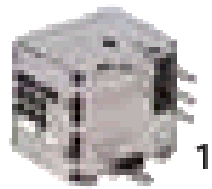
IR Receivers

Infrared Remote-Control Receiver Modules


220628CA


165008CA

Quantity SAVE


176541CA

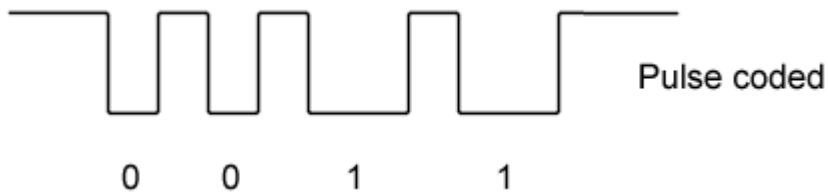
Commonly used in TVs, VCRs, audio equipment, car stereos and home computers that receive signals or data via infrared
Single unit module which incorporates a PIN diode & a receiving preamplifier IC
Excellent mechanical strength and electrical stability
940nm wavelength Size: 0.6"L x 0.6"W x 0.5"H

New Lower Prices

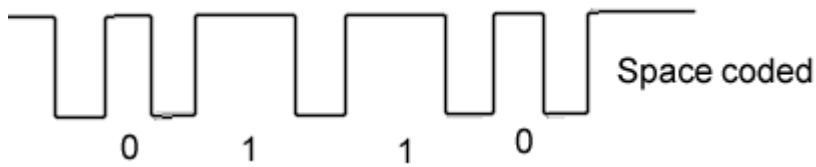
Part No.	Description	Voltage Input	1	10
220628CA	38.0kHz, side view	4.5VDC @ 1.4mA	$2.99	$2.69
165008CA	40.0kHz, top view	5VDC @ 5mA	2.99	2.69
176541CA	56.8kHz, side view	5VDC @ 2mA	1.69	1.53

IR Communication Protocols

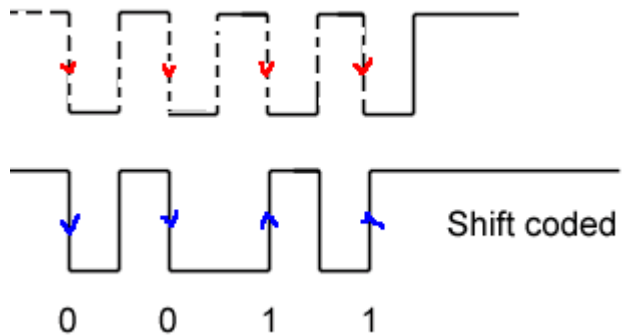
- **Pulse coded**
  - The length of the pulse is varied to represent data.
  - Used by SONY.



- **Space coded**
  - The length of the space between the pulses is varied to represent data.
  - Used by Panasonic(Sharp).



- **Shift coded**
  - The direction of transitions represent the data and all the bits have a constant time period.
  - Used by Philips.



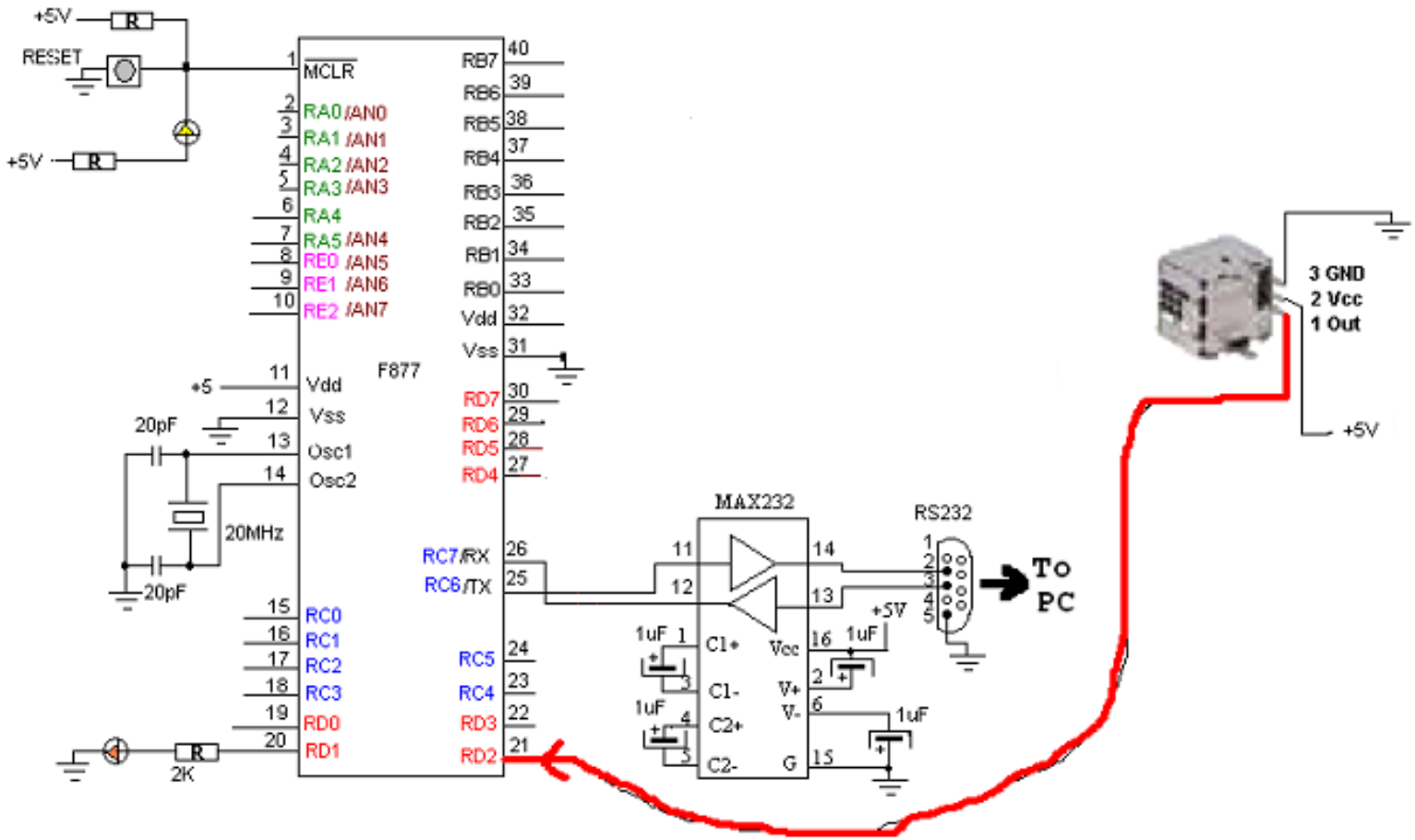
SONY Protocol

- 12-Bit of Information
- 5-Bit for Address and 7-Bit for Command
- Pulse Width Modulation
- Carrier Frequency 40 KHz
- Bit Time: 0.6 ms (0) or 1.2 ms(1)
- Commands are repeated every 45 ms as long as a key is held down.

Sony Protocol –Addr/Com

- Address
  - 1: TV
  - 2: VCR1
  - 3: VCR2
  - 6: Laser Disk Unit
  - 12: Surround Sound
  - 16: Cassette Deck/Tuner
  - 17: CD Player
  - 18: Equalizer
- Command:
  - 0 – 9: Keys 1 – 0
  - 16: Channel +
  - 17: Channel –

IR Receiver Connection

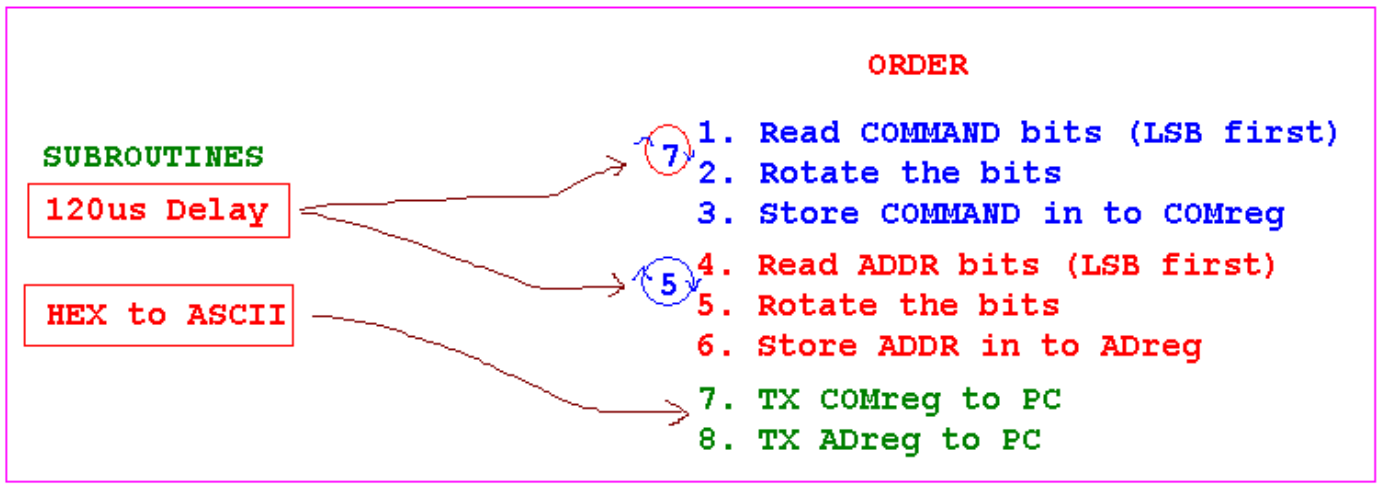


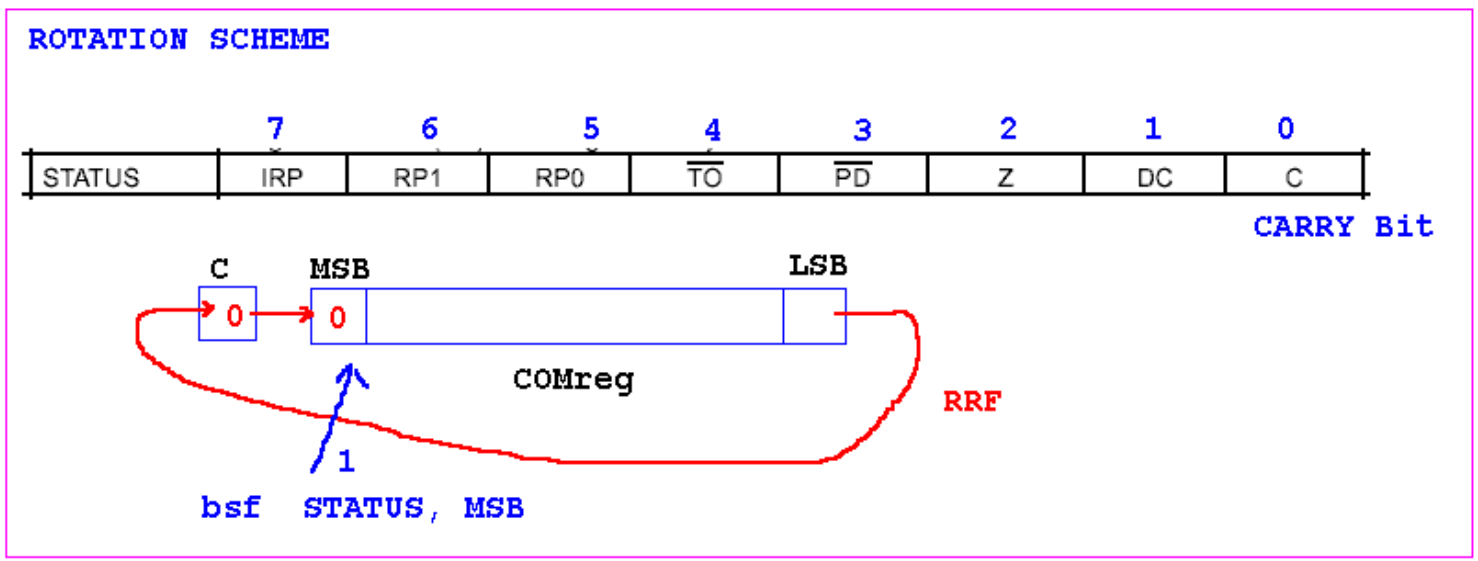
Sony Protocol –Bit Reading Scheme

- "1" : 1200us
- "0": 600 us
- Sequence
  - 1. Detect IR for LOW (START)
  - 2. Wait until IR goes to HIGH (Separator)
  - 3. Wait until IT goes to LOW
  - 4. Wait for 120us
  - 5. Check IR if it goes to HIGH
    - If Not, Increase a counter by 1 and go to 4
    - If High
      - Count<8: "0"
      - Count>8: "1"
      - Go to 3 (to read next bit information)

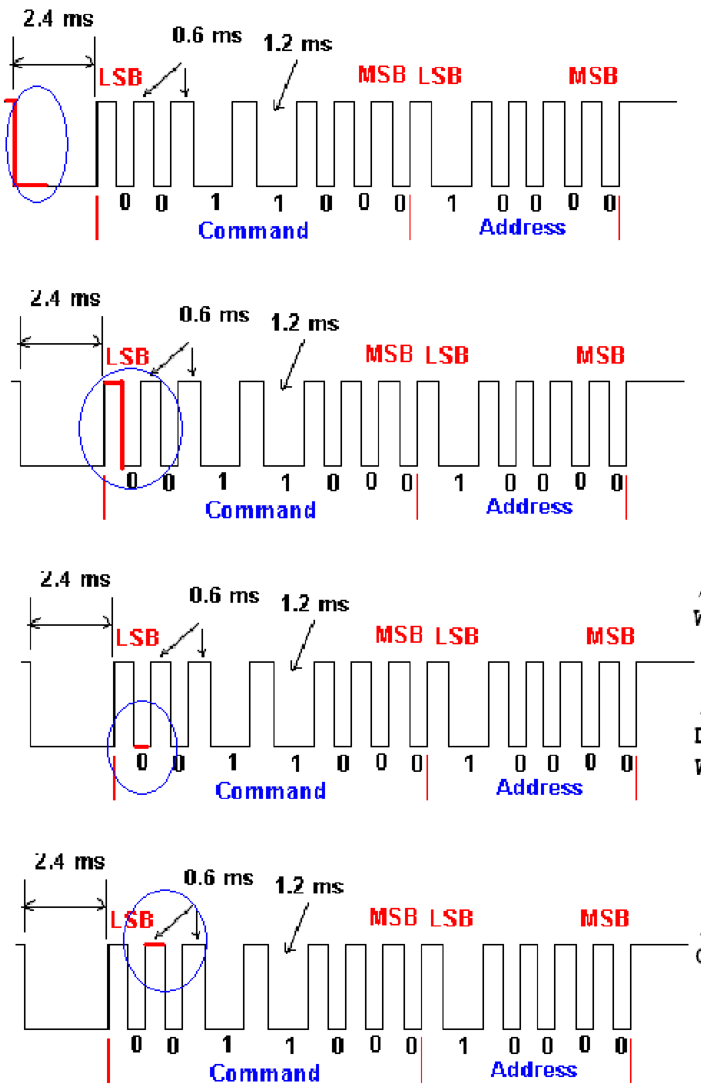
IR Coding Structure

- Start From RXTX code





Sony Protocol – Coding example for COMMAND reading



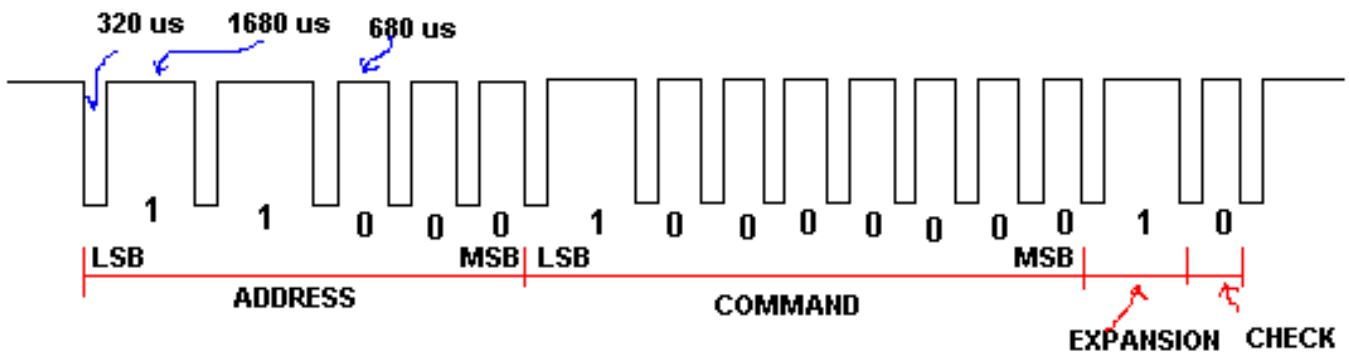

```
; START OF COMMAND READ
;1. Wait for START bit
JAM
        banksel PORTD
        btfsc   PORTD, IRX          ;IRX=2
        goto    JAM
;2. Once START is entered
        banksel CMcount
        movlw   0x07     ;Command has 7 bits
        movwf   CMcount
;3. Wait for separator (600us length)
WAIT    btfss   PORTD, IRX
        goto    WAIT
CMNEXT  clrf    Pcount   ;Number of 120us duration
        bcf     STATUS, CARRY
        rrf     COMreg              ;storage for COMMAND
                                    ;MSB is 0 NOW
;4. WAIT for the end of separator
WAIT2   btfsc   PORTD, IRX
        goto    WAIT2

;5. Pcount update (count how many 120us Low duration)
DST     call    delay120us
WAIT3   btfsc   PORTD, IRX
        goto    Onezero             ;End of LOW duration
                                    ;1 or 0 ?
        incf    Pcount
        goto    DST
;6. At the end of LOW duration
Onezero btfsc   Pcount, 0x03        ;What is this for?
        bsf     COMreg, MSB         ;the MSB is now 1
        decfsz  CMcount
        goto    CMNEXT
;7. Once all 7 bit inforation read
        bcf     STATUS, CARRY
        rrf     COMreg    ;rotate one more for 8-bit re

;END OF COMMAND READ
```

Sharp Protocol

- 13-bit Protocol
  - 8-bit Command
  - 5-bit Address
- Pulse Distance Modulation
- Carrier Frequency of 38 KHz
- Bit Time: 680s (0) or 1680 us(1)
- Separator: 320 us between bits
- Message transmission 2 times separated by 40 ms time delay (Note: Not exactly same)

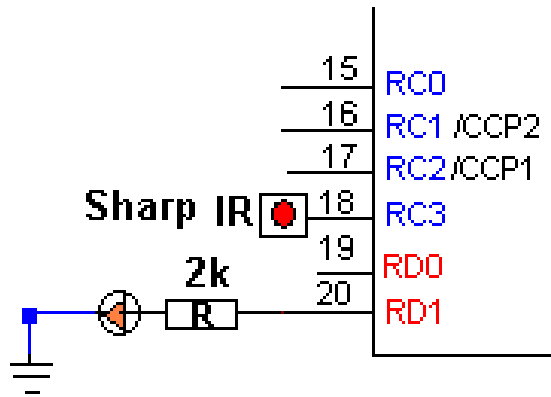


Sharp Protocol -Coding

- 1. Start
- 2. If IR is LOW, give enough delay not to read the second command/address from remote – 200ms delay
- 3. Wait for START bit
- 4. Read Address (5 times)
  - LSB ---> MSB (rrf)
- 5. Read Command (8 times)
  - LSB →MSB (rrf)
- 6. Read EXP and CHK (total 2 times)

IR Control of LED with Sharp

```
            banksel   TRISC
            movlw     H'28'
            movwf     TRISC
            clrf      STATUS
            banksel   TRISD
            movlw     H'00'
            movwf     PORTD
AGAIN       bcf       PORTD, LED
            call      SONYIR
            movf      COMreg, 0
            andlw     B'11111111'
            btfss     STATUS, ZERO      ;W=0? then 1 sec
            goto      next
            goto      oneLED
next        movf      COMreg, 0
            andlw     B'11111110'       ;W=1? then 2 sec
            goto      next
            goto      twoLED
;
;  continueed   blah blah
            goto      AGAIN
```




```
twoLED      bsf       PORTD, LED
            call      delay1s
oneLED      bsf       PORTD, LED
            call      delay1s
;
;blah blah
            goto      AGAIN
```