Mikroişlemci Sistemleri

Dr. Öğr. Üyesi Erkan Uslu

5

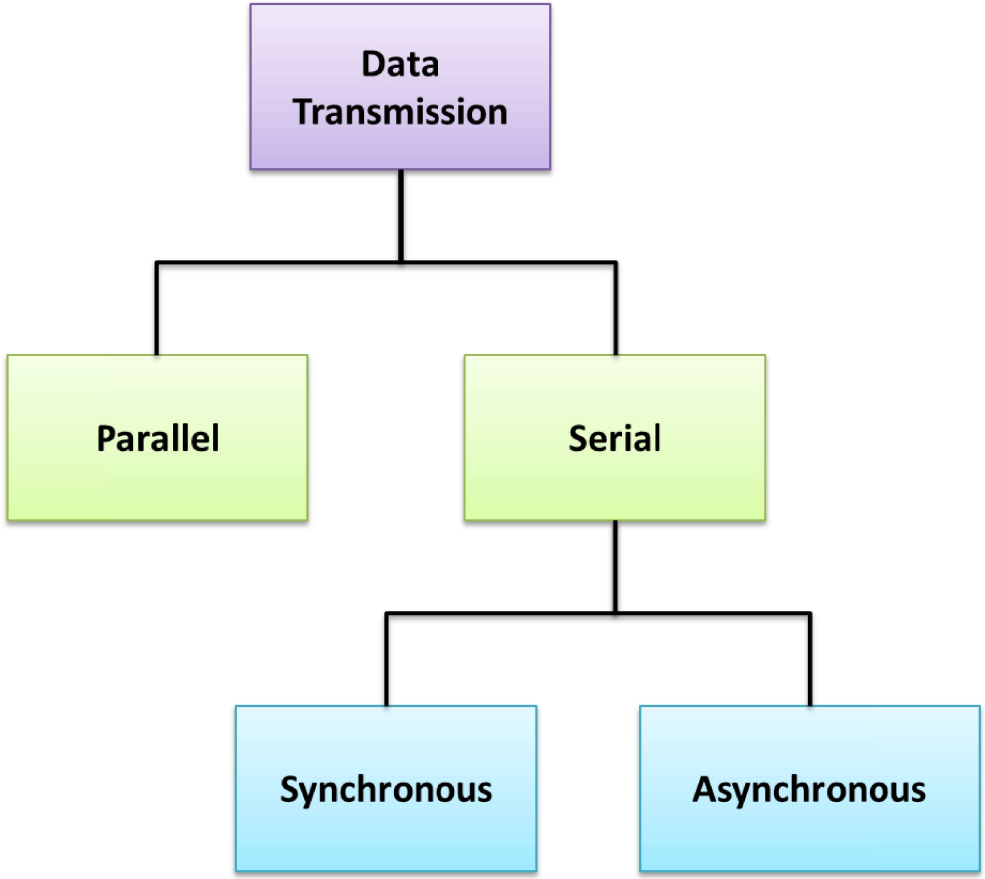
YTÜ-CE

Ders-5 Konular

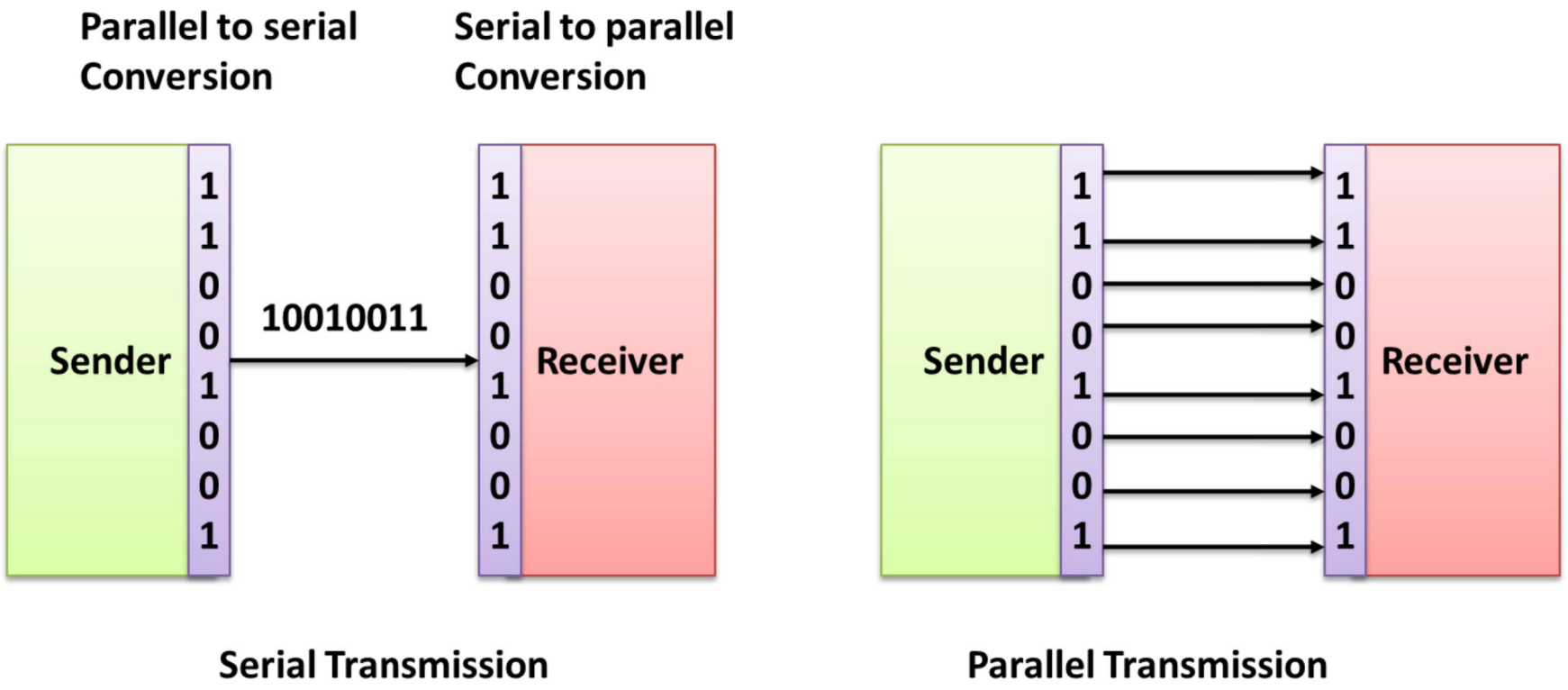
- Paralel Seri Haberleşme
- Seri Haberleşme
  - Synchronous/Asynchronous
  - Simplex/Duplex
  - Baud Rate
  - Error Correction
- Yazılımsal Seri Haberleşme
  - Transmit
  - Receive
- 8251 USART
  - 8251 Blok Diyagram
  - Yazmaçlar
  - Mode Word / Command Word
  - Status Word

Veri İletişimi: Seri-Paralel

- Seri
  - Daha az maliyet
  - Daha yavaş
- Paralel
  - Daha hızlı
  - Kısa mesafeler için



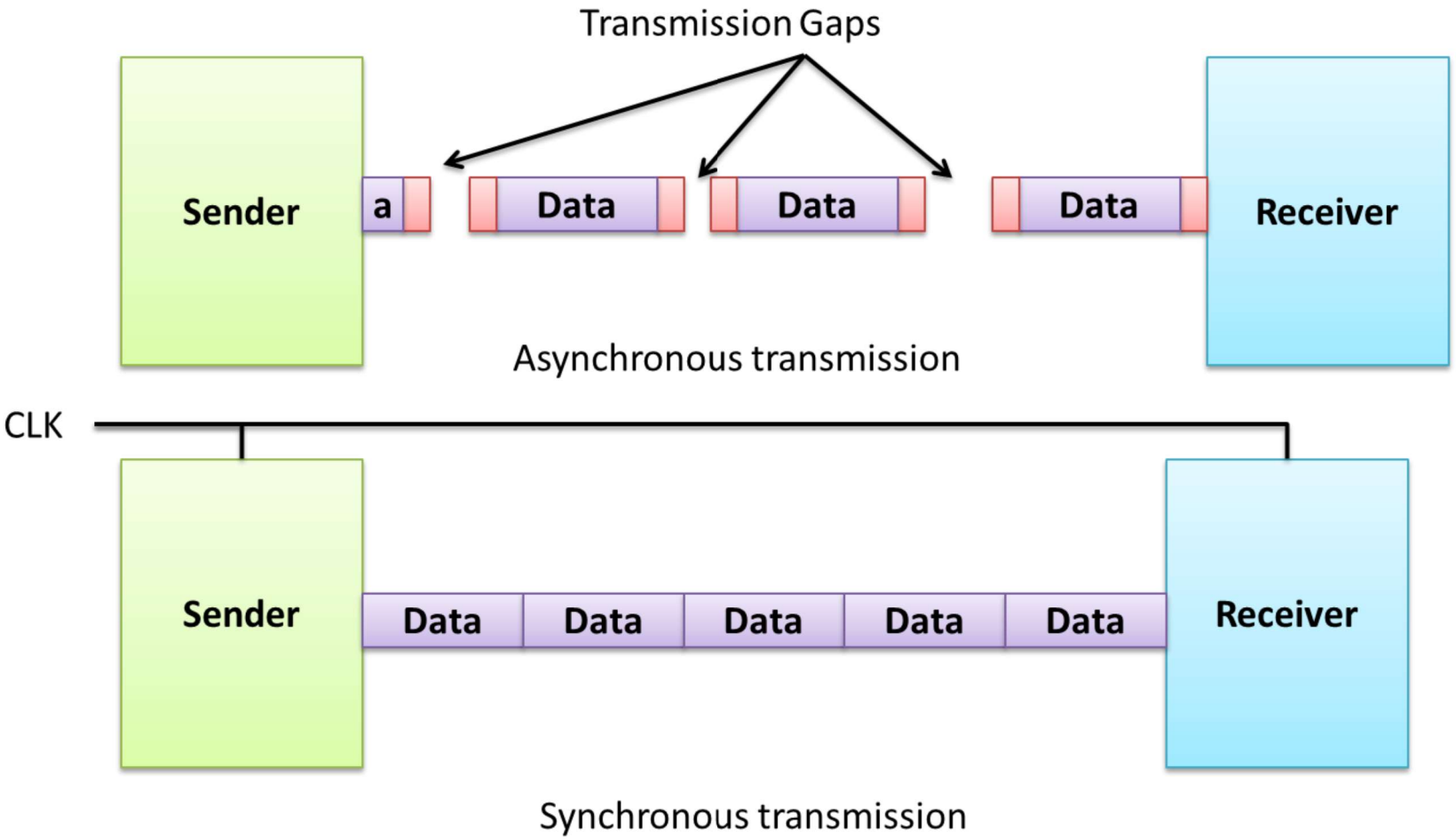
Veri İletişimi: Seri-Paralel



Seri İletişim

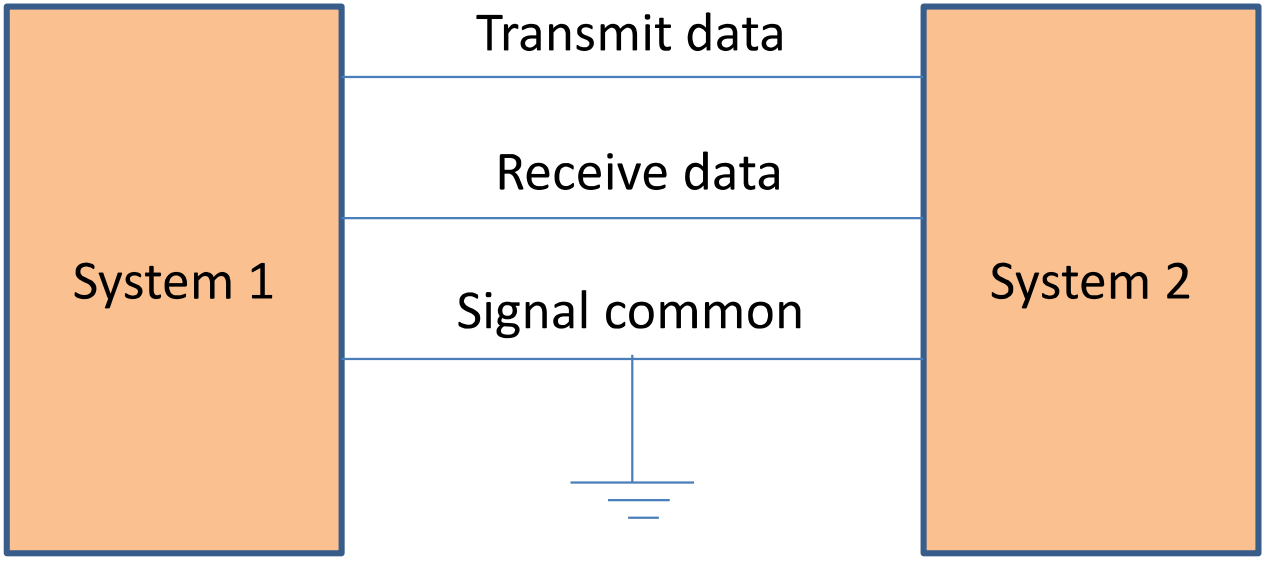
- Synchronous (Senkron)
  - Sender and receiver must synchronize
    - Done in hardware using phase locked loops (PLLs)
  - Block of data can be sent
  - More efficient : Less overhead than asynchronous transmission
  - Expensive
- Asynchronous (Asenkron)
  - Each byte is encoded for transmission
    - Start and stop bits
  - No need for sender and receiver synchronization

Seri İletişim



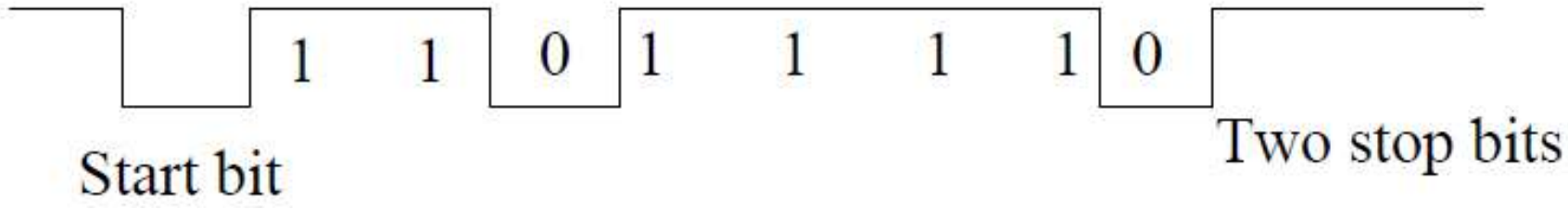
Asynchronous Comm.

- Ortak bir CLK veya senkron işaretine ihtiyaç duymaz

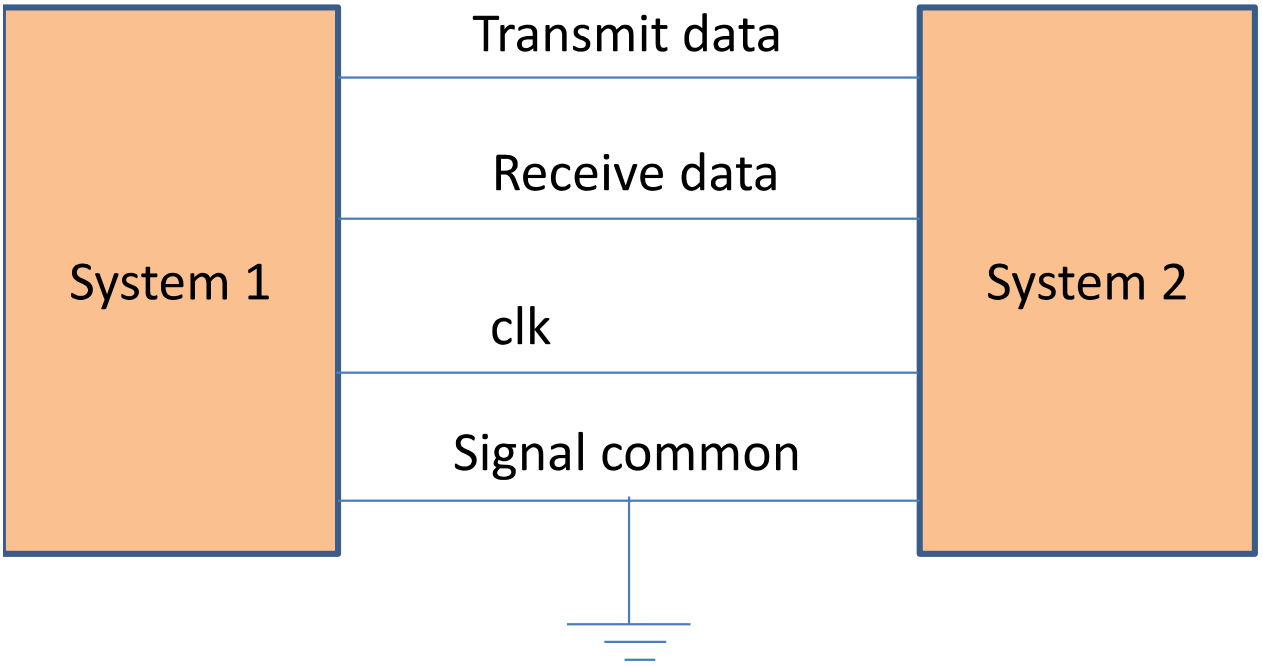


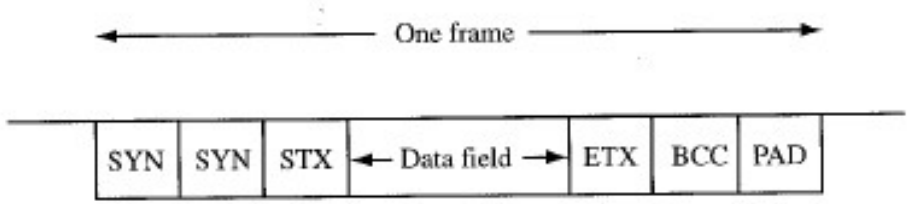
Asynchronous Comm.

- Veri bitler halinde gönderilir.
- Alıcı taraf iletişimin başladığını/bittiğini başta ve sonda bulunan START ve STOP bitleri ile anlar.
- Hat boşta iken lojik 1 değerindedir.

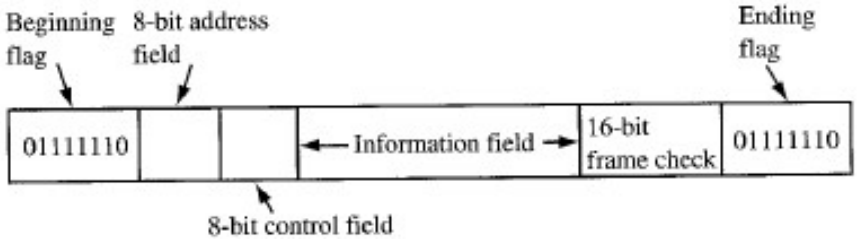


Synchronous Comm.





BISYNC: Each block of data has synch characters. The size of block data can be 100 or more bytes. BCC checks for errors.

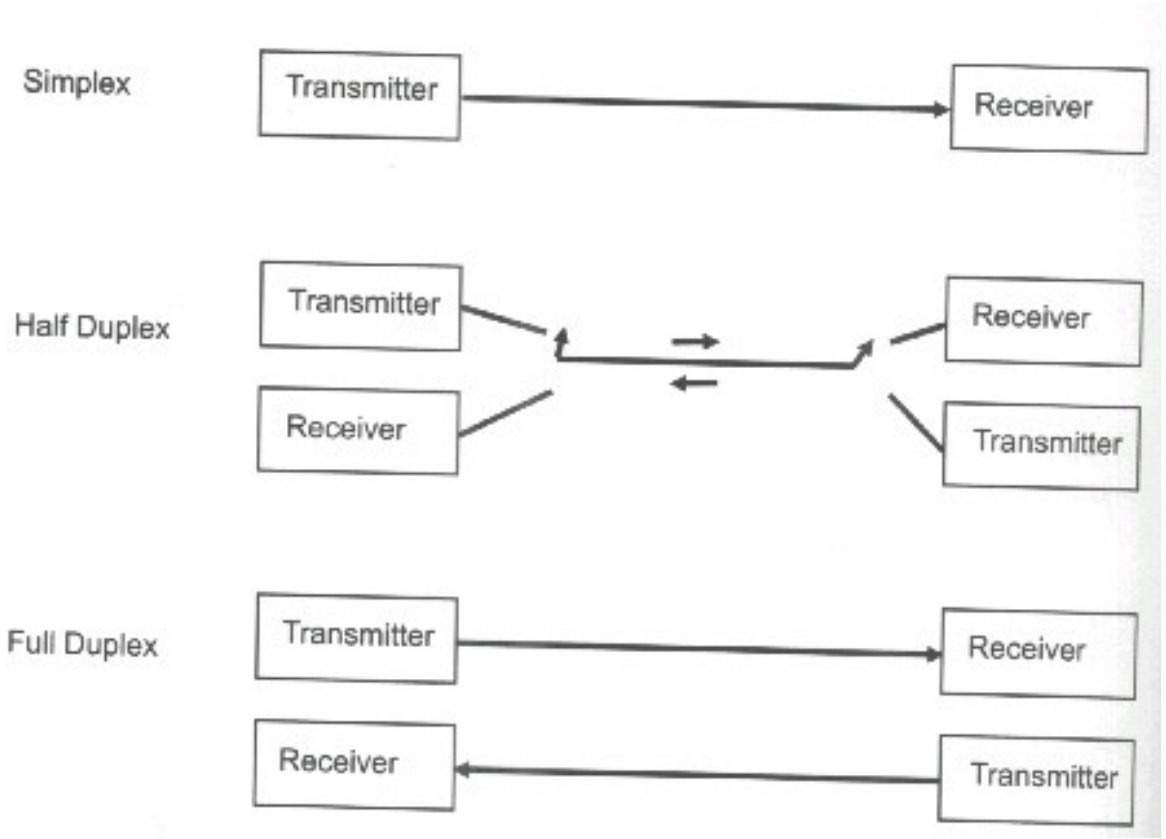


Serial Data Link Control: Developed by IBM used for computer networking (Token Ring). After Flag byte the network address is sent. Control Byte stores information about sequence of data etc. Data is thousands of bits. 16 bit field is used for error checking.

Simplex/Duplex

- Simplex
  - Data are transmitted in one directions
  - Example: CPU to printer
- Duplex
  - Data flow in both direction
  - Half Duplex (Transmission goes on way at a time)
  - Full Duplex (Both ways simultaneously)

Simplex/Duplex



Transmission Rate

- Rate at which bits are transmitted (BAUD)
- Number of signal changes per second
- Bit time: how long the Bit stay On or Off
- Printer, Terminal Baud Adjustable (50-9600)
- 1200Baud means: Bit stay for 1/1200=0.83ms

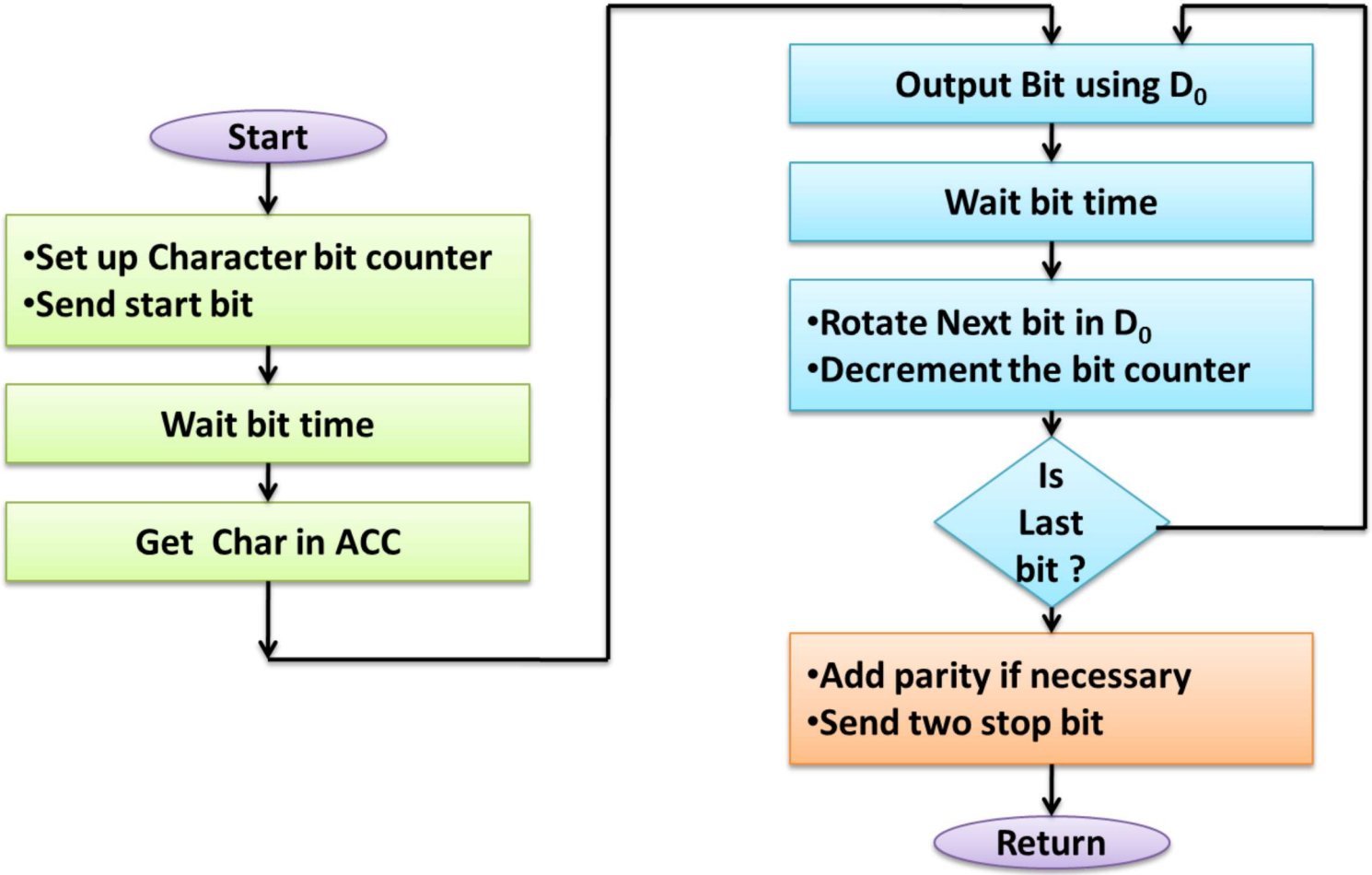
Örnek

- What is the data rate in bits/sec and character rate if the bit time is 3.33 ms (1 start, 8 data, 2 stop)
  - Bit rate = 1 / 3.33 ms = 300 bits/sec
  - 11 x 3.33 ms = 36.63 ms required to transmit a character so character rate = 1/36.63 ms = 27.3 char/sec
- Modems typically transmit data over the telephone network at 9600, 14400, 28800 or 56K bps.
- If 1 MByte file is to be transmitted to another computer using a modem calculate the transmission time (1 start, 7 data, 1 parity, 1 stop)
  - 9600 bps: 1048576x10/ 9600 bits/sec = 1092 s = 18 minutes and 12 sec
  - 28800 bps: 364 s = 6 minutes and 4 sec

Error Check

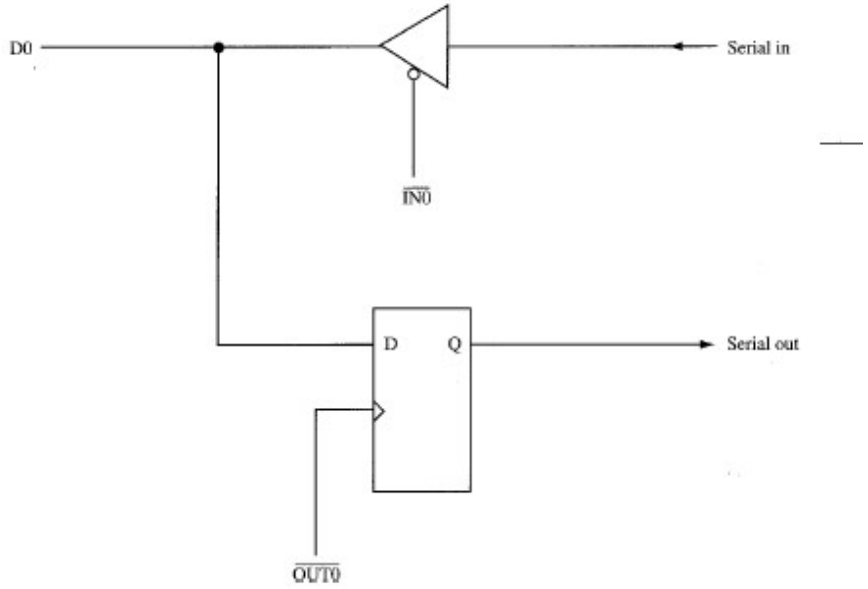
- Parity Check
  - Even parity: When odd numbers of 1 make D7=1
    - Send Even number of 1
  - Odd parity: When even number of 1 make D7=1
    - Send Odd number of 1
- Check Sum
  - Used for block of data
  - Sum of all Bytes without carry and 2's complements
  - Total Sum Result should be Zero
- Cyclic Redundancy Code (CRC)
  - Synchronous Communication
  - Stream of Data can be represented by Cyclic polynomial that divided by a **constant polynomial**
  - Reminder to set **Bits** and Send out as check for error

Yazılımsal Seri İletişim - Transmit

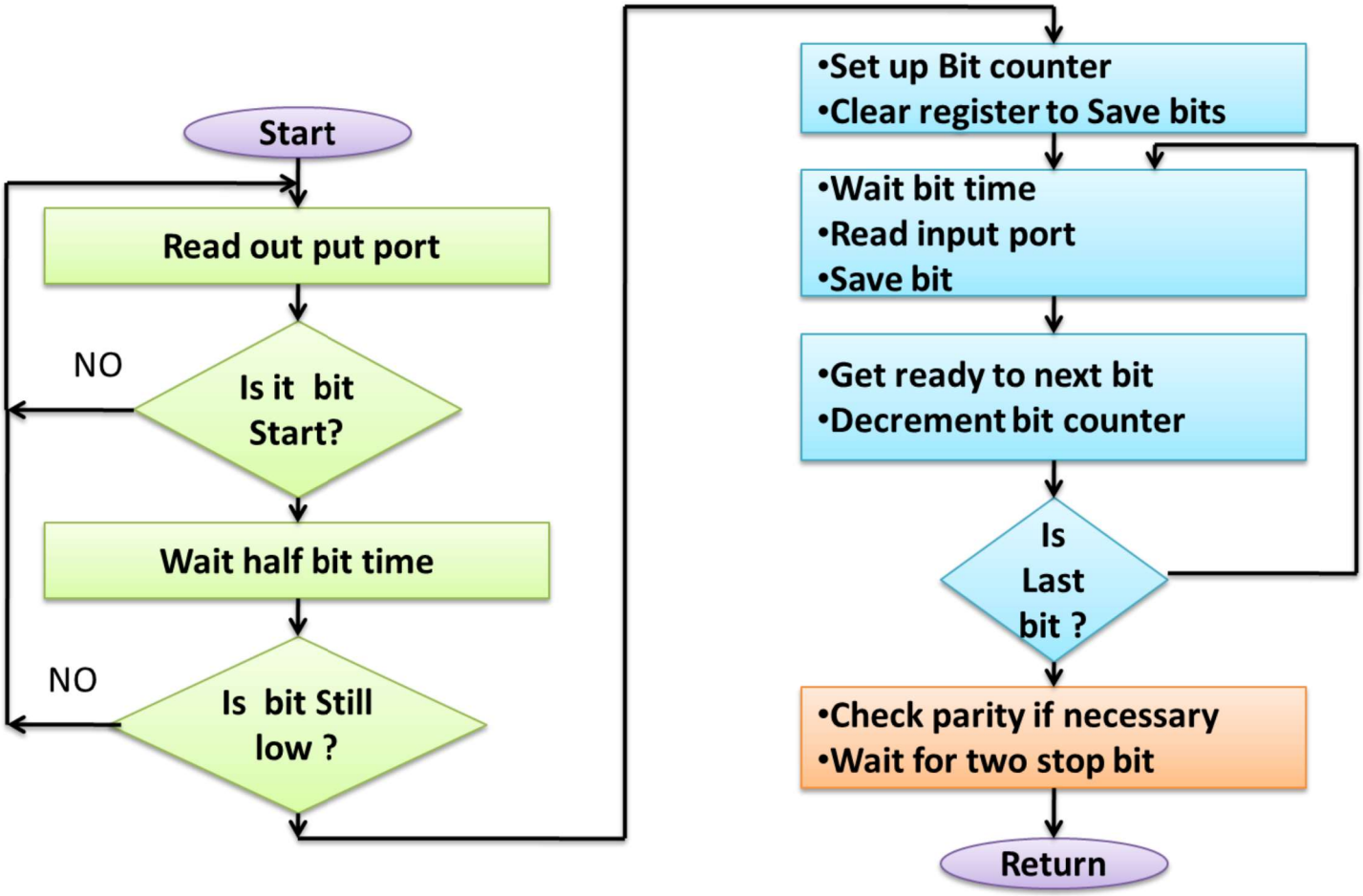


Yazılımsal Seri İletişim - Transmit

```
;Function:  Serial data transmitter.  DELAY
;          procedure determines data rate.
;Inputs:    Character to be transmitted assumed
;          passed in AL.
;Ouputs:    Serial data on bit 0 of DPORT.

;Destroys:  AL,CX,flags.

           EXTRN     DELAY:NEAR
           DPORT     EQU  00H

CODE       SEGMENT
           ASSUME    CS:CODE

FIG10_3    PROC      NEAR
           MOV       CX,10          ;10 bits/char
           CLC                      ;Start bit
           RCL       AL,1           ;Move to position 0
TRANS:     OUT       DPORT,AL       ;Transmit bit
           CALL      DELAY          ;Wait
           RCR       AL,1           ;Next bit
           STC                      ;Stop bit
           LOOP      TRANS          ;Do 10 times
           RET
FIG10_3    ENDP
           CODE      ENDS
           END
```



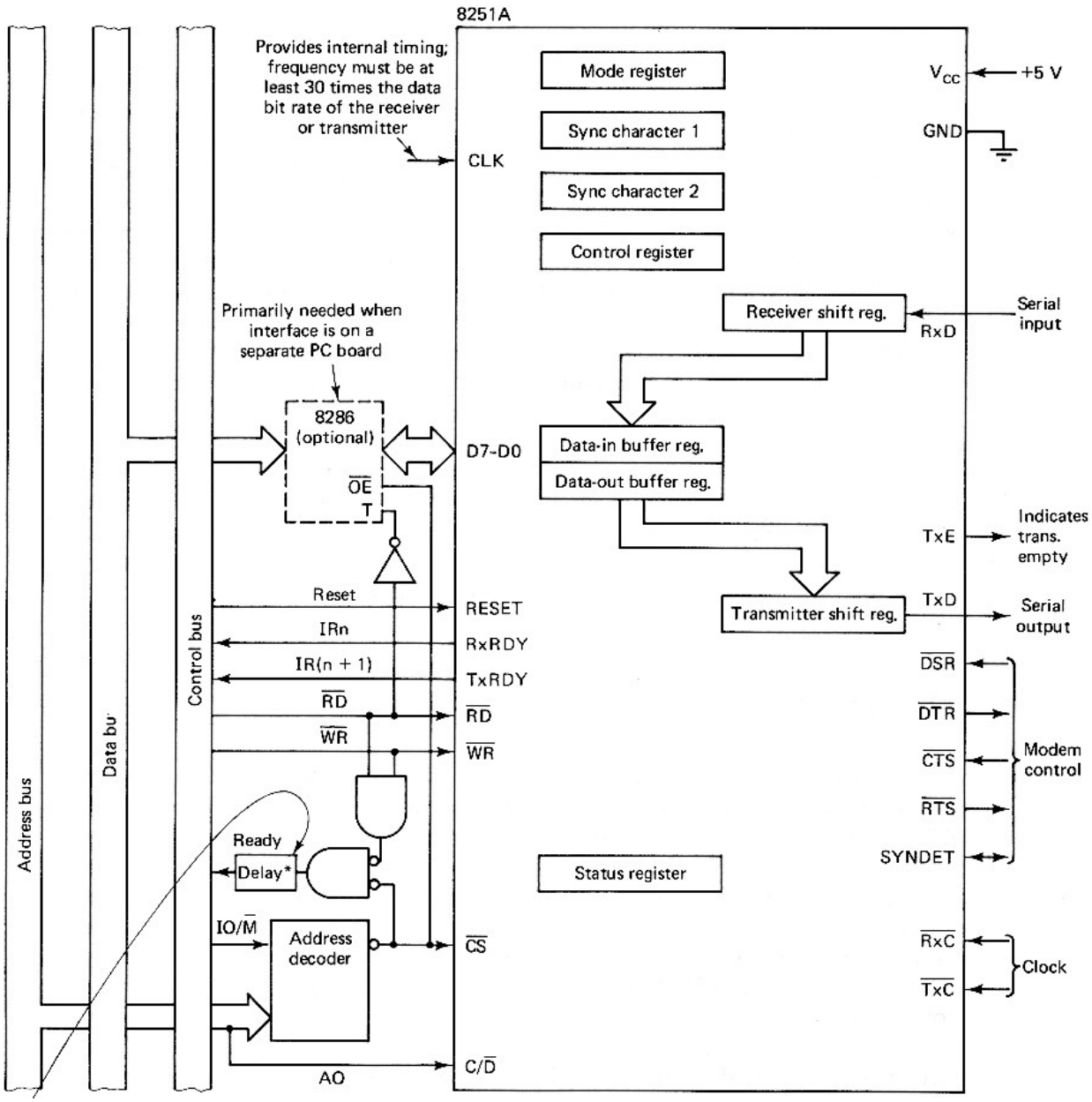
Yazılımsal Seri İletişim - Receive



8251 USART

- USART: universal Synchronous/Asynchronous Receiver/Transmitter

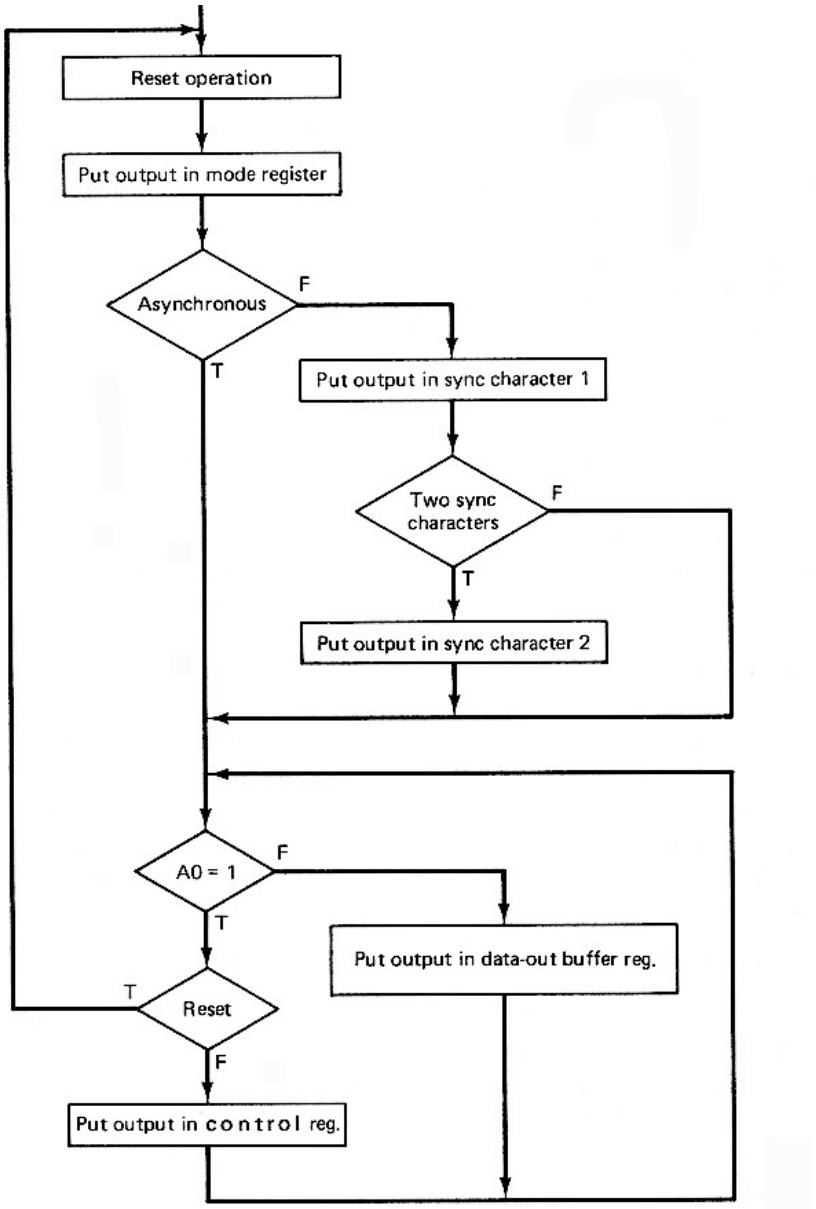
8251


8251A
Provides internal timing; frequency must be at least 30 times the data bit rate of the receiver or transmitter
CLK
Mode register
Sync character 1
Sync character 2
Control register
V_{CC}
+5 V
GND
Primarily needed when interface is on a separate PC board
8286 (optional)
OE
T
D7-D0
Receiver shift reg.
RxD
Serial input
Data-in buffer reg.
Data-out buffer reg.
TxE
Indicates trans. empty
Transmitter shift reg.
TxD
Serial output
Reset
RESET
IRn
RxRDY
IR(n + 1)
TxRDY
RD
WR
DSR
DTR
CTS
RTS
SYNDET
Modem control
Ready
Delay*
Status register
IO/M
Address decoder
CS
RxC
TxC
Clock
C/D
A0
Address bus
Data bu
Control bus

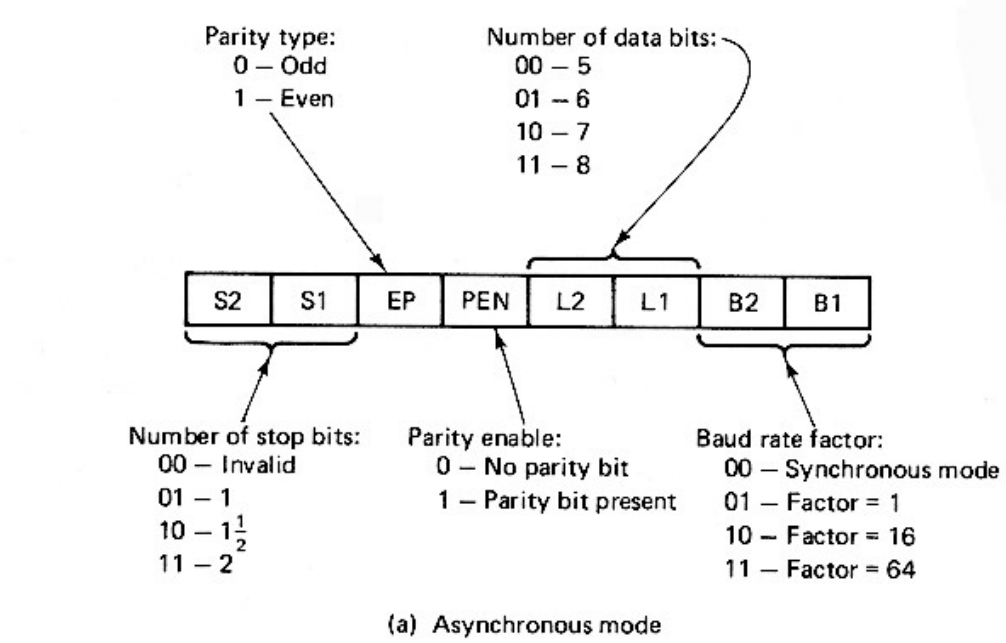
8251 Yazmaçlar

$\overline{CS}$	$C/\overline{D}$	$\overline{RD}$	$\overline{WR}$	Anlam
1	X	X	X	Data-bus tristate
0	X	1	1	Data-bus tristate
0	1	0	1	Status → CPU
0	1	1	0	Mode, Control, Sync← CPU
0	0	0	1	Data → CPU
0	0	1	0	Data ← CPU

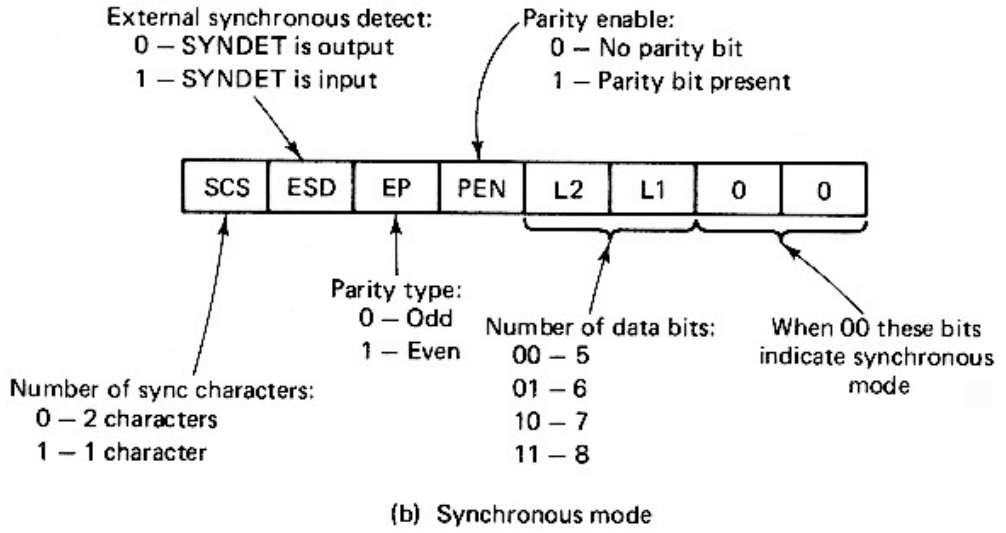
8251 İlk Ayarlama



Mod Yazmacı

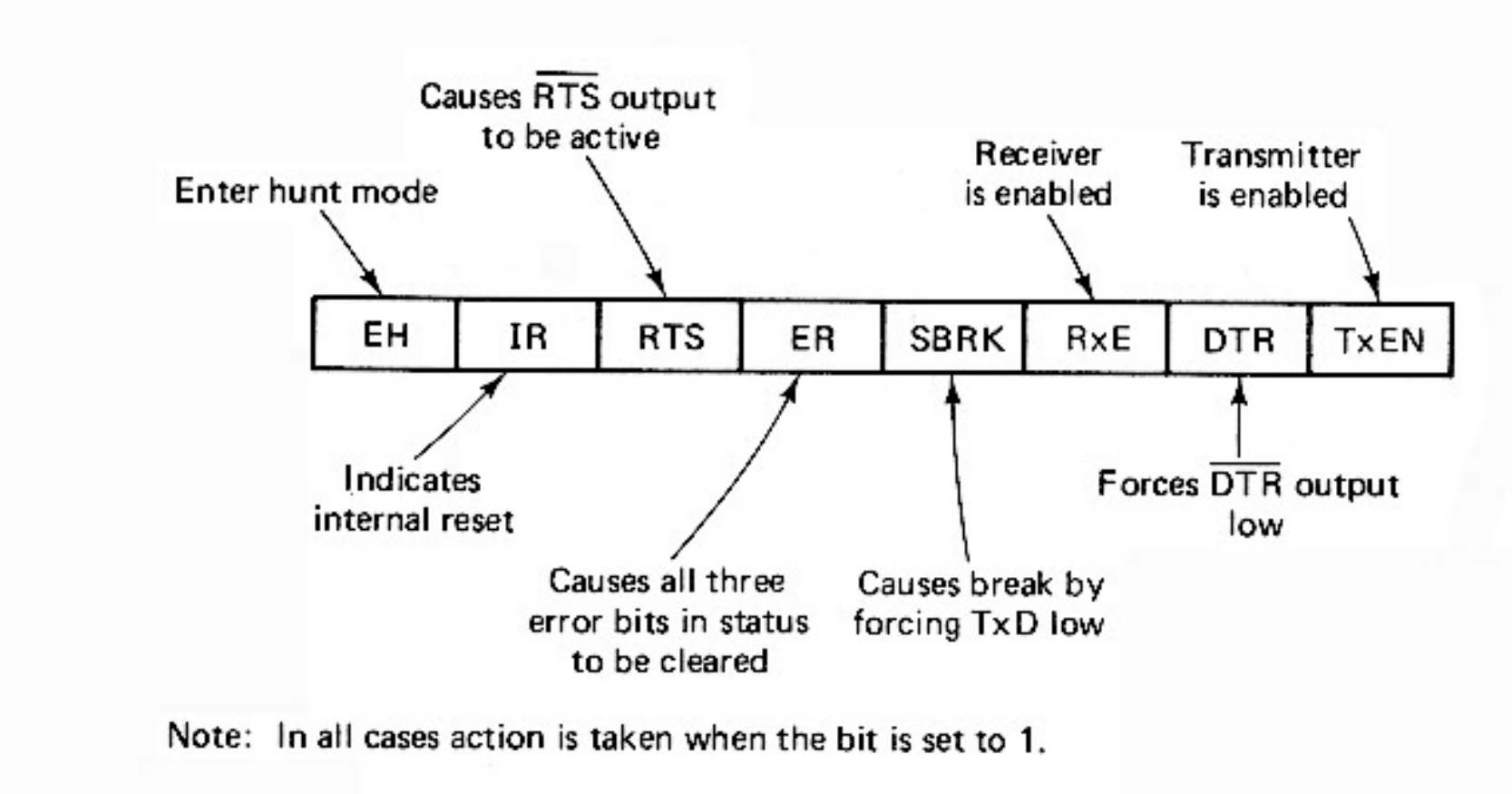


(a) Asynchronous mode



(b) Synchronous mode

Kontrol Yazmacı



Durum Yazmacı