

## UNIVERSAL SYNCHRONOUS ASYNCHRONOUS RECEIVER TRANSMITTER (USART) (8251)

The 8251 is a USART (Universal Synchronous Asynchronous Receiver Transmitter) for serial data communication. As a peripheral device of a microcomputer system, the 8251 receives parallel data from the CPU and transmits serial data after conversion. This device also receives serial data from the outside and transmits parallel data to the CPU after conversion.

### 4.3.1 Block diagram of the 8251 USART (Universal Synchronous Asynchronous Receiver Transmitter)

The 8251 functional configuration is programmed by software. Operation between the 8251 and a CPU is executed by program control. Table 1 shows the operation between a CPU and the device.

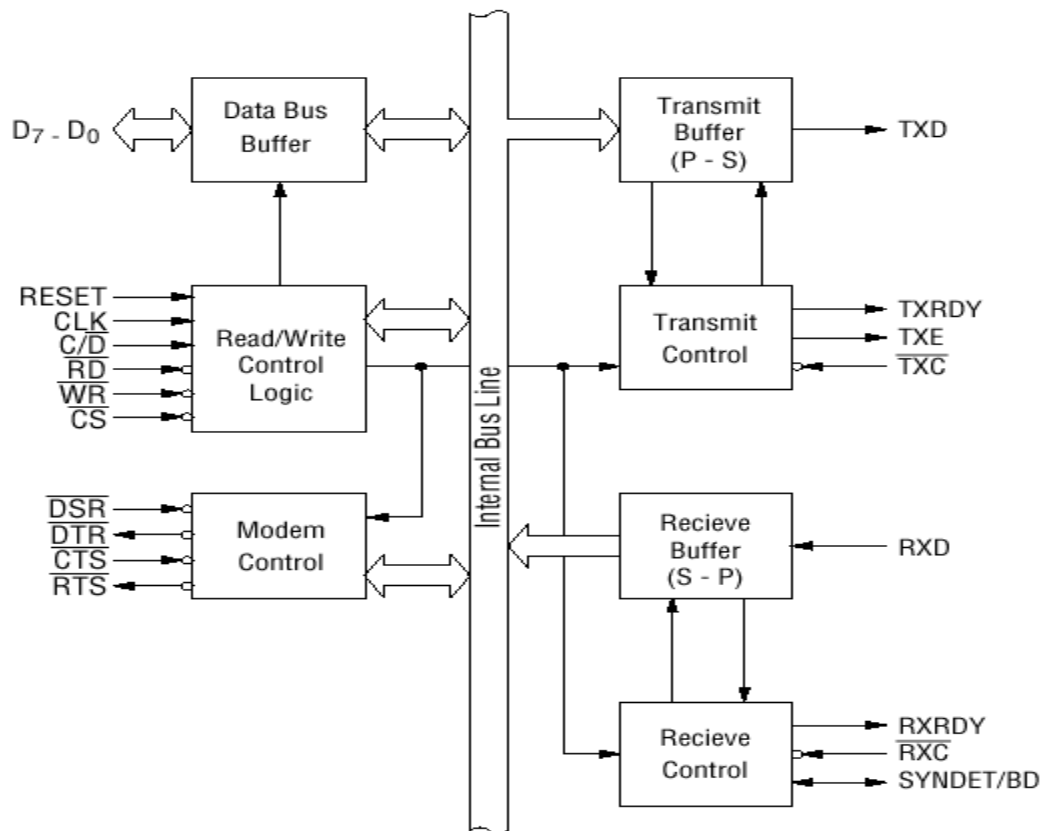
#### Control Words

There are two types of control word.

1. Mode instruction (setting of function)
2. Command (setting of operation)

$\overline{CS}$	$C/D$	$\overline{RD}$	$\overline{WR}$	
1	×	×	×	Data Bus 3-State
0	×	1	1	Data Bus 3-State
0	1	0	1	Status → CPU
0	1	1	0	Control Word ← CPU
0	0	0	1	Data → CPU
0	0	1	0	Data ← CPU

Table 1 Operation between a CPU and 8251



### 1) Mode Instruction

**Mode instruction is used for setting the function of the 8251. Mode instruction will be in "wait for write" at either internal reset or external reset. That is, the writing of a control word after resetting will be recognized as a "mode instruction."**

**Items set by mode instruction are as follows:**

- Synchronous/asynchronous mode
- Stop bit length (asynchronous mode)
- Character length
- Parity bit
- Baud rate factor (asynchronous mode)
- Internal/external synchronization (synchronous mode)
- Number of synchronous characters (Synchronous mode)

**The bit configuration of mode instruction is shown in Figures 2 and 3. In the case of synchronous mode, it is necessary to write one-or two byte sync characters. If sync characters were written, a function will be set because the writing of sync characters constitutes part of mode**

instruction.

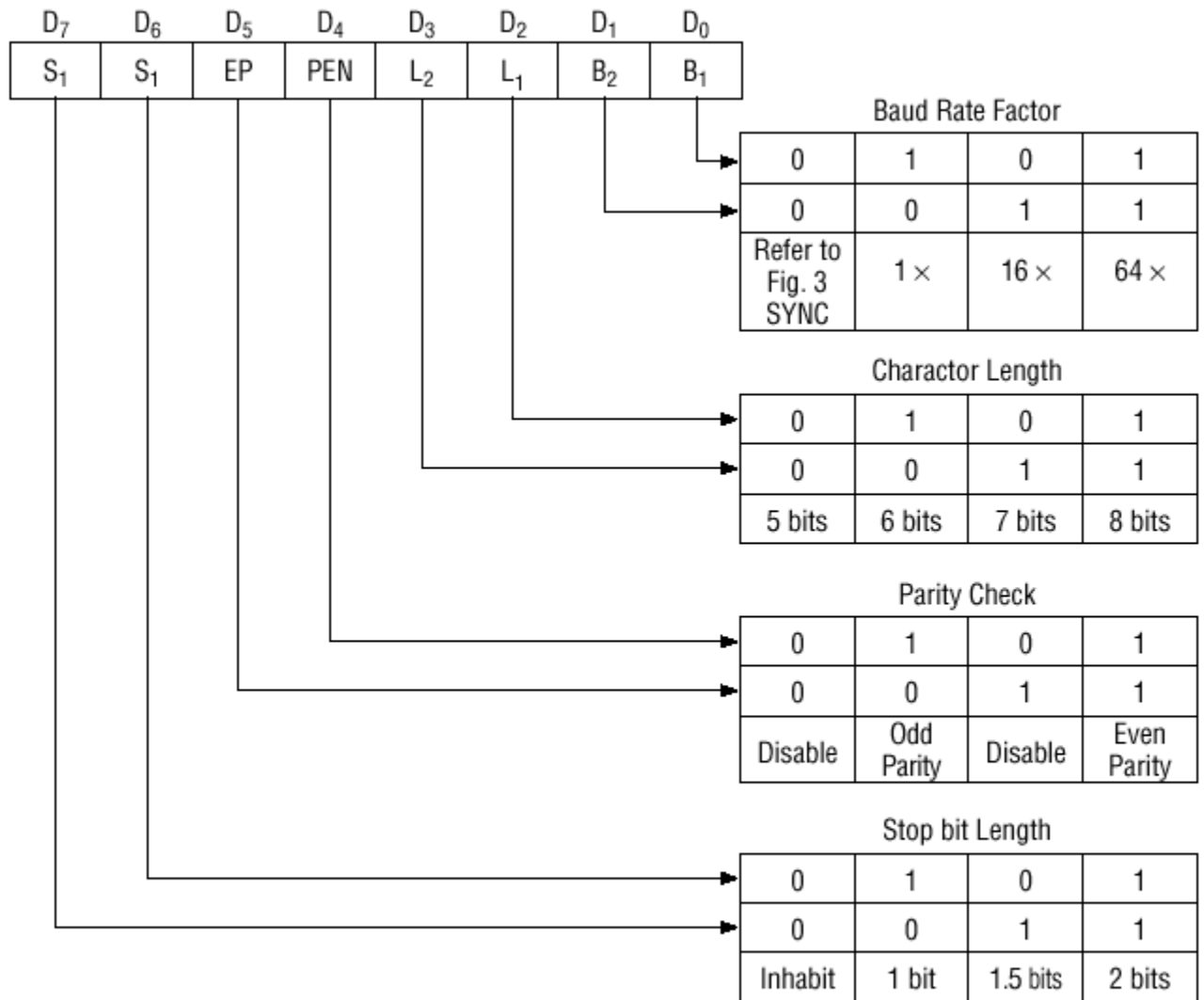
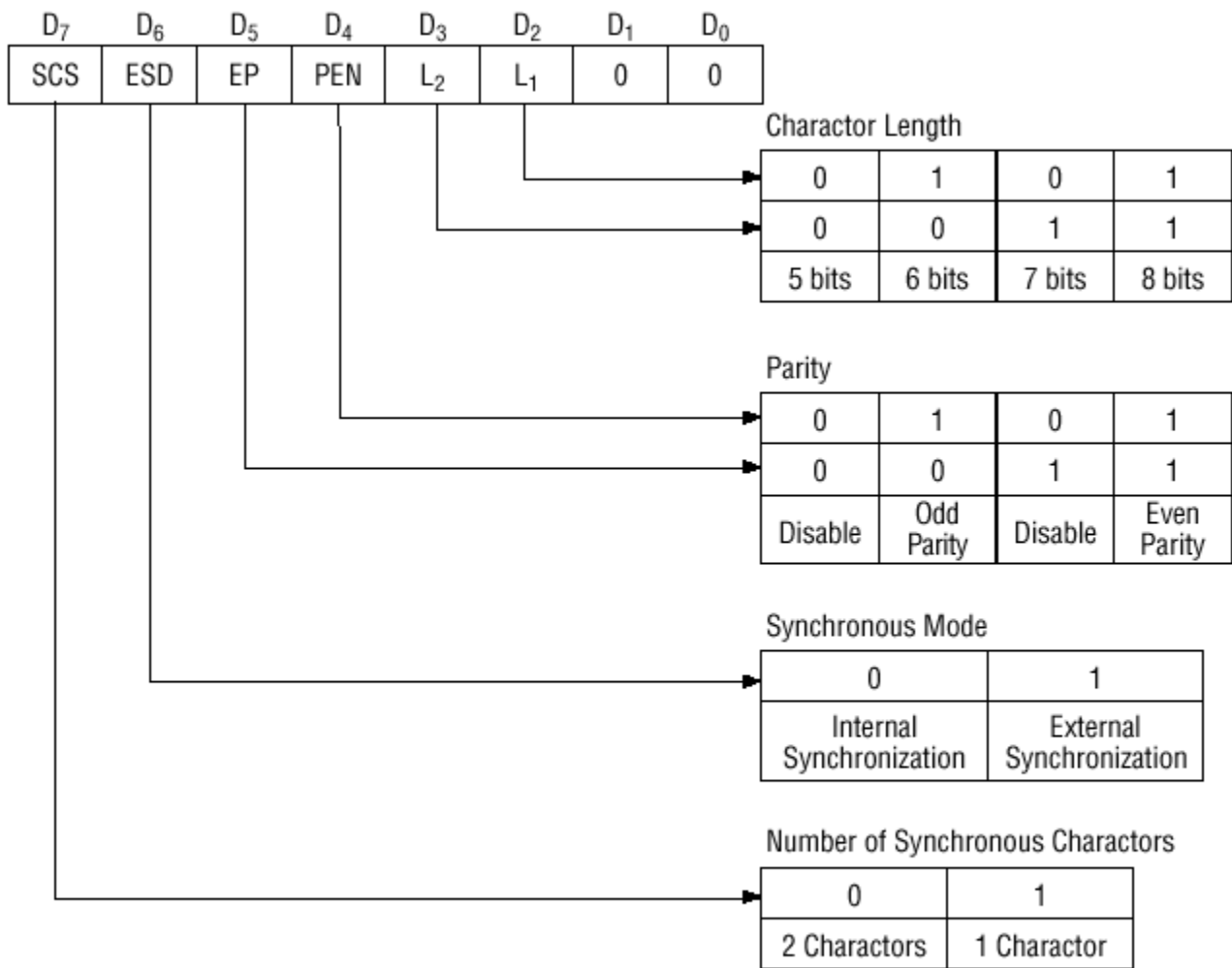


Fig. 2 Bit Configuration of Mode Instruction (Asynchronous)



**Fig. 3 Bit Configuration of Mode Instruction (Synchronous)**

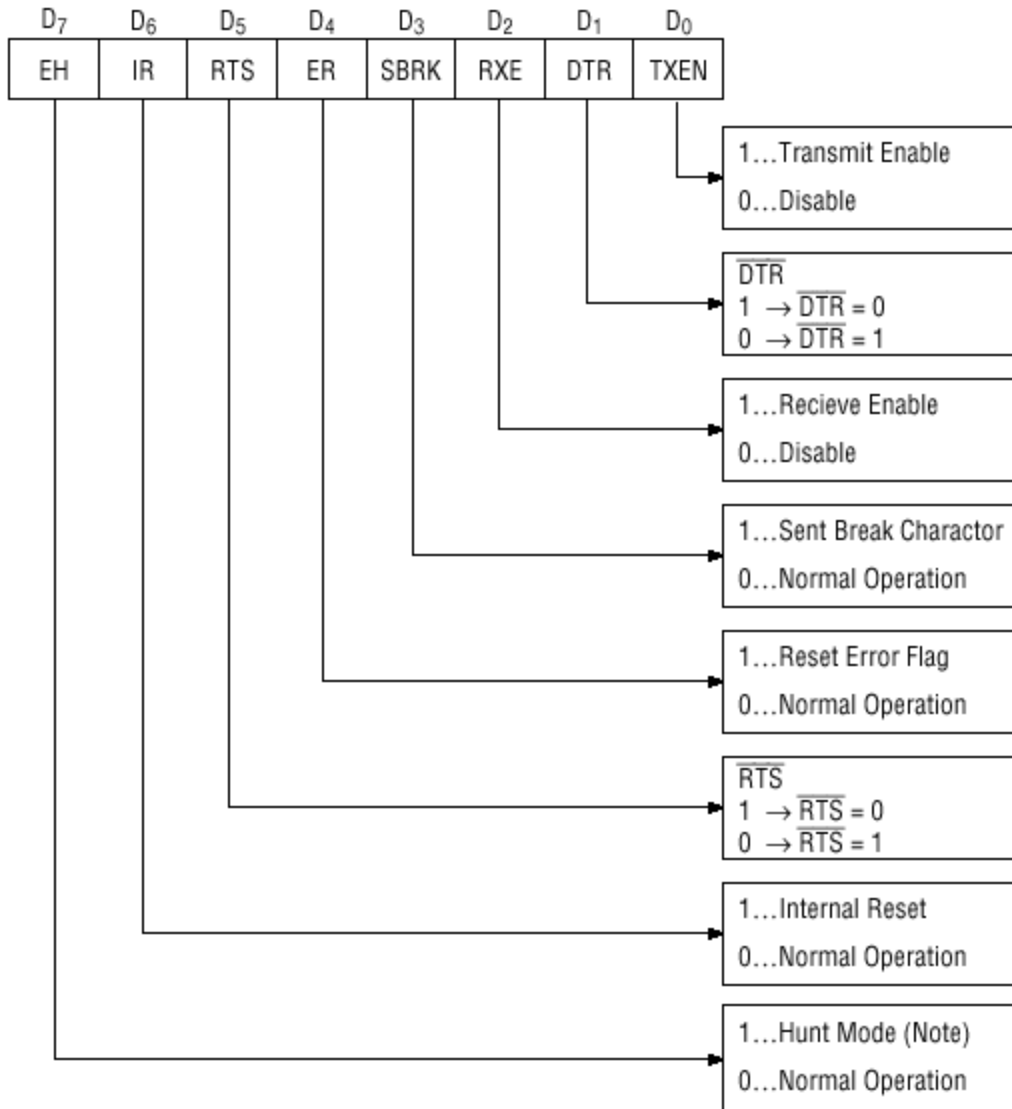
## 2) Command

**Command is used for setting the operation of the 8251. It is possible to write a command whenever necessary after writing a mode instruction and sync characters.**

**Items to be set by command are as follows:**

- Transmit Enable/Disable
- Receive Enable/Disable
- DTR, RTS Output of data.
- Resetting of error flag.
- Sending to break characters

- Internal resetting
- Hunt mode (synchronous mode)



**Note:** Search mode for synchronous characters in synchronous mode.

**Fig. 4 Bit Configuration of Command**

## Status Word

It is possible to see the internal status of the 8251 by reading a status word. The bit configuration of status word is shown in Fig. 5.

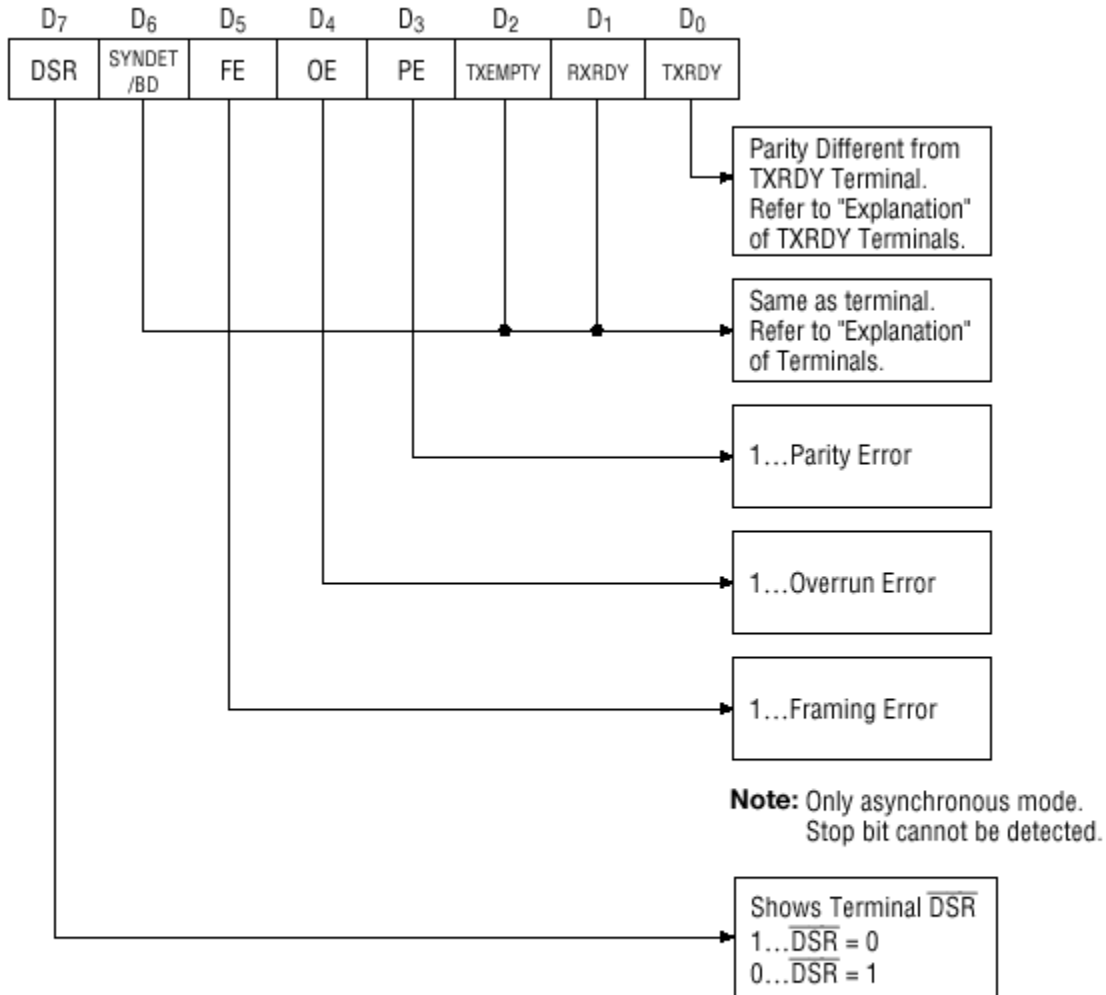


Fig. 5 Bit Configuration of Status Word