ASYNCHRONOUS DATA TRANSFER

- In a computer system, CPU and an I/O interface are designed independently of each other.
- When internal timing in each unit is independent from the other and when registers in interface and registers of CPU uses its own private clock.
- In that case the two units are said to be asynchronous to each other. CPU and I/O device must coordinate for data transfers.

- In asynchronous the transmission of data is generally without the use of an external clock signal, where data can be transmitted intermittently rather than in a steady stream.
- The most significant aspect of asynchronous communications is that data is not transmitted at regular intervals, thus making possible variable bit rate.
- And that the transmitter and receiver clock generators do not have to be exactly synchronized all the time.
- Hence we need a start and stop signal to send and receive data.

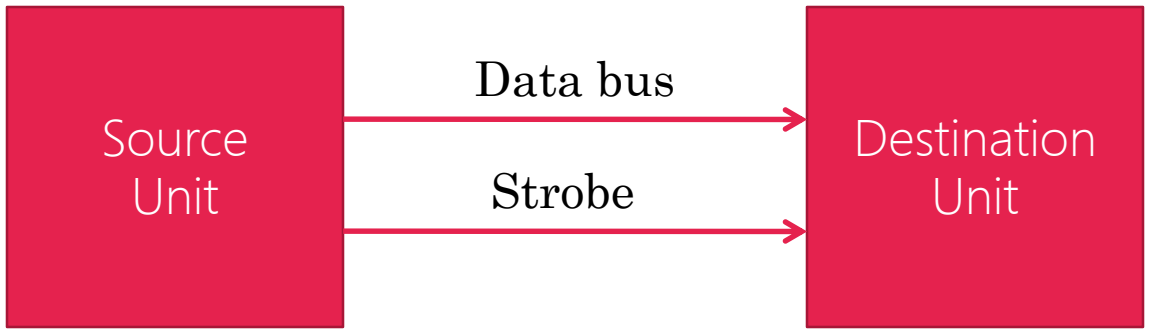
METHODS USED IN ASYNCHRONOUS DATA TRANSFER

- Strobe Control: This is one way of transfer i.e. by means of strobe pulse supplied by one of the units to indicate to the other unit when the transfer has to occur.

- Handshaking: This method is used to accompany each data item being transferred with a control signal that indicates the presence of data in the bus. The unit receiving the data item responds with another control signal to acknowledge receipt of the data.

STROBE CONTROL

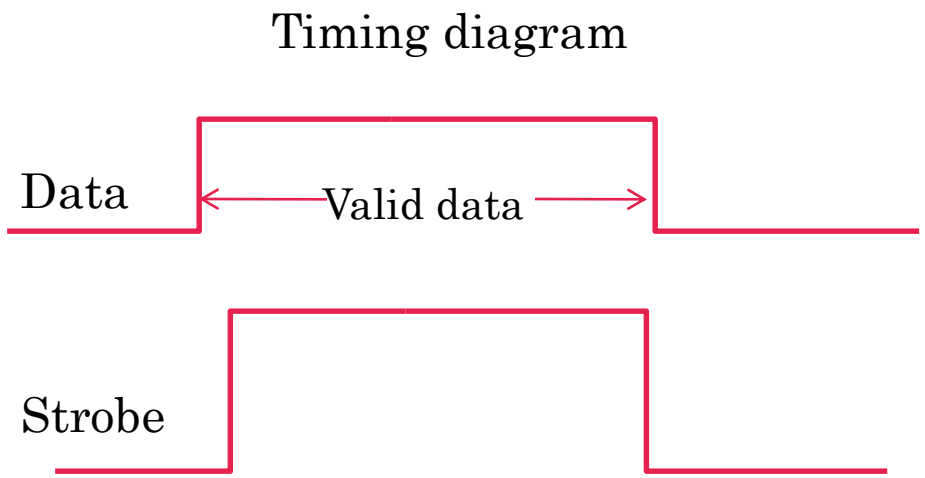
- Strobe control method of data transfer uses a single control signal for each transfer. The strobe may be activated by either the source unit or the destination unit.
  - Source Initiated Strobe
  - Destination Initiated Strobe



SOURCE INITIATED STROBE

- The *data bus* carries the binary information from source unit to the destination unit as shown below.

- The *strobe* is a single line that informs the destination unit when a valid data word is available in the bus.



SOURCE INITIATED STROBE

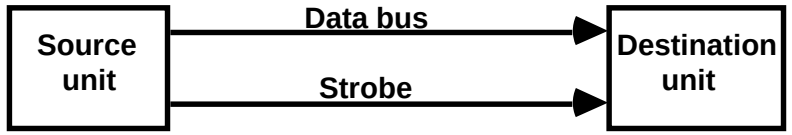
- The source unit first places the data on the bus.
- After a brief delay to ensure that the data settle to a steady value, the source activities the strobe pulse.
- The information of the data bus and the strobe signal remain in the active state for a sufficient time period to allow the destination unit to receive the data.
- The source removes the data from the bus for a brief period of time after it disables its strobe pulse.

DESTINATION INITIATED STROBE

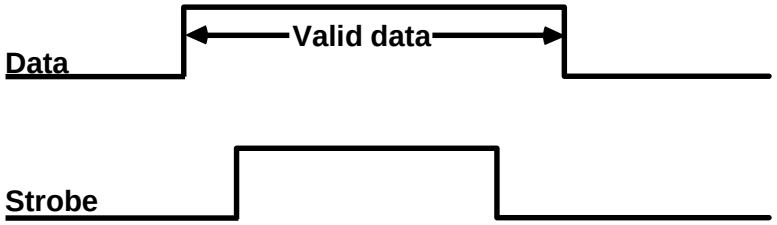
- First, the destination unit activates the strobe pulse, informing the source to provide the data.
- The source unit responds by placing the requested binary information on the unit to accept it.
- The data must be valid and remain in the bus long enough for the destination unit to accept it.
- The falling edge of the strobe pulse can be used again to trigger a destination register.
- The destination unit then disables the strobe. The source removes the data from the bus after a predetermined time interval.

Source-Initiated Strobe for Data Transfer

Block Diagram

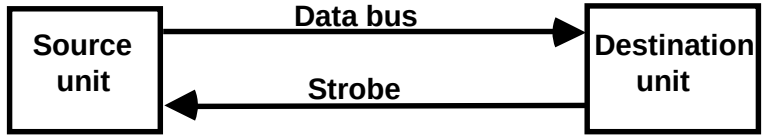


Timing Diagram

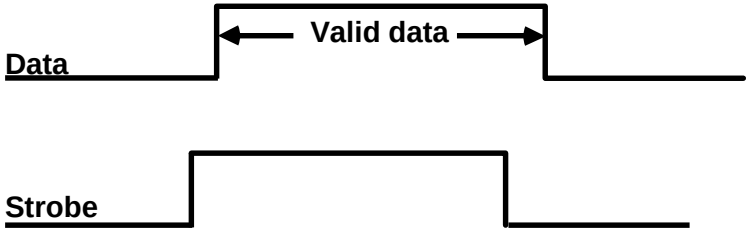


Destination-Initiated Strobe for Data Transfer

Block Diagram



Timing Diagram



HANDSHAKING

Strobe Methods

Source-Initiated

The source unit that initiates the transfer has no way of knowing whether the destination unit has actually received data

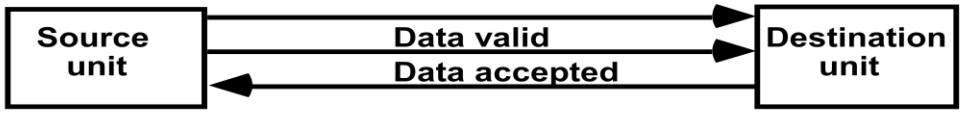
Destination-Initiated

The destination unit that initiates the transfer no way of knowing whether the source has actually placed the data on the bus

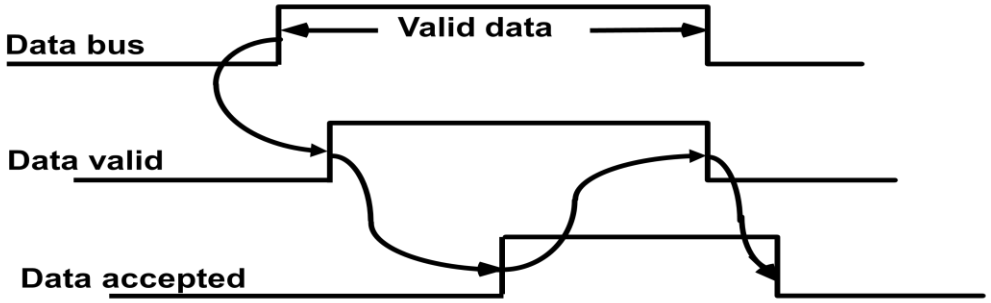
To solve this problem, the *HANDSHAKE* method introduces a second control signal to provide a *Reply* to the unit that initiates the transfer.

SOURCE-INITIATED TRANSFER USING HANDSHAKE

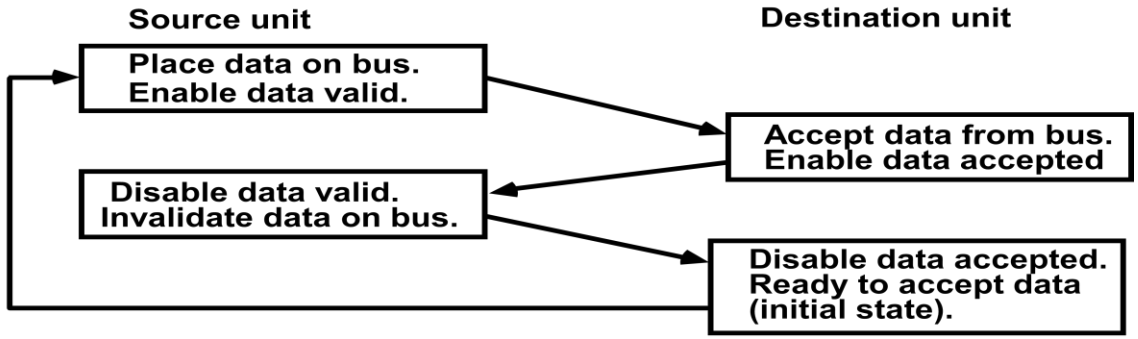
Block diagram:



Timing Diagram:



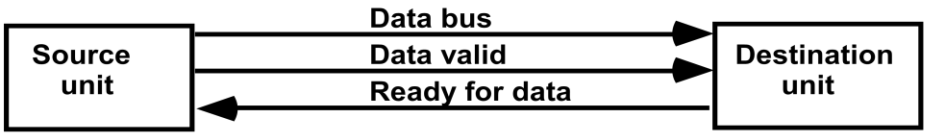
Sequence of Events:



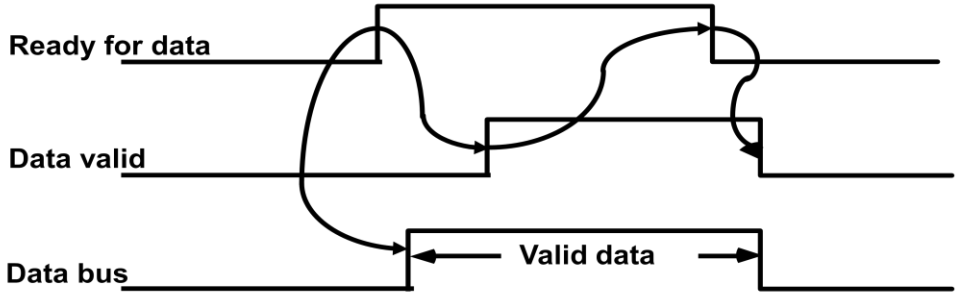
* Allows arbitrary delays from one state to the next
* Permits each unit to respond at its own data transfer rate
* The rate of transfer is determined by the slower unit

DESTINATION-INITIATED TRANSFER USING HANDSHAKE

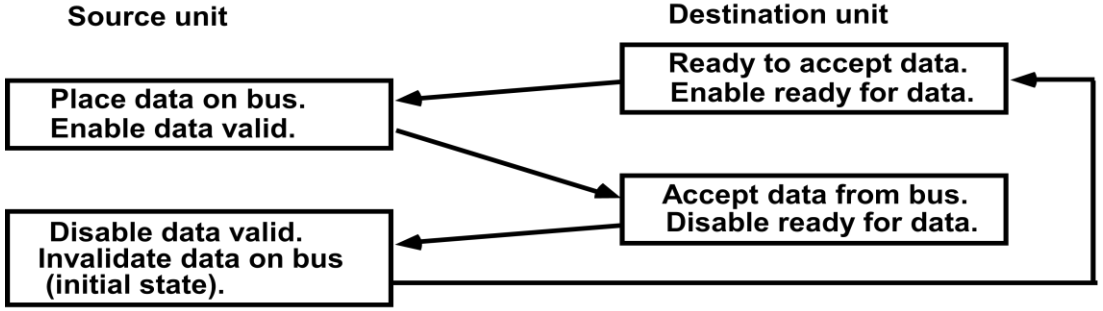
Block Diagram:



Timing Diagram:



Sequence of Events:



* Handshaking provides a high degree of flexibility and reliability because the successful completion of a data transfer relies on active participation by both units
* If one unit is faulty, data transfer will not be completed