

**DB10**  
**Multiplexer Demultiplexer**

**Product Tutorial**  
**Ver.1.1**



Designed & Manufactured in India by-  
An ISO 9001:2008 company

**Sciencetech Technologies Pvt. Ltd.**

94, Electronic Complex, Pardesipura, Indore - 452 010 India,

☎ + 91-731 4211100, ✉ [info@sciencetech.bz](mailto:info@sciencetech.bz), 🌐 [www.SciencetechWorld.com](http://www.SciencetechWorld.com)

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## **DB10**

### **Introduction**

**DB10** is a compact, ready to use **Multiplexer-Demultiplexer** experiment board. This experiment board has been designed to study 4 to 1 Line Multiplexer and 1 to 4 Line Demultiplexer circuit and verify their Truth Table. It can be used as stand alone unit with external power supply or can be used with **Sciencetech 2611 Digital I.C. Platform** which has built in Power Supply, Pulse Generator, Pulser Switches, 8 bits data switches, Logic Probe, Digital Display, 8 bits LED display.

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### Theory

Multiplexing means transmitting a large number of information units over a smaller number of channels or lines. A digital multiplexer is a combinational circuit that selects binary information from one of many input lines and directs it to a single output line. The selection of a particular input line is controlled by a set of selection lines. There are  $2^n$  input lines and  $n$  selection lines whose bit combinations determine which input is selected.

A 4 to 1 Line Multiplexer is shown in figure 1. Each of the four input lines, D0 to D3 is applied to one input of an AND gate. Selection lines S1, S0 are decoded to select a particular AND gate. When S1, S0 = 10. The AND gate associated with input D2 has two of its inputs equal to 1 and third input connected to D2. The other three AND gates have at least one input equal to 0, which makes their output equal to 0. The OR-gate output is now equal to the value of D2, thus providing a path from the selected input to the output. A multiplexer is also called a data selector, since it selects one of many inputs and steers the binary information to the output line. Whenever any input is selected which is in form of clock pulse all other inputs should be at zero level i.e. logic 0.

A demultiplexer is a circuit that receives information on a single line and transmits this information on one of  $2^n$  possible output lines. The selection of a specific output line is controlled by the bit values of  $n$  selection lines. 1 to 4 Line Demultiplexer is shown in figure 2 the single input variable D has a path to all four outputs, but the input information is directed to only one of the output lines, as specified by the binary value of the two selection lines S1 and S0. If the selection lines S1, S0 = 1, 0 output D2 will be same as the input value D, provided D = 0 while all other outputs are maintained at 1. For D=1.

All outputs are at high level. Clock pulse given to D input can be obtained at output lines through selection lines S1 S0.

Table 1a and 2a shows Truth Table for 4 to 1 Line Multiplexer and 1 to 4 line demultiplexer.

## DB10

### Experiment

#### Objective:

To study the following circuit and verify their Truth Table.

1. 4 To 1 Line Multiplexer
2. 1 To 4 Line De-Multiplexer

#### Equipments Needed:

1. Digital board **DB10**.
2. DC Power Supply +5 V from external source or **Sciencetech 2611 Digital I.C. Platform**.
3. Oscilloscope, Digital Multimeter or **Sciencetech 2611 Digital I.C. Platform**.

#### Logic diagram & Truth Table:

(Logic 1 = +5 V & Logic 0=GND)

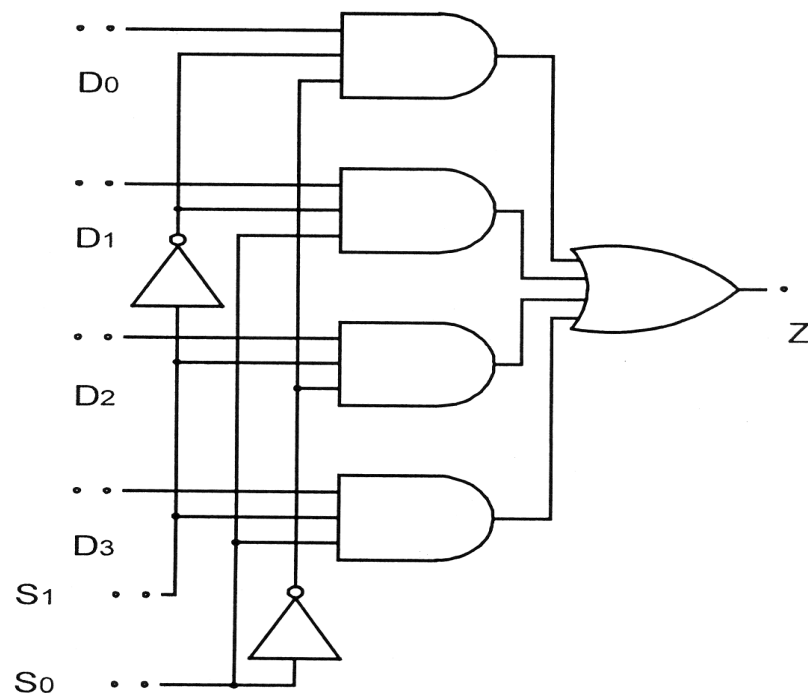


Figure 1

D0	D1	D2	D3	S1	S0	Z
1	0	1	0	0	0	1
1	0	1	0	0	1	0
1	0	1	1	1	0	1
1	0	1	0	1	1	0

Table 1a

DB10

D0	D1	D2	D3	S1	S0	Z
I	0	0	0	0	0	I
0	I	0	0	0	1	I
0	0	I	0	1	0	I
0	0	0	I	1	1	I

I (Clock Pulse of 1 KHz)

Table 1b

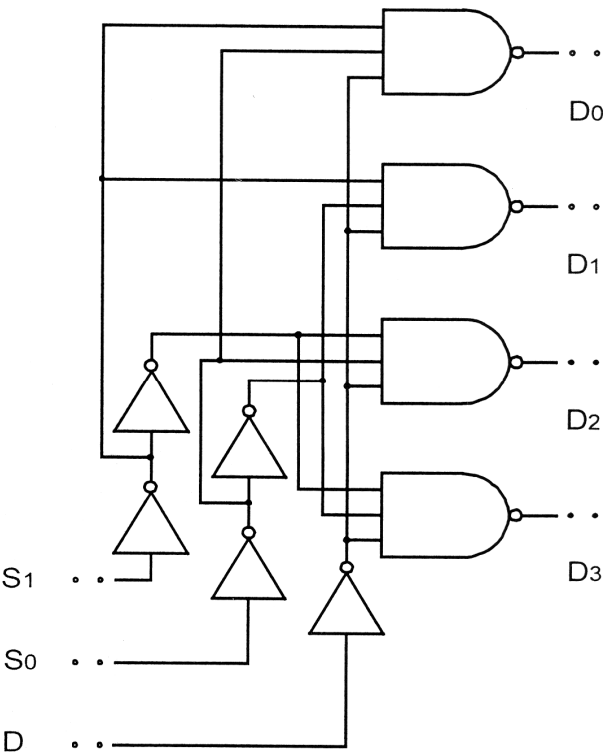


Figure 2

D	S1	S0	D0	D1	D2	D3
0	0	0	0	1	1	1
0	0	1	1	0	1	1
0	1	0	1	1	0	1
0	1	1	1	1	1	0

Table 2a

**DB10**

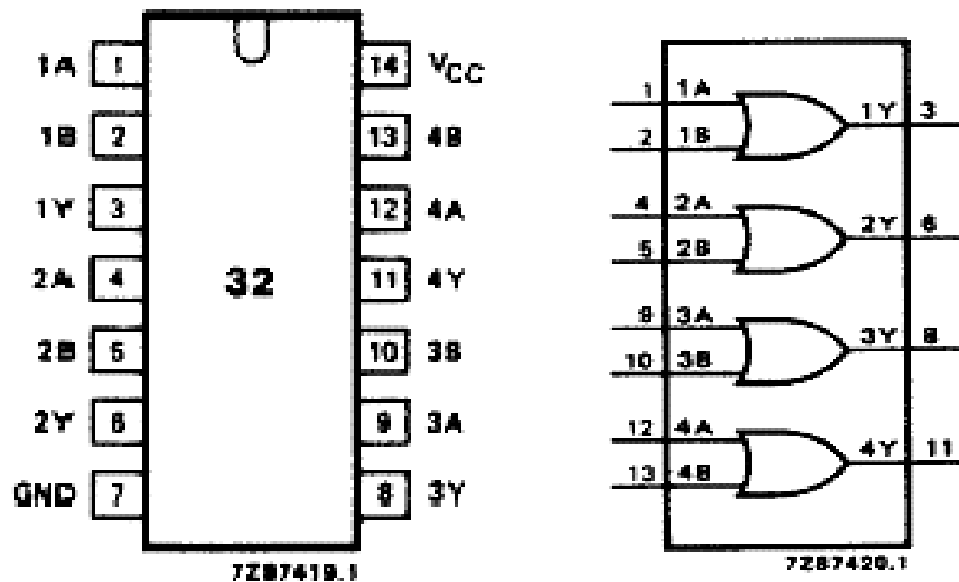
<b>D</b>	<b>S1</b>	<b>S0</b>	<b>D0</b>	<b>D1</b>	<b>D2</b>	<b>D3</b>
<b>I</b>	0	0	<b>I</b>	1	1	1
<b>I</b>	0	1	1	<b>I</b>	1	1
<b>I</b>	1	0	1	1	<b>I</b>	1
<b>I</b>	1	1	1	1	1	<b>I</b>

**I (Clock Pulse of 1 KHz)****Table 2b****Procedure:**

1. Connect +5 V and ground to their indicated position on **DB10** from external DC power supply or from DC power block of **Scientech 2611 Digital I.C. Platform**.
2. Switch ON the power supply.
3. Connect inputs D0-D3 as per Truth Table1a to 4 to 1 line multiplexer. Circuit as shown in figure 1.
4. Observe output, Z on multimeter or on LED display of **Scientech 2611 Digital I.C. Platform** and prove Truth Table.
5. Repeat step 3 and 4 for Table 1b. Observe results on Oscilloscope.
6. Connect input D as per Truth Table 2a to 1 to 4 Line Demultiplexer circuit as shown in figure 2.
7. Observe output D0-D3 on multimeter or on LED display of **Scientech 2611 Digital I.C. Platform** and prove Truth Table.
8. Repeat steps 2 & 3 for Table 2b and observe output on Oscilloscope.

Quad 2-input OR gate

74HC/HCT32



FUNCTION TABLE

INPUTS		OUTPUT
nA	nB	nY
L	L	L
L	H	H
H	L	H
H	H	H

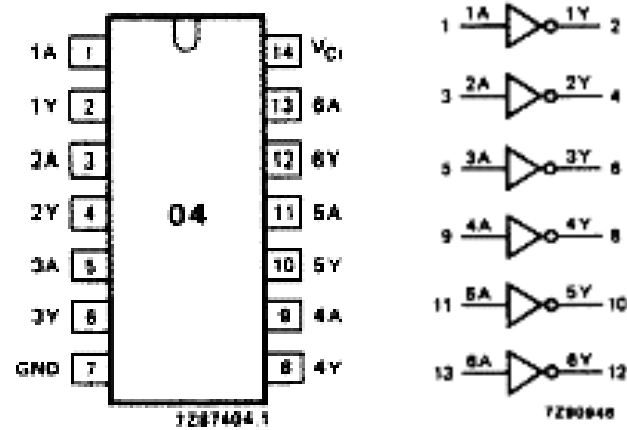
**Notes**

1. H = HIGH voltage level  
L = LOW voltage level



## Hex inverter

74HC/HCT04

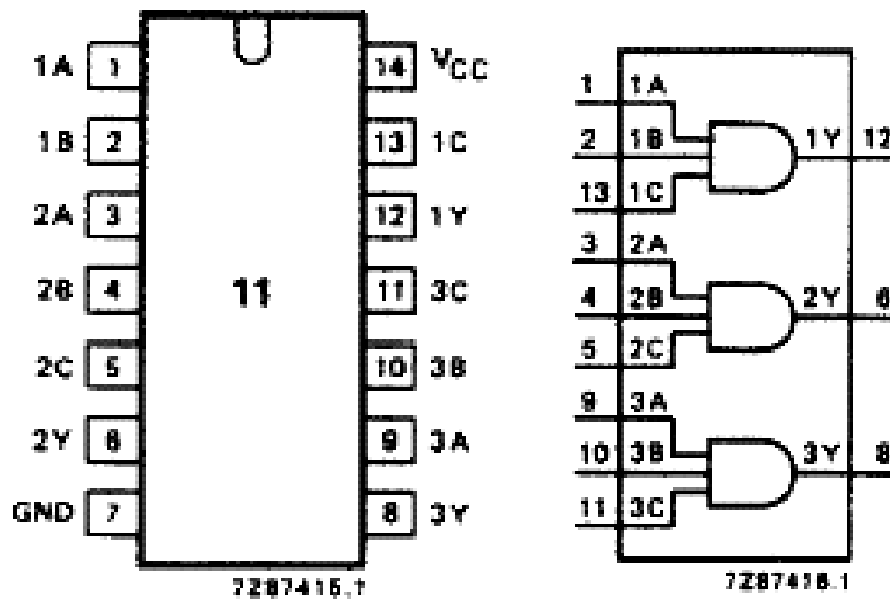


## FUNCTION TABLE

INPUT	OUTPUT
nA	nY
L	H
H	L

## Notes

1. H = HIGH voltage level  
L = LOW voltage level

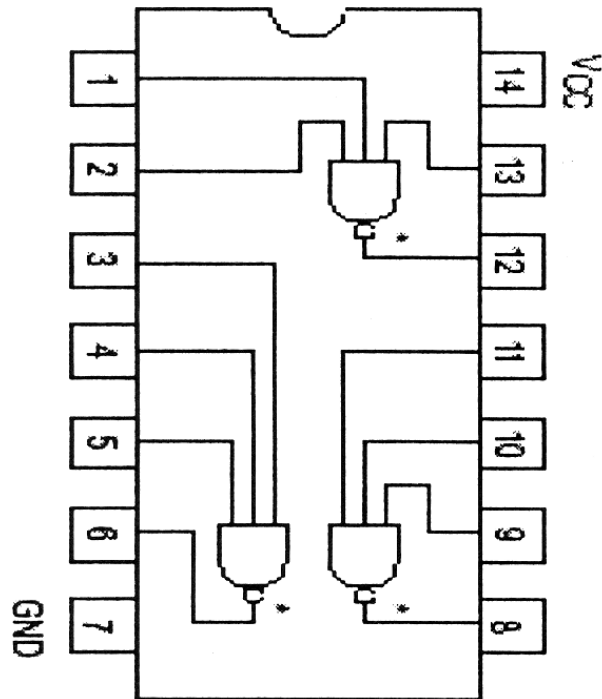


FUNCTION TABLE

INPUTS			OUTPUT
nA	nB	nC	nY
L	L	L	L
L	L	H	L
L	H	L	L
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	L
H	H	H	H

**Notes**

1. H = HIGH voltage level  
L = LOW voltage level



**Note:** Pull up resistance of 1 k is required in open collector ICs to get output.

**Warranty**

1. We guarantee this product against all manufacturing defects for **12 months** from the date of sale by us or through our dealers.
2. The guarantee will become void, if
  - a. The product is not operated as per the instruction given in the Learning Material.
  - b. The agreed payment terms and other conditions of sale are not followed.
  - c. The customer resells the instrument to another party.
  - d. Any attempt is made to service and modify the instrument.
3. The non-working of the product is to be communicated to us immediately giving full details of the complaints and defects noticed specifically mentioning the type, serial number of the product and date of purchase etc.
4. The repair work will be carried out, provided the product is dispatched securely packed and insured. The transportation charges shall be borne by the customer.

**Hope you enjoyed the Scienteck Experience.**

**List of Accessories**

	Quantity
1. 2 mm Patch Cords .....	9