Efficient Implementation of a Demultiplexer

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***Abstract*- This paper will address you about the basic function of the multiplexer (mux) and demultiplexer (demux), the typical application of the mux and demux, It also address you about the A 4 to 1 mux and demux [designed with Small Scale Integration(SSI), A 4 to 1,8 to 1, 16 to 1 Medium Scale Integration]. A Multiplexer is a device that selects one of several analog or digital input signals and forwards the selected input into a single line. Demultiplexer is a device taking a single input signal and selecting one of many data-output-lines, which is connected to the single input.**

I. MUX and DEMUX

In electronics, a **Multiplexer** (or **mux**) is a device that selects one of several analog or digital input signals and forwards the selected input into a single line. A multiplexer of 2^n inputs has n select lines, which are used to select which input line to send to the output. Multiplexers are mainly used to increase the amount of data that can be sent over the network within a certain amount of time and bandwidth. A multiplexer is also called a **data selector**.

An electronic multiplexer makes it possible for several signals to share one device or resource, for example one A or one

communication line, instead of having one device per input signal.

Conversely, a **Demultiplexer** (or **demux**) is a device taking a single input signal and selecting one of many data-output-lines, which is connected to the single input. A multiplexer is often used with a complementary demultiplexer on the receiving end.

An electronic multiplexer can be considered as a multiple-input, single-output switch, and a demultiplexer as a single-input, multiple-output switch. The schematic symbol for a multiplexer is an isosceles trapezoid with the longer parallel side containing the input pins and the short parallel side containing the output pin. The schematic on the right shows a 2-to-1 multiplexer on the left and an equivalent switch on the right. The sel wire connects the desired input to the output.

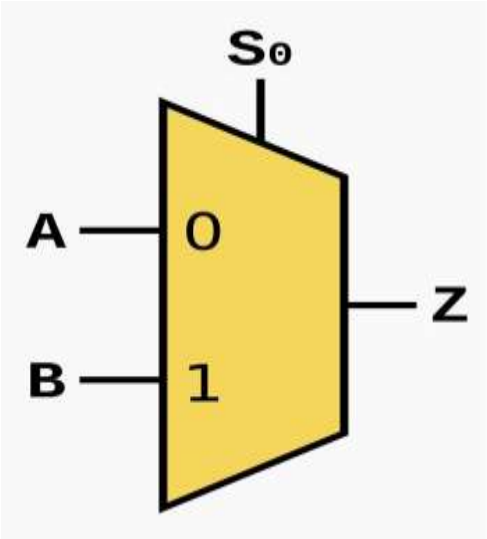
II. DIGITAL MULTIPLEXER

In digital circuit design, the selector wires are of digital value. In the case of a 2-to-1 multiplexer, a logic value of 0 would connect I_0 to the output while a logic value of 1 would connect I_1 to the output. In larger multiplexers, the number of selector pins is equal to $\lceil \log_2(n) \rceil$ where n is the number of inputs.

For example, 9 to 16 inputs would require no fewer than 4 selector pins and 17 to 32 inputs would require no fewer than 5 selector pins. The binary value expressed on these selector pins determines the selected input pin.

A 2-to-1 multiplexer has a boolean equation where A and B are the two inputs, S is the selector input, and Z is the output:

$$Z = (A \cdot \overline{S}) + (B \cdot S)$$



- **A 2-to-1 multiplexer**
- **Chaining Multiplexers**

Larger multiplexers can be constructed by using smaller multiplexers by chaining them together. For example, an 8-to-1 multiplexer can be made with two 4-to-1 and one 2-to-1 multiplexers. The two 4-to-1 multiplexer outputs are fed into the 2-to-1 with the selector pins on the 4-to-1's put in parallel giving a total number of selector inputs to 3, which is equivalent to an 8-to-1.

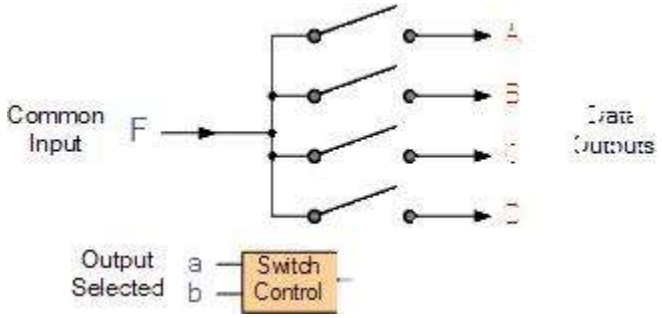
List of ICs which provide multiplexing

The 7400 series has several ICs that contain multiplexer(s):

S.No.	IC No.	Function	Output State
1	74157	Quad 2:1 mux.	Output same as input given
2	74158	Quad 2:1 mux.	Output is inverted input
0	74153	Dual 4:1 mux.	Output same as input
5	74352	Dual 4:1 mux.	Output is inverted input
9	74151A	16:1 mux.	Both outputs available (i.e., complementary outputs)
6	74151	8:1 mux.	Output is inverted input
7	74150	16:1 mux.	Output is inverted input

III. DEMUX

The data distributor, known more commonly as a Demultiplexer or "Demux" for short, is the exact opposite of the Multiplexer **we saw in the previous tutorial. The demultiplexer takes one single input data line and then switches it to any one of a number of individual output lines one at a time.**



Digital Demultiplexer

Demultiplexers take one data input and a number of selection inputs, and they have several outputs. They forward the data input to one of the outputs depending on the values of the selection inputs. Demultiplexers are sometimes convenient for designing general

purpose logic, because if the demultiplexer's input is always true, the demultiplexer acts as a decoder. This means that any function of the selection bits can be constructed by logically OR-ing the correct set of outputs.If X is the input and S is the selector, and A and B are the outputs:

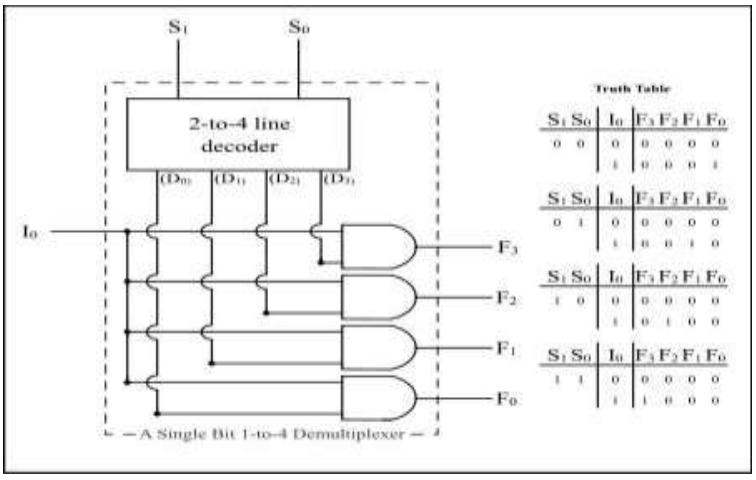
List of ICs which provide demultiplexing

The 7400 series has several ICs that contain demultiplexer(s):

S.No.	IC No. (7400)	IC No. (4000)	Function	Output State
1	74139		Dual 1:4 demux.	Output is inverted input
3	74156		Dual 1:4 demux.	Output is open collector

$$B = (X \cdot S)$$
$$A = (X \cdot \overline{S})$$

4	74138		1:8 demux.	Output is inverted input



5	74238		1:8 demux.	
6	74154		1:16 demux.	Output is inverted input
7	74159	CD4514/15	1:16 demux.	Output is open collector and same as input

IV. CONCLUSION:-

While production managers of today appear to have more education than before, little else seems to have changed over many years. Production managers in New Zealand continue to have a wide range of responsibilities and appear to be happy with their job, status, and remuneration. Production managers feel they need further training in computer skills, accounting, and business management.

REFERENCE:

✓ **Sites:**

1.**) www.google.co.in**

2.) **www.wiki.in**