

A magnitude digital Comparator is a combinational circuit that compares two digital or binary numbers in order to find out whether one binary number is equal, less than or greater than the other binary number. We logically design a circuit for which we will have two inputs one for A and other for B and have three output terminals, one for $A > B$ condition, one for $A = B$ condition and one for $A < B$ condition.



1-Bit Magnitude Comparator –

A comparator used to compare two bits is called a single bit comparator. It consists of two inputs each for two single bit numbers and three outputs to generate less than, equal to and greater than between two binary numbers.

The truth table for a 1-bit comparator is given below:

A	B	$A < B$	$A = B$	$A > B$
0	0	0	1	0
0	1	1	0	0
1	0	0	0	1
1	1	0	1	0

From the above truth table logical expressions for each output can be expressed as follows:

$$A > B: AB'$$

$$A < B: A'B$$

$$A = B: A'B' + AB$$

From the above expressions we can derive the following formula:

$$(A < B) + (A > B) = A'B + AB'$$

Taking complement both sides

$$(A < B) + (A > B) ' = (A'B + AB')'$$

$$(A < B) + (A > B) ' = (A'B)' (AB)'$$

$$(A < B) + (A > B) ' = (A + B') (A' + B)$$

$$(A < B) + (A > B) ' = (AA' + AB + A'B' + BB')$$

$$= (AB + A'B')$$

Thus,

$$(A < B) + (A > B) ' = (A = B)$$

By using these Boolean expressions, we can implement a logic circuit for this comparator as given below:

