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Experiment No - 10

Aim → The objective of experiment is to fully understand the functionality of 4-bit magnitude comparator using 3485 IC and to show how the comparator output changes according to input combinations of two 4-bit binary numbers and to understand the functionality of 8-bit magnitude comparator by cascading two four bit magnitude comparator.

Theory →

IC 7485 is used to compare magnitude of two binary numbers. The two 4-bit numbers are applied at the inputs $A3, A2, A1, A0$ and $B3, B2, B1, B0$ where $A3$ and $B3$ are the most significant bits of the two 4-bit operands to be compared. The three cascading inputs $(A=B)_{IN}$, $(A<B)_{IN}$ should be connected to logic '1' (HIGH), logic '0' (LOW) ~~and logic~~ respectively. The three outputs $(A>B)_{out}$, $(A=B)_{out}$ and $(A<B)_{out}$ will reflect the results of comparing the two 4-bit numbers $A = A_3A_2A_1A_0$ and $B = B_3B_2B_1B_0$.

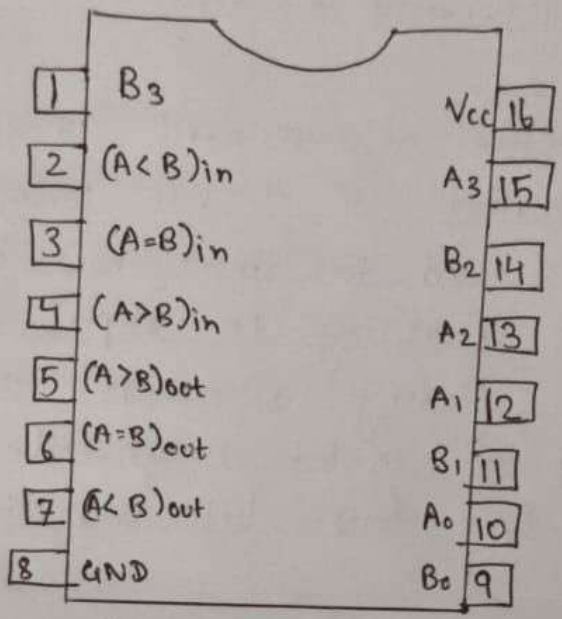
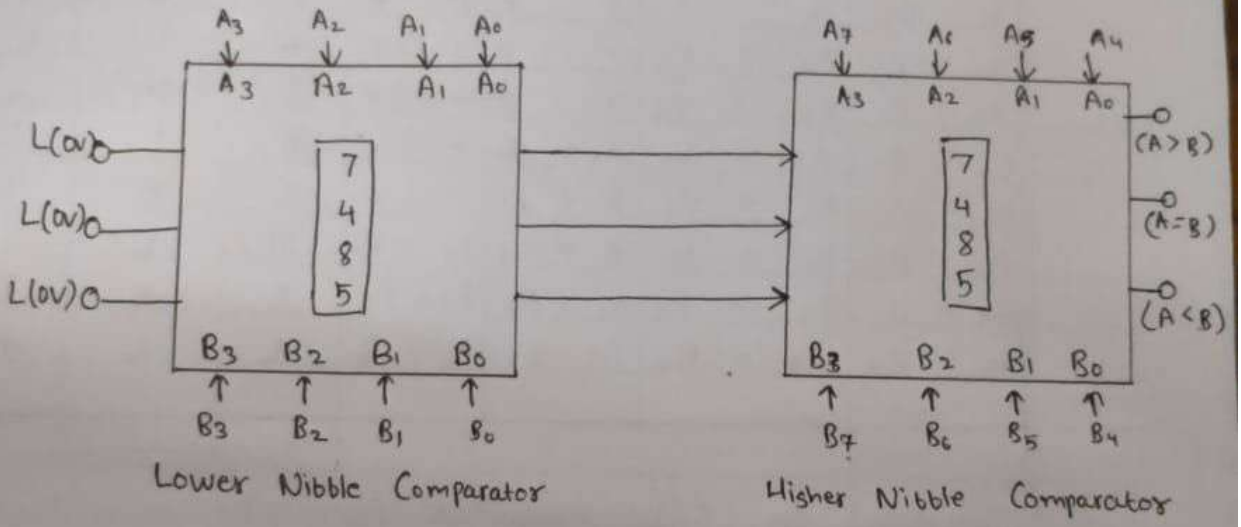

1 B3
2 (A<B)in
3 (A=B)in
4 (A>B)in
5 (A>B)out
6 (A=B)out
7 (A<B)out
8 GND
Vcc 16
A3 15
B2 14
A2 13
A1 12
B1 11
A0 10
B0 9

Fig1- IC 7485

Comparing Inputs				Outputs		
A_3, B_3	A_2, B_2	A_1, B_1	A_0, B_0	A>B	A<B	A=B
$A_3 > B_3$	X X	X X	X X	H	L	L
$A_3 < B_3$	X X	X X	X X	L	H	L
$A_3 = B_3$	$A_2 > B_2$	X X	X X	H	L	L
$A_3 = B_3$	$A_2 < B_2$	X X	X X	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 > B_1$	X X	H	L	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 < B_1$	X X	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 > B_0$	H	L	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 < B_0$	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	L	L	H

Implement an 8-bit magnitude comparator using two 7485 chips. Let $A = A_7 \cdots A_0$ and $B = B_7 \cdots B_0$ be the two 8-bit numbers. Note that no external gates are required. The three outputs of 7485 comparing the lower nibbles, viz $(A>B)_{out}$ and $(A<B)_{out}$ are connected to the corresponding cascading inputs of the 7485 used to compare the higher nibbles. Final results of comparison are obtained at the $(A>B)_{out}$, $(A=B)_{out}$ and $(A<B)_{out}$ terminals the higher nibble comparator.

Conclusion – In conclusion, an 8-bit magnitude comparator can be effectively implemented using two 7485 ICs, cascading the outputs of the lower nibble comparator to the higher nibble, yielding accurate comparison results for the entire 8-bit numbers.



8-bit Magnitude comparator