

Practical No.8: Test the output of BCD to 7 Segment Decoder using Digital IC for the given inputs.

I Practical Significance

BCD is an abbreviation for binary-coded decimal. BCD is a way of representing decimal numbers in binary form. The IC takes a 4-bit BCD input and converts it into the corresponding 7-segment display outputs. It is used to display decimal numbers.

II Industry/Employer Expected Outcome(s)

Students will be able to test the functionality of the digital circuits/system.

III Course Level Learning Outcome(s)

Develop combinational logic circuits for given applications.

IV Laboratory Learning Outcome(s):

1. Construct and test BCD to 7 segment using Digital IC.

V Relevant Affective Domain related outcome(s)

Identify PIN configuration of IC.

Handle the components and equipment carefully.

Follow all safety precautions.

VI Relevant Theoretical Background

A decoder is a combinational circuit that connects the binary information from 'n' input lines to a maximum of 2^n unique output lines. The IC7447 is a BCD to 7-segment pattern converter. The IC7447 takes the Binary Coded Decimal (BCD) as the input and outputs the relevant 7 segment code. A seven segment decoder is an IC decoder that can be used to drive a seven segment indicator. There are two types of 7-segment digital display 1. Common anode display (CAD) and 2.common cathode display (CCD). Each decoder driver has 4 BCD inputs and 7 output pins (a to g segment).

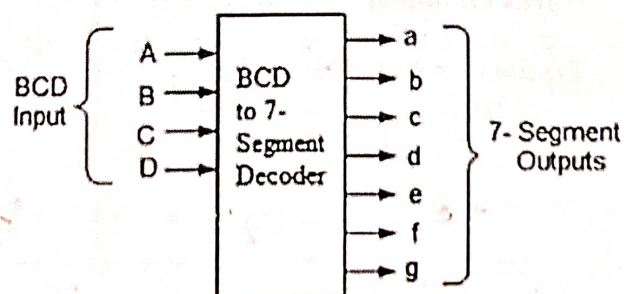


Fig. 8.1 BCD to 7-Segment Decoder

Common Cathode Display (CCD):

Common cathode has all the cathodes of the 7-segments connected directly together to ground (Logic 0). The individual segments are illuminated by application of high (Logic 1) signal to the individual anode terminals. For common cathode LED displays the ICs are IC 7448, IC 74248, IC 7449 etc. are used.

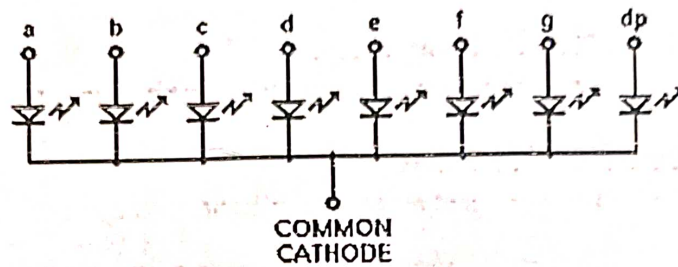


Fig. 8.2 Common Cathode Display (CCD)

Common Anode Display (CAD):

Common anode has all the anodes of the 7-segments connected together to VCC (Logic 1). The individual segments are illuminated by connecting the individual cathode terminals to low (Logic 0) signals to the individual cathode terminals. For common anode LED displays the ICs are IC 7446, IC 74246, IC 7447 etc. are used.

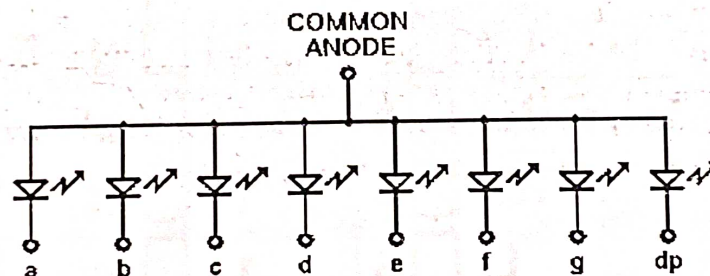
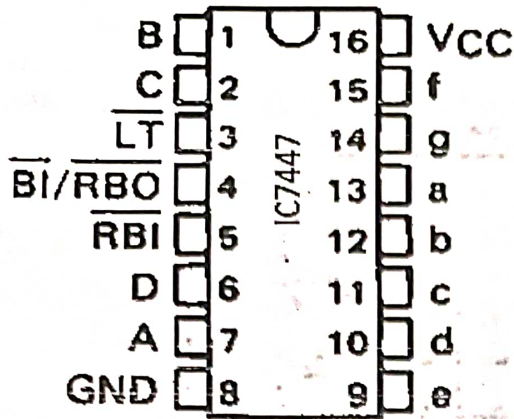


Fig. 8.3 Common Anode Display (CAD)

Courtesy: (<https://arduino.stackexchange.com/questions/16858/leds-difference-between-common-anode-and-common-cathode>)

IC 7447(BCD to 7-Segment decoder IC)

IC 7447 is BCD to 7-Segment decoder IC whose output is active low depending on the corresponding BCD inputs so it is used to drive common anode 7- segment displays.



Pin Name	Description
D,C,B,A	BCD inputs
a to g	Outputs
\overline{LT}	Lamp Test
\overline{RBI}	Ripple Blanking Input
\overline{BI}	Blanking Input
\overline{RBO}	Ripple Blanking Output

Fig. 8.4 IC 7447 pin diagram

IC 7448(BCD to 7-Segment decoder IC)

IC 7448 is BCD to 7-Segment decoder IC whose output is active high depending on the corresponding BCD inputs so it is used to drive common cathode 7- segment displays

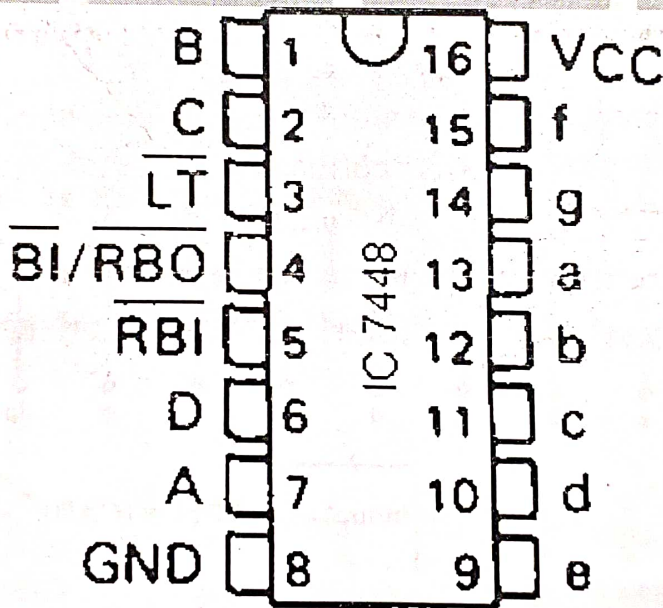
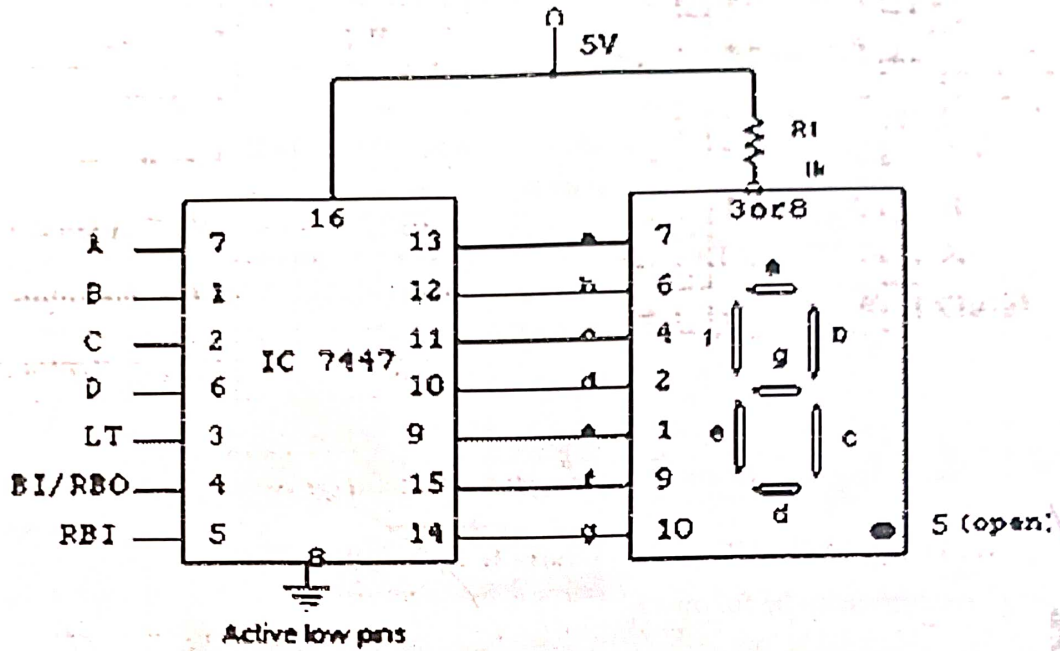


Fig. 8.5 IC 7448 pin diagram

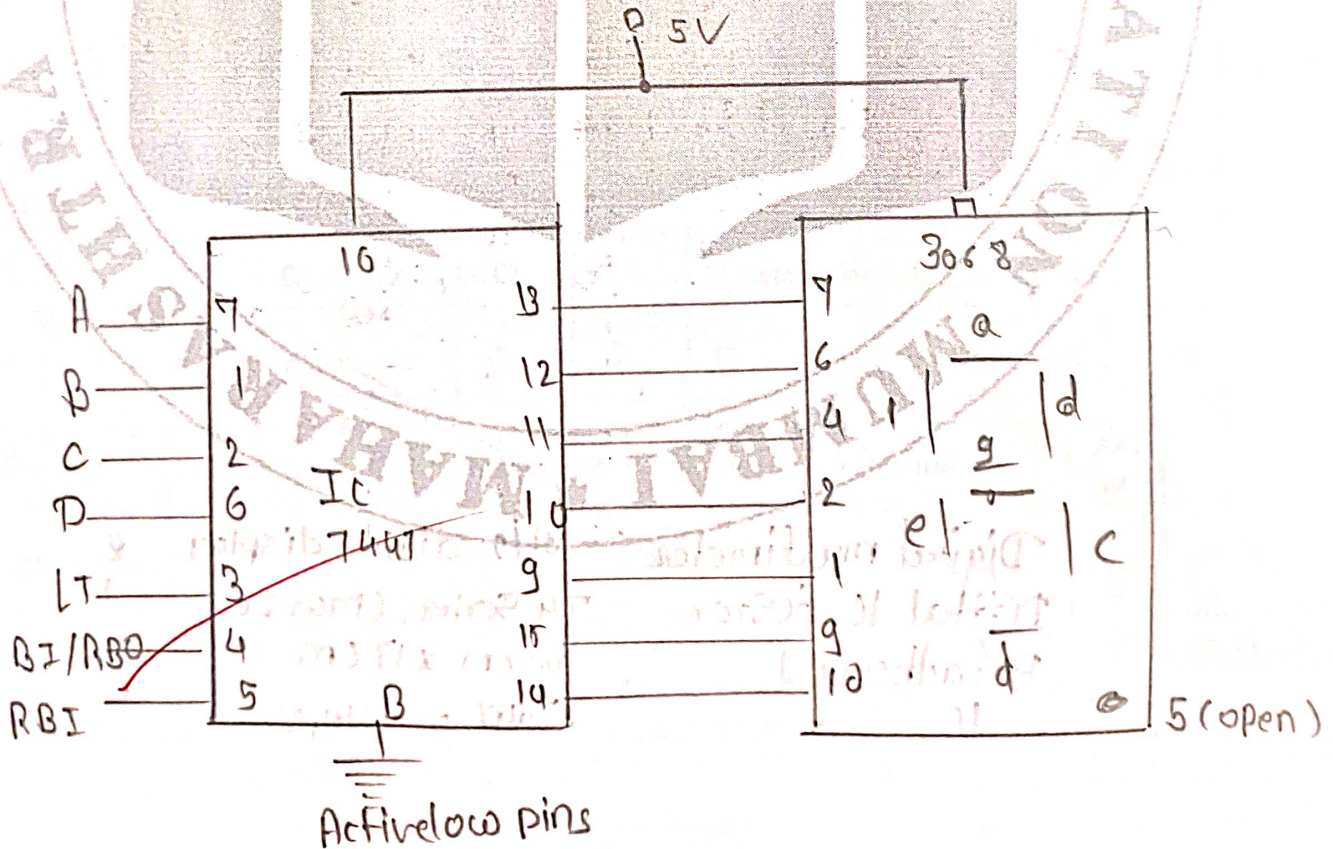
VII Circuit diagram
a) Sample Circuit



For normal functioning of IC 7447 Pin number 3, 4, 5 should be connected to logic 1Vcc
Courtesy: (<http://www.bragitoff.com/2015/10/bcd-to-7-segment-decoderdriver/>)

Fig 8.6: Circuit Diagram

b) Actual circuit



VIII Resources Required

Sr. No.	Name of Resource	Suggested Broad Specification	Quantity
1	Digital Multimeter	Digital Multimeter: 3 1/2 digit display.	2
2	Digital IC Tester	Tests a wide range of Digital IC's such as 74 Series, 40/45 Series of CMOS IC's.	1
3	DC power supply	+5 V Fixed power supply	1
4	Breadboard	5.5cm X 17 cm	1
5	IC	7447 or 7448	1 Each
6	Common anode 7-seg Display	IC FND 507/LT 542	1
7	Common cathode 7-seg Display	IC LT 543	1
8	Connecting wires	Single strand 0.6 mm Teflon coating	As required
9	Resistor	1K Ω /330 Ω	As required

IX Precautions to be followed

- 1) Check IC before use.
- 2) Set power supply to 5V (Variable DC Power Supply) before connecting.
- 3) Check all the connections as per circuit diagram

X Procedure

1. Test the IC using Digital IC tester
2. Make the connection as per fig 8.6
3. Connect different BCD inputs from 0000 to 1001 and note down the corresponding output on the display.
4. Observe the outputs on a 7- segment display.
5. Connect the +5V to +Vcc pin of IC and GND pin to ground
6. Observe the LED (on or off) for each combination of input as per truth table
7. Verify the truth table

XI Resources Used









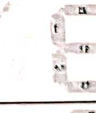

Sr. No.	Name of Resource	Suggested Broad Specification	Quantity
1	Digital multimeter	3 1/2 digit display	2
2	Digital IC tester	74 Series, CMOS IC	1
3	Breadboard	5.5cm x 17cm	1
4	IC	7447 or 7448	1

XII Actual Procedure

- i] Test the IC using Digital IC tester
- ii] make the connection as per fig 8.6.
- iii] observe the outputs on a 7-segment display.

XIII Observation:

Table 8.1: Observation Table common anode display

BCD Inputs				7-Segment Coded Output							Display output
D	C	B	A	a	b	c	d	e	f	g	
0	0	0	0	0	0	0	0	0	0	1	
0	0	0	1	1	0	0	1	1	1	1	
0	0	1	0	0	0	1	0	0	1	0	
0	0	1	1	0	0	0	0	1	1	0	
0	1	0	0	0	1	0	0	1	0	0	
0	1	0	1	0	1	0	0	1	0	0	
0	1	1	0	1	1	0	0	0	0	0	
0	1	1	1	0	0	0	1	1	1	1	
1	0	0	0	0	0	0	0	0	0	0	
1	0	0	1	0	0	0	1	1	0	0	

XIV Result(s)

In this practical we studied the test the output of BCD to 7 segment Decoder using Digital IC for the given inputs.

XV Interpretation of results

In this practical we studied to test the output of BCD to 7 Segment Decoder using digital IC for the given input.

XVI Conclusion and recommendation

Hence we studied to test the output of BCD to 7 Segment Decoder using digital IC for the given input.

XVII Practical related questions

Note: Below given are a few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. Write down the output for the 7-segment decoder using a common cathode display .
2. Write the functions of pin No. 3, 4, and 5 of IC 7448.
3. List different types of decoder.

[Space for Answers]

Ans 1 : output for the 7-segment decoder using a common cathode display

BCD Inputs				7-Segment Coded Output						
D	C	B	A	a	b	c	d	e	f	g
0	0	0	0	0	0	0	0	0	0	1
0	0	0	1	1	0	0	1	1	1	1
0	0	1	0	0	0	1	0	0	1	0
0	0	1	1	0	0	0	0	1	1	0
0	1	0	0	1	0	0	1	1	0	0
0	1	0	1	0	1	0	0	1	0	0
0	1	1	0	1	1	0	0	0	0	0
0	1	1	1	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	1	1	0	0

1) pin number 3 is display test function which is active low where pin 3 is low irrespective of other input pin signals all the segment output

are low

pin no 4 is BI/RBO - blanking input or ripple blanking output. It is a wired AND logic serves as blanking input or output.

Pin 5 is RBI input. Pin when LT input is high then low RBI input. Pin when LT input is high then low RBI input turns all outputs high, making the display blank.

3) →

Types of Decoders are

- i. 2 to 4 line decoder
- ii. 3 to 8 line decoder
- iii. 4 to 16 line decoder

XVIII References/Suggestions for further reading

1. <https://dec-iitkgp.vlabs.ac.in/exp/7-segment-led-display/simulation.html>
2. <https://dec-iitkgp.vlabs.ac.in/exp/7-segment-led-display/index.html>
3. <https://de-iitg.vlabs.ac.in/exp/bcd-to-led/theory.html>
4. <https://www.electroschematics.com/wp-content/uploads/2013/01/7447-datasheet.pdf>

XIX Assessment Scheme

Performance Indicators		Weightage
Process Related : 15 Marks		60 %
1	Handling of the components	10%
2	identification of components	20%
3	Measuring value using suitable instrument	20%
4	working in teams	10%
Product Related: 10 Marks		40%
5	Calculated theoretical values of given component	10%
6	Interpretation of result	05%
7	Conclusion	05%
8	Practical related questions	15%
9	Submitting the journal in time	05%
Total (25 Marks)		100 %

Marks Obtained			Dated signature of Teacher
Process related (15)	Product related (10)	Total (25)	
12	10	22	