

Lab 5 – Combination Logic Circuits

Learning Outcomes

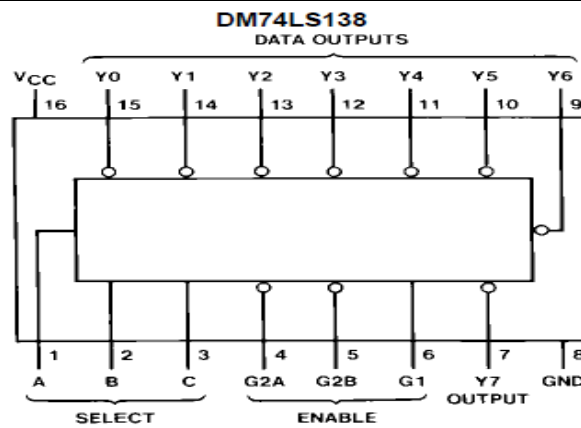
1. Use encoder/decoder to implement digital circuit.
2. Use binary adder to implement digital circuit.

1. Introduction

The following tables show pin diagrams and truth tables for encoder, decoder, and binary adder ICs.

74LS148 8-to-3 Encoder															
FUNCTION TABLE															
INPUTS										OUTPUTS					
EI	0	1	2	3	4	5	6	7		A2	A1	A0	GS	EO	
H	X	X	X	X	X	X	X	X		H	H	H	H	H	
L	H	H	H	H	H	H	H	H		H	H	H	H	L	
L	X	X	X	X	X	X	X	L		L	L	L	L	H	
L	X	X	X	X	X	X	L	H		L	L	H	L	H	
L	X	X	X	X	X	L	H	H		L	H	L	L	H	
L	X	X	X	X	L	H	H	H		L	H	H	L	H	
L	X	X	X	L	H	H	H	H		H	L	L	L	H	
L	X	X	L	H	H	H	H	H		H	L	H	L	H	
L	X	L	H	H	H	H	H	H		H	H	L	L	H	
L	L	H	H	H	H	H	H	H		H	H	H	L	H	

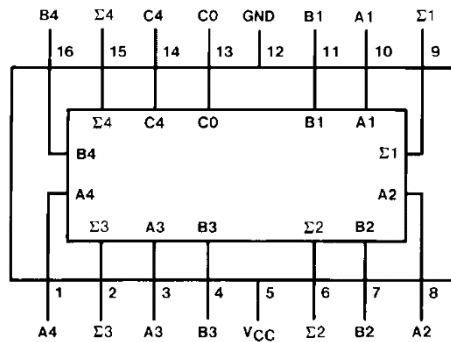
74LS138 3-to-8 Decoder



DM74LS138

Inputs			Outputs										
Enable		Select											
G1	G2 (Note 1)	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	
X	H	X	X	X	H	H	H	H	H	H	H	H	
L	X	X	X	X	H	H	H	H	H	H	H	H	
H	L	L	L	L	L	H	H	H	H	H	H	H	
H	L	L	L	H	H	L	H	H	H	H	H	H	
H	L	L	H	L	H	H	L	H	H	H	H	H	
H	L	L	H	H	H	H	L	H	H	H	H	H	
H	L	H	L	L	H	H	H	H	L	H	H	H	
H	L	H	L	H	H	H	H	H	H	L	H	H	
H	L	H	H	L	H	H	H	H	H	H	L	H	
H	L	H	H	H	H	H	H	H	H	H	H	L	

74LS83 4-Bit Binary Adder with Fast Carry



Truth Table

Inputs						Outputs							
						When C0 = L				When C0 = H			
						When C2 = L				When C2 = H			
A1	A3	B1	B3	A2	A4	B2	B4	Σ1	Σ3	Σ2	Σ4	C2	C4
L		L		L		L		L		H		L	
H		L		L		L		H		L		L	
L		H		L		L		L		H		L	
H		H		L		L		L		H		L	
L		L		H		L		L		H		L	
H		L		H		L		H		L		L	
L		H		H		L		L		H		L	
H		H		H		L		L		H		L	
L		L		L		H		H		L		L	
H		L		L		H		H		L		L	
L		H		L		H		L		H		L	
H		H		L		H		L		H		L	
L		L		H		H		L		L		H	
H		L		H		H		L		L		H	
L		H		H		H		H		L		H	
H		H		H		H		L		H		H	

2. Experiment

Use IC 74LS148 encoder, IC 74LS83 binary adder, and IC 74LS168 decoder to implement digital circuit according to Fig 1. Record the result from encoder, adder, and decoder ICs.

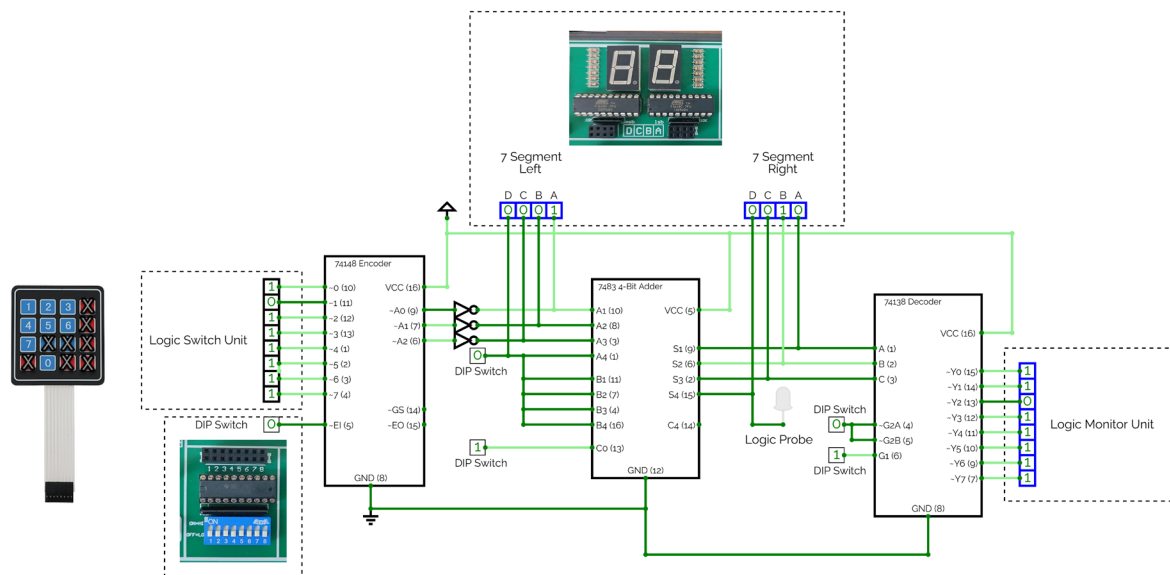


Fig 1 Encoder/Decoder Circuit

Record the result from Encoder/Adder/Decoder circuit.

$c_0 = H$

Encoder								Encoder			7SEG	Adder/Dec				7SEG	Decoder							
Input								Output			Left	Output/Input				Right	Output							
0	1	2	3	4	5	6	7	A2	A1	A0		S4/ OVF	S3/C	S2/B	S1/A		Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
x	x	x	x	x	x	x	0	0	0	0	7	1	0	0	0	8	0	1	1	1	1	1	1	1
x	x	x	x	x	x	0	1	0	0	1	6	0	1	1	1	7	1	1	1	1	1	1	1	0
x	x	x	x	x	0	1	1	0	1	0	5	0	1	1	0	6	1	1	1	1	1	1	0	1
x	x	x	x	0	1	1	1	0	1	1	4	0	1	0	1	5	1	1	1	1	1	0	1	1
x	x	x	0	1	1	1	1	1	0	0	3	0	1	0	0	4	1	1	1	1	0	1	1	1
x	x	0	1	1	1	1	1	1	0	1	2	0	0	1	1	3	1	1	1	0	1	1	1	1
x	0	1	1	1	1	1	1	1	1	0	1	0	0	1	0	2	1	1	0	1	1	1	1	1
0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1

Lab 5 Submission

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Checkpoint

Experiment 1 (15 pts)

Questions

1. What will happen to the circuit if inputting logic 1 to EI pin of encoder.

When input logic 1 to EI pin, 7SEG on the left will display '1' and on 7SEG on the right will only display '1' no matter what we change on input button and according to function table when EI become H, A₂, A₁ and A₀ will also become H.

2. What will happen to the circuit if inputting logic 0 to EI pin of encoder and inputting logic 1 to G2A and G2B pins of decoder.

When we input 1 to G2A and G2B the number on 7SEG on the left and right will not change but the output on logic monitor are all H.