

Updated 74LS192 + 74LS47 Cruise Speed Control Truth Tables

Includes the added XOR green-off-at-10 correction and 74LS08 reset-at-11 / reset-at-99 logic

The uploaded new1.PDF circuit uses two 74LS192 BCD up/down counters, 74LS47 common-anode display drivers, a 74LS85 comparator stage, green/yellow LED range logic, an NE555 flashing red warning circuit, and extra reset/XOR correction gates.

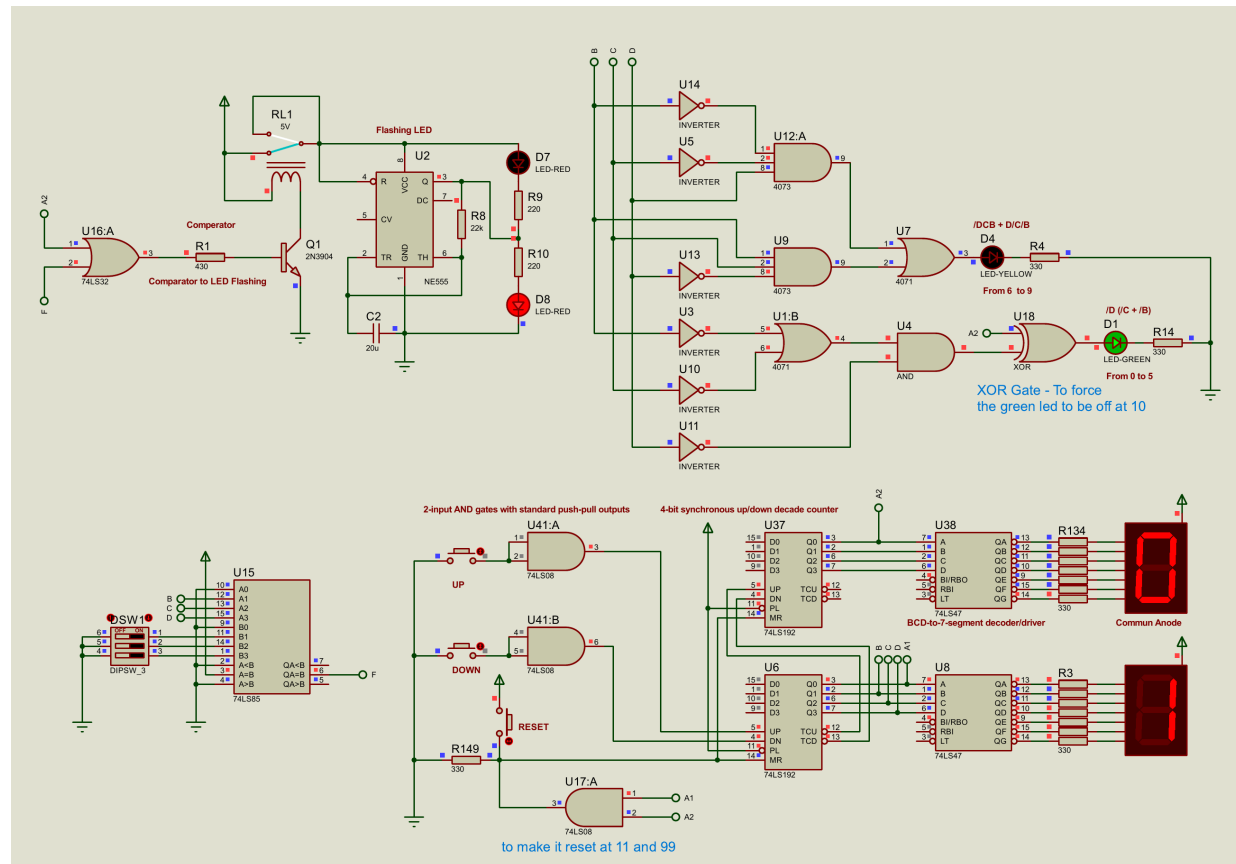


Figure 1: Updated new1 circuit with 74LS192 counters, 74LS47 display drivers, comparator stage, range LED logic, NE555 flashing red LED, XOR green correction, and reset-at-11/99 note.

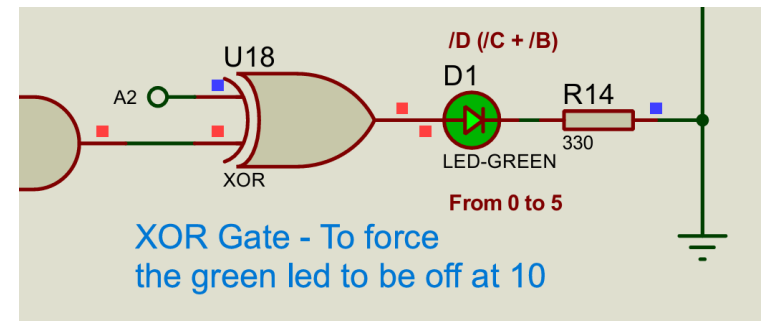
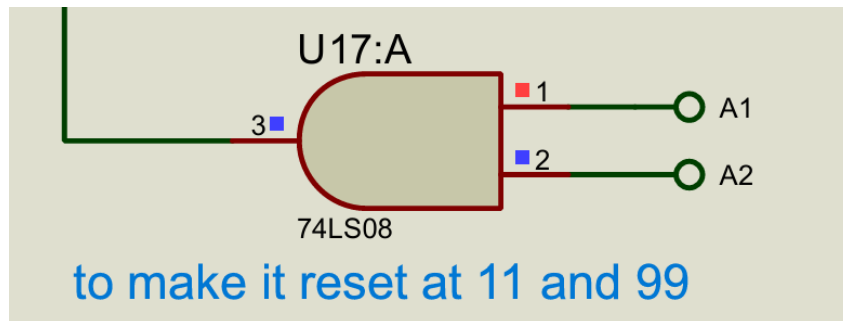


Figure 2: Additional notes supplied for this update. Left: U17:A 74LS08 reset gate to force reset at 11 and 99. Right: U18 XOR gate to make the green LED OFF at 10.

1. Additional Design Notes Included

Added item	Meaning in this truth-table update
U18 XOR green correction	The green LED must be ON only for 00-05. The XOR correction uses the ten-state signal A2 so the green LED is forced OFF when the display reaches 10.
U17:A 74LS08 reset gate	The AND gate is used as part of the automatic reset/limit path. It forces reset when the invalid 11 or 99 condition is detected.
Project maximum	The system is allowed to display 10 as the maximum speed. The next invalid state, 11, must not remain displayed.
Manual reset vs cruise reset	The manual reset button clears the display, while the added reset logic is an automatic limit/reset function and not the normal reset button.

2. Main Component Function Table

Component / label	Part	Function in this solution
U6 and U37	74LS192	Unit and ten BCD up/down decade counters.
U8 and U38	74LS47	BCD-to-seven-segment decoders/drivers for common-anode displays.
U41:A and U41:B	74LS08	UP and DOWN pulse conditioning gates.
U15	74LS85	Compares selected cruise speed with current speed.
DSW1	DIPSW_3	Manual set-speed input for the comparator.
U9, U12:A, U7	4073 and 4071 gates	Create the yellow/amber range output for 06-09.
U4 and U18	AND and XOR gates	Create the corrected green output and force it OFF at 10.
U17:A	74LS08	Automatic reset gate for invalid 11 and 99 conditions.
Q1, RL1, U2	2N3904, relay, NE555	Enable and flash red warning LED when selected cruise speed is reached.

3. 74LS192 Counter BCD Truth Table

The 74LS192 outputs are defined as A = Q0, B = Q1, C = Q2, and D = Q3. A is the least significant bit and D is the most significant bit.

Decimal	D	C	B	A	BCD D C B A	Display
0	0	0	0	0	0000	0
1	0	0	0	1	0001	1
2	0	0	1	0	0010	2
3	0	0	1	1	0011	3
4	0	1	0	0	0100	4
5	0	1	0	1	0101	5
6	0	1	1	0	0110	6
7	0	1	1	1	0111	7
8	1	0	0	0	1000	8
9	1	0	0	1	1001	9

4. 74LS47 Common-Anode Seven-Segment Truth Table

For a common-anode display driven by the 74LS47, 0 means the segment is ON and 1 means the segment is OFF. Segment order is a b c d e f g.

Decimal	BCD D C B A	a	b	c	d	e	f	g	Display
0	0000	0	0	0	0	0	0	1	0
1	0001	1	0	0	1	1	1	1	1
2	0010	0	0	1	0	0	1	0	2
3	0011	0	0	0	0	1	1	0	3
4	0100	1	0	0	1	1	0	0	4
5	0101	0	1	0	0	1	0	0	5
6	0110	0	1	0	0	0	0	0	6
7	0111	0	0	0	1	1	1	1	7
8	1000	0	0	0	0	0	0	0	8
9	1001	0	0	0	0	1	0	0	9

5. 00 to 10 Operating Truth Table

Speed	Ten BCD	Unit BCD	Ten display	Unit display	Green	Yellow	Meaning
00	0000	0000	0	0	1	0	Green range
01	0000	0001	0	1	1	0	Green range
02	0000	0010	0	2	1	0	Green range
03	0000	0011	0	3	1	0	Green range
04	0000	0100	0	4	1	0	Green range
05	0000	0101	0	5	1	0	Green range
06	0000	0110	0	6	0	1	Amber/yellow range
07	0000	0111	0	7	0	1	Amber/yellow range
08	0000	1000	0	8	0	1	Amber/yellow range
09	0000	1001	0	9	0	1	Amber/yellow range
10	0001	0000	1	0	0	0	Maximum speed displayed; green/yellow OFF

6. Green / Yellow Logic With XOR Correction

Yellow = (NOT D . C . B) + (D . NOT C . NOT B)

Raw Green = NOT Yellow

Corrected Green = Raw Green XOR A2

A2 is used as the ten-state correction input. A2 = 0 for 00-09 and A2 = 1 when the system reaches 10, therefore the XOR output turns the green LED OFF at 10.

Speed	D	C	B	A	A2	Yellow	Raw Green	Corrected Green	Final output
00	0	0	0	0	0	0	1	1	Green ON
01	0	0	0	1	0	0	1	1	Green ON
02	0	0	1	0	0	0	1	1	Green ON
03	0	0	1	1	0	0	1	1	Green ON
04	0	1	0	0	0	0	1	1	Green ON
05	0	1	0	1	0	0	1	1	Green ON
06	0	1	1	0	0	1	0	0	Yellow ON
07	0	1	1	1	0	1	0	0	Yellow ON
08	1	0	0	0	0	1	0	0	Yellow ON
09	1	0	0	1	0	1	0	0	Yellow ON
10	0	0	0	0	1	0	1	0	Both OFF

7. Automatic Reset / Limit Truth Table

The U17:A 74LS08 gate is included as an automatic limit-reset path. It is separate from the normal manual reset button and is used to prevent invalid counts after the valid maximum speed.

Present display	UP pulse	Reset at 11	Reset at 99	Action
00 to 08	1	0	0	Count normally upward.
09	1	0	0	Advance to 10.
10	1	1	0	Attempted 11 is detected and reset/blocked.
11 attempted	X	1	0	Invalid state is cleared.
99 attempted/high state	X	X	1	High invalid state reset protection becomes active.
Any value	Manual reset = 1	X	X	Display returns to 00.

8. UP / DOWN / Reset Control Truth Table

UP	DOWN	Manual RESET	Automatic reset	Counter action	Display result
0	0	0	0	Hold	Same number remains displayed.
1 pulse	0	0	0	Count up	Display increases by 1.
0	1 pulse	0	0	Count down	Display decreases by 1.
1	1	0	0	Invalid/avoid	UP and DOWN together is not recommended.
X	X	1	X	Manual reset	Display returns to 00.
X	X	0	1	Automatic limit reset	Invalid state is cleared or blocked.

9. 74LS85 Comparator Truth Table

The comparator output enables the red flashing warning when the current speed is equal to or greater than the selected cruise speed.

F = (Current speed > Set speed) + (Current speed = Set speed)

Current speed condition	QA>B	QA=B	QA<B	F	Red LED
Current speed < Set speed	0	0	1	0	OFF
Current speed = Set speed	0	1	0	1	Flashing
Current speed > Set speed	1	0	0	1	Flashing

DIP switch set-speed table:

Set speed	BCD D C B A	Meaning
6	0110	Red flashes when current speed >= 6
7	0111	Red flashes when current speed >= 7
8	1000	Red flashes when current speed >= 8
9	1001	Red flashes when current speed >= 9
10	1010	Red flashes when current speed >= 10

10. NE555 Flashing Red LED Truth Table

Comparator output F	Q1 / relay stage	NE555 state	Red LED state
0	OFF	Disabled or held reset	OFF
1	ON	Enabled astable mode	Flashing

11. Final Operating Summary

Condition	Green LED	Yellow LED	Red flashing LED	Display behaviour
Speed 00-05	ON	OFF	Depends on comparator set speed	Normal lower-speed range.
Speed 06-09	OFF	ON	Depends on comparator set speed	Amber/yellow range.
Speed 10	OFF	OFF	Flashing if selected speed has been reached	Maximum speed displayed.
Attempted 11	OFF after reset	OFF after reset	Depends after reset	Automatic reset/limit logic clears invalid state.
Attempted 99/high state	OFF after reset	OFF after reset	Depends after reset	High-state reset protection prevents unwanted counts.