

Arduino IC Tester for 74-Series Logic

An Arduino Mega-based tester for 74-series logic ICs that drives every input combination, checks outputs against stored truth tables and reports PASS/FAIL on an LCD.

01. Title

Arduino IC Tester for 74-Series Logic

02. Introduction / Background

Digital-logic courses teach gates, truth tables and Boolean algebra, but students rarely verify the actual chips — a 74HC00 on the bench is assumed good, and a misbehaving breadboard circuit is debugged by guessing. An IC tester closes that gap: it exercises every input combination of the chip under test and compares each output against the known truth table, turning theory into a working instrument the student builds themselves.

03. Problem Statement

Faulty or misidentified 74-series chips waste hours of lab debugging because there is no quick way to confirm a chip is good. Commercial testers are costly; a student-built tester around an Arduino Mega provides the same essential function — exhaustive functional testing of common gates — at a fraction of the cost, while teaching pin driving, lookup tables and automated test sequencing.

04. Objectives

- Build a tester that checks 74HC00, 74HC04, 74HC08, 74HC32 and 74HC02 chips.
- Drive every input combination of the chip under test and verify each output against stored truth tables.
- Report PASS/FAIL on a 16x2 LCD with the failing vector indicated.
- Use a ZIF socket for safe, repeated chip insertion and keep the firmware extensible for more chips.

05. Proposed Methodology

The chip under test plugs into a ZIF socket wired to the Arduino Mega's digital pins. Firmware selects the chip profile (pinout + truth table stored in flash), drives all input combinations sequentially, reads the outputs after a settle delay, and compares them against the stored table. Any mismatch flags FAIL with the failing vector; a complete pass reports PASS. LCD and button interface let the student select the chip type.

06. System Architecture / Working

- Chip under test in ZIF socket → wired to Arduino Mega digital pins
- Chip profile selection (LCD + buttons) → pinout and truth table loaded from flash
- Test sequencer → drives all input combinations, reads outputs after settle delay
- Comparator → output vs truth table → PASS/FAIL with failing vector on LCD

07. Hardware / Software Requirements

- Arduino Mega 2560
- ZIF socket (28-pin), 16x2 character LCD, select buttons
- Breadboard/perfboard wiring, 5 V USB supply
- Arduino IDE (C/C++) firmware with chip-profile lookup tables

08. Expected Outcomes

- Reliable PASS/FAIL testing of five common 74-series chips (74HC00, 74HC04, 74HC08, 74HC32, 74HC02).
- Full truth-table coverage: every input combination is exercised, not just spot checks.
- Failing-vector reporting that pinpoints which gate or combination fails.
- Complete report, PPT and viva Q&A; on digital testing concepts.

09. Applications

- Pre-testing chips before wiring them into lab breadboard circuits.
- Verifying salvaged or surplus 74-series chips for reuse in student projects.
- Demonstrating truth tables and functional testing in digital-logic lab sessions.

10. Future Scope

- Add profiles for more 74-series chips (multiplexers, counters, flip-flops).
- Measure propagation delay with timer-capture for a timing dimension.
- Add a PC serial interface that logs full test reports per chip.