

Project 1C - Wiring, Assembly, and Test

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Rapid Fabrication and Prototyping

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Introduction

Objective: Design and implement a breadboard circuit functioning as a Tetris game controller.

Background:

Tetris is a tile-matching puzzle game where players align falling geometric shapes to complete rows. The circuit serves as the controller, providing button inputs to the Arduino Nano and outputting signals to the 8×8 LED matrix for gameplay. A power indicator LED with a current-limiting resistor confirms circuit operation, while a buzzer supplies audio feedback. The build follows class guidelines for neat, color-coded wiring, trimmed components, and professional photo documentation of functionality.

Assumptions/Requirements

1. Mechanical
 - 1.1. Arcade Enclosure shall be constructed from laserable plywood.(within defined thickness)
 - 1.2. Size of Enclosure Shall standard tabletop
 - 1.3. Enclosure design shall ensure compliance with IP20 rating
 - 1.4. CAD models shall use fully defined sketches and descriptive feature names to support clarity and ease of modification.
 - 1.5. Enclosure shall be free of sharp edges, pinch points, and properly isolates electrical connections
 - 1.6. The enclosure shall use properly sized fasteners to securely mount all components.
 - 1.7. The enclosure shall be free of sharp edges and pinch points to ensure user safety.
 - 1.8. The enclosure shall provide adequate mechanical fastening features to secure all components.
2. Electrical & Circuit Requirements
 - 2.1. The wiring system shall be organized to minimize overlap and allow easy identification of connections.
 - 2.2. The wiring system shall use distinct visual indicators (e.g., colors) to differentiate power, ground, and signal nets.
 - 2.3. The connections shall maintain mechanical and electrical integrity under normal operating conditions.
 - 2.4. The splices shall be protected by appropriate insulation to prevent accidental contact.
 - 2.5. The terminations shall ensure reliable electrical conductivity and mechanical stability.
3. Assembly & Documentation Requirements
 - 3.1. The assembled unit shall demonstrate a functional arcade system capable of running Tetris.
 - 3.2. The assembly shall be presented in a professional manner, free of clutter or unrelated background objects.

- 3.3. The documentation shall include clear visual evidence (photos) of proper assembly and functionality.

Data

Figure 1 - Video Demo of Tetris Arcade

<https://youtube.com/shorts/uGevyLYFnHc>

Figure 1 shows the Tetris arcade machine in operation, demonstrating responsiveness to user input. The video shows the left, right, and turn buttons as well as the rocker switch functioning as intended.

Figure 2 - Exterior view of case with display and LED

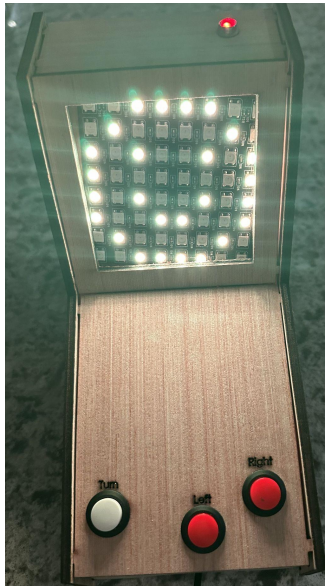


Figure 2 shows the exterior view of the completed Tetris arcade machine with functional buttons (Turn, Left, Right) and illuminated LED display. The system demonstrates full integration of enclosure design, wiring organization, and control functionality [1]–[4].

Figure 3 - Inside Isometric View of disassembled Case



Figure 3 shows the isometric view of the laser-cut arcade case before wiring and assembly. The panels demonstrate proper fit and fastening features to support IP20 enclosure compliance [1] and CAD design practices [3]

Figure 4 - Inside view of case with everything assembled

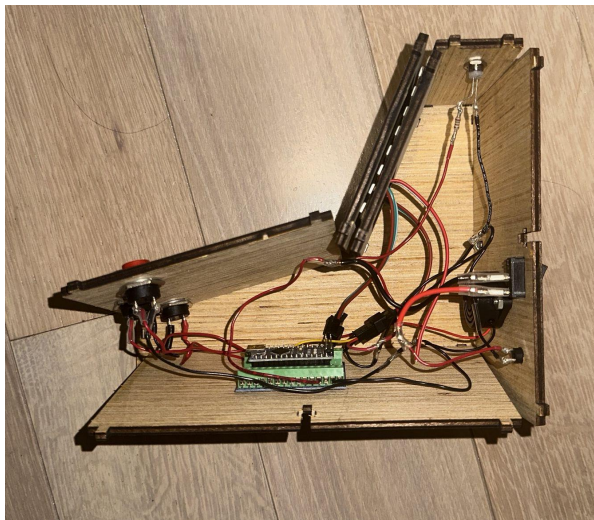


Figure 4 shows the inside isometric view of the assembled arcade case showing button terminations, rocker switch, and wiring harnesses. The enclosure integrates electrical safety with component fastening per industry guidelines [1], [2].

Figure 5 - Front Isometric view of disassembled case

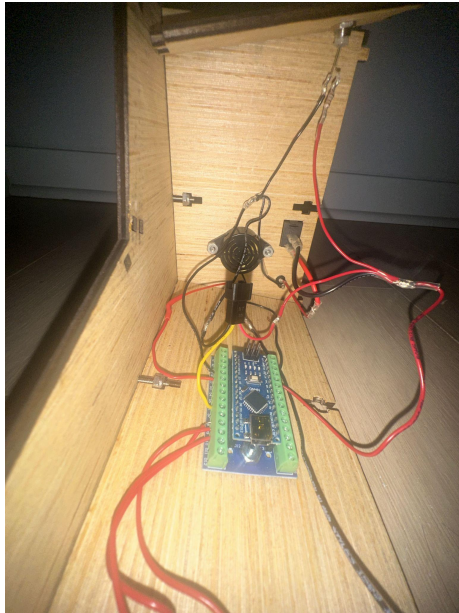


Figure 5 shows the microcontroller board is mounted to the base panel, and preliminary wiring paths are routed toward the rocker switch, buttons, buzzer, and power connections. This stage highlights wire organization practices for minimizing overlap and ensuring traceability, consistent with assembly standards [2], [4]

Figure 6 - Soldered wire connections and assembly of the Tetris arcade machine

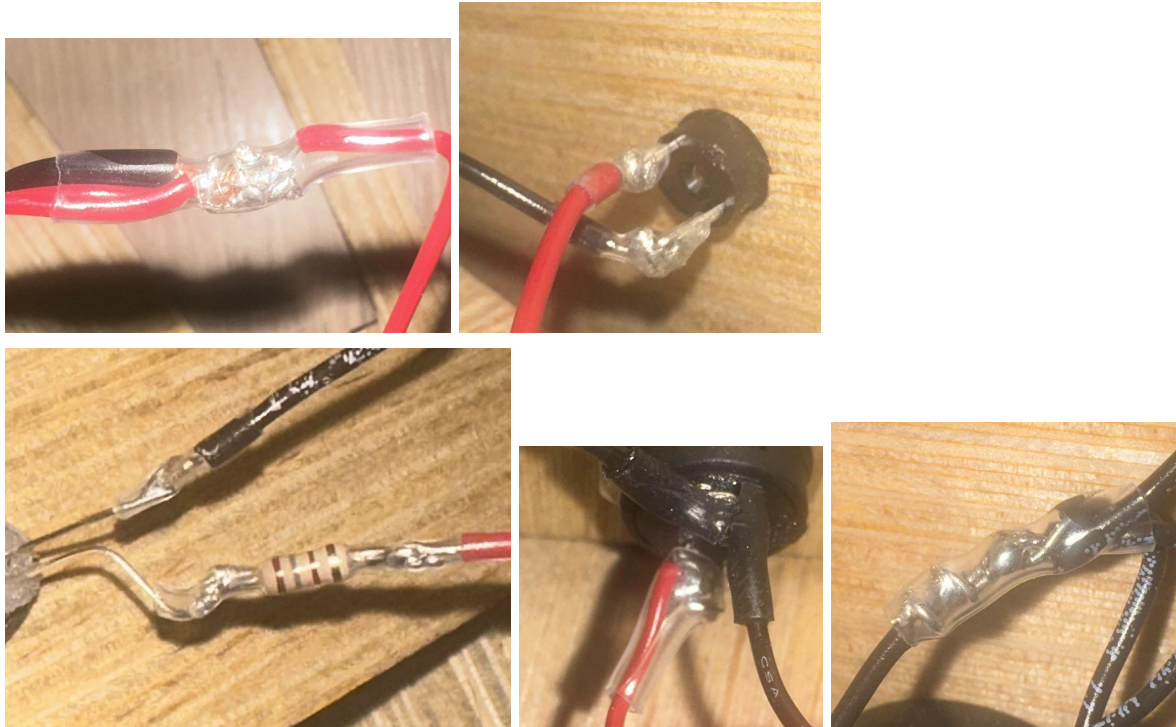


Figure 6 shows the close-up views of soldered connections and splices with heat-shrink sleeving. These joints illustrate compliance with IPC J-STD-001 requirements for solder integrity and insulation [2]

Figure 7 - Rocker switch Terminal Crimps



The image shows the rocker switch panel-mounted in the wooden enclosure with crimped terminal connectors attached to red and black wires. Wire splices are visible with solder joints and heat-shrink sleeving applied, demonstrating proper electrical connection, insulation, and organization in accordance with assembly guidelines.

Reflection

1. While assembling the arcade unit, I realized how important it is to plan the wiring layout ahead of time. At first, I cut some wires too long and ended up with unnecessary slack that made the panel look messy. After redoing a few connections with shorter lengths, the wiring became more organized and easier to trace.
2. Heat shrink sleeving and soldering gave the assembly a professional look, but I underestimated how much time it takes to do them neatly. Some joints I rushed ended up bulky or uneven, and I had to redo them to ensure durability and safety.
3. Mounting the components to the panel taught me the value of precise fit. At first the rocker switch was not going into its designated cutout because I hadn't accounted for the small tolerance in the cutout. To remedy this I had to go back into solid works and increase the width by a few millimeters
4. When selecting button colors I chose green for the turn button and red for the left and right buttons. Later on I realized that those colors made the control panel look like it was Christmas themed so I decided to change the turn button color to white as I didn't want to change the left and right button colors because red is my favorite color.
5. Learned the importance of planning wiring layout in advance. At times, I started soldering without a clear game plan, which led to scrapping components and redoing wiring. Careful planning would have saved both time and materials.
6. Realized how much technique matters in soldering. Rushed joints became bulky or cold, while properly wetted joints created strong, reliable connections.

References

- [1] International Electrotechnical Commission, IEC 60529: Degrees of Protection Provided by Enclosures (IP Code), 2nd ed. Geneva, Switzerland: IEC, 2013.
- [2] IPC, J-STD-001: Requirements for Soldered Electrical and Electronic Assemblies, Rev. H. Bannockburn, IL: IPC, 2020.
- [3] Dassault Systèmes, SOLIDWORKS Essentials 2025: Fully Defined Sketches and Feature Naming. Waltham, MA: Dassault Systèmes, 2025.
- [4] T. L. Floyd, Electronic Devices, 10th ed. Upper Saddle River, NJ: Pearson, 2018.