ADAM System Final Test Module

Assembly T-1638 • PCB T-1132 REV0 • Unit #15 — Complete Technical Reference

Assembly: T-1638 (Coleco Industries)
PCB: T-1132 REV0 / TECH-1
Firmware: Rev 3.3 (Z80) + 68701 MCU ($A38B)
Restored: February 1, 2026
Documentation: February 2026

PROVENANCE Unit #15 — Identification & Origin

The ADAM System Final Test Module (Coleco Assembly **T-1638**) is a factory diagnostic system used by Coleco Industries to verify every ADAM computer before shipping. This is **Unit #15**, originally assigned to the Coleco Test Laboratory under the custody of Philip Kosowsky. After Coleco's bankruptcy in 1988, it remained in storage for nearly four decades before being acquired for preservation, restored to full working condition by John Lundy of Lundy Electronics, and documented by Rich DiRocco for the ColecoVision & ADAM Archive.

UNIT IDENTIFICATION	
Unit Number	#15 (hand-written)
Serial Number	A0125009
FCC ID	BNV8432405
Property Tag	08514 — Coleco Industries
Internal Number	4639 (hand-written)
PCB Designation	T-1132 REV0 / TECH-1
Assembly Number	T-1638

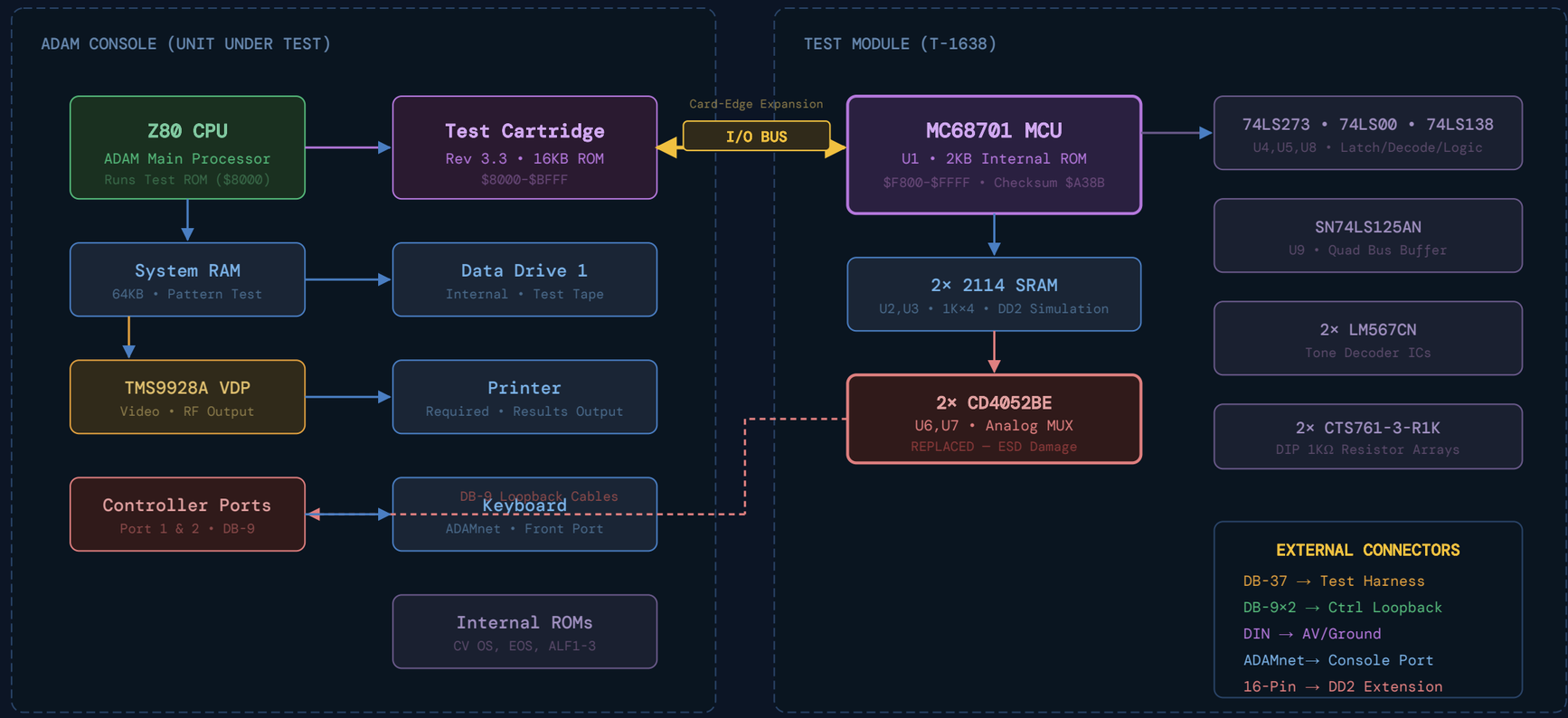
RELATED COLECO TEST EQUIPMENT	
T-1638	Adam System Final Tester
T-1721	Board Level System Tester
T-1658	Data Drive Azimuth Check Fixture
T-1710	Data Drive Switchbox

Source: Coleco Industries Inc. Repair Guide Equipment Listing (Preliminary Draft: 8/16/85)

Known Test Cartridge Revisions:
System Test Cartridge Rev. 3.1 & Rev. 3.3 (per Coleco Repair Guide 8/16/85). Also listed: CPU Burn-In Cartridge Rev. 5.0, Game Board Final Test Rev. 3.1, Gamma Debug Cartridge Rev. 1.0. This unit includes the **Rev 3.3** cartridge — believed to be the final production version.

ARCHITECTURE System Block Diagram

The Final Test Module is a two-processor diagnostic system. The ADAM's Z80 CPU runs the 16KB test cartridge ROM, while the test module's Motorola MC68701 MCU provides intelligent hardware-level test functions. The two processors communicate via a parallel I/O connection through the expansion bus.



Key Architectural Point: The Z80 test ROM and 68701 MCU firmware work in tandem. The Z80 orchestrates the test sequence and handles all user interface (display, keyboard, printer output). The 68701 performs hardware-level operations — driving the CD4052 multiplexers for joystick simulation, managing the 2114 SRAM for Data Drive 2 emulation, and synchronizing with the ADAM's Master 6801. The "CAN'T SYNC-UP WITH MASTER!!!" error appears when this communication fails.

HARDWARE

PCB T-1132 REV0 — Component Map & IC Identification

The main circuit board is marked "COLECO T-1132 REV0" on the component side and "TECH-1" on the solder side. It connects to the ADAM via a card-edge expansion slot connector. Factory bodge wires on the solder side indicate revisions to ADAMnet connections and tape control circuitry.

LOCATION	PART NUMBER	FUNCTION	STATUS
U1	MC68701 (C88091L/CB48336)	Main test MCU, 2KB internal ROM	Original
U2	M5M5114	1K×4 Static RAM — Data Drive 2 simulation	Original
U3	MK2114N-3	1K×4 Static RAM — Data Drive 2 simulation	Original
U4	HD74LS273P	Octal D-type flip-flop latch	Original
U5	DM74LS00N	Quad 2-input NAND gate	Original
U6	CD4052BE (RCA)	Dual 4-channel analog MUX — Joystick Port 1	★ Replaced
U7	CD4052BE (RCA)	Dual 4-channel analog MUX — Joystick Port 2	★ Replaced
U8	74LS138N	3-to-8 line decoder — Address/port selection	Original
U9	SN74LS125AN	Quad bus buffer — Data bus interface	Original
—	LM567CN ×2	Tone decoder ICs	Original
—	CTS761-3-R1K ×2	DIP 1KΩ resistor array	Original

RESTORATION

Restoration by John Lundy — Lundy Electronics

In late 2025, the test module was sent to John Lundy of Lundy Electronics for restoration and firmware preservation. The unit arrived in unknown condition — supposedly working but untested for decades. What followed was a collaborative detective story spanning two months.

December 29, 2025 — Firmware Dump

68701 MCU ROM successfully read using a hand-built reader/writer based on the LP130 from Lucid Technologies. Dump verified with checksum **$A38B**, matching the label on the chip. Conservative cleaning approach — ultrasonic cleaning of data drive connector ends only, mild wipe-down to preserve original labels and patina.

January 18, 2026 — Initial Testing: Tape Checksum Failure

System stepped through tests individually but consistently failed at **"FAIL 5-BLOCK TAPE CHECK-SUM"**. Multiple tapes tried including SmartBASIC and center directory tapes — none worked.

> *"I'm stuck on 'FAIL 5-BLOCK TAPE CHECK-SUM' and it will not go to the next step. I've tried a couple center directory tapes, including a SmartBASIC tape and can't get passed this step. Do you know if it needs a special test tape?"*
>
> — John Lundy, January 18, 2026

January 23, 2026 — Multiple Attempts Failed

Attempts to fool the checksum test failed. The test requires a specially formatted 5-block tape with specific checksum data that simply didn't exist anymore.

January 24, 2026 — Test Tape Created

Rich DiRocco successfully created the required test tape based on analysis of the Z80 ROM code, reverse-engineering the expected checksum algorithm. Tape passed verification!

> *"You did it! You got it passed the tape checksum checks. It goes for quite a while during the process and the text on the screen seems to change colors with each verification."*
>
> — John Lundy, January 24, 2026

January 24, 2026 — Controller Port Failure

After passing tape tests, system errored with **"CONTROLLER PORT #1 FAILURE"**. Replaced test connector cable assembly — same error. Traced all joystick connector wiring to PCB — all connections verified good. Discovery: selecting Expansion mode (E) bypassed controller tests, confirming remaining hardware was functional.

February 1, 2026 — Root Cause Found & Repaired

Tracing the PCB circuitry revealed **two failed CD4052BE analog multiplexer chips** (U6, U7) — the only defective components in the entire unit. Both dedicated to joystick testing circuitry.

> *"Tracing the circuitry, I found two bad CD4052BE multiplexer (MUX) chips that happened to be dedicated to just joystick testing. My guess is to have both chips bad is associated to static discharge damage. The joystick test cables go directly from the outside world to the internal circuitry with no protection."*
>
> — John Lundy, February 1, 2026

February 1, 2026 — 100% Working!

Both CD4052BE chips replaced. Unit passes all tests.

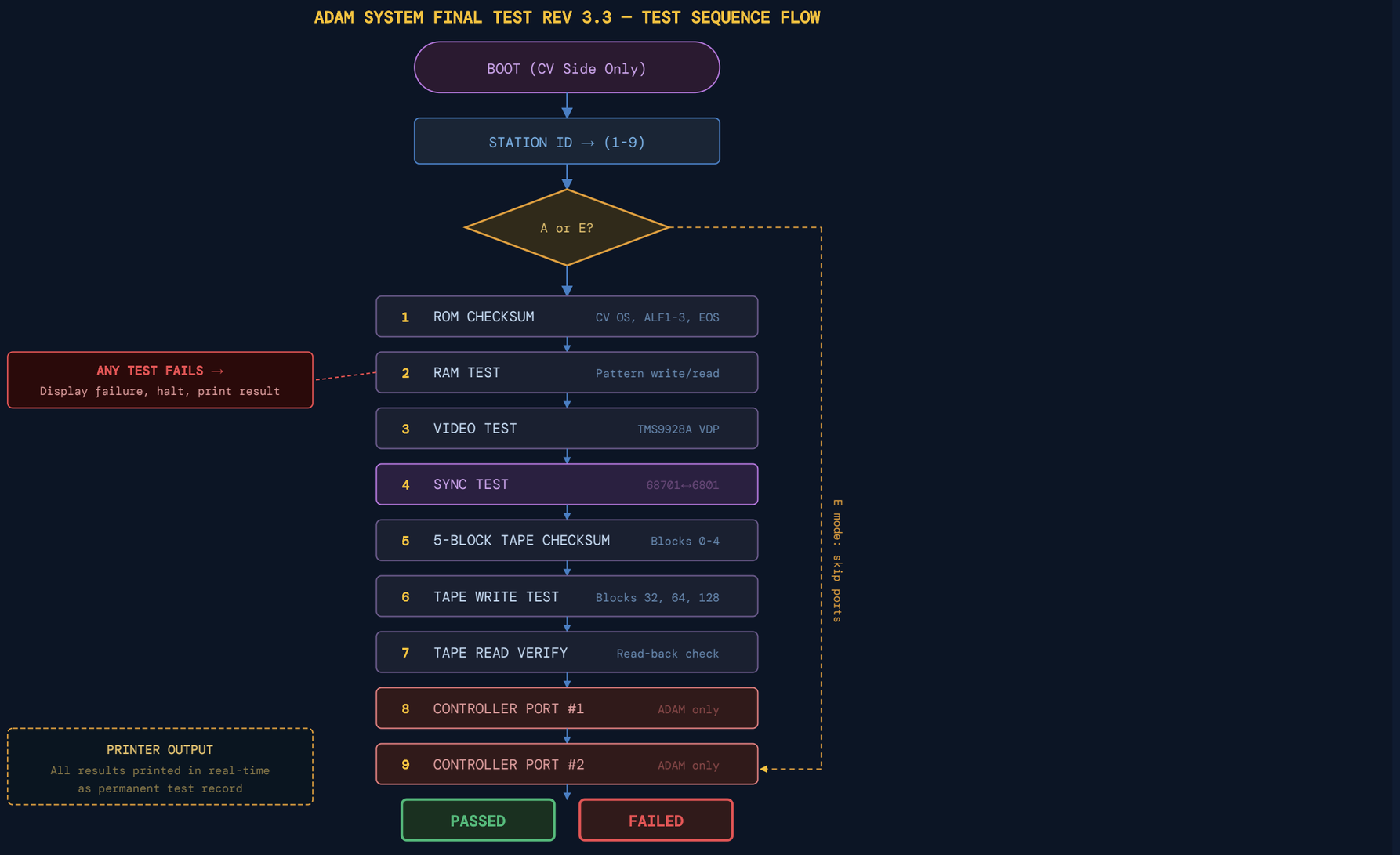
> *"The ADAM System Final Test Module is now 100% working!"*
>
> — John Lundy, February 1, 2026

ESD Vulnerability — Design Flaw: The joystick test cables connect directly from the outside world to the CD4052 multiplexer inputs with *no protection circuitry*. During dry New England winters at Coleco's Connecticut facility, workers walking the test floor would build up static charges and discharge them when touching the connector ends — eventually destroying both MUX chips.

TEST SEQUENCE

System Test — Complete Automated Sequence

Option 1 (System Test) runs the complete factory production-line test. The system first prompts for Station ID (1-9) to identify the test station, then asks whether the unit is a standalone ADAM (A) or Expansion Module (E). In Expansion mode, controller port tests are skipped since those ports reside in the ColecoVision console.

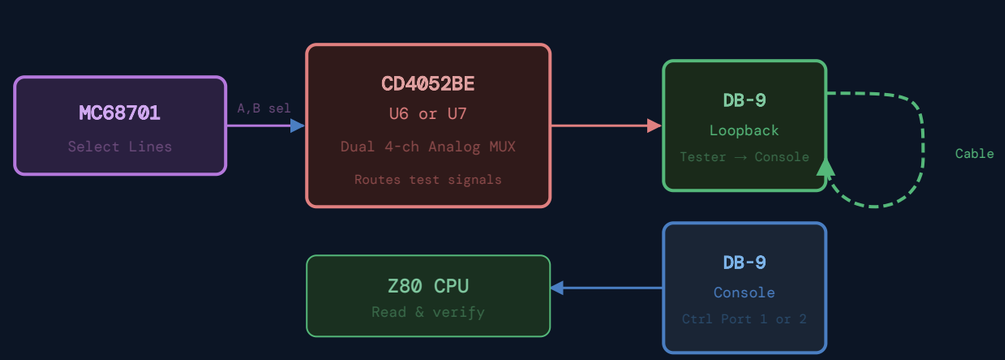


After PASSED: System prompts "PLEASE INSERT PAPER FOR MARKETING MESSAGE AND HIT RETURN" — prints a customer welcome letter included with each new ADAM as proof the unit passed factory testing.

HARDWARE

Controller Port Loopback Test — Signal Path

The controller port tests use loopback cables to verify joystick port functionality without requiring actual controllers. The 68701 MCU drives signals through the CD4052 analog multiplexers, which route test patterns through the DB-9 loopback cables and back into the ADAM's controller port input circuitry, where the Z80 reads them back for verification.



SIGNALS TESTED PER PORT

↑ UP
↓ DOWN
← LEFT
→ RIGHT
● FIRE BUTTONS

⌗ KEYPAD MATRIX
* 0 1 2 3 4 5
6 7 8 9 #

8 strobe/response patterns
via MUX select lines

FIRMWARE MC68701 MCU — Memory Map & Firmware Structure

KEY ROM ENTRY POINTS

$F800-$F891	Data tables, test patterns, state tables, jump table
$F8B1	Reset entry — initializes SCI, stack, ports
$F8C7	Port initialization routine
$F926-$F968	Status flag builder from PORT1/PORT4
$F969-$F9A5	Test mode decoder (8 modes)
$F9C0+	Individual test routines (RAM, serial, sync)

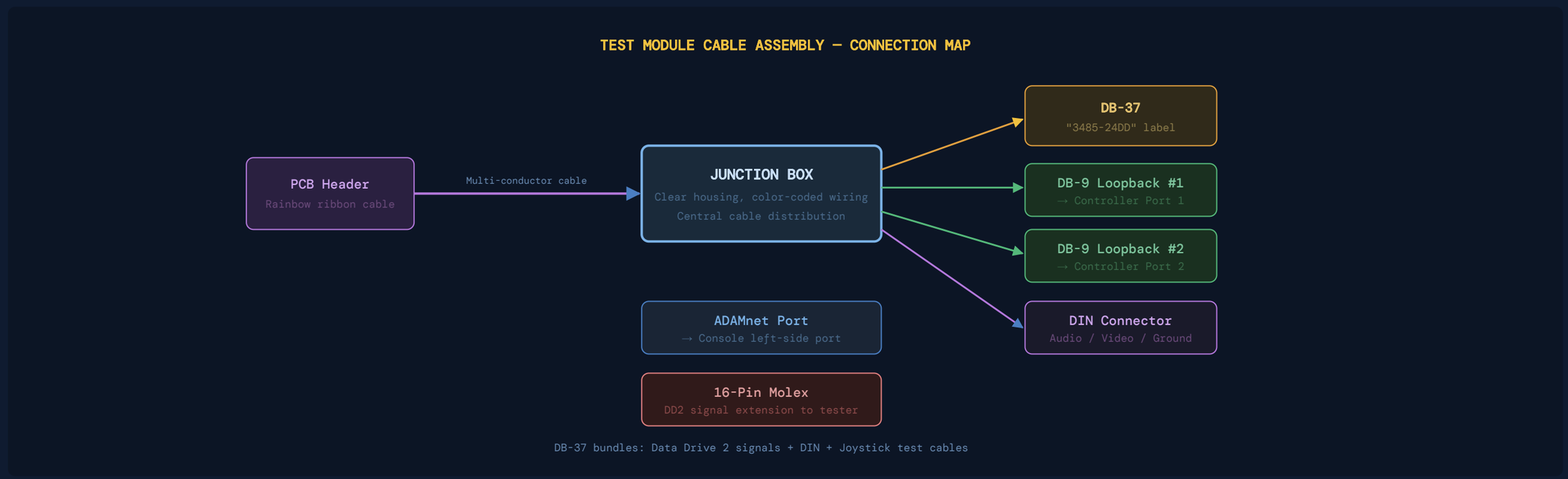
Z80 TEST CARTRIDGE ROM

File	ADAM_Final_Test_Rev_3_3.rom
Size	16,384 bytes (16KB)
Load Address	**$8000-$BFFF**
Header	$55 $AA (ColecoVision signature)

Processor	Z80

> **EPROM Replacement Option:** A damaged MC68701 can be replaced with a `HD68P01V07` controller + 2732 EPROM piggyback configuration programmed with the firmware dump.

CONNECTORS Cable Assembly & Connection Map



CONNECTOR	TYPE	FUNCTION	CONNECTS TO
DB-37	37-pin D-sub	Main test harness assembly	Bundles Data Drive 2, DIN, and joystick test cable connections
DB-9 ×2	9-pin D-sub	Controller port loopback cables	Console controller ports 1 & 2 (gray ribbed sheathing)
DIN	5-pin DIN	Audio, video, and ground	Standard A/V connection for test verification
ADAMnet	DIN	Peripheral bus connection	Console left-side ADAMnet port
16-Pin Molex	4×4 pin header	Data Drive 2 signal extension	Extends DD2 signals to reach tester

DISCOVERY Test Tape — Recreation from ROM Analysis

The CPU Test and System Test require a specially formatted "5-Block" test tape that was lost to history. Standard ADAM tapes will not work. The tape was successfully recreated in January 2026 by reverse-engineering the checksum algorithm from the Z80 test ROM code.

TEST TAPE STRUCTURE	
Blocks 0–4	Read-only test blocks with calculated checksums for verification
Blocks 32, 64, 128	Designated write test target blocks

How it works: The ROM reads each of blocks 0-4, computes a running checksum using an offset accumulator algorithm ($0122 initial offset), and compares against expected values hard-coded in the ROM. If any block fails, testing halts with `"FAIL 5-BLOCK TAPE CHECK-SUM"`. The write test then writes patterns to blocks 32, 64, and 128, reads them back, and verifies data integrity.

FILES PRODUCED	
`5-Block Test Tape.ddp`	Recreated test Data Pack image
`ADAM_Final_Test_Rev_3_3.rom`	Z80 Test Cartridge ROM (16KB)
`ADAM System Final Test Module ($A38B).bin`	68701 MCU ROM dump (2KB)

All files available at AdamArchive.org

SOFTWARE Manufacturing Test Options Menu

After Station ID entry and A/E selection, the main menu displays six options. The menu header reads: `"ADAM SYSTEM FINAL TEST REV 3.3 / STATION ID - n / MANUFACTURING TEST OPTIONS"`

1 SYSTEM TEST
Complete automated sequence — ROM, RAM, Video, Sync, Tape, Controllers, Keyboard, Printer

2 CPU TEST
Console tests minus printer/keyboard. Requires 5-block test tape.

3 PRINTER TEST
Daisy wheel verification: characters, carriage, print head operation

4 KEYBOARD TEST
Key detection, scan matrix, keyboard controller verification

5 PRINT HEAD ALIGNMENT
Calibration "H" patterns left/center/right. Prompts for quality OK.

6 MARKETING MESSAGE
Customer welcome letter included with each new ADAM

PROCEDURE Setup & Connection — Step by Step

1. **Power OFF** the ADAM system completely
2. Insert Test Module into ADAM's side I/O expansion port
3. Connect controller loopback cables to Controller Ports 1 and 2
4. Install Dual Data Drive test fixture — *insert at slight angle, then straighten*
5. Insert Test Cartridge Rev 3.3 into the cartridge slot
6. **Power ON** and reset to ColecoVision mode (ADAM side will NOT boot)
7. Insert 5-Block Test Data Pack into the test fixture's tape drive

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8   System displays "ADAM SYSTEM FINAL TEST REV 3.3" — enter Station ID
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Critical Notes:

- **CV boot only** — ADAM side will not boot with test hardware installed
- **Printer required** — must be attached and detected; all results print in real-time
- **Fixture seating** — if system hangs at "INSERT TAPE", reset and reseat the dual fixture
- **Spring pins** — dual fixture uses pogo pins requiring proper seating for contact
- **RF video required** — unit under test RF connection must be used during testing

CREDITS Preservation Team

Restoration & Firmware Preservation

John Lundy

Lundy Electronics

68701 firmware dump, hardware restoration, troubleshooting, repair. Hand-built LP130-based reader/writer for MCU ROM extraction.

Test Tape Recreation & Documentation

Rich DiRocco

ColecoVision & ADAM Archive

Z80 ROM analysis, checksum algorithm reverse engineering, test tape creation, documentation compilation.

Original Equipment

Philip Kosowsky

Former Coleco Test Laboratory

Original custodian of Unit #15 after Coleco's closure in 1988. Equipment preserved in storage for nearly four decades.

Document Version 1.0 — February 2026 • AdamArchive.org • ColecoVisionADAM.com