ADAM System Final Test Module - Usage Guide

Overview

The ADAM System Final Test is a **two-component factory diagnostic system** used by Coleco to verify ADAM computers during manufacturing. This guide explains how to use both components together.

This documentation is based on analysis of the preserved firmware combined with the official **Coleco Industries Inc. Repair Guide Equipment Listing** (Preliminary Draft: 8/16/85).

Required Components

Hardware (COLECO Equipment)

Per the official Repair Guide, the following Coleco equipment is needed:

Item	Assembly #	Description
Adam System Final Tester	**T-1638**	Main test fixture (includes 68701 module)
Board Level System Tester	T-1721	For board-level diagnostics
Data Drive Azimuth Check Fixture	T-1658	For tape head alignment
Data Drive Switchbox	T-1710	For drive selection during tests
Known Good Adam Sub-Assembly Set	-	Reference units for comparison

Software/Firmware (COLECO Cartridges)

Item	Version	Purpose
System Test Cartridge	**Rev. 3.3**	Main system test (your ROM)
CPU Burn-In Cartridge	Rev. 5.0	Extended CPU testing
Game Board Final Test Cartridge	Rev. 3.1	ColecoVision/Game board tests
Gamma Debug Cartridge	Rev. 1.0	Memory Console debugging
Expansion RAM Debug Cartridge	Rev. 1.0	64K RAM testing

Additional Items Needed

- **Color Television** (Coleco used Sony or Hitachi)
- **Frequency Counter** (Fluke Model #1900 for tape drive tests)

- **Coleco SmartBasic Cassette**
- **Blank Cassette** (for tape read/write tests)
- **8KHz Track A & B Cassette** (reference tape for azimuth)
- **Mousetrap or Carnival Cartridge** (for game board testing)

Which Tests Require the T-1638 System Final Tester

According to the Repair Guide, the **T-1638 Adam System Final Tester** (which contains the 68701 module) is required for testing:

Board/Component	T-1638 Required	Additional Equipment
Gamma/Delta Logic Board	✓	T-1721 Board Level Tester
Printer Logic Board	✓	-
Delta Game Board	✓	Expansion Module #1
Keyboard Logic Board	✓	-
Disk Drive	✓	-
Data Drive	✓	T-1658 Azimuth Fixture, T-1710 Switchbox
64K Expansion RAM	-	(uses Expansion RAM Debug Cart)

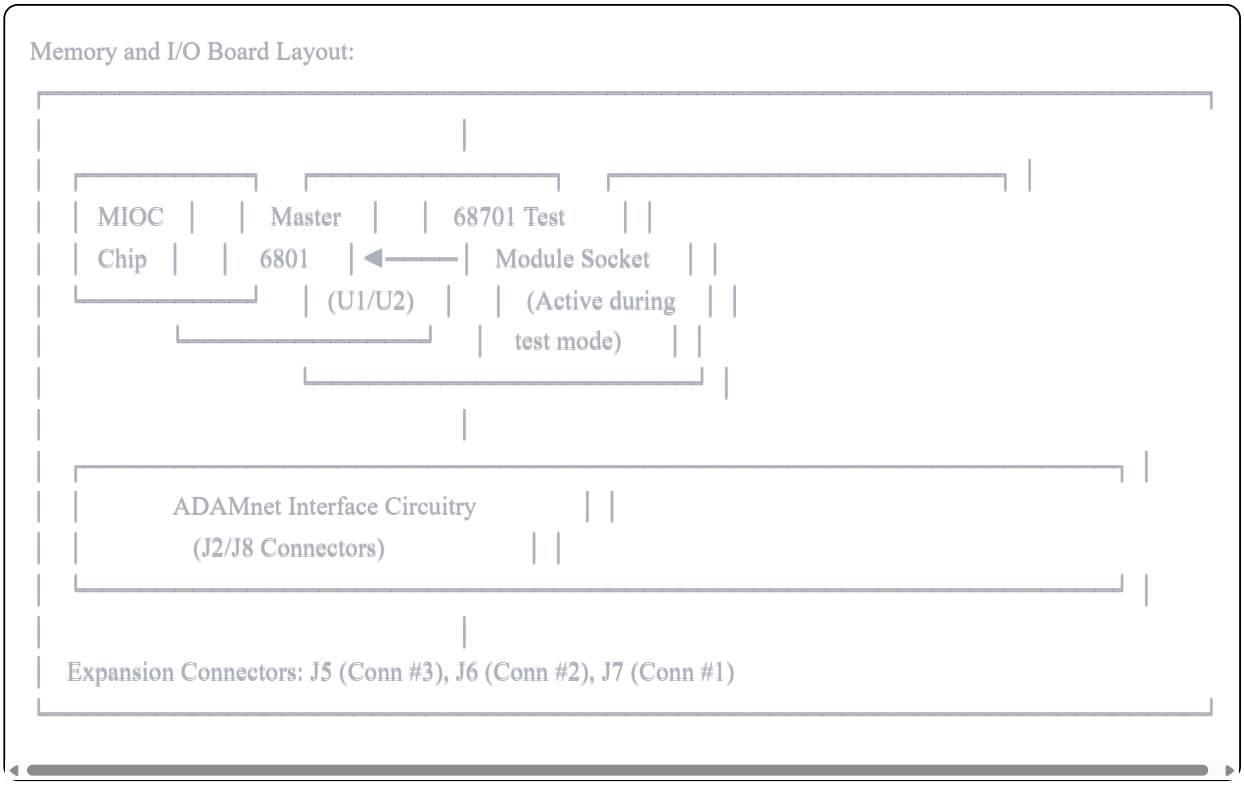
The T-1638 is essentially the complete test station that includes:

- The 68701 Test Module (firmware you have)
- Cabling and interconnects
- Test fixtures for various subsystems

Physical Setup

68701 Test Module Installation

The 68701 Test Module replaces or supplements the Master 6801 on the Memory and I/O Board:



Installation Steps:

1. Power off the ADAM system completely
2. Remove the Memory Console top cover (4 screws)
3. Locate the 68701 test socket near the Master 6801
4. Insert the 68701 Test Module into the socket (pin 1 aligned)
5. Replace the cover

Test ROM Installation

The Test ROM loads as a standard ADAM cartridge or via tape/disk:

Option A - Cartridge:

- Burn the ROM to a 16KB EPROM (27128)
- Install in a ColecoVision/ADAM cartridge PCB
- Insert into the cartridge slot

Option B - From Tape/Disk:

- The ROM may have originally been loaded from a test tape
- Load address: $8000 (standard ADAM program area)

Operating Instructions

Power-On Sequence

1. Insert Test ROM cartridge (or have test tape ready)
2. Ensure 68701 Test Module is installed
3. Connect keyboard, printer, and tape drive(s)
4. Power on the ADAM

Initial Screen

```
ADAM SYSTEM FINAL TEST
    REV  3.3

STATION ID - ____

ADAM OR EXPANSION MODULE ?
    ( A or E )
```

Selection:

- Press **'A'** for full ADAM system (Memory Console)
- Press **'E'** for Expansion Module #3 (ColecoVision add-on)

Main Menu

```
MANUFACTURING TEST OPTIONS

  1)  SYSTEM TEST
  2)  CPU TEST
  3)  PRINTER TEST
  4)  KEYBOARD TEST
  5)  PRINT HEAD ALIGNMENT
  6)  MARKETING MESSAGE
```

Test Descriptions

Option 1: SYSTEM TEST (Complete Manufacturing Test)

This is the primary factory test that verifies all subsystems:

Test Sequence:

1. **ROM Checksum** - Verifies OS-7, ALF1, ALF2, ALF3, EOS ROMs

2. **RAM Test** - Lower 32K and upper RAM verification
3. **Video Test** - VDP functionality, VRAM access
4. **Audio Test** - Sound chip verification
5. **Controller Ports** - Both game controller inputs
6. **ADAMnet Sync** - Communication with Master 6801
7. **Keyboard Test** - Matrix scan verification
8. **Printer Test** - Print mechanism and alignment
9. **Tape Drive Test** - Read/write verification

68701 Module Role: During the ADAMnet Sync test, the 68701 module:

- Verifies Master 6801 port I/O
- Tests ADAMnet timing (62.5 kbps)
- Validates serial communication protocol
- Reports sync status to Z80

Possible Results:

```
PASSED MANUFACTURING TEST     ← All tests OK

FAILED MANUFACTURING TEST     ← One or more failures

CAN'T SYNC-UP WITH MASTER!!! ← 68701/6801 communication failed
```

Option 2: CPU TEST

Tests Z80 processor and memory subsystem:

- Instruction execution
- RAM read/write patterns
- Memory bank switching
- DMA controller verification

Option 3: PRINTER TEST

Prerequisites:

- Paper inserted in printer
- Printer ribbon installed

Tests:

1. Carriage movement (left/right)
2. Daisy wheel rotation
3. Print solenoid firing
4. Paper advance mechanism

Prompts:

```
PLEASE INSERT PAPER
FOR MARKETING MESSAGE
 AND HIT RETURN

PRINT QUALITY O.K. ?
 (Y or N)
```

Option 4: KEYBOARD TEST

Interactive matrix verification:

```
KEYBOARD MATRIX TEST
TYPE THE FOLLOWING

WILD CARD
CLEAR
DELETE
/
L
2
CONTROL B
HOME
SHIFT W
LOCK F
```

Each key must be pressed to verify its matrix position.

Option 5: PRINT HEAD ALIGNMENT

Used to calibrate the daisy wheel printer:

```
CONTINUE PRINT ALIGNMENT ?
 (Y or N)
```

Prints test patterns for visual alignment verification.

Option 6: MARKETING MESSAGE

Prints the consumer welcome message:

```
Your new ADAM Family Computer System is
now ready to make your life easier,
more organize and more fun than ever.
```

This was printed on paper included with new units.

Error Messages and Troubleshooting

Sync Errors

```
CAN'T SYNC-UP WITH MASTER!!!
```

Causes:

- 68701 Test Module not installed or faulty
- Master 6801 chip defective
- ADAMnet interface circuitry failure
- Bad connection on Memory/I/O Board

Solutions:

1. Verify 68701 module is properly seated
2. Check for bent pins on module
3. Inspect ADAMnet comparator circuits
4. Test Master 6801 in known-good system

Component Failures

Error Message	Component	Likely Cause
`LOWER 32K RAM BAD`	RAM chips	Defective 64Kx1 DRAM
`ROM CHECKSUM FAIL`	OS-7/EOS ROM	Bad ROM chip or socket
`FAIL CONTROLLER PORT #1`	Controller port	Bad port or multiplexer
`FAIL CONTROLLER PORT #2`	Controller port	Bad port or multiplexer
`DRIVE 2 OR AUX. NET FAIL`	Tape/ADAMnet	Drive or network issue

Error Message	Component	Likely Cause
FAIL AUX. VIDEO	VDP circuit	Video processor failure
FAIL AUX. AUDIO	Sound chip	SN76489 or audio circuit
PRINTER ERROR	Printer	Mechanism or 6801 failure
KEYBOARD FAIL	Keyboard	Matrix or keyboard 6801

Tape Test Errors

```
INSERT TAPE
   TEST IN PROGRESS

FAIL 5-BLOCK TAPE CHECK-SUM
```

Tape test sequence:

1. WRITE - Writes test pattern to tape
2. READ - Reads back and verifies
3. X-FER - Tests data transfer integrity

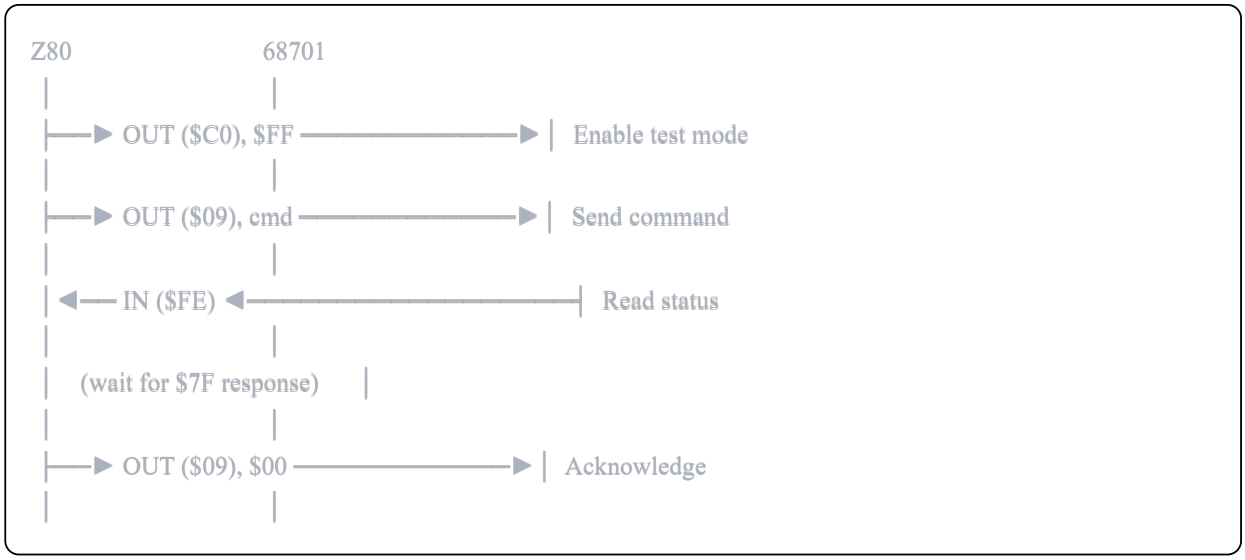
Technical Notes

Communication Protocol

The Z80 test program and 68701 module communicate via:

1. **Port $09** - Primary test module data port
2. **Port FE** - Status/handshake ports
3. **Port $C0/$80** - Memory bank control

Handshake sequence:



Expected Test Byte Sequence

The 68701 module contains test patterns at $F800:

```
47 57 30 00 = "GW0" + null (identification string?)
28 18 38 00 = Test pattern group 1
...
```

These are compared against expected values by the Z80 test program.

Timing Requirements

- ADAMnet bit rate: 62.5 kbps (16µs per bit)
- Sync timeout: ~1000 timer cycles per attempt
- Total sync attempts before failure: Multiple retries

Factory Test Procedure (Reconstructed)

Based on the code analysis, Coleco's factory test procedure was likely:

1. **Assembly complete** - Unit assembled on production line
2. **Install test module** - 68701 inserted into test socket
3. **Connect peripherals** - Keyboard, printer, drive attached
4. **Run System Test** - Option 1 from menu
5. **Verify PASS** - All subsystems must pass
6. **Print marketing message** - Option 6, verify print quality
7. **Remove test module** - 68701 removed from socket
8. **Package unit** - Include printed message with unit

The test module was removed before shipping - it was **not** included with consumer units.

Preservation Notes

This test system is extremely rare because:

1. Factory test equipment was not sold to consumers
2. 68701 modules were likely reused across many units
3. Test ROMs had no retail distribution
4. Most test equipment was discarded when Coleco ceased ADAM production (1985)

Official Coleco Documentation: The Repair Guide Equipment Listing (8/16/85) confirms:

- Assembly T-1638 = "Adam System Final Tester"
- System Test Cartridge Rev. 3.3 was the standard test software
- Multiple specialized cartridges existed for different test scenarios

Preserved components:

- 68701 Firmware: Dumped 12/29/2025 by John Lundy
- Module supplied by: Rich DiRocco
- Checksum $A38B verified against chip label
- Z80 ROM: Rev 3.3, previously preserved
- Official Repair Guide confirms Rev 3.3 as production version

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Appendix: Port Map

Z80 I/O Ports Used by Test Program

Port	Direction	Function
$09	OUT	Test module command/data
$09	IN	Test module status
$20	OUT	Memory bank control
$60	OUT	System control
$80	OUT	Memory page select

Port	Direction	Function
$C0	OUT	Test mode enable
$FC	IN	ADAMnet status
$FE	IN	Handshake status
$FF	OUT	ADAMnet control

68701 Internal Ports

Address	Name	Function in Test
$00	DDR1	Direction: $0E (bits 1-3 output)
$01	DDR2	Direction: $00 (all input)
$02	PORT1	Clock toggle, status bits
$04	DDR3	Direction: $FF (all output)
$05	DDR4	Direction: $07 (bits 0-2 output)
$07	PORT4	Sync detection input
$10	RMCR	SCI rate control
$11	TRCSR	SCI transmit/receive control

Guide compiled from firmware disassembly and ADAM Technical Reference Manual December 2025