

TANDY®

**Technician Series
Diagnostics Software**

**TANDY
Color Computer 3
Diagnostics Manual**

NATIONAL TECHNICAL SUPPORT AND TRAINING

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COLOR COMPUTER-3 Diagnostics Manual:

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IRQTST Diagnostics Software:

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FRQTST Diagnostics Software:

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COLORS64 Diagnostics Software:

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COCO3VID Diagnostics Software:

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CPUSPEED Diagnostics Software:

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COLOR COMPUTER-3 DIAGNOSTICS

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- INTRODUCTION -

The Color Computer-3 diagnostics were written with the purpose of helping the technician diagnose the condition of the Tandy Color Computer-3. These diagnostics will test features specific to the Color Computer-3. Some tests may run on the Color Computer-2 or 1, but this is not recommended.

Below is a list of Color Computer-3 diagnostics, which test various items such as interrupts, memory, and Color Video:

MEMCO3/BIN - Tests all the memory of the Color Computer-3, up to 512k.

IRQTST/BIN - Color Computer Normal Interrupts test.

FRQTST/BIN - Color Computer Fast Interrupts test.

COLORS64/BIN - Displays all 64 Colors of the Advanced Color Video Chip.

COCO3VID/BIN - Displays Alpha & Graphic modes. Also displays crosshatch.

CPUSPEED/BAS - Diagnostic for testing switching of the CPU clock speed.

PSUEDO/BAS - Tests "false" colors (Produced by Artifacting circuitry).

PALTEST/BAS - Tests the Color Computer-3's Color Palette Registers.

VPAGE/BAS - Tests the Color Computer-3's Video Paging Register.

MEMBANK/BAS - Tests the Color Computer-3's MMU Memory Banking Register.

VDGMODES/BAS - Tests the VDG modes of the Color Computer-3.

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- MEMCO3/BIN -

"MEMCO3" is a diagnostic program which allows testing all of the RAM of the Color Computer-3 (128k or 512k). The Memory Management (MMU) section of the Advanced Color Video Chip (ACVC) allows the 6809 processor to access memory outside of the normal 64k address range.

To load this memory diagnostic: type **LOAD "MEMCO3/BIN"** and **<ENTER>**.
To execute this diagnostic: type **EXEC** and press **<ENTER>**.

This diagnostic begins by showing a menu of selections available:

- <1> = PASS MODE (Single/Continuous),**
- <2> = RAM TEST,**
- <3> = Exit to Basic.**

When entering the menu, the MMU is tested to see whether it will access memory outside the normal 64k addressing scheme. If the MMU is operating properly, then the menu will display "MMU Good". If the MMU is not operating properly, the menu will display "MMU Bad" (Memory or the MMU section of the ACVC chip may be faulty).

Press **<1>** to toggle the pass mode and set it as single or continuous. This flags the ram test whether it should test all memory once, or continuously.

Press **<2>** to invoke the memory test. The screen displays the pass number, the test mode (write or verify), and the memory range being tested, with an area on the video reserved for any errors that may occur during the memory test. The memory range being tested, is displayed as two five digit hexadecimal numbers which represent the beginning and ending addresses of the memory range currently being tested.

The process of testing an eight kilobyte range (2000H) of memory involves: Writing a modified address pattern to all segments of this memory range, then verifying it from the minimum valid segment to segment seven, and displaying any error messages. The minimum valid segment, is the segment where the memory begins (128k machines= Segment-7, 512k machines= Segment-0).

Memory is tested in eight kilobyte (2000H) blocks as noted above, until the end of memory (this is a pass). If the test is in the single pass mode, it will exit to the menu. If in the continuous mode, the pass number is incremented by one and all memory is tested again.

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(MEMC03/BIN - memory test, continued)

The <*> key may be pressed in order to freeze the memory test option of "MEMC03", so that the error information may be observed.

Press the <SPACE-BAR> to continue the memory test.

As the test proceeds, the address range being currently tested is displayed, preceeded by the current test mode ("writing" or "verifying").

Press <BREAK> to exit the memory test and return to the menu.

At the menu, press <3> to exit to Basic.

- IRQTST/BIN & FRQTST/BIN -

IRQTST and FRQTST are designed to test the interrupts of the Color Computer-3. Both of these tests are operated the same but IRQTST tests the normal interrupts, and FRQTST tests the fast interrupts (FRQ).

IRQTST and FRQTST are machine language files, and must be loaded and then executed. The proper loading and executing of the programs is shown below.

If testing normal interrupts, load IRQTST by typing:

type LOADM "IRQTST/BIN" and press <ENTER>.

If testing fast interrupts, load FRQTST by typing:

type LOADM "FRQTST/BIN" and press <ENTER>.

To execute either test: type EXEC and press <ENTER>.

Both tests begin the process by displaying the interrupt to be tested then waiting for the interrupt to occur. If the interrupt was received, the program will display "Interrupt Received" followed by "Press Any Key To Continue". If the interrupt didn't occur, then these last two messages will not be displayed, but any key may still be pressed to continue and test the next interrupt. If an interrupt is not received, then there may be a fault in the ACVC or interrupt circuitry.

The interrupts tested include Timer, Horizontal Border, Vertical Border, Serial, Keyboard, and Cartridge.

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- COLORS64/BIN -

COLORS64 is a menu driven program, which allows the technician to ensure that all 64 colors of the Advanced Color Video Chip (ACVC) are displayed.

To load COLORS64: type **LOAD "COLORS64/BIN"** and press **<ENTER>**.

To execute it: type **EXEC** and then press **<ENTER>**.

The program will then display the menu of tests available:

<1> = RGB monitor test,

<2> = CMP monitor test,

<3> = Exit to Basic.

This program uses interrupts, so run the interrupt tests (IRQST and FRQTST) to ensure that the interrupts are functioning properly. A joystick must be plugged into the right joystick port for this test.

Pressing **<1>** invokes the RGB test, which programs the color palette registers for an RGB video monitor, then displays all 64 colors on the screen in a grid pattern. Use the joystick to move the cursor over one of the blocks in the grid. The background color of the screen will change to the color of the block under the joystick cursor. **Press the fire button of the joystick to change the border color of the screen to the same as is under the joystick cursor.** Since this test loads the palettes with RGB values, it is incompatible with composite video monitors. **Press <BREAK> to exit to the menu.**

Pressing **<2>** invokes the CMP test, which programs the color palette registers for a composite video monitor, then displays all 64 colors on the screen. These colors are displayed in rows. Using the joystick, move the joystick cursor over one of these color blocks, and **press the fire button of the joystick to change the border color of the screen.** Since this test loads the palettes with composite values, it is incompatible with RGB video monitors. **Press <BREAK> to exit to the menu.**

At the menu press **<3>** exit to Basic.

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- COCO3VID/BIN -

COCO3VID is designed to test the alpha and graphic modes of the Advanced Color Video Chip (ACVC). Another feature of this test displays a cross hatch pattern, which may be used to align monitors.

To load this diagnostic: type **LOAD "COCO3VID/BIN"** and press **<ENTER>**.
To execute the test: type **EXEC** and press **<ENTER>**.

The test begins with a menu of tests, as shown below:

<1> = ALPHA TEST,
<2> = GRAPHICS TEST,
<3> = CROSSHATCH,
<4> = EXIT to Basic.

Pressing <1> invokes the Alpha Test to test the alpha modes of the Advanced Color Video Chip (ACVC). This test fills the screen with different characters that have different attributes to check all of the alpha modes (Attributes affect the foreground and background colors of a character, and can cause blinking and underline). The test will then cycle through all the alpha modes (32, 40, 64, 80 characters/line) until the **<BREAK>** key is hit, at which time it will exit the test and go back to the menu.

Pressing <2> invokes the Graphics mode test of the ACVC chip. This draws color bars on the screen and then cycles through the different color graphics modes. This test runs continuously, so press **<BREAK>** to return to the menu.

Pressing <3> invokes the Crosshatch feature, which may be used for aligning an RGB or composite monitor. Pressing the **<SPACE-BAR>** will toggle the display between a crosshatch display (vertical & horizontal lines) and a dot pattern display. Pressing **<BREAK>** will exit the test and return to the menu.

At the menu press **<4>** exit to Basic.

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- CPUSPEED/BAS -

CPUSPEED is a Basic program which allows the technician to see if the cpu clock is changing speed properly.

To execute this diagnostic: type **RUN "CPUSPEED/BAS"** and press **<ENTER>**. The test should then appear on the screen.

The test should begin by filling the screen with characters, followed by the message "Press Any Key To Change Speed". The CPU speed (SLOW/FAST) is displayed at the top of the screen. By pressing a key to toggle between the two speeds, there should be an observable difference in speed.

Press **<Q>** to exit this test.

- PSUEDO/BAS -

PSUEDO is a Basic program which allows checking of the artifacting circuitry of the color computer. This circuitry produces "false" colors when under the highest color computer-2 graphics mode. Normally, this graphics mode would produce only two colors (white and black or green and black), but by drawing the pixels close together, the artifacting circuitry will send out a color burst signal to simulate colors ("false" colors). Using this test allows the technician to determine whether or not the artifacting circuitry is working. **This test is only valid on composite monitors, since "false" colors are not produced on the RGB monitors.**

To execute this diagnostic: type **RUN "PSUEDO/BAS"** and press **<ENTER>**. The test should then appear on the screen.

Press any key to begin the test. Four rectangles will be drawn on the screen. The first (top) rectangle appears with a black center while the fourth (bottom) rectangle appears all white. The second and third rectangles will appear to have color on a composite monitor.

Press the **<Q>** key to exit this test and exit to Basic.

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- PALTEST/BAS -

PALTEST is a Basic program which tests the color palette registers of the ACVC chip of the color computer-3.

To execute this diagnostic: type **RUN "CPUSPEED/BAS"** and press **<ENTER>**. The test should then appear on the screen.

Observe the 16 circles on the screen. Each of these represents a palette register. The color inside of the circle is the current color of that pallet register. These will change as each palette register is being tested.

The test terminates if an error occurs or when it is completed. If an error occurred, it will report the palette # of the error, the data written, and the data read. If no error occurred, the test will display, "All Pallets OK!".

- VPAGE/BAS -

VPAGE is a Basic program which tests the Video Paging Register of the Advanced Color Video Chip (ACVC). The program uses a machine language routine to fill memory with a graphics pattern, then the basic program initializes the video paging register for the test.

To execute this diagnostic: type **RUN "VPAGE/BAS"** and press **<ENTER>**. The test should then appear on the screen.

A pattern should appear on the screen when the test begins. As the program tests the video paging register, it is repointed making the screen appear to move left, up, and diagonally to the upper left corner. The pattern on the screen should appear to move these three directions, if it doesn't then check the ACVC. It's section that positions the video in memory may be faulty.

Since VPAGE is a continous test, **press the <Q> key to exit to Basic.**

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- MEMBANK/BAS -

MEMBANK is a Basic program which tests the MMU Memory Banking Register.

To execute this diagnostic: type **RUN "MEMBANK/BAS"** and press **<ENTER>**.
The test should then appear on the screen.

As this diagnostic begins, it should ask for the memory size of the computer (Selection: <1>=128k, <2>=512k). The test will go through each segment of memory writing a pattern (the Ascii value of the current segment). The "physical address" displayed at the top of the screen, is the start of the current screen displayed. The "physical address" contains five digits. The first is the segment number, and the last four are a normal 64k address represented in hexadecimal. The test will cycle through the segments, from the minimum valid segment to segment seven. The minimum valid segment for a 128k machine will be segment-six, while it will be segment-zero for a 512k machine (according to the memory size entered). If the memory segments are not switching, then check the Advanced Video Color Chip. The MMU banking section of the "ACVC" may be faulty.

This test is continuous, so press **<Q>** to exit it.

- VDGMODES/BAS -

VDGMODES is a Basic program which tests the VDG modes of the Advanced Color Chip (ACVC) in the Tandy Color Computer-3. These modes include Alpha, Graphics, GM2, Inverse, and Upper/Lower Case.

To execute this diagnostic: type **RUN "VDGMODES/BAS"** and press **<ENTER>**.
The test should then appear on the screen.

This test should automatically cycle through all the video modes shown below. Below is a description of these modes.

Alpha = Alphanumeric text mode.
Graphics = Bit Plane (Graphics) mode.
GM2 = Will turn on Color Computer-3 Border, unless "INV" is set.
Inverse = Exchanges foreground and background colors of all characters.
Uppercase = Lowercase characters are displayed in reverse video.
Lowercase = Lowercase characters are displayed in true lower case.

Press **<Q>** To exit this test and return to Basic.