**PART TITLE**
2600/2600A VCS DOMESTIC FSM

**DESCRIPTION OF CHANGE:**

Replace pages 4-25, 6-21, 8-3 and 8-7 with the attached corrected pages.

Replace cover page with new (Rev. 02) cover page.

Retain this ECN as a record of these changes.
Atari believes that the information described in this manual is accurate and reliable, and much care has been taken in its preparation. However, no responsibility, financial or otherwise, shall be accepted for any consequences arising out of the use of this material. Information contained herein is subject to change. Revisions may be issued to advise of such changes and/or additions.

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INTRODUCTION

The Video Computer System™ (VCS) Field Service Manual is organized in nine sections:

- **THEORY OF OPERATION** - overview of how the VCS works and what the basic assemblies look like.
- **SILKSCREENS AND SCHEMATICS** - electrical drawings and layouts of the printed circuit boards.
- **TESTING AND TROUBLESHOOTING** - overview of the procedures for testing and repairing the VCS unit.
- **2600 DIAGNOSTIC FLOWCHART** - thorough flowchart enabling the technician to test and troubleshoot a defective 2600 unit.
- **SYMPTOM CHECKLIST** - for the experienced technician, a list of the high failure parts and the flowchart entry point for that particular problem.
- **2600A DIAGNOSTIC FLOWCHART** - thorough flowchart enabling the technician to test and troubleshoot a defective 2600A unit.
- **GAME CONTROLLERS** - overview of hand controller construction with electrical schematics and recommended test and repair procedures.
- **PARTS LIST** - detailed breakdown of all parts used in both the 2600 and 2600A.
- **SERVICE BULLETINS** - section to be used to hold service bulletins released by the Manager of Technical Support. These bulletins will include changes in recommended repair procedures and required modifications for units in the field.

The manual is designed for use by both experienced and inexperienced service personnel. The Diagnostic Flowcharts (Sections 4 and 6) provide detailed diagnostic and repair procedures for technicians who are not yet completely familiar with the VCS. The Symptom Checklist (Section 5) provides a fast repair reference for the more experienced technician.
SECTION 1

THEORY OF OPERATION

INTRODUCTION

There are currently four types of ATARI Video Computer Systems. The original model (2600) is composed of two PC Boards connected by a 12-pin ribbon cable with the motherboard surrounded by a heavy aluminum casing.

The other models (2600A: Revisions 1-13, Revisions 14-15, and Revisions 16 and up) are composed of a single board with a light aluminum shield. The single board models differ slightly in the video output circuitry. Component differences are:

- Revisions 1-13 have no diodes on TIA lines LM1 and Sync.
- Revisions 14-15 have diodes and pull-up resistors on TIA lines LM1 and Sync.
- Revisions 16 and up include the above mentioned diodes and resistors as well as a timer chip.

The revision level is etched directly on the PC board.

OVERVIEW

The ATARI Video Computer System (VCS) Models 2600/2600A are state-of-the-art microcomputers. They receive instructions for the operation of different games from individual Read-Only-Memory game cartridges and interpret data from the players' hand-held controllers. They also allow game players to select both a specific version of each game and the player difficulty (on a per player basis). Figure 1-1 is a block diagram of the functional flow of the VCS Model 2600. Section 7 describes the player controllers.

![Figure 1-1. 2600 Functional Diagram](image-url)
GAME CONSOLE

The VCS game console is composed of an outercasting that houses the switchboard and the RF radiation shielded motherboard.

Outer Casting

The casting consists of three pieces of plastic (see Figure 1-2). The pieces include the base, which holds the switchboard and motherboard assembly; the top; and the bezel.

Figure 1-2. 2600 Game Console
Switchboard

The switchboard assembly holds the player option switches, the power supply, and the RF modulator (See Figure 1-3).

- **PLAYER OPTION SWITCHES**
  Switches S101 thru S104 are double-pole, single-throw. Switches S105 and S106 are double-pole, double-throw. All switches are connected between the switchboard and the motherboard by 12-conductor flexible ribbon cable.

- **POWER SUPPLY**
  The power supply is composed of a +5 voltage regulator, filter capacitors, and the power on/off switch. Unregulated DC is supplied to the board from the battery eliminator. A supply of +5 volts is routed through a filter circuit to the RF modulator. The motherboard also receives its power (+5 volts Vcc) from the switchboard via the same 12-conductor ribbon cable referenced above.

- **RF MODULATOR**
  The RF modulator converts the signal received from the Television Interface Adaptor chip on the motherboard to a frequency that a television can receive and interpret. Data between the RF module and the Television Interface Adaptor chip is passed via the 12-conductor ribbon cable which connects the motherboard to the switchboard. A coaxial cable passes this signal from the RF module to the switch box mounted on the back of the television.

Figure 1-3. 2600 Switchboard and Motherboard Assembly
Motherboard

The motherboard is composed of a PC board containing a microprocessor (MPU) chip, a combination Random Access Memory - Input/Output (RAM-I/O) chip, and a Television Interface Adaptor (TIA) chip (see Figure 1-3). The board also contains numerous capacitors, resistors, transistors, and other assorted electronic components. These parts are all listed in Section 8, PARTS LIST.

- **MICROPROCESSOR CHIP**
  The heart of the VCS is the 6507 microprocessor chip (MPU). This device makes decisions for the VCS based upon information it receives from the game cartridge and the RAM-I/O (discussed in the next paragraph).

- **RANDOM ACCESS MEMORY-INPUT/OUTPUT CHIP**
  Temporary storage of data from the MPU is provided by the 6532 Random Access Memory-input/Output (RAM-I/O) chip. This chip also scans the option switches and the joystick I/O lines for information and maintains time accounting for the MPU.

- **TELEVISION INTERFACE ADAPTOR CHIP**
  This ATARI proprietary chip generates audio and video signals which are required by the RF modulator. The Television Interface Adaptor (TIA) chip also contains the analog-to-digital converter circuitry that allows the MPU to understand signals originating in the hand-held paddle controllers.

TIA outputs are processed by additional circuitry into a composite video, sound, and color signal which is routed to the RF module on the switchboard via the 12-conductor ribbon cable. The RF module converts the composite signal to a RF signal acceptable to the television. A coaxial cable transmits this RF signal from the console to a selection box that can be mounted on the T.V. This switchbox (Figure 1-4) allows you to display either a signal received by the antenna (for normal T.V. viewing) or a signal from the VCS (for playing a game).

![Figure 1-4. TV Switchbox](image)
The major difference between the newer single board VCS (2600A) and the original VCS (2600) is that all of the components formerly on the switchboard are now located on the motherboard (See Figure 1-5). This includes the player control function switches (Power ON/OFF, COLOR/BW, GAME SELECT and GAME RESET), RF modulator and power supply circuitry. The single board design eliminates the need for the ribbon cable, which connected the switchboard to the motherboard on the 2600 VCS.

Gone, too, are the luminescence and RF output buffers and the two TIA input buffers, all of which were contained in chip A203. In the oscillator circuit, one of the transistors and its associated network has been eliminated and R227-R230 (paddle control lines) are no longer present. C239, going to pin 7 on J202 and J203, has been replaced by C236 and C237 (See Figure 1-6).

Figure 1-5. 2600A Game Console
In addition to the component changes, the physical location of several parts has also been changed. Instead of having the right and left difficulty switches placed on top of the game, they are located at the rear of the console next to the game controller plugs. The channel selector switch is also located at the rear of the console. The game cartridge socket is no longer angled, but is mounted vertically on the board.

**2600A MODEL DIFFERENCES - REVISIONS 14 AND 15**

Revisions 14 and 15 contain the model differences described above, and in addition have new components on the TIA lines, LM1 and Sync. There are two IN914 diodes to prevent feedback on the lines and two additional pull-up resistors to insure the signal is at +5v. To compensate for any signal loss, R215 and 217 have been changed to 47K (R215) and 24K (R217).

**2600A MODEL DIFFERENCES - REVISIONS 16 AND UP**

Revisions 16 and up contain the model differences described above; they also include a timer chip (A205) added to the reset circuitry of the MPU chip. This chip eliminates the problem of power-on reset failures.
SUMMARY

The VCS is a microcomputer that receives its operational instructions from game cartridges, the game console, and player controllers. The 2600 switchboard and motherboard assemblies are housed within an outer casting and are the principle assemblies addressed in the remainder of this manual. The boards are connected by a 12-conductor ribbon cable which passes not only power, but also data between the two boards.

Three chips of the motherboard allow for the interaction between the game and the player. These chips are the microprocessor (MPU), the Random Access Memory-Input/Output (RAM I/O), and the Television Interface Adapter (TIA) chips.

The 2600A model differs primarily in the location of the components formerly located on the switchboard. They are attached directly to the motherboard and eliminate the need for the switchboard and the ribbon cable. The 2600A Revisions 14 and up include even further additional components to improve the performance of the output circuitry.
SECTION 2

SILKSCREENS AND SCHEMATICS

On the following pages are representative silkscreens and switchboard schematics for the ATARI Video Computer System. The motherboard schematics for all 2600/2600A VCS models are located in the pocket at the front of this binder. Minor variations in design may be encountered depending on the production date of the game, but these schematics provide all details required for an in-depth understanding of all 2600 units, including the various 2600A model revisions.
Figure 2-1. 2600/2600A IC Pinouts
Figure 2-2. 2600 Motherboard Silkscreen
The following variations may appear on the 2600 switchboard:

CHANNEL 3 SWITCHBOARD:

C102 may or may not be in place.
C103 and/or C104 may or may not be in place.
C103 and/or C104 may be mylar dipped .22 uf.
C103 and/or C104 may be ceramic .01 uf (See Figures 2-3 and 2-4).

CHANNEL 2 OR 3 SWITCHBOARD:

The holes on the PC board for the GAME RESET and GAME SELECT switches may not be wide enough apart for the switch legs. To correct this the legs of the switch must be bent in so they fit into the holes (See Figures 2-5 and 2-6).
Figure 2-4. 2600 Channel 3 Switchboard Schematic
Figure 2-5. 2600 Channel 2-3 Switchboard Silkscreen
Figure 2-6. 2600 Channel 2-3 Switchboard Schematic
Figure 2-7. 2600A Motherboard Silkscreen (Revs. 1-13)
Figure 2-8. 2600A Motherboard Silkscreen (Revs. 14 and 15)
Figure 2-9. 2600A Motherboard Silkscreen (Revs. 16 and up)
SECTION 3

TESTING AND TROUBLESHOOTING

EQUIPMENT REQUIREMENTS

You require eight basic pieces of equipment in order to analyze failures in the 2600/2600A Video Computer Systems (VCS). These items include:

- A 15 MHz oscilloscope
- A Video Computer System switchboard assembly that is known to be operating properly (not required for repairing 2600A units)
- A Video Computer System diagnostic test cartridge, version 2.6 (DTC)
- Two blue controller port shorting plugs for use with the 2.6 (DTC) diagnostic cartridge
- Signal Tracing Cartridge (STC or KLUGE)
- VCS Field Service Manual for Domestic Model 2600/2600A
- Color television set (properly adjusted)
- Frequency Counter
TEST PROCEDURES AND METHODS

Atari requires each 2600/2600A model returned for service to be checked for certain conditions. In some instances, a unit must be modified to conform to Atari standards. These changes are summarized below.

2600 MODEL MODIFICATIONS

- Each 2600 model opened must be modified as shown in Figure 3-1 to provide additional protection from static discharge. A Zener diode is connected between the trigger lines and ground, and static strips are placed on the switches on the switchboard (See Figures 3-1, 3-2 and 3-4). These modifications are crucial to prevent component damage due to static discharge.

- Each connector and plug should be checked for a tight, secure fit. Intermittent failures frequently result from a loose connector or plug.

- Connectors J202 and J203 should be checked for pushed or broken pins.

- If the unit has a green J200 connector, insert cartridge and wiggle it. If the unit shows intermittent problems, replace J200.

- Each board with Molex chip sockets with insertion aids should have the insertion aids removed and the chip reinserted.

- Check that all components (especially those on the perimeter of the motherboard) are properly soldered. Check for broken or shorted trace lines.

- Check for an inductor and capacitor over C201 and R206. Cut the inductor and cap out, being careful not to cut the C201 or R206 leads.

- If unit has a standup regulator and heatsink, inspect for hairline fractures between the regulator and switchboard. Also ensure that the regulator is firmly secured to the heatsink by a Tinnerman clip or rivet.

- Ensure that motherboards (Rev. 8 or lower) have a colored dot over the trace on the upper-left corner of the board. This prevents shorting the board and the casting (See Figure 3-3).

- Two types of 12-conductor cable assemblies have been used on 2600 model units, the flat-wire type and the ribbon type. When a defect is found in the flat-wire type cable assembly or its male connector on the switchboard, the flat-wire cable assembly should be replaced with the ribbon cable assembly and the 12-pin male switchboard connector should be replaced with the 12-pin female switchboard socket.
Install the static modification on all 2600 units. Install CR202 and CR203 by removing C236 and C237 and inserting the C236/CR202 and C237/CR203 assemblies in their place (See Figure 3-2). CAUTION: Observe the polarity on CR202 and CR203 (the dark band must be toward the J202/J203 connectors). On the switchboard, install the static strips as shown in Figure 3-4.
Figure 3-2. 2600 Static Modification Zener Diode

Figure 3-3. Location of Colored Dot Over Trace
Figure 3-4. 2600 Switchboard Static Modification
2600A MODEL MODIFICATIONS

- Each 2600A (Revs 1-13) model must have static strips placed on the front panel switches (See Figure 3-5).
- Check each connector and plug for a tight, secure fit. Intermittent failures frequently result from a loose connector or plug.
- Check that all components are properly soldered, and check for broken or shorted trace lines.
- If a unit exhibits RF interference that does not clean up using normal adjustment methods, or if a series of lines and bright grid distortions on the screen are accompanied by a loud hum even when properly adjusted, a defective or leaking capacitor may be at fault. Replace C241 (.1 microfarad) and/or C242 (.1 microfarad) located respectively between the power jack and voltage regulator.

![Diagram of static strips being placed on front panel switches]

Mount Static Strips onto Front Panel Switches as shown in this drawing.

Figure 3-5. 2600A (Revs. 1-13) Static Modifications
TESTING WITH THE DIAGNOSTIC TEST CARTRIDGE (VERSION 2.6)

The 2600 Diagnostic Test Cartridge (version 2.6 DTC) contains a variety of tests to assist the service technician in identifying the source of problems within the VCS switchboard and motherboard hardware. The test cartridge is used in conjunction with the equipment listed at the beginning of this section. Each test is reviewed in the remainder of this section. Detailed procedures for use of the tests are described in Section 4, 2600 Diagnostic Flowchart, and Section 6, 2600A Diagnostic Flowchart. The tests available in the cartridge are:

- RAM Test
- Color Bar Test
- Gray Bar Test
- Diagnostic Matrix Test
- Audio Tones Test
- Paddle Control Lines Test

The technician also has a Signal Trace Cartridge (STC or KLUGE) available for tracking motherboard problems that are not repairable with the Diagnostic Test Cartridge.

INITIALIZATION

- Purpose: To prepare the VCS unit for testing by the diagnostic cartridge.
- Format: Connect VCS unit to television and battery eliminator. Set television to proper channel (channel 3). Plug in the 2.6 diagnostic cartridge. Set all 2600 switches to the up position. On the 2600A, set all front panel switches up and rear panel switches to the left (See Figure 3-6).

![Switch Initialization Positions](image)

Figure 3-6. Switch Initialization Positions
RAM TEST

Purpose: To test the 6532 RAM chip for proper operation.

Format: On power-up the television displays diagonal lines of some type if the RAM is defective. See Figure 3-7 for examples of screens indicating a defective RAM.

NOTE: The absence of defective patterns is no assurance that the entire chip is sound, only the RAM. The operation of the I/O and Timer functions is not verified by this test.

Figure 3-7. Defective RAM Patterns
COLOR BAR TEST

- **Purpose:** To test the 6507 microprocessor, 6532 RAM - I/O chip, and TIA chip for correct operation.

- **Format:** Set all switches to initialization position. A screen of horizontal color bars is displayed (See Figure 3-8). The screen should be steady and unchanging. A gray or blue horizontal reference line runs across the screen about three bars from its bottom. This reference line is thinner than the bars around it. R211 (R213 on the 2600A board) should be adjusted so the bars immediately above and below the reference line are within one shade of each other. Proper operation of the unit is indicated by being able to make this adjustment and by consistent color within the entire span of each bar on the screen. Minor glitches on the edges of the color bars are acceptable. Leave this test on for at least ten seconds in order to catch any intermittent problems, such as a bar momentarily changing colors or blanking out.

**NOTE:** This figure is a black and white representation of a color television screen.

![Figure 3-8. Color Bars Screen](image-url)
GRAY BAR TEST

- **Purpose:** To test the function of the luminescence lines (LMO, LM1, LM2) from the TIA chip to the RF Module.

- **Format:** Move the Color/Black & White switch to the Black and White position. There should be eight horizontal gray bars displayed, going from black at the top to white at the bottom in even gradations (See Figure 3-9). The screen should be steady and unchanging. These lines may have minor glitches on their edges. A thin white line always appears just over the top (black) bar. No color should appear anywhere on the screen. The areas above the top (black) bar and below the bottom (white) bar are of no importance to the test. This test should be left on for at least ten seconds to ensure that there is no "flashing" of any color or shifting of the gray bars.

![Gray Bars Screen](image)

Figure 3-9. Gray Bars Screen
DIAGNOSTIC MATRIX TEST

**Purpose:** To test the proper function of the Input-Output ports of the VCS unit.

**Format:** Set all switches to the initialized position, then move the Left Difficulty switch to the "B" position. The test is performed in two parts:

1. With the blue shorting plugs removed, the matrix of nine rectangles on the screen should look like Figure 3-10.

2. The shorting plugs are then inserted and the pattern should look like Figure 3-11.

3. Press the GAME SELECT switch. If the switch is properly functioning, that area of the matrix will black out. Release the GAME SELECT switch and repeat the procedure with the GAME RESET switch.

The matrix jumps once every second.

![Figure 3-10. Diagnostic Matrix Screen (Shorting Plugs OUT)](image-url)
**Figure 3-11. Diagnostic Matrix Screen (Shorting Plugs IN)**
AUDIO TONES TEST

- **Purpose:** To test the function of the audio tone generation and modulation circuitry.

- **Format:** The VCS unit should be in the initialized mode. Move the Right Difficulty switch to the "B" position. The test displays two alternating patterns on the screen (as shown in Figure 3-12) while two alternating tones are heard. The tones change in sync with the screen. This test pattern continues for one full cycle after the Right Difficulty switch has been returned to the initialized position.

![Audio Tone Test Screens](image)

Figure 3-12. Audio Tone Test Screens
PADDLE CONTROL LINES TEST

Purpose: To test the proper operation of the Paddle Control Lines by viewing the analog waveforms at the analog-to-digital conversion inputs of the TIA chip.

Format: Pins 37, 38, 39, and 40 of the TIA chip are checked with the oscilloscope with the VCS unit in Diagnostic Matrix mode and with the shorting plugs in place. This test is required only if there is a problem with the hand controller lines. The procedure for this test is detailed in Section 4.
SECTION 4

2600 DIAGNOSTIC FLOWCHART

The Diagnostic Flowchart is intended to be easy to use and the primary aid when troubleshooting the 2600. Follow the prompts in the order presented. When a question is asked, follow the line from that box which best applies to the unit's condition. The figures referenced in the flowcharts are located at the end of this section. When a line terminates with a letter inside a circle, note that a page number (i.e., pg. 4-3) is near it. Turn to that page, locate the letter in another circle, and continue the diagnosis. The flowchart leaves nothing to chance, it tells you when to perform a specific test, and when to replace components, and even when and how long to "burn-in" the unit. "Burn-in" the unit for at least two hours after completing repairs.

When a problem is extremely difficult to diagnose, the flowchart sends you to the Signal Tracing Cartridge (STC) routine, "D" page 4-47. Due to the repetitive nature of the STC routine, no flowchart is used. Read and follow the instructions as directed. Should the STC procedure fail to isolate the problem, after carefully inspecting the switchboard and motherboard assemblies for shorted and/or open trace lines, and solder bridges swap all three chips (6507, 6532, and TIA). Should the problem still persist, call ATARI, Techline Specialist: Inside California at (800) 672-1466 and Outside California at (800) 538-1535. Be certain to always burn-in the unit for two hours after completing repairs. This helps to ensure that intermittent problems are found and also greatly increases your customer's satisfaction with your repair work.

SWAP OUT PROCEDURES

Many places in the diagnostic flowchart, a box tells you to "swapout" a chip or a number of chips in a particular order. The "swapout" instruction means that you should replace the indicated components one at a time with a known good component of the same type. The VCS should then be tested with the new, known-good component in place to see whether the "swapout" solved the problem being checked. If the swapout did not fix the problem, the known-good component should be left in, and the next component inserted. Once the problem is solved, you then place the suspected bad chips one by one into the system to determine whether or not those you pulled out are truly defective. In this way, you avoid needlessly replacing good components.

CAUTION

Extreme care should be taken when handling the integrated circuit chips (A200, A201, A202, A203). They are all very sensitive to static electricity and can easily be damaged by careless handling. Always keep the chips in their plastic carrier tubes or on conductive foam when not handling them. Make certain you are well grounded when handling the chips. Atari strongly recommends that you wear a conductive grounding band (which ties from your arm to ground) when handling the chips.

The chips are also susceptible to damage from stress when being removed from or inserted into the sockets. Always use a chip-puller when removing the chips. Do not pry chips out with a screwdriver or any other tool.

Failure to follow the above guidelines results in unusually high chip failure rates and extra expense.
2600 Diagnostic Flowchart

Start

Visually inspect switches, jacks and connectors. Make certain no shorted or open traces or solder bridges are on the board(s).

Connect VCS to TV battery eliminator. Set TV to channel 3.

Insert Diagnostic Cartridge (DTC), initialize (Figure 4-1) and turn on.

A

Does any defective RAM pattern appear on screen (see Fig. 4-3)?

No

Replace the A202.

Yes

Is picture warped and ragged on left side of screen?

Yes

C

Pg. 4-6

No

B

Pg. 4-3

Does unit now show the color bars pattern?

No

Swapout 1) A200 2) A202

D

Pg. 4-45

Yes

A

Does unit now show the color bars pattern?

No

Yes

A
Are color bars present? (See Figure 4-2).

- Yes:
  - Are color bars properly adjusted? (See Figure 4-2)
    - Yes: E
    - No: F

- No:
  - Is any other test pattern on the screen? (See Figure 4-4, 4-6, 4-9).
    - Yes: G
    - No: J

  - Is there "snow" on the screen? (no modulation)
    - Yes: Check VCS connections to TV and channel setting.
    - No: L

- Test VCS with known - good battery eliminator.

- Is "snow" on screen gone?
  - Yes: A
  - No: L

E, F, G, J, A, L

Pg. 4-2, 4-5, 4-6, 4-7, 4-9, 4-11
Gray Bars Test Procedure

1. Place color/black & white switch in B&W position.
2. Did screen pattern change when switch was moved?
   - No: G (Pg. 4-7)
   - Yes: Is proper gray bar pattern present? (See Figure 4-4).
     - No: Z (Pg. 4-20)
     - Yes: Is a partial segment missing or is any color present? (See Figure 9-5)
       - No: P (Pg. 4-14)
       - Yes: D (Pg. 4-45)
Color Bars Test Procedure

Reconnect VCS and initialize.

Are color bars present on screen?

Adjust R211 so that color is aligned properly. (See Figure 4-2).

Is VCS tunable to proper shades?

A

No

Pg. 4-2

Yes

No

Yes

Pg. 4-23

Pg. 4-5

F

E

AA

Pg. 4-23
Defective Switch Troubleshooting Procedure

1. On 2600 units, use swapout procedure to identify bad board. (See Chart)
   - If bad switchboard, go to AL, Pg. 4-34
   - If bad motherboard, go to H, Pg. 4-8

2. With inoperative switch in up position (open), is +5V present at J201 pin for that switch? (See Chart)
   - If no, go to H, Pg. 4-8
   - If yes, go to I, Pg. 4-7

3. Close the switch.
   - Is +5V now present at the RAM pin for that switch? (See chart)
     - If no, go to G, Pg. 4-7
     - If yes, repair open trace.

4. Does switch now change the pattern on screen?
   - If yes, go to A, Pg. 4-2
   - If no, go to G, Pg. 4-7

5. Swapout
   - 1) A202
   - 2) A200
   - 3) A201

6. Does switch now work?
   - If yes, go to A, Pg. 4-2
   - If no, go to G, Pg. 4-7

---

**Connection Chart**

<table>
<thead>
<tr>
<th>Switch</th>
<th>J201 Pin No.</th>
<th>A202 Pin No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color/Black and White</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Left Difficulty</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Right Difficulty</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Select</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>Reset</td>
<td>8</td>
<td>24</td>
</tr>
</tbody>
</table>
Defective Switch Troubleshooting Procedure (Continued)

Check RAM (A202) pin for the switch for +5v. Is it present?

Check for shorted trace line. Repair as necessary.

Does switch now work?

Check whether capacitor on that RAM line is shorted to ground. Replace as necessary. Does switch now work?

Swapout 1) A200
2) A201

A

Pg. 4-2

Yes

No

Yes

No

J

Pg. 4-9
Black or Solid Colored Screen Troubleshooting

Use swapout procedure to identify which board is bad.

Defective switchboard

Pg. 4-16

Defective Motherboard

Is 4.5v p-p 62 signal present on A202 pin 39?

Yes

Swapout
1) X200
2) Q200
3) Q201
4) Other Clock Circuit Components

Pg. 4-10

Is 4.5v p-p osc. signal present between C203 and R203?

Yes

Open between C203 and pin 11 A201.

Repair

Is 4.5v p-p osc. signal present on pin 11 A201?

Yes

Swapout
1) A201
2) A200

Does unit function?

Yes

Pin 4 A201 shorted.

Repair

No

Pin # A200 is shorted.

Repair

Is 4.5v p-p 6O signal present on pin 27 A200?

Yes

Open between Pin 27 A200 and Pin # A201.

Russian

No

Swapout
1) A200
2) A202

Does unit function?

Yes

Pin 28 A200 is shorted.

Repair

No

Is 4.5v p-p 62 signal present on pin 28 A200?

Yes

Open between Pin 26 A201 and Pin 28 A200.

Does unit function?

Yes

Pin 28 A200 is shorted.

Repair

No

Is 4.5v p-p 62 signal present on A201 pin 26?

Yes

Open between Pin 39 A202 and pin 28 A200.

4-9

2600/2600A Domestic VCS
Black or Solid Colored Screen Troubleshooting (Continued)

K

Is 4-5v p-p 42 signal present on pin 26 A201?

Yes

No

Open trace between pin 26 A201 and pin 39 A202.

Is there +5v and ground on all of A200, A201, A202, A203?

Yes

No

Open on line to +5 or ground.

Reset and ready lines good?

Yes

No

Open or shorted line.

Swapout
1) A200
2) A202
3) A201

Does unit operate properly?

Yes

No

Repair

D

Pg. 4-45

Pg. 4-2
Snowy Screen Troubleshooting Procedure, Motherboard

L

Use swapout procedure to identify which board is bad.

Bad switchboard.

Pg. 4-13

Bad motherboard.

M

Is +5v present at J201 Pin 1?

Yes

Is +9v present at J201 Pin 2?

Yes

Swapout 1) A202 2) A200 3) A201

Is modulation evident on the TV screen?

Yes

Is there continuity across J201 pin 2?

Yes

Check for open trace line between J204 and J201.

M  L

Pg. 4-11  Pg. 4-11

Replace J204.

No

No

Is modulation evident on the TV screen?

No

Replace J201.

Is modulation evident on the TV screen?

Yes

No

Yes

Is +7.5-9.0v present at J204 (the power jack)? Check at bottom of board.

Yes

Check for open trace line between J204 and J201.

No

Voltage shorted to ground.

Repair

Is 3204 OK?

Yes

Replace 3204.

No

A

Pg. 4-2

Pg. 4-12

Pg. 4-31
Snowy Screen Troubleshooting Procedure,
Motherboard, (Continued)

*Caution: Observe polarity of continuity checker. Do not put + probe on ground.

Check for and repair any shorted traces or solder bridges.

Is there continuity across J201 Pins 1, 3, 6, 10, 11?

No

Replace connector.

Is modulation evident on the screen?

Yes

No

Is there an open trace on either +5V or ground?

Yes

Repair.

No

Is there modulation evident on the screen?

Yes

No

Check for and replace shorted caps: C204, C201, C220, C239, C200, C214.

Is modulation evident on the screen?

Yes

No

A

Pg. 4-2

L

Pg. 4-11
Bad/No Color, Bad/No Sound
Switchboard

Is RF mod output tuned to 61.25 MHz? (Channel 3)

Can unit be tuned to 61.25 MHz (± .15 MHz)?

Replace RF modulator.

Is color (or sound) now OK?

Replace RF modulator.

Short across L101. Does color (or sound) re-appear?

Replace L101.

A  Pg. 4-2
Gray Bars Troubleshooting Procedure

Is there a 3-5v p-p signal on the A203 side of R222, R223, R224?

**Yes**
- Check R222-R224 with Ohm meter. Replace any failed or off-value resistors.
  
  **D**
  
  Pg. 4-45

**No**
- Do all of pins 2, 12, and 15 on A203 have a signal present?
  
  **Yes**
  - There is an open line between A203 and the resistors. Fix it.
  
  **E**
  
  Pg. 4-5

  **No**
  - Check inputs of A203 (pins 3, 11, 14). Does each have a signal present?
    
    **Yes**
    - Replace A203.
    
    **A**
    
    Pg. 4-2

    **No**
    - Do all of pins 5, 7, 8 on A201 have a signal present?
      
      **Yes**
      - Check for open lines between A201 and A203. Fix.

      **Q**
      
      Pg. 4-15

- Swapout A201 chip.
Gray Bars Troubleshooting Procedure (Continued)

1. **Make sure** R218, R219, R220 have +5V connected to top side.
2. **Check** R218, R219, R220 for proper values.
3. **Inspect** traces around LM lines for shorts or opens.
4. **Is picture now OK?** *(See Figure 4-4)*
   - **Yes**
     - Go to matrix test.
   - **No**
     - **Swapout** A200 and then A202.
     - **Is picture now OK?** *(See Figure 4-4)*
       - **Yes**
       - Z
       - Pg. 4-20
       - D
       - Pg. 4-45

*2600/2600A Domestic VCS*
Colored Screen Troubleshooting Procedure
Switchboard

V

Bad Switchboard

Is +5v at J101 Pin 1?  
Yes

Is RF mod. output tuned to 61.25 MHz (channel 3, ±.15 MHz)  
No
Tune RF mod. at adjustment hole.
If RF mod cannot be tuned to 61.25 MHz, replace it.

No

Is video signal present at J101 pin 12?  
Yes

Check for open trace or bad connection between J201 and RF module pin. Repair.

No

Is J101 pin 12 shorted to ground?  
Yes
Defective J101. Replace.

Check for shorted trace. If none is found, the RF module is shorted and must be replaced.

A

Pg. 4-2
Colored Screen Troubleshooting Procedure, Switchboard, (Continued)

- Is +9v present at J101 Pin 2?
  - Yes: Is C101 shorted?
    - Yes: Replace C101.
    - No: Replace voltage regulator (A101).
  - No: Check that J101 pin 1 or 2 is not shorted to ground.
    - Replace if shorted.
    - Check that C101, C103, or C106 are not shorted. Replace if shorted.
      - If +9v is still not present at J101 pin 2, then replace the regulator (A101).
      - Z

Pg. 4-20
Snowy Screen Troubleshooting Procedure, 
Switchboard

Is +5v present at J101 pin 1 on the switchboard?

Yes

Is +5v at the RF modulator pin 3 (5 pin mod) or pin 2 (3 pin mod)?

Yes

Does RF modulator pin 1 have continuity to ground?

Yes

Make sure RF module output is tuned to 61.25 MHz (± 0.15 MHz).

No

Open between A101 pin 3 and RF module pin 3.

Check for and repair opens between RF module pin 1 and J101 pins 6 and 10 (ground).

No

If there is still a white screen, check the J102 connector. Replace as required.

If no modulation, the RF module is bad. Replace.

Is there modulation?

Yes

Repair

No

A

Pg. 4-2

Pg. 4-19
Snowy Screen Troubleshooting Procedure, Switchboard, (Continued)

Y

- Is +5v at the output of the voltage regulator (A101, pin 3)?
  - Yes: Check for and repair defective J101 or open trace between J101 pins and A101.
  - No: Is unregulated +7.5-9v at voltage regulator input (A101, Pin 1)?
    - Yes: Check for bad regulator (A101) or open between ground and A101.
    - No: Is +7.5-9v present on the J101 side of S101?
      - Yes: Replace S101.
      - No: Does J101 pin 2 have continuity?
        - Yes: Replace J101.
        - No: Is J101 pin 2 shorted to ground?
          - Yes: Check that C103 or C106 have not shorted to ground.
          - No: Is there modulation?
            - Yes: A Pag. 4-2
            - No: X Pag. 4-18

Pg. 4-19 2600/2600A Domestic VCS
Matrix Test Procedure

1. Initialize switches, then push "left" difficulty switch down.

2. Does screen match Figure 4-6?
   - Yes
     - Put in shorting plugs.
   - No
     - Does screen match Figure 4-7?
       - Yes
         - Push down "Game Select" switch (S106).
       - No
         - AC
           - Pg. 4-23

3. Did lower middle block on screen turn black in center?
   - Yes
     - Push down "Reset" switch (S105)
   - No
     - G
       - Pg. 4-7

4. Does lower middle block turn black on left and right ends?
   - Yes
     - AD
     - Pg. 4-24
   - No

4-20 2600/2600A Domestic VCS
Color Troubleshooting Procedure,
Motherboard

Use swapout procedure to determine which board is bad.

Defective Motherboard

X200 frequency correct? (3.546 ± .04MHz)
- Yes
- No

Defective X200.

Is color very weak or not present at all?
- Yes
- No

Defective Motherboard

With R211 fully counterclockwise is there 6.5-7.5v on pin 10 A201?
- Yes
- No

Defective C208, C209, R211 or open trace between CR201 and pin 10 A201.

Is there -6-7v on the cathode of CR201?
- Yes
- No

Defective CR200.

Is there a 3-5v p-p signal on cathode CR200?
- Yes
- No

Defective CR201

Is there a 3-5v p-p signal on cathode CR200?
- Yes
- No

Open or shorted trace to diodes (CR200 or CR201)

Replace or Repair

Defective signal on cathode CR200?

Swap 1) A201 2) A200 3) A202

Pg. 4-22

Pg. 4-13
Color Troubleshooting Procedure, Motherboard, (Continued)

AB

Swapout
1) A201
2) A202
3) A200

Does screen now have color?

Yes → A

No

Is 3.5-5v p-p signal present between C213 and R215?

Yes → Defective R215.

No

Is 3.5-5v p-p signal present between C212 and C213?

Yes → Defective C213

No

Is 3.5-5v p-p signal present pin 9 A201?

Yes → Defective C212

No

Pin 9 A201 shorted to another line.

Replace or Repair

A

Pg. 4-2

2600/2600A Domestic VCS
Pattern is disrupted if blue or black lines are missing or some portion of the Matrix fails to appear on the TV screen.

Is blue black grid pattern disrupted? (See Figure 4-8 for example bad pattern)

Yes

Swapout
1) A200
2) A202
3) A201

Is entire matrix now on screen?

Yes

D

No

Pg. 4-43

Is upper left block on screen defective? (See Figure 4-6 or 4-7 for correct pattern)

No

Are either the middle lower or the left lower block defective? (See Figure 4-6 or 4-7 for correct pattern)

No

Are middle-left and lower-left blocks now correct (See Figure 4-6 or 4-7)?

No

AF

Pg. 4-76

Yes

Swapout
1) A202
2) A200
3) A201

Is middle-middle block now OK?

Yes

D

No

Pg. 4-43

Is upper-middle block defective?

Pg. 4-27

Yes

AG

No

Swapout
1) A200
2) A202
3) A201

Is lower-middle block defective?

Pg. 4-27

Yes

AG

No

2

Pg. 4-20

Defective Matrix Troubleshooting Procedure
Audio Test Procedure

1. Reinitialize switches. Press down the "right difficulty" switch.

2. Is there a clear tone?
   - Yes: Go to AE
   - No: Go to Page 4-27

3. Use scope or frequency counter to measure frequency at emitter of Q202.

4. Tune audio to 5.5 MHz by adjusting L201.

5. Adjust to ±.06 MHz. Look for stable frequency.

6. Can unit be adjusted and is sound clear?
   - Yes: Go to AD
   - No: Go to AH

Page 4-28
Audio Test Procedure (Continued)

Are the two patterns in Figure 4-9 alternating on the screen?

Yes → AH

No → AD

Do the patterns alternate with the tones?

Yes → Are both colors and tones consistent each cycle?

Yes → Put switches back to initialized positions.

VCS will go through one last cycle before changing to color bar test.

No → A201

Swapout
1) A201
2) A200
3) A202

Are patterns now correct? (As in Figure 4-9)

Yes → AJ

No → D

Pg. 4-24

Pg. 4-28

Pg. 4-30

Pg. 4-45
Defective I/O Lines Troubleshooting Procedure

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>C235</td>
<td>J202-Pin a</td>
</tr>
<tr>
<td>14</td>
<td>C234</td>
<td>J202-Pin 3</td>
</tr>
<tr>
<td>13</td>
<td>C233</td>
<td>J202-Pin 2</td>
</tr>
<tr>
<td>12</td>
<td>C232</td>
<td>J202-Pin 1</td>
</tr>
<tr>
<td>11</td>
<td>C231</td>
<td>J203-Pin b</td>
</tr>
<tr>
<td>10</td>
<td>C230</td>
<td>J203-Pin 3</td>
</tr>
<tr>
<td>9</td>
<td>C229</td>
<td>J203-Pin 2</td>
</tr>
<tr>
<td>8</td>
<td>C228</td>
<td>J203-Pin 1</td>
</tr>
</tbody>
</table>

1. Check which lines are defective by referring to Figure 4-7.

2. Check the lines indicated as defective for +5V at J202 or J203 (See chart).

3. Is +5V present on the line(s) just checked?
   - Yes: Swapout A202
   - No: Check the RAM (A202) pin. Is +5V present there?
     - Yes: Repair open trace between A202 pin and the J203/J203.
     - No: Check trace line(s) from defective pin(s) for shorts to ground. Are there any shorts?
       - Yes: Repair

4. Is +5V now present at the A202 pin?
   - Yes: Replace the capacitor on that line (see chart).
   - No: Does the Diagnostic Matrix screen now look correct (See Fig. 4-6 or 4-7)?
     - Yes: Repair
     - No: Swapout
       1. A200
       2. A201

5. Does the Diagnostic Matrix now look correct (See Figure 4-6 or 4-7)?
   - Yes: Repair
   - No: Swapout
     1. A200
     2. A201

---

4-26 2600/2600A Domestic VCS
Trigger Line Troubleshooting Procedure

1. Is +5v at pin 6 of J203 (right) trigger) or J202 (left trigger)?
   - Yes
   - No

2. Is +5v at A203 pin 7 (right trigger) and pin 9 (left trigger)?
   - Yes
   - No

3. Is 4.5-5v at A203 pin 6 (right) and pin 19 (left)?
   - Yes
   - No

   Swap out A201

4. Does trigger line now work properly?
   - Yes
   - No

   Swap out
   1) A200
   2) A202

5. Does trigger line now work properly?
   - Yes
   - No

   Check/Repair
   C236, CR202 (left)
   C237, CR203 (right)

   Swap out A203.

6. Is trigger line now operating correctly?
   - Yes
   - No

   Check for VMOD (+5v) at top of R225 (right) or R226 (left)

   Repair open trace from: R225 to J203, pin 6 (right), R226 to J202, pin 6 (left)

   Check/repair trace lines from: R225 to J203, pin 6 (right), R226 to J202, pin 6 (left)

   Is trigger line now operating correctly?

   Yes
   No

   Swap out A201.

   Does trigger line now work properly?

   Yes
   No

   Swap out
   1) A200
   2) A202

   Swap out A203.

   Is trigger line now operating correctly?

   Yes
   No

   Swap out A201.

   Check for VMOD (+5v) at top of R225 (right) or R226 (left)

   Repair open trace from: R225 to J203, pin 6 (right), R226 to J202, pin 6 (left)

   Check/repair trace lines from: R225 to J203, pin 6 (right), R226 to J202, pin 6 (left)

   Is trigger line now operating correctly?

   Yes
   No

   Swap out A201.

   Does trigger line now work properly?

   Yes
   No

   Check/Repair
   C236, CR202 (left)
   C237, CR203 (right)

   Swap out A203.

   Is trigger line now operating correctly?

   Yes
   No

   Swap out A201.

   Does trigger line now work properly?

   Yes
   No

   Check/Repair
   C236, CR202 (left)
   C237, CR203 (right)
Audio Troubleshooting Procedure, Motherboard

1. Use swapout procedure to isolate the bad board.
2. Is there a 2V p-p square wave which alternates between two frequencies on Pin 13 of A201?
   - Yes: Swapout A201.
   - No: Fix open trace line between C210 and Pin 12/13 or A201.
3. Is there now an alternating audio tone from the TV?
   - Yes: Replace 1) C211 2) R216
   - No: Repair open trace between J201 pin 1 and R208.
   - Is +5v at the top of R208?
     - No: Repair open between R208 & A201 Pin 13.
Audio Troubleshooting Procedure, Motherboard, (Continued)

Is there +5v at one end of L201?

No

Repair trace from VMOD (+5v) to L201.

Yes

Check that L201 is good (has continuity and isn't shorted or cracked).

Check/Replace
1) C206, C207
2) Q202
3) L202

If audio is still dead, check the trace lines around C211 for opens and shorts:

Is there now an alternating audio tone from the TV?

Yes

A

No

Pg. 4-28

AH

Pg. 4-28
Cartridge Test Procedure

AJ

DTC works, but VCS unit is still suspect.

Plug in customer cartridge, if available.

Connect, initialize, and turn VCS on with customer's game cartridge.

Does correct video pattern for that game appear?

No

Play game. Does it play OK?

No

Check customer cartridge on known good game. Is it OK?

No

Replace with good cartridge.

AK

Not Available

AK

Pg. 4-31

Available

Pg. 4-31

Yes

Play game. Does it play OK?

Yes

AK

Pg. 4-31

Swapout

1) A201
2) A200
3) A202

Does game now operate properly with game cartridge?

Yes

AJ

Yes

D

Pg. 4-45

No

2600/2600A Domestic VCS
Burn-In Procedure

Place customer cartridge in game, if available. Otherwise, use other game cartridge.

Run game for 2 hours, minimum. Do not turn off during this period.

Check game's operation.

Is game working properly? Yes

End of test sequence.

No

Pg. 4-2
Defective Switch Troubleshooting Procedure

Put inoperative switch in up (open) position.

Is +5v present at the J201 pin for that switch (see connection chart)?

Yes

Is trace line shorted to ground?

Yes

Repair

No

Is there continuity across J201 connector?

Yes

Change J201

No

Put switch in down (closed) position.

Is 5v now present on J201 pin for that switch (see chart)?

Yes

Page 4-2

A

No

Is one side of switch tied to ground as shown in schematic?

Yes

Replace switch.

No

Repair open between switch and ground.

Does pattern on screen change when switch is flipped?

Yes

Page 4-2

A

No

Connection Chart

<table>
<thead>
<tr>
<th>Switch</th>
<th>2101 Pin No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color/Black &amp; White</td>
<td>4</td>
</tr>
<tr>
<td>Left Difficulty</td>
<td>3</td>
</tr>
<tr>
<td>Right Difficulty</td>
<td>7</td>
</tr>
<tr>
<td>Select</td>
<td>9</td>
</tr>
<tr>
<td>Reset</td>
<td>8</td>
</tr>
</tbody>
</table>

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2600/2600A Domestic VCS
Snowy Screen Troubleshooting Procedure

1. Is there 6v on J201 pin 12?
   - No
   - Yes

2. Is there +5v on pin 20 of A201?
   - No
   - Yes

3. Is there an open line between pin 20 and +5v?
   - Yes
   - No

4. Swap out A201.

5. Is there continuity across J201 pin 12?
   - No
   - Yes

6. Is J201 pin 12 shorted to ground? (check continuity)
   - Yes
   - No

7. Swap out A201.

8. Are C221 or R223 shorted to ground?
   - Yes
   - No

9. Check for solder bridges or trace shorts.
   - Yes
   - No

10. Repair

11. Is there modulation?
    - Yes
    - No

12. Swap out

A

Pg. 4-2
Paddle Lines Test

Start

Put shorting plugs in. Put VCS into Diagnostic Matrix mode.

Check J202/J203 for RC waveform (see Fig. 4-10). Is waveform present on each of the pins shown in chart?

Does waveform appear at each of the A201 pins shown in the chart?

Repair open trace between A201 and J202/J203.

Swapout
1) A201
2) A200
3) A202

Is there continuity between the J202 or J203 pin (see chart) and the A201?

Yes
Replace cap (C213-C218) on the failed line.

No
Check trace lines and resistors for opens.

Does waveform appear on the appropriate J202 or J203 line? (See Chart)

Yes
Swapout
1) A201
2) A200
3) A202

No

Does Paddle Line now work?

Yes

Repair

No
Paddle line is open or shorted.

Connection Chart

<table>
<thead>
<tr>
<th>Player</th>
<th>Pin A201</th>
<th>Pin J202</th>
<th>Pin J203</th>
<th>Pin Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60 5</td>
<td>-</td>
<td>-</td>
<td>C214</td>
</tr>
<tr>
<td>2</td>
<td>39 9</td>
<td>-</td>
<td>-</td>
<td>C216</td>
</tr>
<tr>
<td>3</td>
<td>38 -</td>
<td>5</td>
<td>-</td>
<td>C217</td>
</tr>
<tr>
<td>4</td>
<td>37 -</td>
<td>9</td>
<td>C218</td>
<td></td>
</tr>
</tbody>
</table>

A

Pg. 4-2

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2600/2600A Domestic VCS
NOTE: The following figures are referenced in the 2600/2600A Diagnostic Flowcharts, Sections 4 and 6, and are included here for your convenience. They can also be found in Section 3, where the tests are described in more detail.

Figure 4-1. Switch Initialization Positions

initially to the left
Figure 4-2. Color Bars Screen

NOTE: Set all switches to initialized position. A screen of horizontal color bars is displayed (see Figure 4-2). The screen should be steady and unchanging. A gray or blue horizontal reference line runs across the screen about three bars from its bottom. This reference line is thinner than the bars around it. R211 (R213 on the 2600A board) should be adjusted so the bars immediately above and below the reference line are within one shade of each other. Proper operation of the unit is indicated by being able to make this adjustment and by consistent color within the entire span of each bar on the screen. Minor glitches on the edges of the color bars are acceptable. Leave this test on for at least ten seconds in order to catch any intermittent problems, such as a bar momentarily changing colors or blanking out.
ANY DIAGONAL LINES ON THE SCREEN INDICATE A FAILURE IN THE RAM CHIP (A202).

Figure 4-3. Defective RAM Patterns
The gray bars screen has eight horizontal shaded bars. It is normal for the bars to have some uneven areas on their upper and lower edges. The bars must appear (in descending order) as going from black to white in even steps. The screen may not have any color in it. All eight bars must be consistent in their shade across the entire bar. The area of the screen outside the bars is irrelevant. The white line immediately above the top bar (black) is normal. This screen tests the operation of the chip set, especially the TIA (A202).
This screen shows an example of a defective gray bars test screen. The appearance of a black rectangle in the middle of a light gray bar means that the data for that part of the screen has failed to be translated properly to the TV. Any disruption of the standard gray bars pattern (See Figure 4-4) or any color in the gray bars screen indicates a failure.
The Diagnostic Matrix Screen appears as above, on a black background, when the shorting plugs are not inserted. The three left rectangles and the blue/black grid joining them indicate the status of the I/O line connections to the 6532 RAM chip (A202).
Figure 4-7. Diagnostic Matrix Screen
(Shorting Plugs IN)
Any missing grid lines or disrupted rectangles indicate an I/O line failure (see page 4-26). Any missing or disrupted blue or black reference lines indicate that there has probably been a microprocessor failure (see page 4-23).
The test displays two alternating patterns on the screen (as shown in Figure 4-9) while two alternating tones are heard. The tones change in sync with the screen. This test pattern continues for one full cycle after the Right Difficulty switch has been switched to stop the test.
Figure 4-10. RC Waveforms
The Signal Tracing Cartridge (STC) is used to locate easily open or shorted traces in the address and data lines of the 2600/2600A. The STC causes the 6507 microprocessor (A200) to cycle through the entire memory space while executing "no operation" instructions. This is valuable because it puts a known signal on each address and data line. Then the signal can be traced through to the J200 connector, the TIA and RAM-I/O chips.

Since the STC procedure is not easily reduced to a flowchart, it is presented as a series of written instructions and illustrations on the following pages.

CAUTION: The STC procedure requires three known-good chips and a working clock circuit. The STC should only be used after all other procedures have been tried.

GETTING STARTED

Insert the STC into the 2600/2600A. Turn on the unit. The television screen should be gray or black. If it is "snowy" it indicates that you should return to the start of the Diagnostic Flowchart. Set the scope sweep to .5 microsec/division and set the vertical to 1 volt/division.

ADDRESS LINES AB0-AB12

Check the address lines at the microprocessor (A200). Check address lines, starting with pin 5. A signal with a waveform similar to those shown in Figure 4-11 should be seen on the address lines, with each succeeding address line's waveform having a frequency half that of the line before it. For example, A1 should be half the frequency of A0. If one or more of the address lines shows no signal, it is likely that the line is either open or shorted to ground or +5v. Check all traces and pins for shorts.

If you have a defective address line and it is not open or shorted, swapout the A200, A202 and A201, in that order.

If all address lines have signals, trace those signals to the J200 and the other chips. Table 4-1 illustrates which address lines connect to which pins on J200, 6532, and the TIA. The signal present on each address line of the microprocessor should also be present on each pin of J200, 6532, and the TIA connected to that line. If the same signal is not found, the trace line and/or solder joints between the microprocessor and the dead pin(s) is (are) broken. Check the trace lines carefully to locate the break.

DATA LINES DB0-7

Set the vertical on your scope to 2v/division. The data lines are tested very much like the address lines. The only difference is that the waveform seen on the data lines is different. The signals you should see are illustrated in Figure 4-12. If any data lines are completely inactive (simply remaining a constant voltage), it probably means that the line is either open or shorted to ground or +5v. Check the traces and pins for shorts. If none are found, one of the three chips or the STC itself probably has an internal short. Try swapping out the 6532, TIA, and the microprocessor. Also carefully check J200 for shorts between pins.
If all data lines have signals, trace those signals to J200 and the other chips. Table 4-1 illustrates which lines connect to which pins of J200, 6532 and the TIA. The signal present on each data line of the microprocessor should also be present on each pin of J200, 6532 and the TIA connected to that line. If the same signal is not found, the trace line and/or solder joints between the microprocessor and the dead pin(s) is(are) broken. Check the trace lines carefully to locate the break.

Address lines $0, 7-12$

$1\text{v/division}$

Figure 4-11. STC Address Line Waveforms

Data Lines $0, 2, \text{ and } 4$

$2\text{v/division}$

$2\text{ms./division}$

Figure 4-12. STC Data Line Waveforms
### TABLE 4-1

Connected Pins on Motherboard

<table>
<thead>
<tr>
<th>ADDRESS LINES</th>
<th>A200 (MPU)</th>
<th>A201 (TIA)</th>
<th>A202 (RAM)</th>
<th>J200 Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB0</td>
<td>5</td>
<td>32</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>AB1</td>
<td>6</td>
<td>31</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>AB2</td>
<td>7</td>
<td>30</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>AB3</td>
<td>8</td>
<td>29</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>AB4</td>
<td>9</td>
<td>28</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>AB5</td>
<td>10</td>
<td>27</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>AB6</td>
<td>11</td>
<td>--</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>AB7</td>
<td>12</td>
<td>21 (CS3)</td>
<td>38 (CS1)</td>
<td>1</td>
</tr>
<tr>
<td>AB8</td>
<td>13</td>
<td>--</td>
<td>--</td>
<td>22</td>
</tr>
<tr>
<td>AB9</td>
<td>14</td>
<td>--</td>
<td>36 (RS)</td>
<td>21</td>
</tr>
<tr>
<td>AB10</td>
<td>15</td>
<td>--</td>
<td>--</td>
<td>19</td>
</tr>
<tr>
<td>AB11</td>
<td>16</td>
<td>--</td>
<td>--</td>
<td>20</td>
</tr>
<tr>
<td>AB12</td>
<td>17</td>
<td>24 (CS0)</td>
<td>37 (CS0)</td>
<td>18</td>
</tr>
</tbody>
</table>

**DATA LINES:**

| DB0           | 25         | 14         | 33         | 9              |
| DB1           | 24         | 15         | 32         | 10             |
| DB2           | 23         | 16         | 31         | 11             |
| DB3           | 22         | 17         | 30         | 13             |
| DB4           | 21         | 18         | 29         | 14             |
| DB5           | 20         | 19         | 28         | 15             |
| DB6           | 19         | 33         | 27         | 16             |
| DB7           | 18         | 34         | 26         | 17             |

-- Indicates no connection on that line
SECTION 5

SYMPTOM CHECKLIST

The Symptom Checklist is designed to assist the experienced technician arrive at a rapid diagnosis of VCS problems. The checklist is not intended to replace the Diagnostic Flowchart as the primary troubleshooting guide, but is designed to supplement the flowchart.

Symptoms have been divided into six general categories of failure:

- Logic
- Video
- Color
- Audio
- Controller
- Other

Each symptom is accompanied by some possible causes and the best point to enter the Diagnostic Flowchart to locate the problem.
### LOGIC FAILURES

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE (motherboard)</th>
<th>POSSIBLE CAUSE (switchboard)</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid colored screen</td>
<td>A200, A202, TIA X200, Q200, Q201, open or shorted Address or Data line</td>
<td>A101, RF Module</td>
<td>J, pg. 4-9</td>
</tr>
<tr>
<td>Vertical lines</td>
<td>A200, A201, A202, J200, open or shorted Address or Data line</td>
<td>N/A</td>
<td>J, pg. 4-9</td>
</tr>
</tbody>
</table>

### VIDEO FAILURES

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE (motherboard)</th>
<th>POSSIBLE CAUSE (switchboard)</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snowy screen</td>
<td>no power, A203 J201, J204</td>
<td>A101, L101, RF Module, J101</td>
<td>L, pg. 4-11</td>
</tr>
<tr>
<td>Weak picture</td>
<td>N/A</td>
<td>L101, RF Module, RF Cable</td>
<td>X, pg. 4-18</td>
</tr>
<tr>
<td>Wrong Gray Bars</td>
<td>A201, A203, R218-R220</td>
<td>N/A</td>
<td>P, pg. 4-14</td>
</tr>
</tbody>
</table>
# 2600 FAILURES (Continued)

## COLOR FAILURES

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE (motherboard)</th>
<th>POSSIBLE CAUSE (switchboard)</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No color</td>
<td>X200, A201</td>
<td>L101, RF Module</td>
<td>AA, pg. 4-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RF Cable</td>
<td></td>
</tr>
<tr>
<td>Only the reference bar appears</td>
<td>C208, R211</td>
<td>N/A</td>
<td>AA, pg. 4-21</td>
</tr>
<tr>
<td>Color won't adjust</td>
<td>R211, C208, C209</td>
<td>N/A</td>
<td>AA, pg. 4-21</td>
</tr>
<tr>
<td>Weak color</td>
<td>C212, C213, R215</td>
<td>RF Module, L101</td>
<td>AA, pg. 4-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RF Cable</td>
<td></td>
</tr>
</tbody>
</table>

## AUDIO FAILURES

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE (motherboard)</th>
<th>POSSIBLE CAUSE (switchboard)</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No audio</td>
<td>C206, C207, L201 adjustment, Q202</td>
<td>RF module adjustment</td>
<td>AH, pg. 4-28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weak audio</td>
<td>A201, C206, C207, L201 adjustment, C201</td>
<td>RF module adjustment</td>
<td>AH, pg. 4-28</td>
</tr>
<tr>
<td>DTC audio test fails</td>
<td>A201, A200, A202</td>
<td>N/A</td>
<td>AD, pg. 4-24</td>
</tr>
</tbody>
</table>
### CONTROLLER FAILURES

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE (motherboard)</th>
<th>POSSIBLE CAUSE (switchboard)</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire button does not work</td>
<td>A203, J202, J203, defective Controller</td>
<td>N/A</td>
<td>AG, pg. 4-27</td>
</tr>
<tr>
<td>Joystick does not work</td>
<td>A202, J202, J203, defective Joystick</td>
<td>N/A</td>
<td>AF, pg. 4-26</td>
</tr>
<tr>
<td>Driving Controllers</td>
<td>A202, J202, J203 defective Controller</td>
<td>N/A</td>
<td>AF, pg. 4-26</td>
</tr>
<tr>
<td>Paddle Controllers</td>
<td>A201, C215-C218, J202 - J203, defective controller</td>
<td>N/A</td>
<td>pg. 4-34</td>
</tr>
</tbody>
</table>

### OTHER FAILURES

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE (motherboard)</th>
<th>POSSIBLE CAUSE (switchboard)</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switches not working</td>
<td>A202, C222-C227</td>
<td>S102-S106, J101</td>
<td>AL, pg. 4-32</td>
</tr>
</tbody>
</table>
## 2600A FAILURES

### LOGIC FAILURES (2600A)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid colored screen</td>
<td>A200, A202, A201, X200, Q200, RF Module</td>
<td>I, pg. 6-10</td>
</tr>
<tr>
<td>Vertical lines</td>
<td>A200, A201, A202, J200, open or shorted Address or Data line</td>
<td>I, pg. 6-10</td>
</tr>
</tbody>
</table>

### VIDEO FAILURES (2600A)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>DIAGNOSTIC FLOWCHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snowy screen</td>
<td>A203, S201, RF Module, L205</td>
<td>K, pg. 6-12</td>
</tr>
<tr>
<td>Weak picture</td>
<td>RF Module, RF Cable</td>
<td>K, pg. 6-12</td>
</tr>
<tr>
<td>Wrong Gray Bars</td>
<td>A201, R218-221, R214-R217</td>
<td>M, pg. 6-14</td>
</tr>
<tr>
<td>Revisions 1-13</td>
<td>A201, R218-R221, R229, R230, CR202, CR203, R214-R217</td>
<td>N, pg. 6-15</td>
</tr>
<tr>
<td>Wrong Gray Bars</td>
<td>A201, R221, R217</td>
<td>C, pg. 6-4</td>
</tr>
<tr>
<td>Revision 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warped picture</td>
<td>A201, R217, R221, R230, R203</td>
<td>C1, pg. 6-5</td>
</tr>
<tr>
<td>Revisions 1-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warped picture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revision 14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### COLOR FAILURES (2600A)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSES</th>
<th>DIAGNOSTIC FLOW CHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No color</td>
<td>X200, A201, C210, C211</td>
<td>P, pg. 6-16</td>
</tr>
<tr>
<td>RF Cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only the reference bar appears</td>
<td>R213, C205, A201P, pg. 6-16</td>
<td></td>
</tr>
<tr>
<td>Color won't adjust</td>
<td>R213, C205, CR200, CR201</td>
<td>P, pg. 6-16</td>
</tr>
<tr>
<td>Weak color</td>
<td>RF Module, C210, C211, R210, RF Cable</td>
<td>P, pg. 6-16</td>
</tr>
</tbody>
</table>

### AUDIO FAILURES (2600A)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSES</th>
<th>DIAGNOSTIC FLOW CHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No audio</td>
<td>C206, C207, Q201, RF Module adjustment</td>
<td>X, pg. 6-24</td>
</tr>
<tr>
<td>Weak audio</td>
<td>A201, C208, R207, C206, C207, RF Module adjustment</td>
<td>X, pg. 6-24</td>
</tr>
<tr>
<td>Diagnostic test cartridge audio test fails</td>
<td>A201, A200, A202</td>
<td>X, pg. 6-24</td>
</tr>
</tbody>
</table>
2600A FAILURES (Continued)

CONTROLLER FAILURES (2600A)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSES</th>
<th>DIAGNOSTIC FLOW CHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Button does not work</td>
<td>J202, J203, Defective Controller</td>
<td>W, pg. 6-23</td>
</tr>
<tr>
<td>Joystick does not work</td>
<td>A202, J202, J203, Defective Joystick</td>
<td>V, pg. 6-22</td>
</tr>
<tr>
<td>Driving Controllers</td>
<td>A202, J202, J203, Defective Controller</td>
<td>V, pg. 6-22</td>
</tr>
<tr>
<td>Paddle Controllers</td>
<td>A201, C218-C221, J202, J203, Defective Controller</td>
<td>pg. 6-29</td>
</tr>
</tbody>
</table>

OTHER FAILURES (2600A)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSES</th>
<th>DIAGNOSTIC FLOW CHART ENTRY POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switches not working</td>
<td>A202, C231-C235, S202-S206</td>
<td>G, pg. 6-8</td>
</tr>
</tbody>
</table>
SECTION 6

2600A DIAGNOSTIC FLOWCHART

The Diagnostic Flowchart is intended to be easy to use and the primary aid when troubleshooting the 2600A. Follow the prompts in the order presented. The figures referenced in the flowcharts are located at the end of Section 4, beginning on page 4-37. When a question is asked, follow the line from that box which best applies to the unit's situation. When a line terminates with a letter inside a circle, note that a page number (i.e., pg. 6-3) is near it. Turn to that page, locate the letter in another circle, and continue the diagnosis. The flowchart leaves nothing to chance, it tells you when to perform a specific test, and when to replace components, and even when and how long to "burn-in" the unit. "Burn-in" the unit for at least two hours after completing repairs.

When a problem is extremely difficult to diagnose, the flowchart sends you to the Signal Tracing Cartridge (STC) routine, "D", page 4-47. Due to the repetitive nature of the STC routine, no flowchart is used. Read and follow the instructions as directed. Should the STC procedure fail to isolate the problem, after carefully inspecting the motherboard assembly for shorted and/or open trace lines and solder bridges, swap all three chips (6507, 6532, and TIA). Should the problem still persist, call ATARI, Techline Specialist: Inside California at (800) 672-1466 and Outside California at (800) 538-1535. Be certain to always burn-in the unit for two hours after completing repairs. This helps to ensure that intermittent problems are found and also greatly increases your customer's satisfaction with your repair work.

SWAP OUT PROCEDURES

Many places in the diagnostic flowchart, a box tells you to "swapout" a chip or a number of chips in a particular order. The "swapout" instruction means that you should replace the indicated components one at a time with a known good component of the same type. The VCS should then be tested with the new, known-good component in place to see whether the "swapout" solved the problem being checked. If the swapout did not fix the problem, the known-good component should be left in, and the next component inserted. Once the problem is solved, you then place the suspected bad chips one by one into the system to determine whether or not those you pulled out are truly defective. In this way, you avoid needlessly replacing good components.

CAUTION:

Extreme care should be taken when handling the integrated circuit chips (A200, A201, A202, A203). They are all very sensitive to static electricity and can easily be damaged by careless handling. Always keep the chips in their plastic carrier tubes or on conductive foam when not handling them. Make certain you are well grounded when handling the chips. Atari strongly recommends that you wear a conductive grounding band (which ties from your arm to ground) when handling the chips.

The chips are also susceptible to damage from stress when being removed from or inserted into the sockets. Always use a chip-puller when removing the chips. Do not pry chips out with a screwdriver or any other tool.

Failure to follow the above guidelines results in unusually high chip failure rates and extra expense.
2600A Diagnostic Flowchart

Start

Visually inspect switches, jacks and connectors. Make certain no shorted or open traces or solder bridges are on the board(s).

Connect VCS to TV battery eliminator. Set TV to channel 3.

Insert Diagnostic Cartridge (DTC), initialize (Figure 4-1) and turn on.

Does any defective RAM pattern appear on screen (see Fig. 4-1)?

Yes

Replace the A202.

No

Is picture warped and ragged on left side of screen?

Yes

C or Cl

Pg. 6-8 or Pg. 6-9

C - 2600A Revs. 1-13
Cl - 2600A Revs. 14 and up

No

B

Pg. 6-3

Does unit now show the color bars pattern?

Yes

A

No

Swapping 1) A200 2) A202

Does unit now show the color bars pattern?

Yes

D

Pg. 6-45

No

6-2 2600/2600A Domestic VCS
2600A Diagnostic Flowchart (Continued)

- Are color bars present? (See Figure 4-2).
  - Yes: Are color bars properly adjusted? (See Figure 4-2)
    - Yes: E (Pg. 6-6)
    - No: F
  - No: Is any other test pattern on the screen? (See Figure 4-4, 4-6, 4-9).
    - Yes: Check your switch settings. Are they correct?
      - Yes: G (Pg. 6-3)
      - No: Pg. 6-8
    - No: Is there "snow" on the screen? (no modulation)
      - Yes: Check VCS connections to TV and channel setting.
      - No: I
        - Yes: Is ANY modulation present on screen?
          - Yes: A (Pg. 6-2)
          - No: K (Pg. 6-12)
        - No: Is "snow" on screen gone?
          - Yes: A (Pg. 6-2)
          - No: K (Pg. 6-12)
2600A Bad Video Troubleshooting (Loss of Sync.)
(Revisions 1-13)

RF module tuned to 61.25 MHz? (Channel 3)
Yes
No
Can RF module be properly tuned?
Yes
No
Replace RF module
Tune RF module
Defective R217 or bad A201.

3.5-5V P-P signal on A201 side of R217.
Yes
No
Swapout
1) A201
2) A200
3) A202

Good video
Yes
No
Defective R221
Replace

A
Pg. 6-2
2600A Bad Video Troubleshooting (Loss of Sync.)
(Revisions 14 and up)

R F module tuned to 61.25 MHz, Channel 3?

Yes

Can R F module be properly tuned?

Yes

Tune R F module.

No

R F module tuned to 61.25 MHz, Channel 3?

No

Replace R F module.

3.5-5V P-P signal on A201 side of R217.

Yes

Defective R217 or defective CR203. or defective A201.

No

Swapout 1) A201 2) A200 3) A202

Good video?

Yes

No

Detective R221 or R230. Replace.

Good video?

Good video?

A

Pg. 6-2

6-5 2600/2600A Domestic VCS
2600A Gray Bars Test Procedure

E

Place color/ black & white switch in B&W position.

Did screen pattern change when switch was moved?

No

G

Pg. 6-8

Yes

L

Pg. 6-13

Is proper gray bar pattern present? (See Figure 4-4).

No

Yes

D

Pg. 4-45

Is a partial segment missing or is any color present? (See Figure 4-5)

No

M or N

Pg. 6-14 or 6-15
M - 2600A Revs. 1-13
N - 2600A Revs. 14 and up
2600A Color Bars Test Procedure

Reconnect VCS and initialize.

Are color bars present on screen?

Adjust R213 so that color is aligned properly (See figure 4-2).

Is VCS tunable to proper shades?

M or N

Pg. 6-14 or 6-15
M - 2600A Revs. 1-13
N - 2600A Revs. 14 and up
With inoperative switch in open position, is there +5v present at the A202 side of it? 

Is 0v now present at the RAM pin for that switch? (See chart) 

Is there an open between A201 and that switch? 

Is switch connected to ground on other side? 

Does switch now work? 

Swapout 
1) A202 
2) A200 
3) A201 

Replace switch. 

Repair trace.
Is switch internally shorted? 

Yes: Replace switch.

No: 

Is cap on that line shorted to ground? (See chart)

Yes: Replace cap.

No: 

Is there +5v on the RAM pin for that switch? (See chart)

Yes: Open between RAM pin and inoperative switch.

No: 

Swapout 1) A202  
2) A200  
3) A201

Repair

A

Pg. 6-2

---

Connection Chart

<table>
<thead>
<tr>
<th>A202</th>
<th>Switch Pin No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Color/Black and</td>
</tr>
<tr>
<td></td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Left Difficulty</td>
</tr>
<tr>
<td></td>
<td>Right Difficulty</td>
</tr>
<tr>
<td></td>
<td>Select</td>
</tr>
<tr>
<td></td>
<td>Reset</td>
</tr>
</tbody>
</table>
2600A Solid Colored Screen Troubleshooting

Is 4.5V p-p 0Ω signal present on A202 pin 39? Yes

Is 4.5V p-p osc signal present between R202 and R201? No

Is 4.5V p-p osc signal present on pin 11 A201? Yes

Is 4.5V p-p osc signal present on pin + A201? No

Swapping signal
1) A200
2) A202

Does unit function? No Pin + A201 shorted.

Yes

Is 4.5V p-p 0Ω signal present on pin + A200? No

Open between pin 27 A200 and pin + A201.

Does unit function? Yes

Pin + A200 shorted to ground. Repair.

No

Swapout
1) A201
2) A200

Is 4.5V p-p 0Ω signal present on pin 28 A200? Yes

Open between pin 26 A201 and pin 28 A200.

Yes

Pin 23 A200 shorted to ground. Repair.

No

Is 4.5V p-p 0Ω signal present on pin 26 A201? Yes

Open between pin 26 A201 and pin 28 A200.

Yes

Pin 23 A200 shorted to ground. Repair.

No

Open between pin 39 A202 and pin 28 A200.

Repair

A

Pg. 6-2

6-10 2600/2600A Domestic VCS
Is 4-5v p-p @2 signal present on A201 pin 26?
Yes
Is there +5v and ground on all of A200, A201, A202, A203?
Yes
Reset ready lines good?
Yes
Swapout 1) A200 2) A202 3) A201
No
Does unit operate properly?
Yes
Repair
No
Open trace between pin 26 A201 and pin 39 A202.
Open on line to +5v or ground, or bad regulator.
Open or shorted line.

A
Pg. 6-2

D
Pg. 4-45
2600A Snowy Screen Troubleshooting Procedure

Is -5v present on output of A203?

Yes: Is there +5v on pin 4 RF module?

Yes: Replace RF module or bad RF cable?

No: L205 defective?

Yes: Replace L205.

No: Open between A203 output and RF module pin 4.

No: Repair

7.5 unregulated on A203 input?

Yes: Defective A203.

No: Repair

7.5 unregulated on J201?

Yes: Open between J201 and input A203.

No: Repair

-5v shorted to ground?

Yes: Repair

No: Swapout

1) A201
2) A200
3) A202

Any modulation?

Yes: Defective J201.

No: Replace

A

Pg. 6-2
2600A Matrix Test Procedure

L

Initialize switches, then push "left" difficulty switch down.

Does screen match Figure 4-6?

Yes

Put in shorting plugs.

No

Does screen match Figure 4-7?

Yes

Push down "Game Select" switch (S105).

No

Pg. 6-16

S

Did lower middle block on screen turn black in center?

Yes

Push down "Reset" switch (S105).

No

Pg. 6-8

G

Does lower middle block turn black on left and right ends?

Yes

Pg. 6-17

T
2600A Gray Bar Troubleshooting Procedure
(Revisions 1-13)

Is there 3-5v P-P signal on the A201 side of R214, R215, and R216?

Yes

Check R214, R15, and R216 with meter for correct value. Replace any defective components.

No

Is there 3-5v P-P signal on the A201 pin corresponding to the resistor that had no signal?

Yes

Open between A201 and that resistor.

No

Check pullup resistor R218, R219, or R220 on that line to insure resistor is good and one side is connected to +5v.

Resistor Defective?

Yes

Replace

No

Swap
1) A201
2) A200
3) A202

No

D

Pg. 4-45

Yes

A

Pg. 6-2
2600A Gray Bars Troubleshooting Procedures
(Revisions 14 and up)

N

Is there 3-5v P-P signal on the A201 side of R214, R215, and R216?

Yes

Check R214, R15, and R216 with meter for correct value. Replace any defective components.

No

Is there 3-5v P-P signal on the A201 pin corresponding to the resistor that had no signal?

Yes

Open between A201 and that resistor or defective CR202 if LM1 is bad.

No

Check pullup resistors R218, R219, or R229 on that line to insure resistor is good and one side is connected to +5V.

Resistor Defective?

Yes

Replace

No

Swap
1) A201
2) A200
3) A202

No

Yes

A

D

Pg. 4-45

Pg. 6-2
2600A Color Troubleshooting

1. Is any color visible (including reference bar)?
   - Yes: Go to step Q
   - No: Go to step R

2. Is there a 2-3.5v p-p signal on a 2.5v level between R210 and C2117?
   - Yes: Replace C211
   - No: Go back to step R

3. Is there a 2.5-3v p-p signal on a 3-3.8v level between C210 and C2117?
   - Yes: Replace C210
   - No: Go back to step R

4. Is there a 4.5-5v p-p signal on pin 9 of TIA?
   - No: Go back to step R

5. Is R228 good?
   - Yes: Go back to step R
   - No: Repair or Replace

6. Is R211 good?
   - Yes: Go back to step R
   - No: Repair or Replace

*Swapout:
1) A201
2) A202
3) A203
2600A Color Troubleshooting (Continued)

Is color constantly rolling (cycling)?

Yes

Does voltage vary between 5 & 6v on anode of A201 when R213 is rotated?

Yes

Is Y200 frequency 3.3795 MHz?

Yes

Swapout
1) A201
2) A202

No

Replace

No

Replace Y200.

Turn R213 fully clockwise.

Is there 6v on anode of CR200?

Yes

Detective R213 or open between R7 and A201.

Repair or Replace

No

Is 5.5v on anode of CR201?

Yes

Is R212 good?

Yes

Detective CR200.

No

Detective CR201.

-5v on cathode of CR201.

No

Open between -5 & CR201.

Repair or Replace
2600A Color Troubleshooting (Continued)

1) Y200
2) Q200 & Q20

Is RF frequency 61.25 MHz ± 1.15?

Yes

Can RF Module be tuned properly?

Yes

Tune RF module.

No

Replace RF module.

Is RF cable good?

Yes

Replace RF Module

No

Replace

R213 good?

Yes

No

Replace RF module.
2600A Defective Matrix Troubleshooting Procedure

Pattern is disrupted if blue or black lines are missing or some portion of the Matrix fails to appear on the TV screen.

Is blue black grid pattern disrupted? (See Figure 4-8 for example bad pattern)
Yes: Swapout
1) A200
2) A202
3) A201

No: Is entire matrix now on screen?
Yes

No: Is upper left block on screen defective? (See Figure 4-6 or 4-7 for correct pattern)
Yes: Yes

No: Are either the middle lower or the left lower block defective? (See Figure 4-6 or 4-7 for correct pattern)
Yes: Swapout
1) A202
2) A200
3) A201

No: Is upper-middle block defective?
Yes: Yes

No: Is middle-middle block defective?
Yes: Swapout
1) A200
2) A202
3) A201

No: Is lower-middle block defective?
Yes: Yes

No: L

D

The pattern may have errors, but all nine blocks are present on screen.

Yes: Is entire matrix now on screen?

No: D

Pg. 4-45

3) A20
1) A202
2) A200
3) A201

Are middle-left and lower-level blocks now correct (See Figure 4-6 or 4-7)?
Yes: Is middle-middle block now OK?

No: D

Pg. 4-45

1) A200
2) A202
3) A201

Pg. 6-22

Pg. 6-13

Pg. 6-22

Pg. 6-23

Pg. 6-22
2600A Audio Test Procedure

Reinitialize switches. Slide the right difficulty switch to the right.

Is there a clear tone?

Yes

Use scope or frequency counter to measure frequency at emitter of Q201.

Tone audio to 4.5 MHz by adjusting L201.

Adjust to ±0.06 MHz. Look for stable frequency.

Can unit be adjusted and is sound clear?

Yes

No

X

Pg. 6-21

Pg. 6-24
2600A Audio Test Procedure (Continued)

Are the two patterns in Figure 4-9 alternating on the screen?

Yes

Do the patterns alternate with the tones?

Yes

Are both colors and tones consistent each cycle?

Yes

Put switches back to initialized positions.

VCS will go through one last cycle before changing to color bar test.

No

Swapout
1) A201
2) A200
3) A202

Are patterns now correct? (As in Figure 4-9)

No

Ab
Pg. 6-27
2600A Defective I/O Lines Troubleshooting Procedure

Determine which lines are defective by referring to Figure 4-7.

Check the lines indicated as defective for -5v at J202 or J203 (see chart).

Is -5v present on the line(s) just checked?

Check the RAM (A202) pin. Is +5v present there?

Check trace line(s) from defective pin(s) for shorts to ground. Are there any shorts?

Swapout A202.

Is -5v now present at the A202 pin?

Replace the capacitor on that line (see chart).

Does the Diagnostic Matrix screen now look correct (see Fig. 4-6)?

-5v defective I/O Lines Troubleshooting Procedure

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>C230</td>
<td>J202-Pin 4</td>
</tr>
<tr>
<td>14</td>
<td>C229</td>
<td>J202-Pin 3</td>
</tr>
<tr>
<td>13</td>
<td>C228</td>
<td>J202-Pin 2</td>
</tr>
<tr>
<td>12</td>
<td>C227</td>
<td>J202-Pin 1</td>
</tr>
<tr>
<td>11</td>
<td>C226</td>
<td>J203-Pin 4</td>
</tr>
<tr>
<td>10</td>
<td>C225</td>
<td>J203-Pin 3</td>
</tr>
<tr>
<td>9</td>
<td>C224</td>
<td>J203-Pin 2</td>
</tr>
<tr>
<td>8</td>
<td>C223</td>
<td>J203-Pin 1</td>
</tr>
</tbody>
</table>
2600A Trigger Line Troubleshooting Procedure

Is there +5v at pin 6 of J202 (Left Trigger) or J203 (Right Trigger)?

Yes

Swapout:
1) A201
2) A200
3) A202

Does trigger line work properly now?

No

R223 or R226 is shorted to +5v.

Replace

Yes

Are R226 (Left Trigger) R223 (Right Trigger) good and connect to +5v?

No

Replace defective resistor.

Yes

Check continuity between 9-Pins (J202 & J203) and resistors (R225 and R224).

Continuity good?

No

Repair Trace

Yes

Open R224, R225 or shorted C216, C217.

Replace

Pg. 6-2
Is RF module tuned to 61.25 MHz? (Channel 3)

Is only one audio tone present?

Is there a 2V p-p square wave that alternates between two frequencies on pin 13 of A201?

Does square wave signal appear at C208?

Is there a 4.5 MHz, modulated, 1-2V p-p audio signal at C211 (either side)?

Fix open trace line between C208 and Pin 12/13 of A201.

Is there now an alternating audio tone from the TV?
Can RF module be properly tuned?

Yes

Tune RF module.

No

Replace RF module.

Is +5 present at the side of R206 closest to L201?

Yes

Open between +5 & R206

No

Is there continuity from R206 to A201 pin 13?

Yes

Swapout A201.

No

Repair open between R206 and A201 pin 13.
Fix open trace line between C208 and Pin 12/13 of A201.

Is there -5v at one end of L201?

Check that L201 is good. (Has continuity and is not shorted or cracked.)

Check/Replace

1. C204, C207
2. L201
3. L202

If audio is still dead, check the trace lines around C211 for opens and shorts.

Is there now an alternating audio tone from the TV?

Page 6-2

Page 6-24
2600A Cartridge Test Procedure

AB

DTC works, but VCS unit is still suspect.

Plug in customer cartridge, if available.

Connect, initialize, and turn VCS on with customer's game cartridge.

Does correct video pattern for that game appear?

Yes

Play game. Does it play OK?

Yes

Check customer cartridge on known good game. Is it OK?

Yes

Replace with good cartridge.

No

No

Swapout
1) A201
2) A200
3) A202

Does game now operate properly with game cartridge?

Yes

AB

No

D

Pg. 4-45

Pg. 6-28
Place customer cartridge in game, if available. Otherwise, use other game cartridge.

Run game for 2 hours, minimum. Do not turn off during this period.

Check game's operation.

Is game working properly?

Yes → End of test sequence.

No → A

Pg. 6-2
2600A Paddle Lines Test

Start

Put snorting plugs in. Put VCS into Diagnostic Matrix mode.

Check J202/J203 for RC waveform (see Fig. 4-10). Is waveform present on each of the pins shown in chart?

No

Yes

Repair open trace between A201 and J202/J203.

Do paddle lines now work OK?

Yes

No

Swapout
1) A201
2) A200
3) A202

Is there continuity between the J202 or J203 pin (see chart) and the A201?

No

Yes

Replace cap (C215-C218) on the failed line.

Does RC waveform appear on the appropriate J202 or J203 line? (See Chart)

No

Swapout
1) A201
2) A200
3) A202

Yes

Check trace lines and resistors for opens.

Repair

Does Paddle Line now work?

No

Paddle line is open or shorted.

Repair

Yes

Connection Chart

<table>
<thead>
<tr>
<th>Player</th>
<th>Pin A201</th>
<th>Pin J202</th>
<th>Pin J203</th>
<th>Cap No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>5</td>
<td></td>
<td>C215</td>
</tr>
<tr>
<td>2</td>
<td>39</td>
<td>9</td>
<td></td>
<td>C216</td>
</tr>
<tr>
<td>3</td>
<td>38</td>
<td></td>
<td>5</td>
<td>C217</td>
</tr>
<tr>
<td>4</td>
<td>37</td>
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Pg. 6-2

6-29
2600/2600A Domestic VCS
SECTION 7
GAME CONTROLLERS

OVERVIEW

The following pages contain descriptions, schematics, and test procedures for the four game controllers used with the Video Computer System.

JOYSTICK (X-Y) CONTROLLER
Inside each joystick is a small PC board that has five calculator-type keypads mounted on it. Two versions of the PC board exist in current joystick models; see Figure 7-1. Four of the keypads are positioned beneath the stick in a square shaped pattern, and the fifth is located beneath the pushbutton. When the stick is pushed forward, the bottom surface of the stick presses against the forward keypad, causing it to make contact, and complete the circuit that is connected to it. In the same way, pushing the stick back, left and right causes the respective keypad underneath that position to close and complete the circuit.

NOTE: The earliest models of the joystick had five spring-loaded buttons instead of the present configurations. These earlier models cannot be repaired.
If the stick is pushed forward and to the right at the same time (that is, in a northeastern direction), both the forward and right keypad close simultaneously, which causes the 6532 to see two switch closures happening at once. The result is that the object being controlled on the screen moves diagonally. With the four keypads, 8 different directions can be attained. The pushbutton determines whether the keypad beneath it is either open or closed. See Figure 7-2 for Joystick Schematics.

Figure 7-2. Joystick Schematic
JOYSTICK (X-Y CONTROLLER) CHECK

Equipment Needed

- T.V. set
- Known good VCS unit
- Combat cartridge

Procedure

1. Check for cosmetic damage.
2. Plug in cartridge and plug controller to be tested into the left player port.
3. Turn on unit and press GAME SELECT until game #18 appears.
4. Press GAME RESET.
5. Push the joystick handle away from you and the plane should go down.
6. Pull the joystick handle toward you and the plane should go up.
7. Move the joystick right and plane should speed up. Move it left and plane should slow down.
8. Push the Red button and the plane should fire.
9. This completes the (X-Y controller) check.
PADDLE CONTROLLER

Each game paddle consists of a 1 Megohm potentiometer that, when varied, causes different values to be seen and acted upon by the TIA. Also contained in the paddle is a simple spring loaded push-to-make pushbutton switch. There are two game paddles connected to each I/O plug. Figure 7-3 illustrates the paddle controller assembly and Figure 7-4 the paddle controller schematic.

Figure 7-3. Paddle Controller
PADDLE CONTROLLER CHECK

Equipment Needed

- T.V. Set
- Known good VCS unit
- Casino™ cartridge

Procedure

1. Check for cosmetic damage.

2. Plug in cartridge and plug controllers to be tested into the left player port.

3. Press game reset.

4. Press the button on one of the controllers. A pair of numbers should appear.

5. When you turn the knob, one set of numbers should go between 20 and 290 by steps of 20. The numbers should not advance greater than a step of 20.

6. Repeat steps 3, 4, & 5 for the other controller.
DRIVING CONTROLLER

The heart of the driving controller is a switching device that generates a full two-bit gray code for each quarter turn of the controller knob. The output of both the gray code generator and the pushbutton switch is detected by the 6532, causing the program to respond accordingly. Unlike the non-linear resistive game paddles, the driving controller gives the user precise linear positional control over the complete turning range of the knob. As with the game paddles, there is a simple push-to-make pushbutton switch located on the side of the controller. The driving controller assembly is illustrated in Figure 7-5; the schematic in Figure 7-6.

Figure 7-5. Driving Controller
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2 BIT GRAY CODE
CLOCKWISE ROTATION
X, NO CONNECTION
0 GND

1. OCCURS 4 TIMES PER REV.

Figure 7-6. Driving Controller Schematic

DRIVING CONTROLLER CHECK

Equipment Needed

- T.V. set
- Known good VCS unit
- Indy 500 cartridge

Procedure

1. Plug in Indy 500 cartridge and plug in driving controller to be tested in left hand port.

2. Press game reset switch.

3. Turn controller knob and insure that car turns in the same direction as the knob. Insure that car doesn't skip position or wobble between positions. There should be 16 different positions for the car.

4. Press down on the knob and lightly wiggle it back and forth. The car should not move at all.

5. Press down on the red button. The car should move forward.

6. If the controller fails any of the above tests it is defective.
KEYBOARD CONTROLLER

The keyboard controller (Figure 7-7) is a 12 button calculator-type switch array that functions like a small computer keyboard. When one of the pushbuttons is pressed, the corresponding set of sense lines is closed, completing the circuit. The closure is detected by the 6532 and appropriate action is taken by the program. Figure 7-8 illustrates the keyboard wiring and Figure 7-9 the keyboard schematic.

Figure 7-7. Keyboard Controller
Figure 7-8. Keyboard Wiring Diagram

Figure 7-9. Keyboard Schematic
KEYBOARD CONTROLLER CHECK

Equipment Needed

- T.V. set
- Known good VCS unit
- Brain Games cartridge
- One good keyboard controller

Procedure

1. Check for cosmetic damage.

2. Plug in Brain Games cartridge and plug the known good keyboard into the right-hand plug.

3. Plug the controller to be tested into the left-hand plug.

4. Press game select until game #19 appears and press game reset.

5. If an audio tone sounds, the controller is defective.

6. Starting with the "1" key, press the keys in the following order: 1, 2, 3, 4, 5, 6, 7, 8, 9, *, 0, #. Each key should generate a tone lower than the key before it.

7. Test completed.
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# CX2600A DOMESTIC (M/N) VCS

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**CX2600A DOMESTIC (M/N) VCS**

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6-11 NTSC
TECH TIP #1

Green J200

On early production 2600's the J200 is green. We found that it is a very unreliable connector after many insertions. This appears to you as a game that sometimes does not work with a cartridge. Replace the connector.

TECH TIP #2

Audio Failures

On Audio Failures the primary suspects are the two polystyrene caps C206/C207. By putting pressure on the sound caps the audio may come on again. Always replace both caps when you replace one.

TECH TIP #3

Kludge

In some of the early production games you notice a inductor and cap over C201 & R206. This was to cure a problem on a cartridge then, but is now no longer needed. Cut the inductor and cap out being careful not to cut the R206 lead.

TECH TIP #4

Molex Sockets

Chip sockets made by Molex have a low retention value in some cases. This may cause an intermittent color or graphics problem. All sockets with insertion aids should have the insertion aid removed and the chip reinserted.
TECH TIP #5

Floating Ground on 2600

If the ground signal has a lot of noise on it (approx. 1 v.) check continuity on pins 3, 6, and 10 on the J101.

TECH TIP #6

Left Paddle Failure

Early production 2600 mother boards (Rev 8 and lower) had an artwork error which was corrected by placing a dot over the trace. This insulates the trace from the casting and should always be on the board. The dot is located under the J200 upper left corner, and the trace should be completely covered.

TECH TIP #7

Indy 500

If a unit works on everything except Indy 500 then pin 23 of the A202 is probably shorted to a data line.

TECH TIP #8

Power Jacks

All power jacks should be tested for a snug fit. When the game is on, lightly move power plug in a small circle, if the picture goes off, replace the jack with a new one.

TECH TIP #9

9-Pins

Check all 9-Pin connectors (J202, J203) for pushed or broken pins. Replace all showing problems.
TECH TIP #10

R-220

Check that R220 is properly soldered. If they aren't, they will cause intermittent gray bar problems.

TECH TIP #11

Solder Check

Check solder on the following components: C210, C211, C203, C220, C212, C208, and C209. Long miscues on these caps prevented them from being soldered properly, causing intermittent problems on the board.

TECH TIP #12

Hex Buffers

The 4050 (A203) on the 2600 should be one of the first things checked for any of the following problems: any trigger problem, no Sync., lose of lum lines. This is the reason for a high percentage of returns.

TECH TIP #13

J201 and J101 on the 2600

Both of these connectors should be checked for a good, secure fit.

TECH TIP #14

Crooked Switches

Inspect switches on 2600 switchboard to insure that they set flat and perpendicular to the board. Reset all switches which are not.
TECH TIP #15

L200 and Chicklets on 2600/2600A

Be sure when assembling the mother board into the casting that the L200 and chicklets are back under the shroud of the casting.

TECH TIP #16

L201

Make sure the L201 core has a snug fit or else when 4.5 MHz is set, the core can slip in handling. Also, some L201 cores be frozen or cracked in the jacket. Replacement is necessary only if the audio carrier frequency cannot be adjusted to 4.5 MHz.

TECH TIP #17

Reassembly

When assembling the 2600 mother board into casting make sure C220 and C239 are pushed away from J200 shroud.

TECH TIP #18

Excess Lead Length

Check lead length on model 2600 Taiwan games. Trim excessive lead length on the bottom of the mother board to avoid shorting on casting.

TECH TIP #19

Regulator

On early production 2600 units with standup regulator and heatsink assemblies, inspect for hairline fractures between the regulator and the switchboard. Also insure that on early domestically produced units the regulator is firmly secured to the heatsink by a tinnerman clip.
SUBJECT:
Blanking Resistor

DESCRIPTION:
The Rev. 4 CX2800 PCB has an 820 Ohm resistor soldered across pins 6 and 9 of U2 (TIA) on the soldered side (bottom). This resistor improves the game color and must not be removed. Rev. 5 and above CX2800 PCB have this resistor incorporated in their design.

DIFFICULTY REPORTING:
If you need further clarification concerning this Tech Tip, call the ATARI Tech-Line Specialist.

Inside California
(800) 672-1466

Outside California
(800) 538-1535
SUBJECT:
Switchcaps

DESCRIPTION:
If at power-up two switches are activated at the same time (indicated by both the Joystick and Paddle, or Novice and Expert LED's "on" at the same time), you must shorten the switchcap hand ends with sand paper, to eliminate binding.

If the switchcaps seem to be binding when activated on Rev. 4 PCBs, tilt the momentary switches (S2-S9) toward the player port side of the board so that there is a .030 inch gap between the board and the leading edge of the switch bottom (a manual approximation is usually successful). Some Rev. 4 PCB's have a shim glued to the PCB to correct this problem.

DIFFICULTY REPORTING:
If you need further clarification concerning this Tech Tip, call the ATARI Tech-Line Specialist:

Inside California
(800) 672-1466

Outside California
(800) 538-1535
Subject: Blanking Resistor

Description:

Some 2600A PCBs have an 820 1/4 W 5% resistor (P/N 14-5821) installed on the solder side (bottom). The resistor is located between pins 6 and 9 of A201 (TIA) and improves the color reproduction of the unit.

The resistor may be added to existing 2600A units at your discretion and the customer's expense. The addition will result in improved color saturation.

Rev. 16 PCBs and above will have the resistor incorporated into their design.

Difficulty reporting:

If you need further clarification concerning this Tech Tip, call the ATARI Tech-Line Specialist:

Inside California  
(800) 672-1466

Outside California  
(800) 538-1535
SUBJECT:
Switch Shorting

DESCRIPTION:
The Rev. 4 CX2800 PCB switch S1 (On/Off) has a metal standoff that may short to the trace beneath the switch. To prevent shorting, place a small piece of insulating tape on the board beneath the switch. PCB to Rev. 4 and above have the traces rerouted.

DIFFICULTY REPORTING:
If you need further clarification concerning this Tech Tip, call the ATARI Tech-Line Specialist:

Inside California  
(800) 672-1466

Outside California  
(800) 538-1535
PROBLEM
Compatability problems between the cable and connectors linking 2600 Mother Board to the switch board.

CAUSE
Two types of 12-conductor cable assemblies have been used on Model 2600 units:

- A flat-wire type cable, with female connector (see Figure 8-1) which plugs into a male 12-pin in-line connector on the switch board.

- A ribbon cable with a male connector which plugs into a female, 12-pin in-line socket on the switch board.

SOLUTION
When a defect is found in the flat-wire type cable assembly or its male connector on the switch board, the flat-wire cable assembly should be replaced with the ribbon cable assembly (part number C012776) and the 12-pin male switch board connector should be replaced with the 12-pin female switch board socket (part number C014778-03).
PROBLEM

-- RF interference that does not clear up using normal adjustment methods.

-- A series of lines and bright grid distortions on the screen accompanied by a loud hum on the audio carrier even when the audio and video are properly adjusted.

The above problems may temporarily disappear when the unit is turned off for a few minutes and then turned on again.

CAUSE

These 2600A problems have been diagnosed by Atari as being caused by a leaking or defective C241 (.1 microfarad) and/or C242 (.1 microfarad) located between the power jack and voltage regulator.

SOLUTION

Replace the defective components with ones from your kit. Make certain the replacement components are rated at a value 50V or greater.
**MODEL:** 2600 Video Computer System  
**DATE:** February 18, 1982

**PROBLEM**

Damage to Hex Buffer, and other components

**CAUSE**

Static discharge

**SOLUTION**

To provide protection from static discharge a Zener diode must be placed between the trigger lines and ground. Also, static strips must be placed on the switches of the switchboard. (Refer to pages 3-3 thru 3-5 of your ATARI VIDEO COMPUTER FIELD SERVICE MANUAL DOMESTIC MODEL 2600/2600A.)

The part number for the Zener Diode/Axial Cap. Assembly is CA018263 and can be ordered **(at no charge to you)** from Sales Order Processing, Sunnyvale, after March 8, 1982.

You should have the static strips (Part Numbers C017294 and C017297) in current parts inventory. If you do not, please order them when you order the Zener/Axial Assembly.