



# HYDROTHUNDER™

## CHAPTER SIX

### TROUBLESHOOTING

	<b>NOTICE:</b> The term VGM refers to the video game machine.
	<b>CAUTION:</b> This VGM uses complex electronic components that are <i>very sensitive to static electricity</i> . Observe the following precautions before handling VGM electronics. Failure to do so may void your warranty and could damage electronic assemblies.

- Before servicing electronics, turn off AC power to the VGM. Wait for capacitors to discharge.
- Before touching or handling electronic assemblies, discharge static electricity on your body. To discharge this static, begin by connecting the line cord to a grounded outlet. Don't turn on the VGM! Next, touch the safety ground stud of the power supply chassis.
- Store electronic assemblies in an anti-static area. Use anti-static bags to store or transport VGM circuit boards. Transport the hard drive in its shipping container.
- Don't remove or connect electronic assemblies when cabinet power is on. Otherwise, you'll damage electronic assemblies and void the VGM warranty.
- After you complete maintenance or service, replace ground wires, shields, safety covers, etc. Install and tighten ground and mounting screws.

# Coin Mechanism and Pricing Troubleshooting Table

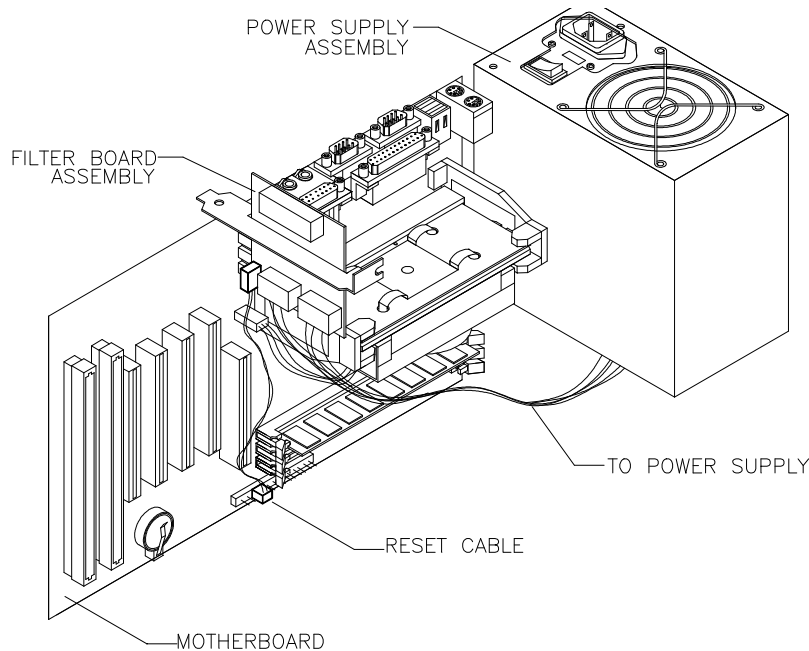
SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>VGM (<i>video game machine</i>) accepts currency or tokens, but number of credits per coin or bill is incorrect.</li> </ul>	Improper settings at Pricing Menu	<ol style="list-style-type: none"> <li>Enter Menu System by pressing and holding TEST MODE switch inside coin door. From Diagnostics Menu, choose SWITCH TEST. Use tests to confirm operation of switches.</li> <li>From Adjustments Menu, choose PRICING MENU. Verify that units and credits are set correctly.</li> </ol>
	Faulty wiring	<ol style="list-style-type: none"> <li>Check that cabinet wiring is correct for this VGM.</li> <li>Assure that coin meter and coin switches connect properly to control input wires.</li> </ol>
<ul style="list-style-type: none"> <li>VGM won't accept currency or tokens.</li> <li>VGM won't start.</li> <li>Audio and video are present.</li> </ul>	Improper currency	<ol style="list-style-type: none"> <li>Unlock and open cash door. Empty cash box. Inspect revenue for counterfeit currency.</li> <li>Check vault. Remove any items that block path from mechanism.</li> </ol>
	Faulty coin mechanism	<ol style="list-style-type: none"> <li>Unlock and open coin door. Check each mechanism for proper mounting.</li> <li>Remove mechanism.</li> <li>Clear currency path.</li> <li>Reinstall mechanism and latch it.</li> </ol>
	Tilted coin mechanism or VGM	<ol style="list-style-type: none"> <li>Verify that mechanism is level after doors close.</li> <li>Repair or replace coin door if it is bent or damaged.</li> <li>If necessary, adjust cabinet leg levelers to keep mechanisms vertical.</li> </ol>
<ul style="list-style-type: none"> <li>Coin indicators don't light</li> </ul>	Burned-out bulb	<ol style="list-style-type: none"> <li>Burned-out bulbs may appear white or darkened. Check continuity with DVM.</li> <li>Replace burned-out bulb with same type.</li> </ol>
	Open fuse circuit	<ol style="list-style-type: none"> <li>Check fuse continuity with DVM.</li> <li>If fuse is blown, replace fuse with same type.</li> <li>If fuse isn't blown, check wiring.</li> </ol>



**CAUTION:** Don't remove or install any connector when power is turned on. Installation under power will damage the circuit boards or hard disk drive and void the warranty.

# VGM Startup Troubleshooting Table

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>VGM (video game machine) doesn't start.</li> <li>VGM appears completely non-functional.</li> <li>No audio</li> <li>No illumination</li> <li>No video display</li> </ul>	Power problem	<ol style="list-style-type: none"> <li>Check that VGM power switch is on.</li> <li>Inspect computer to see if fans are turning. <i>If not:</i> Is computer power supply connected to its power cable? Is computer power supply turned on?</li> <li>Plug VGM into AC power outlet. Verify presence of AC line voltage.</li> </ol>
	Improper line voltage switch setting	Turn off VGM power. Unplug AC line cord. Check line voltage switch. If necessary, set it to agree with local AC line voltage. Retest VGM.
	Open fuse	<ol style="list-style-type: none"> <li>Turn off VGM power. Examine AC fuse on power chassis, under computer.</li> <li>Examine DC fuses on cabinet wall or electronic equipment shelf.</li> <li>Replace faulty fuses with identically rated parts.</li> <li>Turn on VGM power. If fuse opens again, check DC wiring harness and connectors.</li> </ol>
	Faulty wiring	<ol style="list-style-type: none"> <li>Remove line cord. Test line cord, power plug, and IEC connector for breaks or damage. Verify continuity of each wire in cord. Install cord at power chassis. Press connector firmly to seat it.</li> <li>Check computer cord in same manner.</li> <li>Assure that cabinet wiring harness connectors fully seat in corresponding power supply and board connectors.</li> <li>Inspect wiring for breaks or damage.</li> </ol>
	Arcade computer problem	Turn off power for one minute and turn VGM on again. Power On Self-Test checks electronics. Screen may report errors. If video circuits don't operate properly, computer produces series of beeps. (See <i>Error Message Troubleshooting Table</i> .)



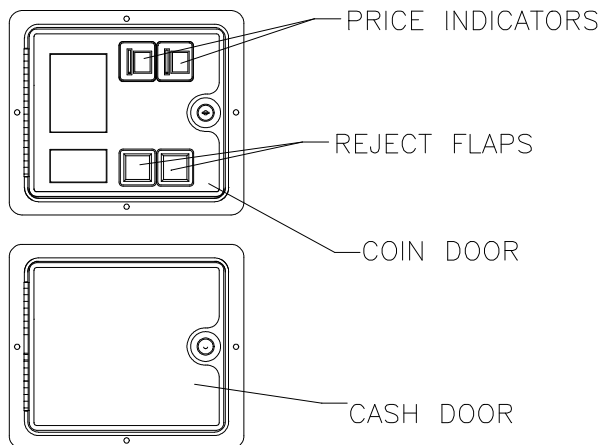
## Location of Power Supply

# VGM Startup Troubleshooting Table, *continued*

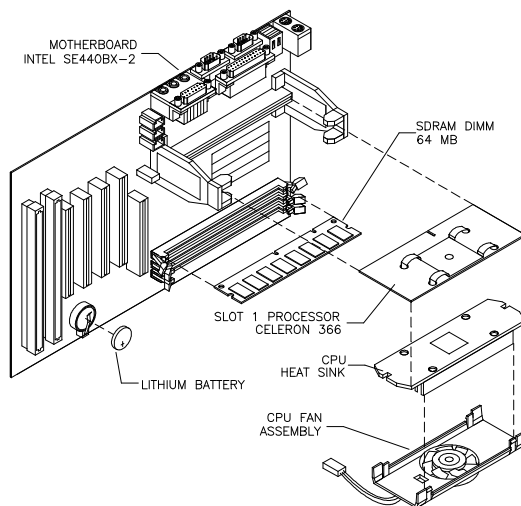
SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>VGM (<i>video game machine</i>) appears non-functional.</li> <li>Currency acceptor price indicator is illuminated.</li> </ul>	Power problem	<ol style="list-style-type: none"> <li>Inspect circuit boards under low-light conditions. LEDs glow if processor circuits receive voltage. Fan should be turning. These indications prove presence of DC from power supply. Still, voltages or signals may not be normal. Computer has no internal LEDs.</li> <li>Turn on VGM power. Using 20-volt DC setting on digital voltmeter, measure DC voltages at power connector pins. (Power supply voltage isn't adjustable.)</li> <li>Using 2-volt AC setting on digital voltmeter, measure same DC voltages as above. Any reading here indicates that supply voltages are unstable and may contain ripple or noise.</li> </ol>
	Faulty wiring	Turn off VGM power. Assure that wiring harness connectors fully seat onto mating board connectors. Verify that harness connects to computer. Check other connectors in same way.
	Improper jumper or DIP switch settings	Verify that circuit board jumpers are set as intended. Check DIP switch settings.
	Faulty circuit boards or arcade computer	<ol style="list-style-type: none"> <li>Run power-up self-test sequence. Note errors or failures during tests. Compare LEDs with LED indicator status charts. Note discrepancies.</li> <li>Turn off computer. Wait for hard disk to stop spinning. Leave VGM power on. Loosen computer case thumbscrews and lift off cover. Turn computer power on. Listen for beeping sounds. Compare beeps with <i>Error Message Troubleshooting Table</i>.</li> </ol>



**CAUTION:** Don't remove or install any connector while power is turned on. Doing so will damage circuit boards or hard disk drive, and void warranty.



**Front View of Coin Door**



**Interior View of Electronics**

## VGM Startup Troubleshooting Table, *continued*

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>• VGM (<i>video game machine</i>) doesn't start.</li> <li>• VGM accepts currency or tokens.</li> <li>• Audio and video are present.</li> </ul>	Faulty coin mechanism	<ol style="list-style-type: none"> <li>1. Unlock and open coin door. Check each currency acceptor to assure proper mounting. Verify that each release latch is closed and locked. Does mechanism accept and reject currency correctly? Test mechanism with good and bad coins.</li> <li>2. Inspect to see if external acceptor indicators (Pricing, Flashing Arrows, etc.) are lit.</li> <li>3. Verify that each acceptor operates properly by placing it in working VGM. Replace bad parts.</li> </ol>
	Faulty switches	<ol style="list-style-type: none"> <li>1. Enter Menu System by pressing and holding TEST MODE switch inside coin door. From Diagnostics Menu, choose SWITCH AND LAMP TESTS. Use tests to confirm operation of each switch in VGM.</li> <li>2. Assure that no loose parts or wires are caught in switch contacts.</li> <li>3. Check for continuity in each suspect switch connection (Common to Normally Open or Common to Normally Closed).</li> <li>4. Replace faulty switches (bent levers, broken actuators, etc.).</li> </ol>
	Faulty wiring	<ol style="list-style-type: none"> <li>1. Assure that no wires are caught in hinges, latches or switch contacts.</li> <li>2. Check wiring continuity from circuit board connectors to acceptors.</li> </ol>

## Audio Troubleshooting Table

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>No audio</li> <li>Video is present</li> <li>VGM (<i>video game machine</i>) appears to operate normally</li> </ul>	Improper volume setting	Enter Menu System by pressing and holding TEST MODE switch. From Operator (Main) Menu, choose VOLUME MENU. Check that Attract Music is on (enabled). Verify that all volume levels are set well above zero. If necessary, change levels to make VGM audible.
	Faulty wiring	Turn off VGM power. Assure that wiring harness connectors attach and fully seat onto mating board connectors. Verify that harness connects to computer. Check audio cable connectors in same way.
	Faulty or obstructed speaker	Remove grilles and inspect speakers. Free speaker cones, terminals, mounting screws and magnets of loose parts or wires.
	Faulty Audio Board	Verify proper operation of Audio Board by placing it in working VGM.
<ul style="list-style-type: none"> <li>Constant low hum from all speakers.</li> </ul>	Faulty wiring	<ol style="list-style-type: none"> <li>Check that cabinet wiring is correct for this VGM.</li> <li>Verify that cabinet wiring provides separate wires (not common return) for each speaker.</li> <li>Check connection of all cabinet ground wires.</li> </ol>
	Faulty Audio Board	<ol style="list-style-type: none"> <li>Run power-up self-test sequence. Note errors that VGM finds during tests. Compare Diego Board LEDs with LED indicator status charts. Note discrepancies.</li> <li>Verify that Audio Board operates by placing it in working VGM. Replace bad parts.</li> </ol>
	Faulty power supply	Using 2 Volt AC setting on digital voltmeter, measure voltages at speaker terminals. Any reading indicates unstable supply that may contain ripple or noise.
<ul style="list-style-type: none"> <li>Audio is distorted, muffled or has missing frequencies.</li> </ul>	Faulty or improper speaker	<ol style="list-style-type: none"> <li>Turn off VGM power. Remove grilles and check speakers. Assure that speakers are full range (100 to 10,000 Hz response) and rated for at least 20 watts. Woofers must be rated for at least 40 watts.</li> <li>Verify proper speaker operation by connecting speaker in question to working VGM.</li> </ol>
	Faulty wiring	Multiple-speaker installations: Check for reversed wires at one speaker. Weak low frequencies and thin or hollow sound quality is symptom of incorrectly phased speakers. Sound tests may not detect this condition, but you can hear it during VGM operation.
<ul style="list-style-type: none"> <li>Dead sound channel</li> </ul>	Faulty speaker	<ol style="list-style-type: none"> <li>From Diagnostics Menu, choose SOUND TEST. Recheck speakers with audio signals provided by test.</li> <li>Verify proper speaker operation by connecting speaker in question to working VGM.</li> </ol>
	Faulty circuit board	Run power-up self-test sequence. Note errors that VGM finds during tests. Compare circuit board LEDs with LED indicator status charts. Note discrepancies.
	Faulty wiring	Verify that cabinet wiring is correct. Assure that all speakers connect to audio wires. Audio cable must be fully seated in Computer Line Output Jack. Check for broken or shorted wires.

# Error Message Troubleshooting Table

## Power-On Self-Test Beep Codes

(Audio beeps only. Video may or may not be present): See Note 1

MESSAGE	MEANING	REQUIRED ACTION
No beep	No system power	Check power supply and cables
1 continuous beep	Partial system power	Check power supply and cables
1 short beep	Normal start; no errors	Check other VGM components
2 short beeps	Processor problem	Check processor/fan module
3 short beeps	Graphics initialization problem	Check Video Board, cables
4 short beeps	Processor problem	Check processor/fan module
5 short beeps	Insufficient system memory	Check DIMM circuit modules
6 short beeps	Peripheral problem	Check other VGM components

## System Error Message Codes

(One or more lines of text appear on video screen): See Note 2

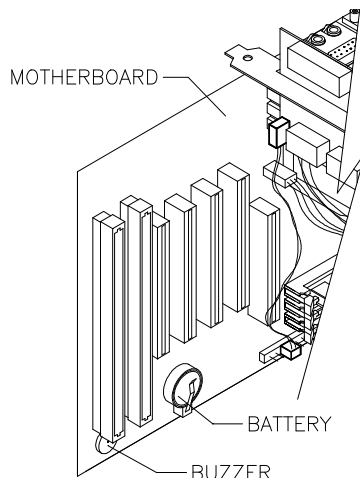
MESSAGE	MEANING	REQUIRED ACTION
CONFLICTING UNIT ID:	Linking problem	Check for unique unit ID number
GAME STARTUP:	Normal start; no errors	Check other VGM components
VERSION MISMATCH	Software problem	Check for differing revision level
XXXX DATA LOAD:	Corrupted files or failing circuits	Check named drive or circuit
XXXX INIT OR INIT FAILURE:	Circuit/file initialization problem	Check named drive or circuit

### Notes

1. The audio buzzer that generates 1 kHz beeps is on the computer, inside the VGM (*video game machine*). If hearing beep codes is difficult, remove the cabinet doors and computer cover.
2. Arcade Computer circuit boards resemble those in personal computers. Yet Midway engineers reprogrammed the boards for application to this VGM. *Power-On Self-Test codes are unique to the Arcade Computer in this VGM.*
3. Wiring or peripheral circuit problems may not trigger on-screen error messages. You may discover difficulties during Menu System diagnostic or calibration procedures.
4. Call your authorized distributor for help with unresolved error messages.



**NOTICE:** Don't attempt to move computer circuit boards into alternate slots. Midway assigned boards to specific slots. The custom operating system won't recognize improperly placed boards, even though they function normally.



**Location of Beeper in Arcade Computer**

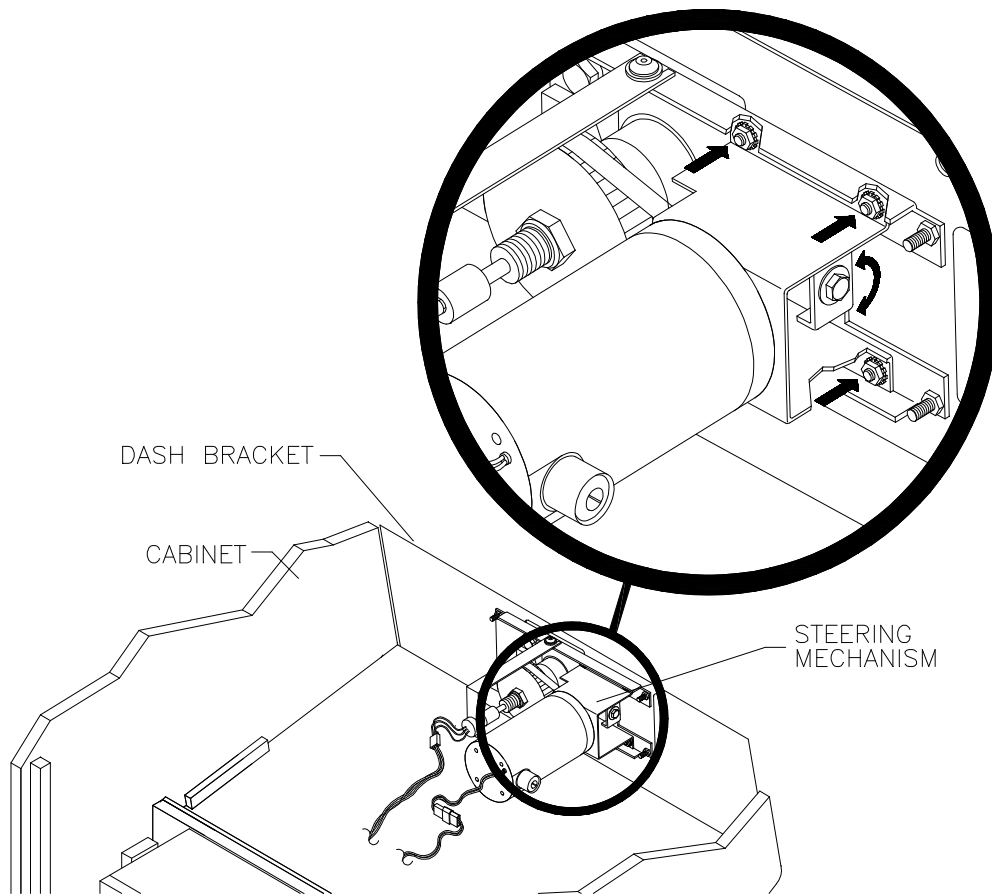
## Link Troubleshooting Table

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>Can't connect VGMs (<i>video game machines</i>) together</li> </ul>	Faulty wiring	<ol style="list-style-type: none"> <li>Don't extend linking cables that come with VGM.</li> <li>Install required crossover between VGM cabinets. Each coupler connects two cabinets (one pair). <i>Don't use standard telephone type couplers or wiring to link cabinets.</i></li> <li>Use only 10Base-T, Ethernet-type, Category 5, twisted-pair wiring for VGM data.</li> </ol>
	Improper linking hardware	Use required network hub for your local network. Hub Link Kit permits up to four cabinet connections. Cabinet array completion requires basic kit brackets and spacers.
<ul style="list-style-type: none"> <li>VGM doesn't recognize other players in linking operation</li> <li>VGM functions normally by itself</li> </ul>	Improper settings	<ol style="list-style-type: none"> <li>Record any error messages that occur during self-test.</li> <li>From Operator (Main) Menu, choose Adjustments Menu. Then select Linked Play Adjustments Menu. Assure that you've set LINKED PLAY to ON.</li> <li>Be sure that each VGM has unique ID number.</li> </ol>
	Power problem	If hub is in use, verify that power is applied. AC adapter wires are thin and easily damaged.
	Faulty wiring ( <i>3 or more cabinets</i> )	<ol style="list-style-type: none"> <li>Inspect hub indicator lights. Each active port should have illuminated indicator. If cable connects, and that position has no lit indicator, check for cable continuity from hub to cabinet.</li> <li>Assure that no loose wires catch in hinges, doors, or under cabinet.</li> <li>Verify that linking cable connects to Network Board at each VGM's computer.</li> <li>Verify that each linking cable operates properly by placing it in working VGM.</li> </ol>
<ul style="list-style-type: none"> <li>Some VGMs in group link properly, while others don't</li> </ul>	Improper hub switch setting	<ol style="list-style-type: none"> <li>Assure that switches on hub are set correctly according to Hub Link Kit instructions. (Networked cabinets don't require couplers. Hub has electronic crossover.)</li> <li>Inspect hub indicator lights for link activity. See manufacturer's literature for diagnostics.</li> </ol>
	Wrong software version	Verify that all linked cabinets use same software version. Otherwise, linked cabinets won't recognize each other. Contact your distributor.
	Faulty wiring ( <i>2 cabinets</i> )	<ol style="list-style-type: none"> <li>Insert crossover connections between coupled cabinets. Standard couplers appear identical to devices supplied with cabinets, but don't include internal crossover.</li> <li>Verify that each linking crossover coupler operates properly by placing it in working link between two cabinets.</li> </ol>
	Faulty wiring ( <i>3 or more cabinets</i> )	<ol style="list-style-type: none"> <li>You used additional crossover connector and cable to extend VGM or hub link connection. Two crossovers cancel and cause same problem as no link crossover.</li> <li>Connect cables directly to hub. Don't use crossover coupler and hub together in single network.</li> <li>Separate communications wiring from other wiring. Wires that must cross should cross at right angles to limit noise pickup.</li> </ol>



# Player Control Troubleshooting Table

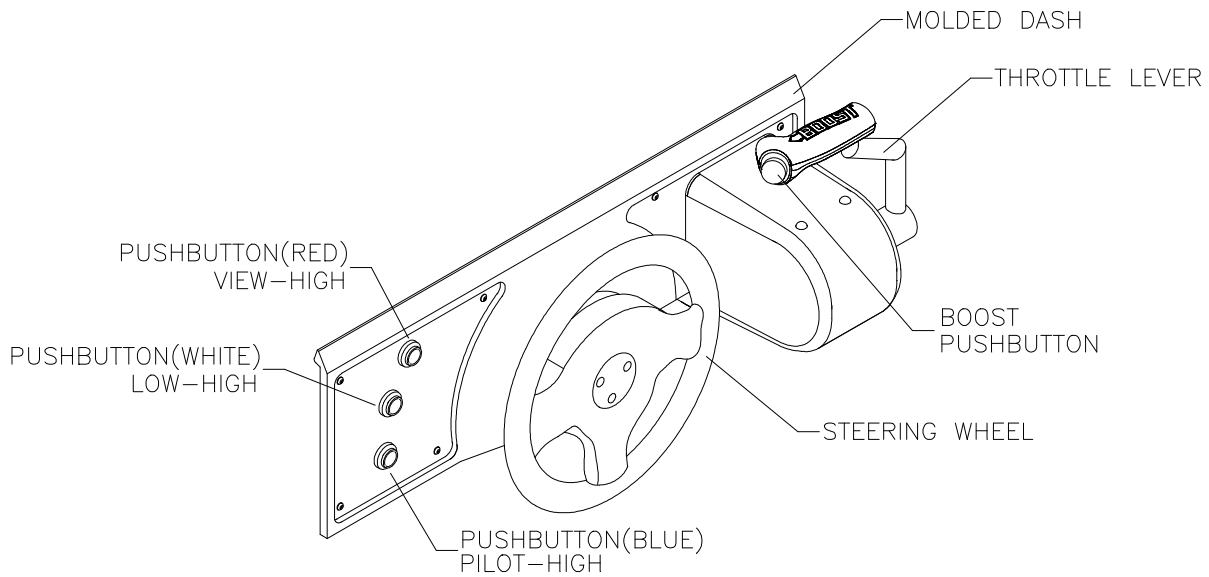
SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>Intermittent or completely non-functional player controls</li> <li>VGM (<i>video game machine</i>) starts normally.</li> </ul>	Faulty switches or lamps	<ol style="list-style-type: none"> <li>Enter Menu System by pressing and holding TEST MODE switch inside coin door. From Diagnostic Menu, choose SWITCH TEST. Run tests to confirm switch operation.</li> <li>Check for loose parts or wires caught in switch contacts.</li> <li>Check continuity at each switch connection (Common to Normally Open or Common to Normally Closed).</li> <li>Verify that control operates properly by placing it in working VGM.</li> <li>Verify that dashboard switch light bulbs are type specified in parts listing. Other types light, but may produce too much heat. Eventually excess heat may cause switches to bind.</li> </ol>
	Faulty switch wiring	<ol style="list-style-type: none"> <li>Check for wires caught in door hinges, latches, or switch contacts.</li> <li>Verify that harness connectors are attached and fully seated.</li> <li>Assure that control switches connect properly to control input wires.</li> <li>Check that cabinet wiring is correct for this VGM.</li> </ol>
<ul style="list-style-type: none"> <li>Steering pulls to one side</li> </ul>	Faulty Wheel Driver Board	Find power amp on Wheel Driver Board's large heatsink. Test and replace bad part or board.




**How to Adjust Belt Tightness**

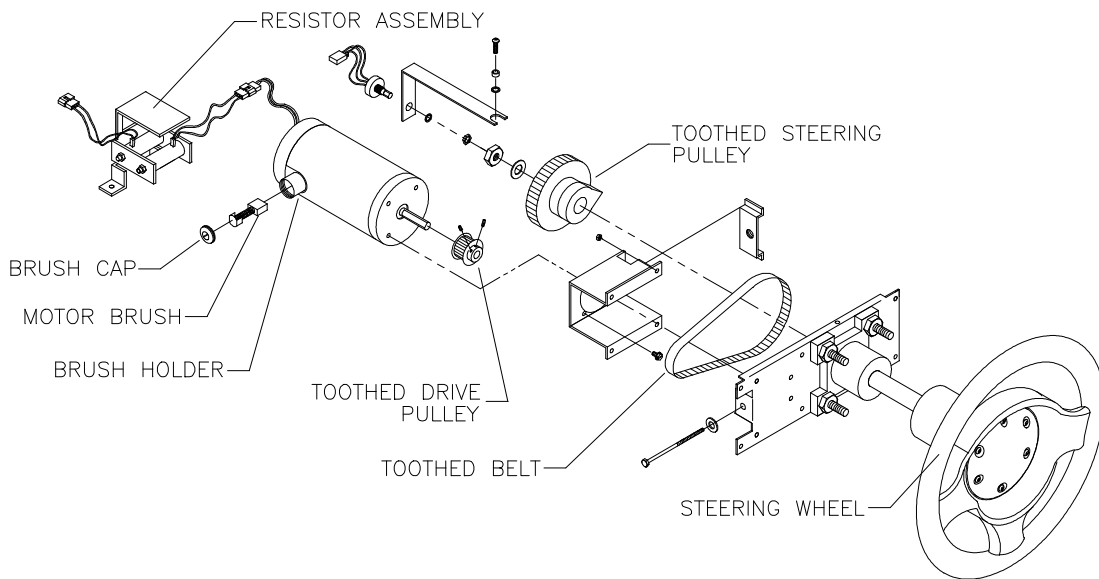
## Player Control Troubleshooting Table, *continued*

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>• Sloppy, unpredictable or ineffective steering</li> <li>• Video appears on screen</li> <li>• VGM (<i>video game machine</i>) starts normally</li> </ul>	Blocked or faulty fan	With VGM power on, check airflow near each computer fan. Case cooling fans are intake fans. Power supply fan is exhaust fan. Assure that nothing blocks airflow.
	Faulty mechanical parts	Turn off VGM power. Open dashboard. Support steering wheel and remove outer mounting screws. Remove metal shield (if your VGM has one) over motor. Inspect for faulty or worn belts, bearings, couplings, gears, etc.
	Faulty Wheel Driver Board	<ol style="list-style-type: none"> <li>1. Inspect Wheel Driver Board under low-light conditions. LEDs glow if motor driver circuits receive AC power from transformer. (Voltages or signals may or may not be normal.)</li> <li>2. Examine fuses and cables on Wheel Driver Board. Replace bad fuses. Using digital voltmeter, verify AC voltage between each fuse holder and ground. You should measure approximately 25V. See Wiring Diagram.</li> <li>3. Using 20 VAC setting on digital voltmeter, measure DC voltage at motor. <i>Don't move steering wheel, drive belt, or motor while making this measurement.</i> Any reading indicates unstable supply that may contain ripple or noise.</li> <li>4. Verify proper operation of Wheel Driver Board by placing it in working VGM.</li> </ol>
	Loose or worn drive belt	<ol style="list-style-type: none"> <li>1. Turn off VGM power. Open dashboard. Support steering wheel and remove outer mounting screws. Remove metal shield (if your VGM has one) over motor. Inspect for faulty or worn belts, bearings, couplings, gears, etc.</li> <li>2. If drive belt isn't worn or damaged, check its tightness.</li> </ol>
<ul style="list-style-type: none"> <li>• No wheel feedback</li> <li>• Steering aims vehicle as expected</li> </ul>	Improperly set feedback	<ol style="list-style-type: none"> <li>1. From Diagnostics Menu, choose FORCE FEEDBACK ADJUSTMENT.</li> <li>2. Set feedback to match player requirements. Maximum force may be too extreme for very young or inexperienced customers.</li> </ol>
	Faulty circuit	<ol style="list-style-type: none"> <li>1. Examine fuses and cables on Wheel Driver Board.</li> <li>2. Check cables and wiring between computer, interface, driver and motor.</li> <li>3. Check resistance of motor series resistors</li> <li>4. Replace bad parts.</li> </ol>
	Faulty motor	<ol style="list-style-type: none"> <li>1. Turn off VGM power. Open dashboard. Support steering wheel and remove outer mounting screws.</li> <li>2. Remove metal shield (if you VGM has one) over motor.</li> <li>3. Unscrew caps.</li> <li>4. Inspect motor brushes. Replace worn parts.</li> </ol>



### ***Player Panel Controls***



	<p><b>WARNING:</b> The Wheel Driver Board heatsink, power resistors, and other components may be very hot. The DC Motor in the steering wheel may also be hot.</p>
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### ***Steering Components***



# Video Troubleshooting Table

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>• Monitor appears non-functional</li> <li>• Audio is present</li> <li>• VGM (<i>video game machine</i>) controls operate normally</li> </ul>	Power problem	Verify connection of AC Power to video monitor. Inspect CRT neck in dim light. Glowing filament near CRT base proves that some monitor circuits receive power. Still, voltages or signals may not be normal.
	Faulty wiring	<ol style="list-style-type: none"> <li>1. Turn off VGM power. Verify that video signal and Remote Adjustment Board connectors seat properly on Video Monitor Board.</li> <li>2. Assure that video cables connect to circuit boards and computer.</li> <li>3. Assure that no wires are caught on chassis or mounting brackets.</li> </ol>
	Improper monitor adjustments	Check that BRIGHTNESS (intensity) and CONTRAST are set above their minimum levels.
	Faulty monitor circuitry	<ol style="list-style-type: none"> <li>1. Examine AC line fuse on Video Monitor Board. If fuse is faulty, replace it with identical fuse.</li> <li>2. If fuse is good: Verify that video monitor operates correctly by placing it in working VGM.</li> <li>3. If monitor is bad: Check monitor power supply.</li> <li>4. If power supply is good: Check monitor horizontal output transistor and related circuitry.</li> </ol>

	<p><b>WARNING: HIGH VOLTAGE.</b> VGM (<i>video game machine</i>) monitors generate and store potentially lethal high voltages. Avoid touching any part of the monitor until power has been off for some time. A picture tube can maintain a hazardous charge for up to several days. Only qualified technicians should service monitors. Turn off the power, unplug the VGM and discharge the CRT before attempting service. Even properly discharged tubes can revert to a highly charged state, <i>without reapplication of power.</i></p>
	<p><b>WARNING:</b> In normal operation, the monitor doesn't require isolation from AC line voltage. During bench servicing, you may need to operate the monitor outside the cabinet. If you do, <i>isolate the monitor from line voltage with an isolation transformer.</i></p>

## Video Troubleshooting Table, *continued*

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>VGM (<i>video game machine</i>) doesn't appear</li> <li>No audio</li> <li>Power-up self-test runs</li> </ul>	Floppy disk in drive	Check floppy drive for diskette. If you find disk, eject it. Leave VGM power on. Turn off computer. Wait for hard disk to stop spinning. Turn on computer.
	Faulty wiring	Loosen computer case lid thumbscrews and lift off cover. Assure that hard drive ribbon cable connector is fully seated into mating connector on motherboard. Check hard drive power cable.
	Improper components	<ol style="list-style-type: none"> <li>Verify that hard disk drive is correct for this VGM. Label on drive records manufacturer name, assembly number and program version.</li> <li>Verify that circuit boards are correct for this VGM. Label on each board records manufacturer name, assembly number and hardware version.</li> <li>Verify that ROM instruction set is correct for this VGM. VGM set includes more than one ROM. Label on each ROM records assembly number and software version.</li> </ol>
	Hard drive problems	<ol style="list-style-type: none"> <li>Turn computer on. Immediately look <i>under</i> hard drive. Hard Drive Activity LED flashes if drive is operating properly.</li> <li>Allow VGM to load normally. Note and record any error messages that occur during self-test.</li> <li>Remove hard drive and install it in working VGM. If symptom recurs there, hard drive is faulty. Replace it.</li> </ol>
<ul style="list-style-type: none"> <li>Blotches of color appear on screen</li> </ul>	Picture tube aperture mask is magnetized	Remove diskettes from room. Demagnetize monitor with external degaussing coil. Take care not to magnetize neighboring VGMs. Monitor may be on or off for this procedure.
<ul style="list-style-type: none"> <li>White areas in center of screen appear tinged with color</li> <li>Object edges have fringe of one or more colors</li> </ul>	Picture tube purity or static convergence is out of alignment	<ol style="list-style-type: none"> <li>Turn on VGM.</li> <li>Press and hold TEST MODE to enter Menu System. At Operator (Main) Menu, select Diagnostic Menu. Then select Monitor Patterns Menu. Run through Crosshatch, Red, Green and Blue screens to find clearest display of problem.</li> <li>Display screen with greatest problem.</li> <li>Display Crosshatch Screen. Locate purity and static convergence ring magnets on back of monitor neck. Watch screen in mirror. Adjust magnets to minimize problem. Follow instructions from monitor manufacturer.</li> <li>Display Crosshatch Screen. Touch up adjustments while watching screen in mirror.</li> </ol>

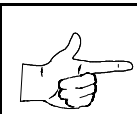
	<p><b>CAUTION:</b> Don't operate the monitor without its Remote Adjustment Board.</p>
	<p><b>WARNING: HANDLE FLUORESCENT TUBE AND CRT WITH CARE.</b> If you drop a fluorescent tube or CRT and it breaks, it will implode! Shattered glass can fly eight feet or more from the implosion.</p>

## Video Troubleshooting Table, *continued*

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>White areas at screen edges appear tinged with color</li> <li>Dots at screen edges appear ovoid or cylindrical</li> </ul>	Picture tube dynamic convergence is out of alignment	Have service bureau dynamically reconverge monitor. This procedure requires removing and repositioning yoke. Service bureau must follow instructions from monitor manufacturer.
<ul style="list-style-type: none"> <li>Video tears or rolls, or has black bar down middle of screen</li> </ul>	Faulty wiring	<ol style="list-style-type: none"> <li>Check connectors and cables for wiring continuity. Video cables connect computer to circuit boards, and then to video monitor.</li> <li>Assure connection of all cabinet ground wires, especially at video monitor chassis.</li> </ol>
	Faulty monitor circuitry	<ol style="list-style-type: none"> <li>Verify that video monitor operates correctly by connecting it to working VGM.</li> <li>Assure that video monitor is correct type for this VGM. Video monitors with wrong resolution can't lock sync.</li> </ol>
	Improper sync signals	<ol style="list-style-type: none"> <li>Check to see if Video Board puts out type of sync that your monitor requires.</li> <li>Verify that jumpers are set correctly for monitor.</li> <li>If necessary, change video sync jumper on Diego Board. Refer to Wiring chapter for details.</li> </ol>
	Electromagnetic fields	Move cabinet far away from machines, appliances, or VGMs ( <i>video game machines</i> ).
<ul style="list-style-type: none"> <li>Missing colors</li> </ul>	Faulty wiring	Check connectors and cables for wiring continuity from circuit boards to video monitor.
	Faulty monitor color drive circuitry	Verify that video monitor operates correctly by connecting it to working VGM.
<ul style="list-style-type: none"> <li>One color is dimmer or brighter than others</li> <li>Whites appear tinted everywhere on screen</li> </ul>	Maladjusted color bias pots	<ol style="list-style-type: none"> <li>Turn on VGM.</li> <li>Enter Monitor Patterns Menu.</li> <li>Watch Color Bars screen in mirror.</li> <li>Adjust three bias pots for best colors. (Most monitor neck boards include these pots.)</li> <li>Also check White Screen. Touch up controls.</li> <li>If whites still seem tinted, have service bureau rejuvenate picture tube.</li> </ol>
<ul style="list-style-type: none"> <li>Picture is dim or faded</li> </ul>	Maladjusted BRIGHTNESS pot or subnormal picture tube emission	<ol style="list-style-type: none"> <li>Watch Color Bars screen. Adjust BRIGHTNESS and CONTRAST pots for greatest number of grays. You'll find these pots on Monitor Remote Control Board, behind coin door.</li> <li>If pots have no effect, have service bureau rejuvenate picture tube.</li> </ol>
<ul style="list-style-type: none"> <li>Picture is too narrow</li> </ul>	Maladjusted WIDTH pot	Enter Monitor Patterns Menu. Watch Crosshatch Screen while adjusting WIDTH pot for best picture. You'll find this pot on Monitor Remote Control Board, behind coin door.
<ul style="list-style-type: none"> <li>Picture is too short</li> </ul>	Maladjusted HEIGHT pot or damaged vertical circuit	<ol style="list-style-type: none"> <li>Enter Monitor Patterns Menu. Watch Crosshatch Screen while adjusting HEIGHT pot for best picture. You'll find this pot on Monitor Remote Control Board, behind coin door.</li> <li>If pot has no effect, service vertical output circuit.</li> </ol>
<ul style="list-style-type: none"> <li>Picture seems shifted to one side</li> </ul>	Maladjusted HORIZONTAL POSITION pot	Enter Monitor Patterns Menu. Watch Crosshatch Screen while adjusting HORIZONTAL POSITION pot for best picture. You'll find this pot on Monitor Remote Control Board, behind coin door.
<ul style="list-style-type: none"> <li>Keystone-shaped picture</li> </ul>	Shorted turns in yoke	<ol style="list-style-type: none"> <li>Substitute working yoke.</li> <li>Have service bureau converge monitor.</li> <li>Retest monitor.</li> </ol>

## Software Update Troubleshooting Table

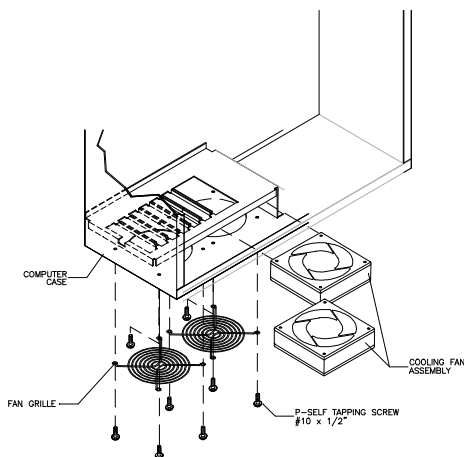
SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>Update didn't work</li> <li>After update procedure, screen reports lower than latest version</li> </ul>	You skipped steps or performed them out of sequence.	Return update components to kit, reinstall original parts in cabinet, and try process again.
	You connected linked VGMs ( <i>video game machines</i> ) to cabinet being updated.	<ol style="list-style-type: none"> <li>Network communication circuits may have prevented full update. Turn off power to all connected cabinets.</li> <li>Perform update on one cabinet at time. If power is off, you need not disconnect linking cables.</li> </ol>
	Installation error may have damaged device.	<ol style="list-style-type: none"> <li>Inspect for bent or broken pins.</li> <li>If you have another kit, try it.</li> <li>Ask your distributor to check your floppy disk.</li> </ol>



**NOTICE:** Someday, software updates for your VGM (*video game machine*) might become available. These upgrades may improve your VGM's performance or add new VGM features. Such upgrades tend to appear sometime after factory first releases VGM. Contact your distributor for information about updates.

# Miscellaneous Problem Troubleshooting Table

SYMPTOM	CAUSE	REQUIRED ACTION
<ul style="list-style-type: none"> <li>Marquee lamp is intermittent or non-functional</li> <li>VGM (<i>video game machine</i>) starts and plays normally</li> </ul>	Faulty fluorescent tube	<ol style="list-style-type: none"> <li>Remove fluorescent tube from its sockets. If you find cracks or darkened ends, install new lamp. Clean tube.</li> <li>Check continuity of both fluorescent tube filaments.</li> <li>Verify that fluorescent tube operates by placing it in working VGM.</li> </ol>
	Faulty lamp fixture	Verify that lamp pins make good connection with socket contacts.
	Faulty wiring	Measure fluorescent lamp AC voltages. Check wiring and connector continuity from AC power chassis to lamp assembly.
<ul style="list-style-type: none"> <li>VGM operates normally</li> <li>Cabinet becomes warm after several hours of use</li> </ul>	Obstructed fan	<ol style="list-style-type: none"> <li>Check bottom and rear of cabinet for blocked airflow.</li> <li>Move VGM away from sources of heat.</li> <li>Turn off VGM power. Remove dust from vent holes with high-power vacuum cleaner.</li> </ol>
	Faulty wiring	Check fan wiring and connectors.
	Faulty fan	Check operation of all fans.
<ul style="list-style-type: none"> <li>Error messages appear on screen</li> </ul>	Faulty hardware	<ol style="list-style-type: none"> <li>Check any assembly (RAM, ROM, Battery, etc.) identified in error messages.</li> <li>Call your authorized distributor for help with unresolved screen messages.</li> </ol>



**Fan Location and Mounting**