



HYDROTHUNDER™

CHAPTER THREE

SERVICE



	NOTICE: The term VGM refers to the video game machine.
	CAUTION: 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 touching the case of the Arcade Computer. Next, connect the line cord to a grounded outlet. Don't turn on the VGM!
- 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.

SERVICING

Only qualified service personnel should repair VGM equipment. The following product guidelines apply to all video game operators and service personnel. Notes, cautions and warnings appear throughout this manual where they apply. Study the *Safety* pages before beginning service.

- **Battery**

	CAUTION: If you install the battery incorrectly, it may explode! Avoid direct shorts across the terminals or from terminals to ground. These batteries are designed for very long life. Don't attempt to recharge these batteries!
	CAUTION: Avoid an explosion! Replacement batteries must match the originals in size, voltage rating, and composition. Manufacturer recommended equivalent types are acceptable. Store batteries in a safe place until you've completed repairs. Dispose of used batteries according to manufacturer instructions.

A battery on the CPU Board retains data in memory during power disruptions. This battery is a 3-volt, lithium button cell of type CR 2032. Switch off power to the game. Unlock and remove the rear door. Remove the back of the Arcade Computer. The battery resides toward the edge of the motherboard, near the daughter board sockets. Carefully pry up the battery retaining lever. Then grasp the battery edges and remove the device. Set the battery aside.

Note the "+" marking on one side of the replacement battery. When you install a battery, this "+" marking must face the battery retaining lever. After replacing the battery, set the system clock to the correct date and time. Also enter the Menu System and check or update system adjustments as necessary.

- **Coin Counter**


Switch off power to the VGM. Unlock the cash door and swing it open. Find the meter at the lower left corner of the vault opening. Record the meter count before testing or replacement.

Locate the meter wires. Disconnect wiring at the connector. Remove two screws from the front bracket. The meter is a 5V D.C. meter. Assure that the replacement meter has a diode across the terminals to protect driver circuits.

- **Coin Mechanism**

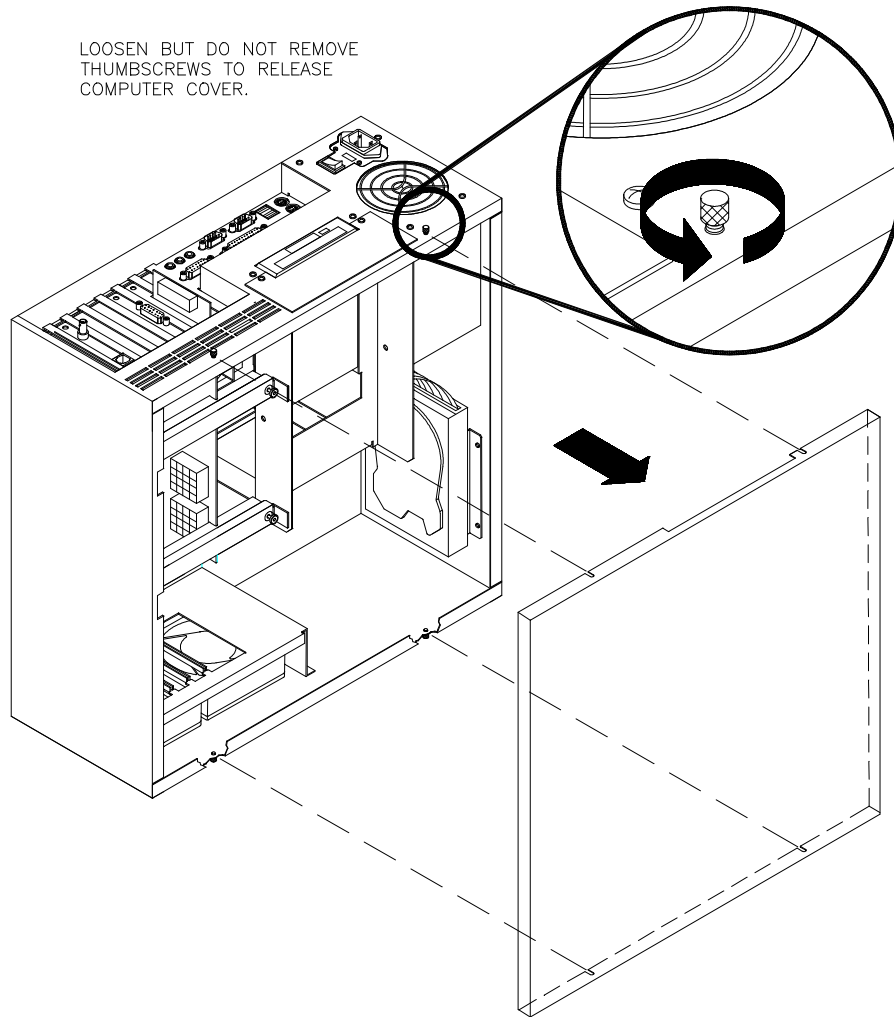
Switch off power to the VGM. Unlock the coin door and swing it open. To clean or replace a coin mechanism, unlatch and remove it. After reinstallation, assure that the mechanism seats fully in its bracket. Close and lock the release latch. Then close the door. Enter the Menu System to change the coin mechanism setup. Test known good and bad coins to verify operation.

- **CPU Board**

	NOTICE: Avoid damage to electronics! Turn off VGM power before servicing circuit boards or any electronic assembly. Never "hot plug" circuit boards.
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The CPU Board is part of the Arcade Computer. Switch off power to the VGM. Open and remove the rear door. The Arcade Computer is behind this door.

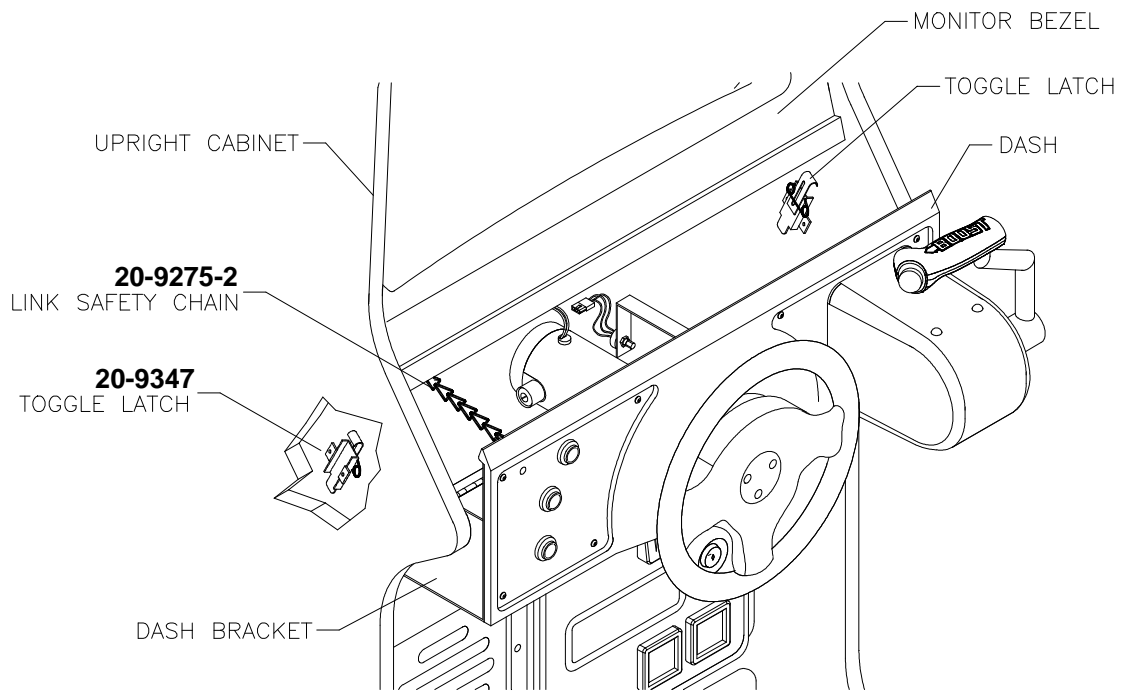
To expose the CPU Board, loosen four metal thumbscrews. Don't remove the screws. These screws reside at the top and bottom corners of the case. Slide off the back of the computer. Disconnect the floppy disk power and data cables at the disk drive. Loosen the drive mounting screws. Lift the floppy drive out of the cabinet. Set it aside for reassembly. Remove the I/O Board brackets.



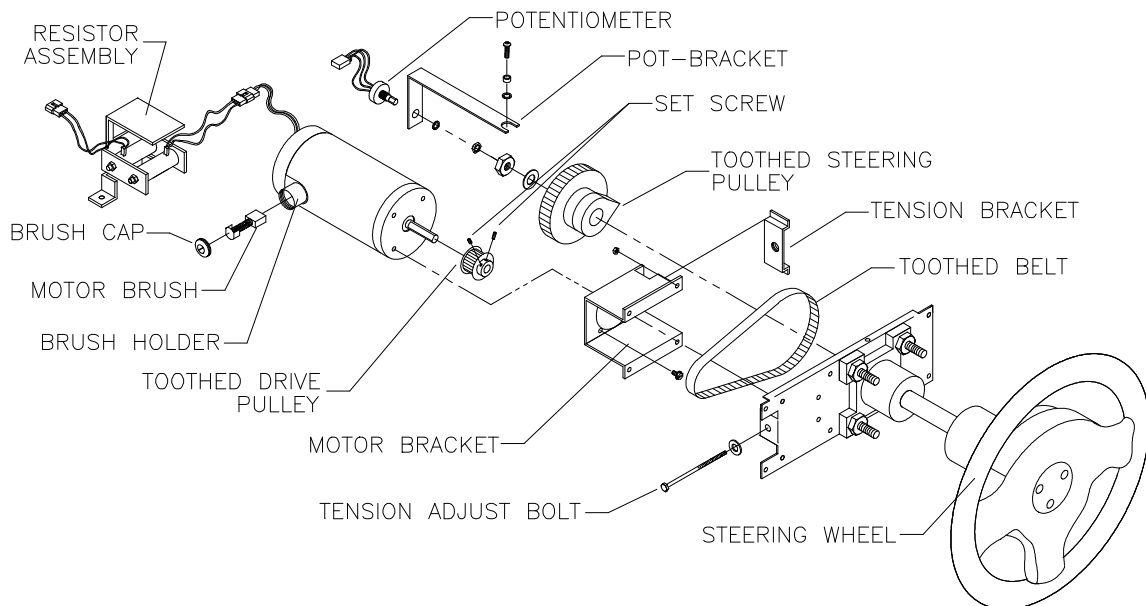
Remove the CPU Board power cables at the CPU Board. Remove the circuit board retention bars. Disconnect the Reset cable from the Filter Board and Motherboard, noting the orientation of the connectors. Remove the Filter Board Assembly, Video Card, and Network Card. Remove the floppy drive mounting bracket. Remove CPU Board mounting screws. Pinch the top of a CPU Board standoff and raise the board off the standoff. Repeat this procedure at the other standoffs. Lift the circuit board out of the cabinet and set it aside for reassembly. Use anti-static packaging from new parts to store boards that you won't reinstall.

- **Dashboard and Steering Mechanism**

Switch off power to the VGM. Remove the control panel bolts on the right and left side of the cabinet. Open the coin door and release the latches on the left and right sides of the control panel. Support the steering wheel and lower the dash. Be sure that you don't pinch cables in the hinge.



Dashboard Assembly



Steering Wheel Assembly

Inspect the motor, pulleys, and belt. If the belt is broken or shows signs of wear, replace it. Locate the two nuts on each side of the motor mounting bracket. Loosen all four bracket nuts. Rotate the tension adjustment bolt as necessary. Tighten this bolt until the belt is taut. Then restore correct tension by loosening the bolt one full turn. Tighten the motor bracket nuts.

- **Wheel Driver Board**

Switch off power to the VGM. Unlock and open the coin door and rear door. Note the orientation of the connector and other cables. Extract the harnesses from the board connectors. Remove mounting screws and washers from the Wheel Driver Board. Lift the board off its mounting posts. Handle the board by a heatsink. If you aren't reinstalling the board, store it in an anti-static bag and protective container.

Dollar Bill Validator

(Use MARS AE2451-U5 UL Recognized currency changer)

Dollar bill validators or other currency acceptors may be installed in VGMs that were manufactured with the additional wiring connector. Switch off power to the VGM and unplug the AC line cord. Unlock the coin door and swing it open. Read the coin door label for additional information.

Remove nuts, spacers, and cover plate from the door. Change switch settings or make adjustments before mounting the unit. If the manufacturer has supplied an adapter plate, place it over the door cutout. Install spacers on threaded studs. Align the validator mounting holes with the studs. Seat the unit in the door opening. Install and tighten the nuts. Attach the ground wire (green with yellow stripe) lug to the door ground stud. The stud is beside the hinge. Mate the wiring harnesses and press them together to fully seat connectors. Route wires away from door edges and hinge. Inspect the bill chute for proper alignment. Set the dollar bill validator to produce long output pulse widths, 1 pulse per dollar, and accept dollar bills only. To remove for service or replacement, reverse these steps.

Plug in the line cord and turn on the VGM. From the Menu System, change the mechanism setup and pricing. Then test known good and bad bills to verify proper operation. Close and lock the coin door.

- **Fans**



Switch off power to the VGM. Remove the cabinet rear door. Remove the back of the Arcade Computer. To remove a fan, disconnect its power harness and remove the fan mounting screws. Note the fan orientation. Each fan has an arrow molded into its plastic case to indicate airflow direction. Be certain to reinstall the fans in the proper direction to assure airflow over circuitry.

- **Throttle Lever**

Switch off power to the VGM. Unlock and open the coin door. Unlatch and lower the dashboard. Remove three tamper-resistant bolts at the base of the lever. Lift off the throttle lever. Careful! Cable remains attached to the lever. To remove throttle assembly, unbolt the assembly cover. Support the assembly, then unbolt it from inside the control panel.

- **Hard Disk Drive**

Switch off power to the game. Unlock and remove the rear door. Remove the back of the Arcade Computer. Disconnect the DC power cable from the hard disk drive. Unplug the ribbon cable from the hard drive but leave it attached to the CPU board. Remove the drive mounting screws. Lift the drive out of the cabinet. Save the mounting screws for reuse in future hard drive installations. When returning a hard drive to your distributor, pack it in an anti-static bag. Box the drive in approved shipping container 08-8068.

	CAUTION: Hard disk drives are very fragile! Handle them with care. Keep disk drives away from magnets, heat and vibration. Don't move a game with the power on.
	CAUTION: Don't stack or drop hard disk drives. Use an anti-static bag and an approved shipping container to return the drive to your distributor.

REINSTALLATION. Before mounting the hard drive in its bracket, install the drive mounting screws. To avoid damage during installation, mount the hard drive in the brackets before connecting cables.

After a driver plays one game, the new drive copies data from other linked VGMs. **Important!** *The data won't copy if players are actively driving. Files transfer only when all VGMs return to Attract Mode.*

- **Audio Amplifier Board**

Switch off power to the VGM. Unlock and open the rear door and the coin door. Note the orientation of the connector and other cables. Extract the harnesses from the board connectors. Remove mounting screws and washers from the Audio Board. Lift the board off its mounting posts. Handle the board by a heatsink. If you aren't reinstalling the board, store it in an anti-static bag and protective container.

- **Diego Interface Board**

Switch off power to the VGM. Unlock and open the rear door. Extract the harnesses from the board connectors. Remove mounting screws and washers from the Diego Board. Remove the Diego Board. Lift the board off its mounting posts. During reinstallation, tighten the screws: Start at the board's center and work toward the outer edge. If you aren't reinstalling the board, store it in an anti-static bag and protective container.

- **Speakers**

Switch off power to the VGM. Unbolt and remove the speaker grille from below the marquee. Note the orientation of speaker wires. Unbolt and remove the speakers. To remove subwoofer, unlock and open the rear door. Note the orientation of speaker wires. Unbolt and remove the speaker.



- **Marquee Light Box**

Switch off power to the VGM. Remove the speaker panel screws. Lift off the marquee glass and artwork to expose the interior of the light box.

- **Viewing Glass**

Switch off power to the game. Unlock and open the coin door. Unlatch and lower the dashboard. Remove the glass retaining bracket at the bottom center of the viewing glass. Carefully remove glass and set aside. Clean glass before reinstalling.

- **Monitor**

	<p>WARNING: The video monitor is <i>very heavy</i>, with most of the weight toward the front. Solidly support the monitor as you remove from it from the cabinet.</p>
	<p>WARNING: When operating the monitor outside the cabinet, use an isolation transformer. In normal operation, the monitor doesn't require isolation from AC line voltage.</p>

Switch off power to the VGM. Unlock and open the coin door. Unlatch and lower the dashboard. Remove the viewing glass. Lift out the monitor bezel. Remove the flange nuts that secure the monitor's mounting brackets to its mounting panel. Carefully pull the monitor from the cabinet. Set the monitor in a safe place. Clean the face of the CRT and viewing glass before reinstalling the bezel and viewing glass.

- **Network Interface Board**

Switch off power to the VGM. Unlock and open the rear door. Remove the back of the Arcade Computer. Note the orientation of the cables. Loosen the header-mounting screw. Disconnect the network cables from the board header connectors. Remove the circuit board retention bars. Remove the board. If you aren't reinstalling the board, store it in an anti-static bag and protective container.

- **Video Card**

Switch off power to the VGM. Unlock and open the rear door. Remove the back of the Arcade Computer. Loosen the header-mounting screw. Disconnect the video cable from the board header connector. Remove the circuit board retention bars. Remove the board. If you aren't reinstalling the board, store it in an anti-static bag and protective container.

- **Filter Board**

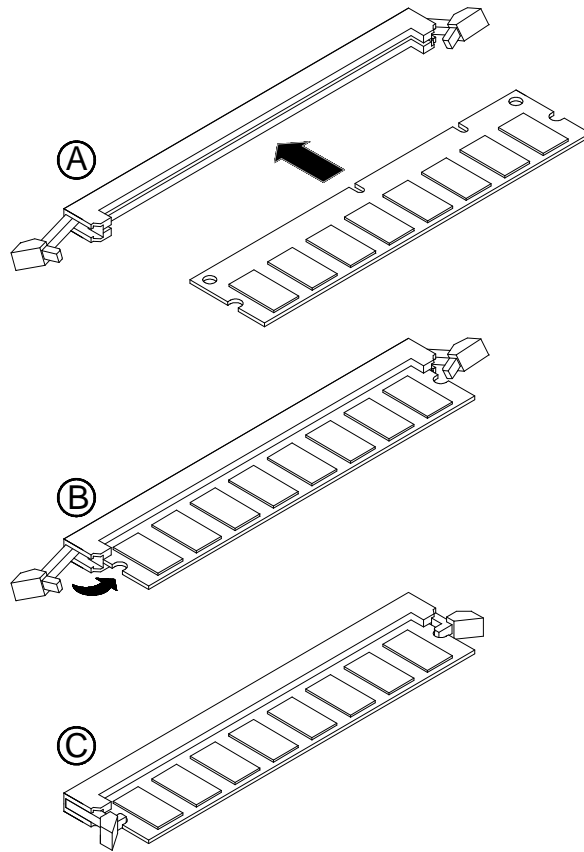
Switch off power to the VGM. Unlock and open the rear door. Remove the back of the Arcade Computer. Note the orientation of the cables. Loosen the header-mounting screw. Disconnect the cables from the board header connectors. Remove the board. If you aren't reinstalling the board, store it in an anti-static bag and protective container.

- **DIMMs (Dual In-line Memory Modules)**



CAUTION: Static electricity builds up on your body. This static can damage or destroy sensitive circuits. *Before* touching or handling electronics, discharge static electricity by touching the power supply chassis.

DIMM circuits contain the computer read-write memory for this game. Switch off power to the game. Remove the cabinet rear door. Remove the back of the Arcade Computer. Unplug the ribbon cable from the floppy drive. Leave the other end of the cable attached to the CPU Board. Unscrew and remove the circuit board retention bars. Remove the floppy drive mounting bracket. Remove the floppy drive. Note DIMM positions. Press out on the locking retainers on each side of the DIMM. The DIMM should partially or completely pop out of its socket. Lift the DIMM from its socket. Handle the DIMM only by its edges.



DIMM Installation

To reinstall memory circuits, hold the DIMM upright over its socket. Make sure the keying holes and notches are in their proper positions. Gently push the DIMM board into the socket, so that the board snaps into place under the locking retainer on each side of the socket. Be sure that the retainers mate tightly with DIMM board notches. *Do not force a DIMM into its socket!*

ARCADE COMPUTER MECHANICAL COMPONENTS

