

# Need for Speed™ Common Repairs

040-0196-01 Rev. A



www.globalvr.com  
http://service.globalvr.com  
techsupport@globalvr.com  
Phone: 408.597.3435  
Fax: 408.597.3437

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## Safety

The following safety instructions apply to all game operators and service personnel. Specific warnings and cautions will be included throughout this manual.

Use the following safety guidelines to help protect the system from potential damage and to ensure your personal safety:

- Electronic components in the game cabinet run on 115 VAC. The voltage switch on the back of the computer must be set to 115. If you power up the computer outside of the cabinet, set the switch to match the local AC voltage:
  - 115 volts / 60Hz in most of North and South America and some Far Eastern countries such as Japan, South Korea and Taiwan
  - 230 volts / 50Hz in most of Europe, the Middle East and the Far East
- To help prevent electric shock, plug the system into a properly grounded power source. These cables are equipped with 3-prong plugs to help ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable. If you must use an extension cable, use a 3-wire cable with properly grounded plugs.
- To help protect your system from sudden increases and decreases in electrical power, use a surge suppressor, line conditioner or Uninterruptible Power Supply (UPS).
- Be sure nothing rests on the system's cables and that the cables are not located where they can be stepped on or tripped over.
- Keep your system far away from radiators and other heat sources.
- Do not block cooling vents.



**CAUTION: GLOBAL VR assumes no liability for any damage or injuries incurred while servicing the cabinet. Only qualified service personnel should perform service and installation of cabinet hardware.**

**To prevent electrostatic discharge (ESD) damage, handle PCBs by the edges only and use a grounding wrist strap or similar precaution.**

**Please read the service instructions before working on the cabinet.**

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**Always turn the cabinet OFF and disconnect the AC power cord before performing any repair work.**

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## Environmental Conditions

Cabinet is intended for indoor use only. Be sure to keep the cabinet dry and maintain operating temperatures of 59°-86° F (15°-30° C).

## Introduction

This document provides maintenance and repair procedures for the driving controls and audio system. For more detailed information, refer to the System Manual or Service and Repair Manual for your specific cabinet.

## Force-Feedback Steering System Repairs

The major components of the force-feedback steering system are listed below. The figures on the next page show the harnessing of the system.

- Steering Wheel
- 5 K $\Omega$  Steering Pot (Potentiometer)
- Force-Feedback PCB(s), one of the following:
  - Dual PCB system with Force-Feedback PCB (Blue Board, part # COEM-6040-245) and Force-Feedback Motor Controller PCB (Green Board, part # COEM-6052), connected with a ribbon cable.
  - Single-PCB system (Part #: 990-0040-01). This single PCB is a direct replacement for the dual PCBs and ribbon cable.
- +24 VDC Power Supply
- Steering Motor

The steering pot sends the steering wheel position to the computer, via the PCB, as the player drives. The computer sends back instructions for controlling the steering motor.

The force-feedback steering system is powered by the +24 VDC power supply. The power supply connects to the PCB, which routes the power to the force-feedback steering motor.



**CAUTION: Do not connect the power supply directly to the steering motor. Doing this will damage the motor and the power supply.**

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# Force-Feedback Steering System Repairs

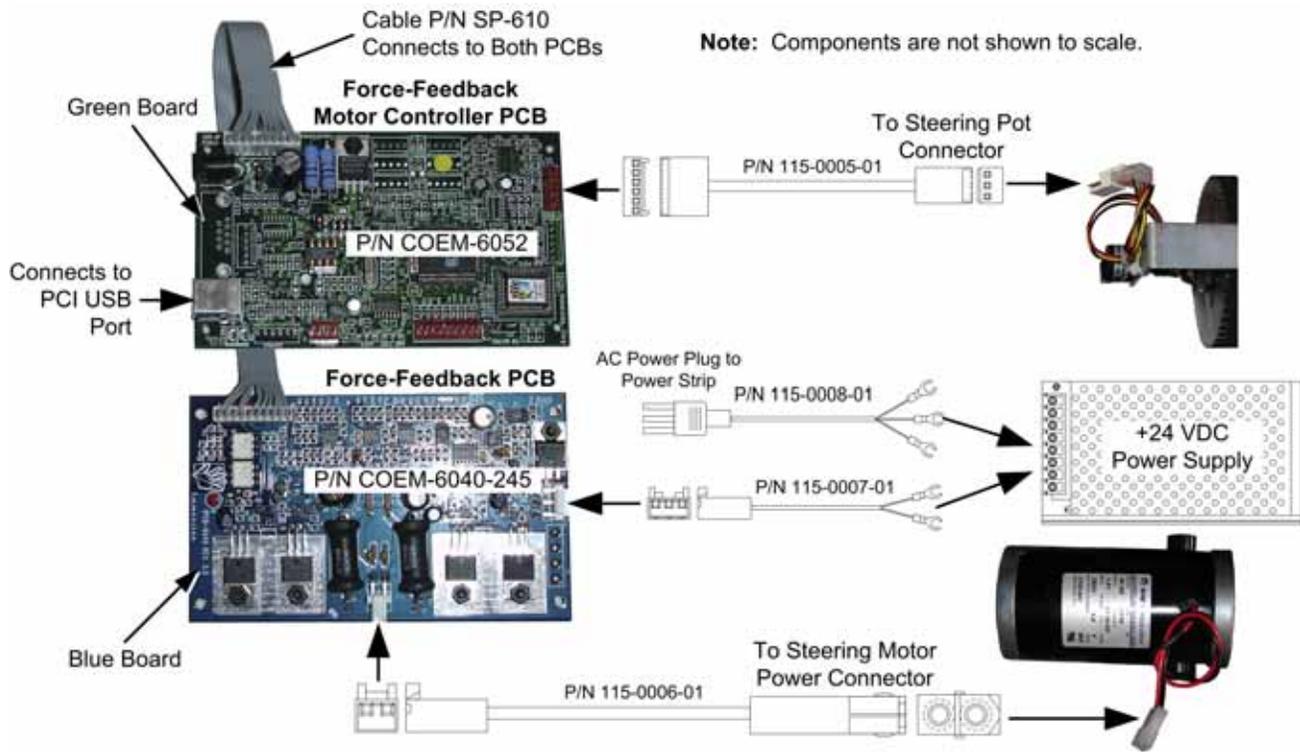


Figure 1. Dual PCB Force-Feedback Steering System

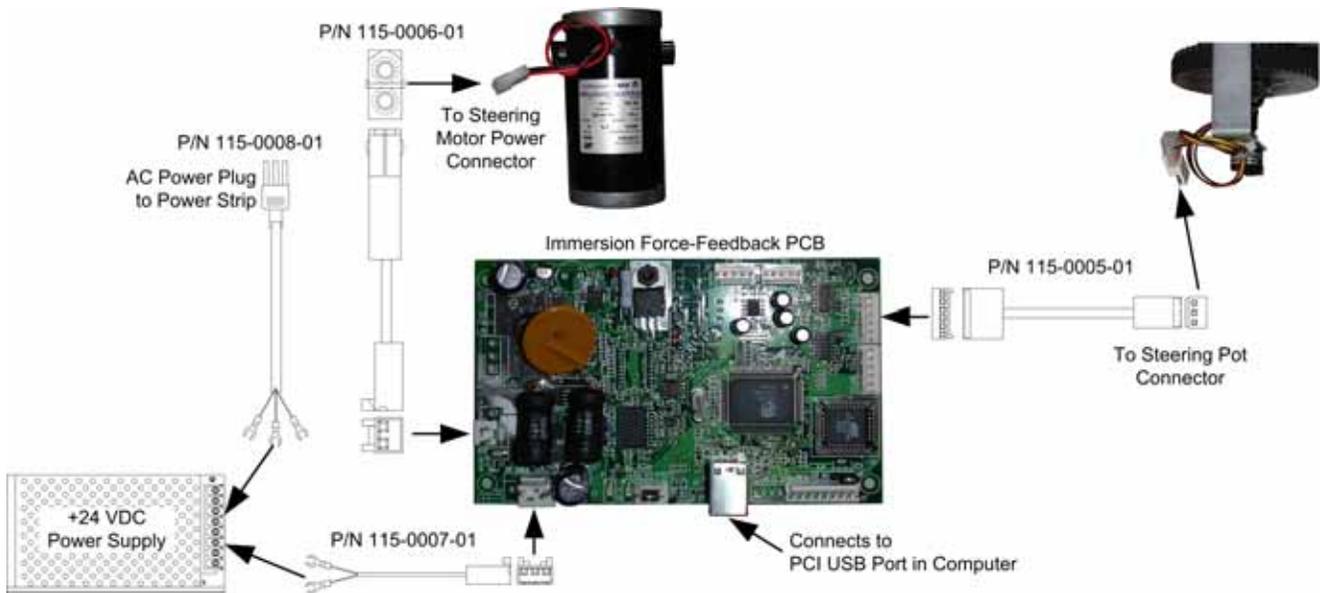


Figure 2. Single PCB Force-Feedback Steering System

**Note:** The Single and Dual PCB systems are interchangeable as replacement parts. The Single PCB system went into production on later Need for Speed™ Underground systems.

## ESD Shock Protection for Dual PCB Systems

In some locations, players tend to generate high levels of static electricity that can knock out the force-feedback steering. The figure below illustrates how to add additional ESD protection to prevent steering failure in high-static environments. (This fix applies to dual-PCB systems only.)

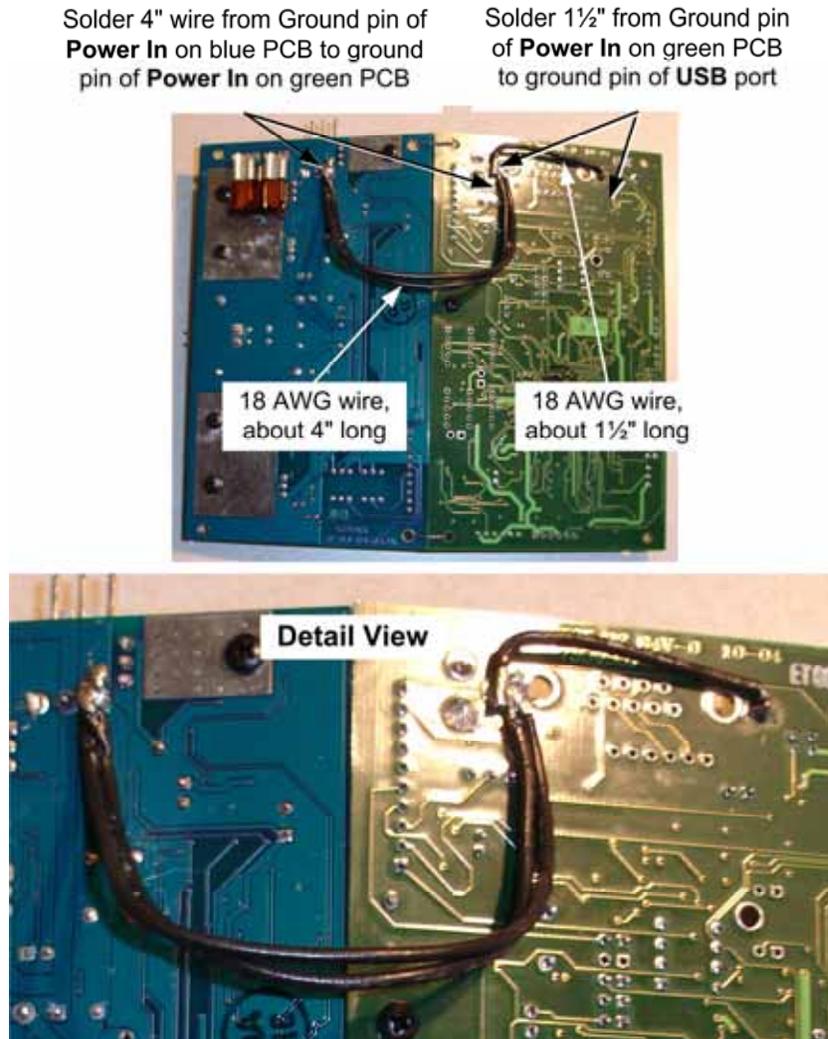


Figure 3. Adding a Ground Wire for ESD Protection

## 5 K $\Omega$ Steering Pot (Potentiometer) Replacement

You can test the steering pot from the Operator Menu. While turning the wheel, the change in the numbers displayed onscreen should be smooth and linear, with no jumps.

You can also power off the game and test resistance at the pot. While turning the wheel, you should see a steady linear increase or decrease in resistance, with no jumps.

To replace a pot, refer to Figure 4 and perform the following steps:

1. Using a 7/64 Allen wrench, loosen the set screw from the steering column and remove the bracket with the 5 K $\Omega$  steering pot attached.
2. Using a 1/2-inch wrench, remove the nut and lock washer from the bracket and remove the pot.

3. Reverse these steps to install the new pot. Install the pot with the plastic pin through the small hole in the bracket, as shown in Figure 4 below. Make sure the set screw is against the flat part of the shaft. Tighten the set screw firmly with an Allen wrench and secure with blue Loctite<sup>®</sup>.
4. Calibrate the steering from the Operator Menu after replacing the pot.

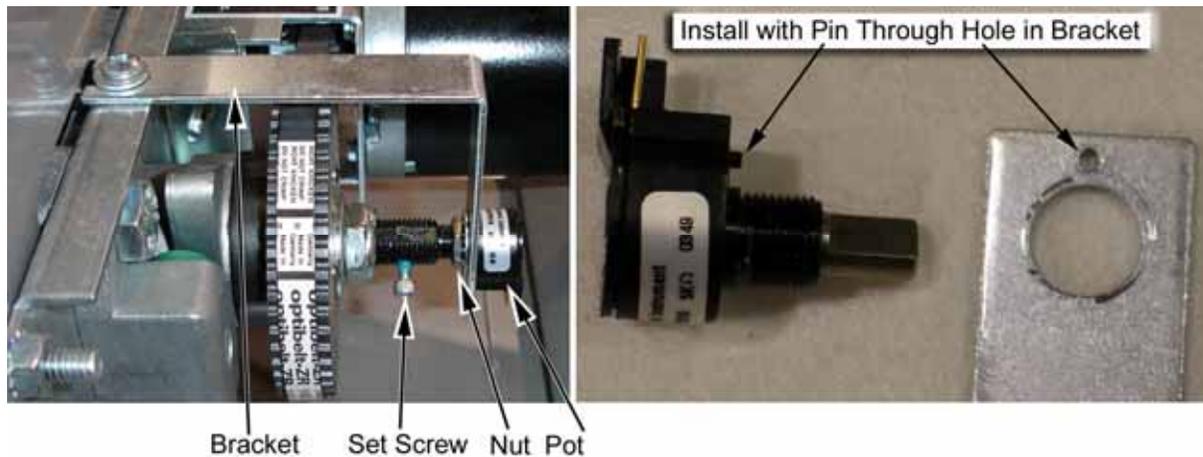


Figure 4. Replacing the 5 K $\Omega$  Steering Pot

### Force-Feedback Belt, Gear or Motor Replacement

Refer to Figure 4 above, and Figure 5 below, and perform the following steps to remove the force-feedback belt for repair. Always replace the belt if it looks cracked or worn.

Inspect the belt and the gears, and if any teeth are missing or worn, replace the component. Make sure the motor gear lines up perfectly with the steering gear to prevent damage to the belt and the gears.

1. Using a 7/64 Allen wrench, loosen the set screw from the steering column and remove the bracket with the pot attached (see Figure 4).
2. Using a 10mm socket wrench, loosen the belt tension adjustment bolt several turns until you can slip the belt off of the motor and steering gears (see Figure 5).
3. Loosen the four (4) 3/8" motor mount Kep nuts that secure the steering motor to the frame (see Figure 5).
4. To replace the motor, remove the four (4) 3/8" Kep nuts that you loosened in step 2, and remove the motor.
5. Reverse these steps to re-install the motor and belt. When installing the belt, tighten the tension adjustment bolt until the belt is fully stretched, and then loosen the bolt by 1/2 turn. Make sure the motor gear lines up perfectly with the steering gear to avoid damaging the belt and the gears. Tighten all set screws firmly with an Allen wrench and secure with blue Loctite.
6. Calibrate the steering from the Operator Menu after servicing the belt or motor.

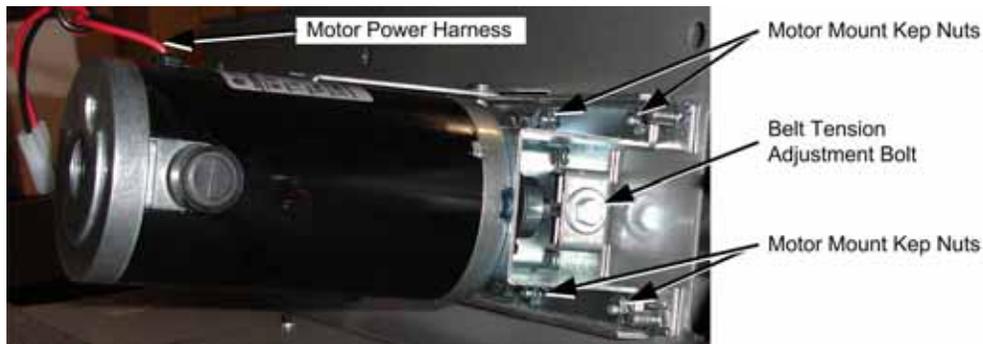


Figure 5. Servicing the Steering motor

## Force-Feedback PCB Replacement



**CAUTION:** To prevent electrostatic discharge (ESD) damage, handle PCBs by the edges only and use a grounding wrist strap or similar precaution.

If the steering pulls to one side, this could indicate a bad force-feedback motor controller PCB. Use the following steps to replace one or both force-feedback PCBs.

**Important:** Part #: 990-0040-01 is a single-PCB system that replaces **both** COEM-6052 and COEM-6040-245.

1. Disconnect the cabinet from AC power.
2. Disconnect all cables from the PCB.
3. Remove the four screws that secure the PCB to the cabinet.
4. Reverse these steps to install the new PCB.
5. Calibrate all analog inputs from the Operator Menu after replacing the PCBs.

## Control Panel Button Service

Refer to Figure 6 and perform the following steps to replace the button bulbs or micro switches:

1. Disconnect the cabinet from AC power.
2. Open the driving control panel assembly (or, to replace the E-brake button, remove the shifter assembly from the housing as described on page 9).

**Note:** Make sure the steering pot cable has enough slack that it doesn't get pulled and broken when the panel opens.

3. To remove a micro switch, gently rock it to the side and remove it from the housing. Remove the wires and install them on the same connectors on the new micro switch.
4. To replace a bulb, gently rock the white plastic bulb housing from side to side to pop it out of the button housing.
5. The buttons are lit with 5-volt C555 bulbs. To remove a bulb, pull it straight out of the housing.



**CAUTION:** Do not connect the 5-volt lamp power wire to the micro switch. Doing so can damage the USB I/O card in the computer.

- When connecting the wiring to the micro switch and bulb, refer to the labels on the wires to make sure the connections are correct.

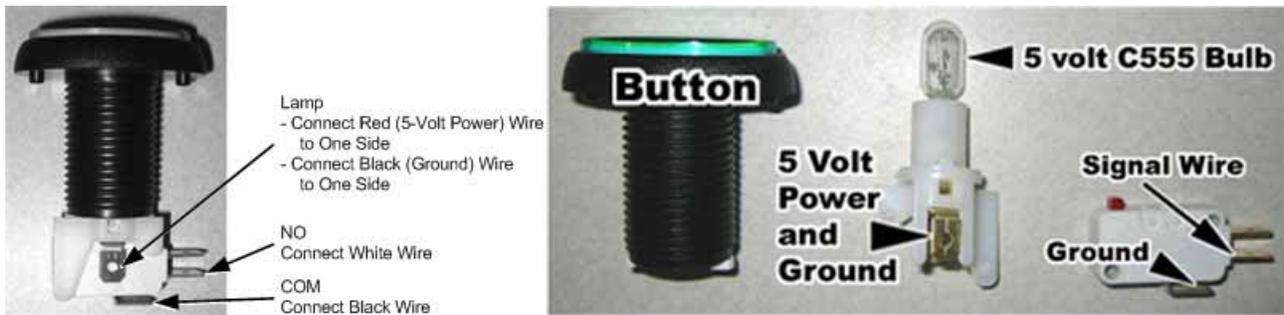


Figure 6. Button Assembly

## Pedal Assembly Service

Perform the following steps to remove the pedal assembly. It is removed and installed as one unit.

- From inside the cabinet, disconnect the pedal cable assembly connector.
- Remove the four (4) 1/4-20H Torx Security Pedal Assembly Mounting Bolts, shown by the arrows in the picture below.
- Pull the pedal assembly towards the seat to remove.

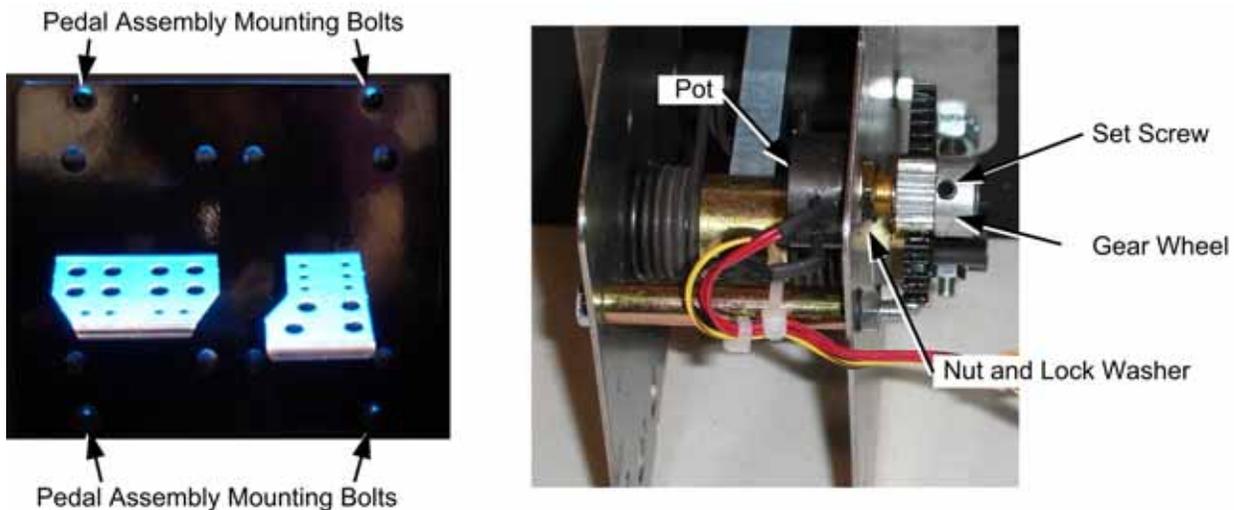


Figure 7. Pedal Assembly Details

## 5 K $\Omega$ Gas and Brake Pot (Potentiometer) Replacement

You can test a pot from the Operator Menu. When you press and release the pedals, you should see a steady increase or decrease in the numbers displayed onscreen, with no jumps. None of the values displayed should read zero (0) or 255; if they do you need to adjust the pot.

You can also power off the game and test resistance at the pot. When you press and release the pedals, you should see a steady linear increase or decrease in resistance, with no jumps.

To replace a pot, refer to Figure 7 above and perform the following steps:

1. Using a 7/64 Allen wrench, loosen the set screw from the gear wheel and remove the gear wheel, as shown in Figure 7.
2. Using a 1/2" wrench, remove the nut and lock washer that secure the pot to the frame.
3. Install the new pot with the same orientation. Make sure that the plastic keys on the pot match with the metal.
4. Re-install the lock washer and nut, being careful not to over-tighten.
5. Re-install the gear wheel. Make sure the set screw is against the flat part of the shaft. Tighten the set screw firmly with an Allen wrench and secure with blue Loctite.
6. Calibrate all analog inputs from the Operator Menu after replacing the pot.

## **Six-Speed Shifter Replacement**

Perform the following steps to remove the shifter from the seat for replacement or repair.

1. Remove the four (4) T-10H Security Torx screws from the top of the shifter assembly and carefully pull the shifter up out of the housing.
2. Disconnect the Molex connector from the shifter.
3. Reverse these steps to re-install the shifter. Make sure that none of the shifter wires are pulled or pinched in the housing, and there is some slack in the wires so they are not pulled as you shift.

## **Six-Speed Shifter Micro Switch Service**

The shifter uses four miniature micro switches to relay the shifter position to the computer. Figure 8 shows micro switch placement, and which micro switches are actuated for each gear. By using the chart, you can determine which switch may be faulty. For example, if gears 1 and 2 stop working, the problem is probably with the Left micro switch.

**Note:** In Need for Speed™ Underground, the Controls screen in the Operator Menu also displays which micro switches are actuated as you shift through the gears.

## Six-Speed Shifter Replacement

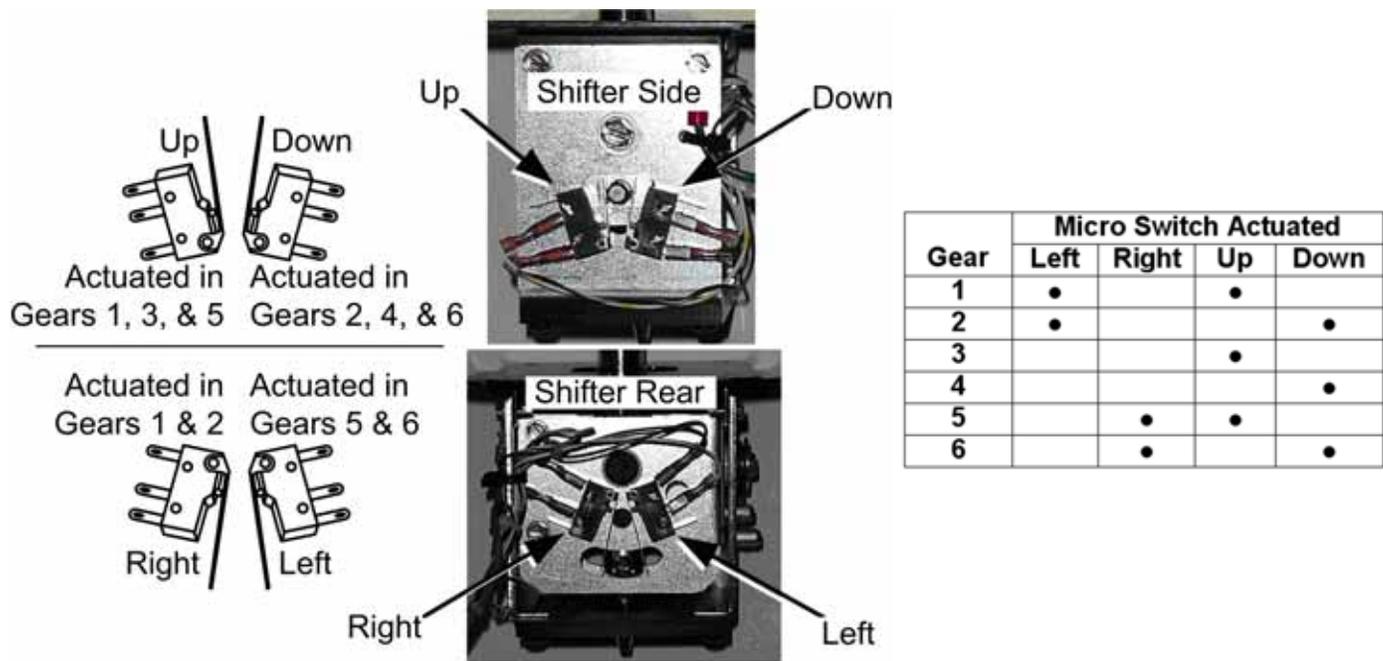


Figure 8. Six-Speed Shifter Gears and Micro Switch Actuation

Perform the following steps to replace a micro switch:

1. Remove the shifter assembly from the housing as described on page 9.
2. Disconnect the two wires from the micro switch.
3. Remove the two screws that secure the micro switch to the shifter and remove the switch.
4. Reverse these steps to install the new micro switch.

**Note:** Make sure there is some slack in the wires so they are not pulled as you shift.

### Six-Speed Shifter Spring Replacement

If the shifter does not stay in gear, the spring has probably broken and should be replaced:

1. Remove the shifter assembly from the housing as described on page 9.
2. Make a note of how the components are assembled, and then remove the E-Ring and Screw shown in Figure 9, and remove the spring and flat washers.
3. Reverse the disassembly steps to re-assemble the shifter.

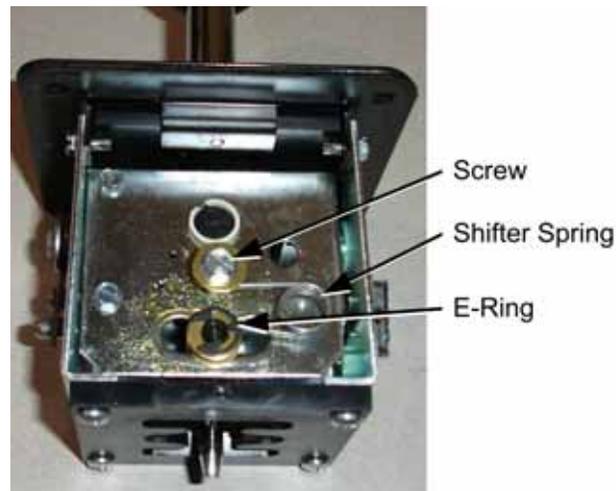


Figure 9. Six-Speed Shifter Spring Replacement

## Audio Amp and Speakers Service

The u5.1 audio amp supports 6-channel 5.1 Surround Sound. The audio amp PCB is powered by the +5/+12 volt DC power supply through a standard PC power connector. A fuse is installed on the PCB to help prevent electrical damage to the PCB.

The volume level for each channel on the audio amp can be manually adjusted using a small screwdriver to turn the Adjustment Pots, shown in Figure 10. For best results, turn each pot counterclockwise to turn the volume levels all the way down. Next, turn each pot 1/5 of a turn clockwise to bring the audio levels up. You can fine-tune the sound levels for your location from this point.

The figure below illustrates audio wiring and speaker locations.

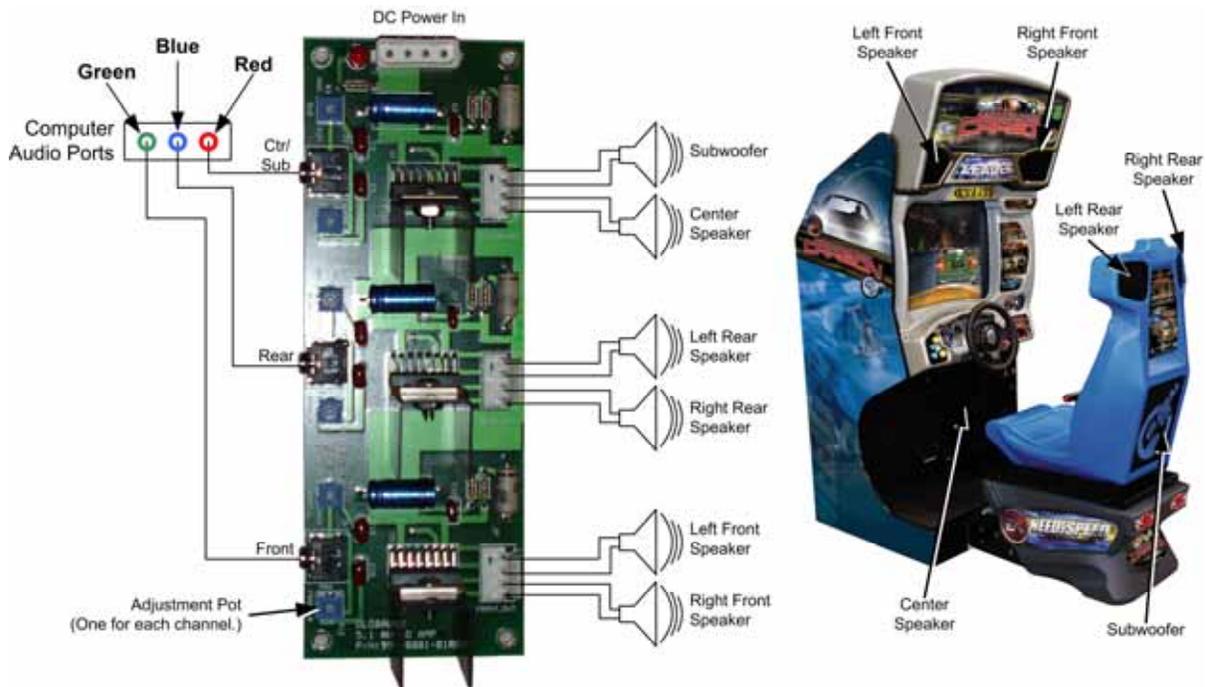


Figure 10. Audio Wiring and Speaker Locations