

# How to Fix Ground Loop Issues

*Today's Presenter: Aaron Offringa*



# Meet VR



# What is a Ground Loop?

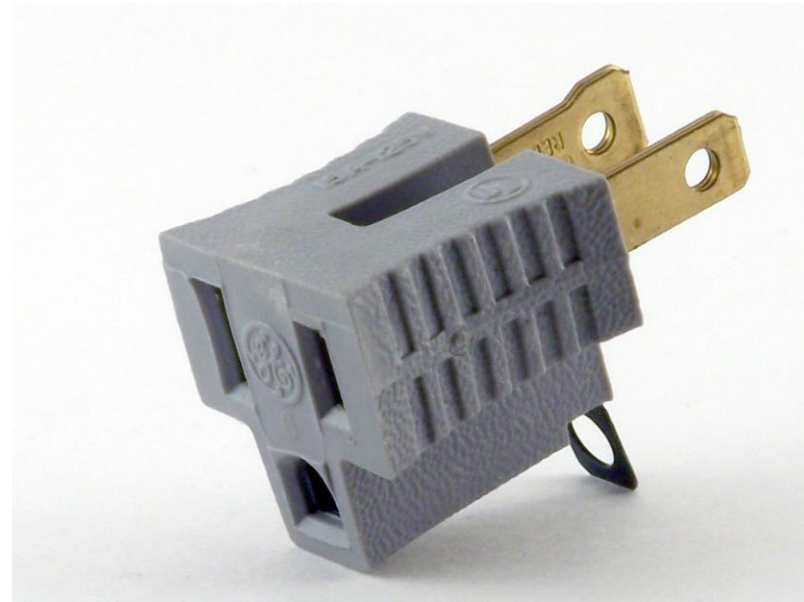
- A ground loop occurs when two (or more) pieces of equipment are connect to a ground through two or more paths. This causes a “Mains Hum” and will cause an audible buzz at the base frequency (50/60Hz) and all of its harmonics. (120Hz, 180Hz.....etc)
- Noise can also be created by shaker systems emitting an electro-magnetic interference signal. (EMI)

# How to Fix Ground Loop Issues

- Check Controller (Baseline)
- Check Sensor (Noise Floor of Sensor)
- Check Amplifier (Checking integrity of amplifier)
- Check Shaker (Blower isolation or servo hydraulic pumps)
  
- Connecting complete system.

# How to Fix Ground Loop Issues

- If you can't plug your controller into the courtesy outlet on the amplifier you have the option of ripping off the ground on your power cable or use a cheater plug like the one pictured.



# How to Fix Ground Loop Issues

- Power down the amplifier, blower, and any hydraulic pumps.
- Disconnect the drive cable between the controller and the amplifier.
- Disconnect the accelerometers from the controller.
- Turn off Accelerometer Power in VibrationVIEW, but keep the accelerometer sensitivity set. This will ensure all noise comparisons are done at the same level.

# How to Fix Ground Loop Issues

- Switch to system check mode. Set the sample rate to 32768 and the number of lines to 32768. This will give .5 Hz resolution out to 16 kHz.
- Bring up a waveform graph and a spectrum graph
- Terminate the controller inputs (short the Input pin to the Input shell either with a 50-75 Ohm BNC Terminator or jumper). This will give you the base noise floor of the controller.
- Save a data file called 'base noise floor'
- Make a copy of the traces on the waveform and spectrum graphs



# How to Fix Ground Loop Issues Amplifier Off

- Connect the accelerometers to the controller and turn on accel power if needed.
- Mount the accelerometers on the shaker. Use an isolation base or some other means to guarantee there is no electrical connection between the accelerometer and the shaker. Some accelerometers have a thin, anodized layer that is easy to scratch off.



# How to Fix Ground Loop Issues Amplifier Off

- Save a data file called 'accelerometers connected'
- Compare the signal levels to the base noise floor traces.
- Sources of noise can include
  - The base noise floor of the accelerometer
  - Emitted interference from other equipment picked up by the accelerometer cable
  - Vibration on the shaker. Either coming through the floor or through the air.

# How to Fix Ground Loop Issues Servo hydraulic

- Make a copy of the traces on the waveform and spectrum graphs
- Power on any hydraulic pumps (If applicable)
- Compare the signal level to the 'accelerometers connected'
- Save a data file called 'hydraulic pump on' (If applicable)
- Make a copy of the traces on the waveform and spectrum graphs



# How to Fix Ground Loop Issues Blower

- Power on any blower
- Compare the signal level to the 'accelerometers connected'
- Save a Data file called 'blower on'
- Make a copy of the traces on the waveform and spectrum graphs
- Power on the field to the shaker
- Save a data file called 'field on'
- Make a copy of the traces on the waveform and spectrum graphs

# How to Fix Ground Loop Issues Blower

- Sources of noise can include:
- If the field is not stable, the armature can vibrate.
- Emitted interference (EMI) from the field that is picked up by the accelerometer cable.
- To tell the difference between the two, the following steps can be taken: See Next page

# How to Fix Ground Loop Issues Blower

- Feel the shaker head to see if it is vibrating
- Disconnect the accelerometer from the shaker head but keep the cable in the same location.
- Short the accelerometer shell to the ground screw on the back of the VR9500 unit. If the source is emitted interference from other equipment , this will reduce it. If this is the case, there are jumpers that can be installed to bypass the protective fuse and short the shell to ground. Contact Vibration Research for details.

# How to Fix Ground Loop Issues Amplifier

- Put a terminator on the input for the amplifier (Where the controller's drive is usually connected to)
- Power on the amplifier
- Turn the gain all the way down to reset.
- Save a data file called 'Amp on gain reset'



# How to Fix Ground Loop Issues Amplifier

- Make a copy of the traces on the waveform and spectrum graphs
- Turn the gain all the way up to 100%
- Save a data file called 'Amp on gain 100%'
- Any noise generated at this stage comes solely from the amplifier. Contact the amplifier manufacturer for further guidance.

# How to Fix Ground Loop Issues Complete System

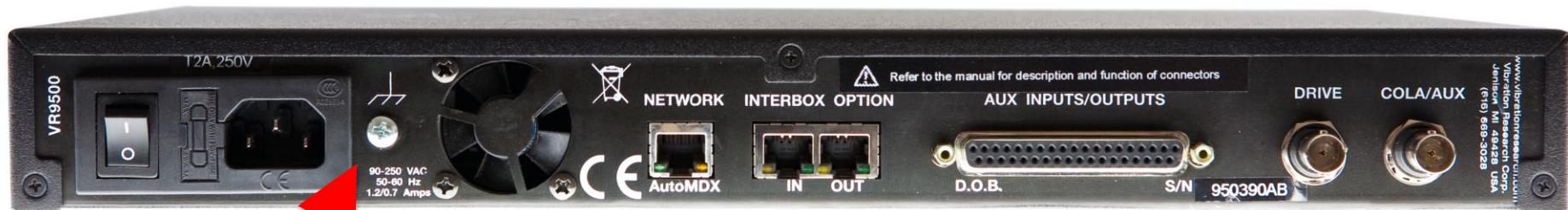
- Make a copy of the traces on the waveform and spectrum graphs.
- Turn the amplifier gain down to reset
- Connect the drive of the controller to the input of the amplifier
- Turn the gain up to 100%
- Save a data file called 'Controller connected'
- Sources of noise include:
  - A ground loop between the controller and the amplifier
  - Amplifier emissions picked up by the accelerometer cable



# How to Fix Ground Loop Issues Complete System

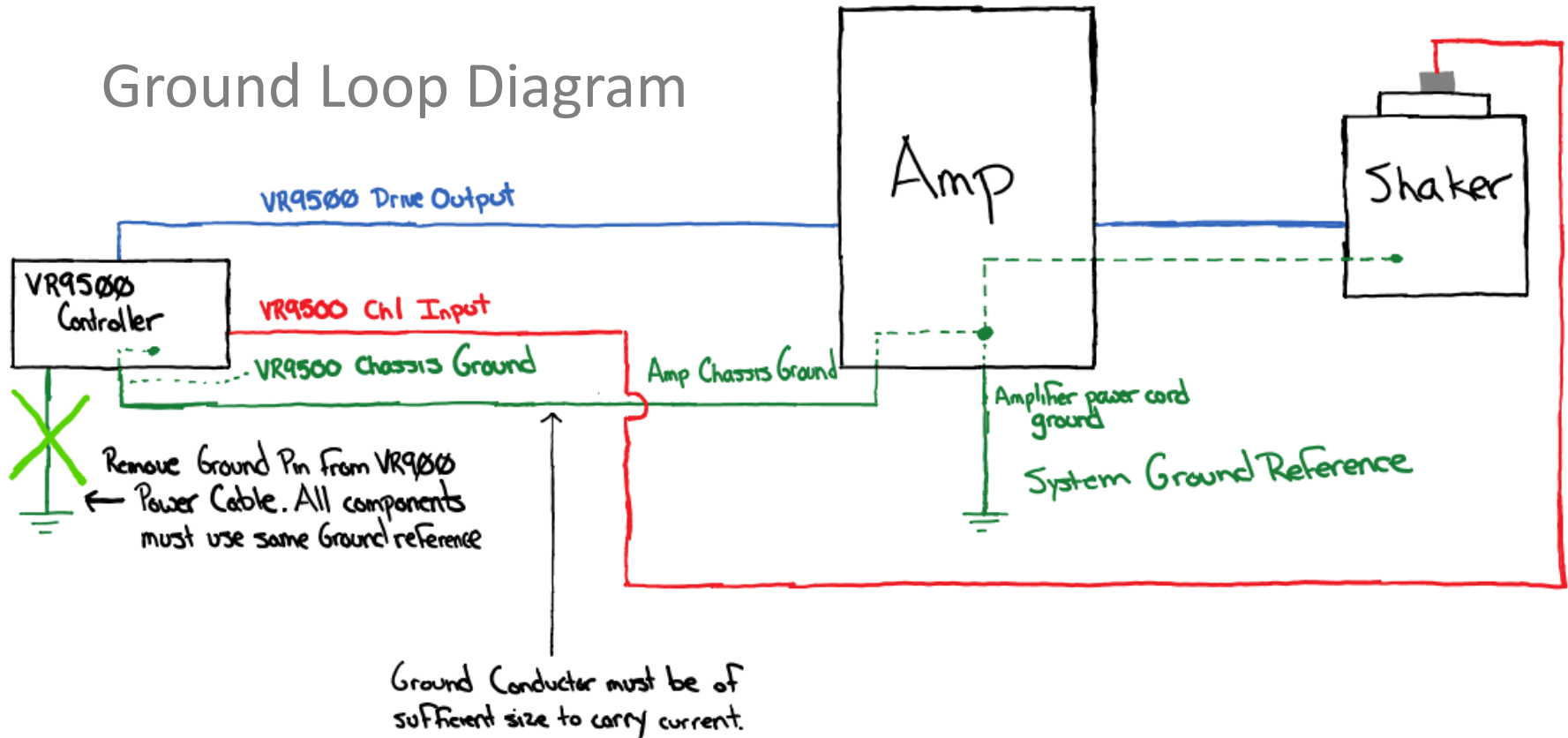
- The most likely cause of noise is a ground loop between the controller and the amplifier. The following steps can be taken to remove this ground loop.
  - Power the controller from the outlet on the amplifier provided for controller.
  - Power the controller and the amplifier from the same outlet
  - Remove the ground pin from the controller power cable and connect the ground screw on the VR9500 to an appropriate ground point on the amplifier.
  - If the amplifier has differential inputs, use the differential output adapter cable and differential output mode on the VR9500.

# How to Fix Ground Loop Issues



# How to Fix Ground Loop Issues

Ground Loop Diagram



# How to Fix Ground Loop Issues

- Website registration
  - Go to <http://www.vibrationresearch.com/forums/register.php?do=signup>
  - In the sign up form, please do not include “HTTPS” in your company’s website

# Thank You for Attending!

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