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tech tips

Testing Audio Amplifiers With The PA81 Stereo Power Amplifier Analyzer™

One area of audio servicing that many shops are having troubles with is proving amplifier performance at higher power levels. To determine the maximum useable RMS output power, you must know at what output level distortion or clipping starts. In this Tech Tip, you will read how to use the PA81 STEREO POWER AMPLIFIER ANALYZER for a full power amplifier performance test.

High Power Failures

Audio amplifiers can develop many failures. Some failures may only be noticeable when the amplifier is run at its full output power. These include: DC offset or balance, clipping, distortion, or protection circuit trip. The following section is a brief summary of each failure. Plus we've included tips that will help you recognize the most common symptoms:

DC offset or balance:

If the amplifier has a DC offset or balance problem, (Figure 1) you may see clipping on either the positive or the negative peak of a sinewave before the opposite peak clips. If the amplifier was working properly, you would see clipping equally on both the positive and negative peaks. Clipping distortion produces a raspy (squarewave) sounding audio.(Figure 2)

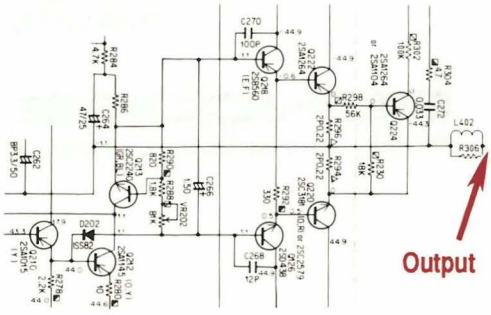

Fig. 1: The output of an amplifier should have very little DCV on it. Some amps use a push pull output stage while others may use a capacitor coupled output.

DC offset or balance problems may also cause an excessive DC voltage on the output. This type of problem can be noticed when listening to the speaker when power is first applied. You may notice a thump as the DC voltage is run through the speaker coils. This DC can damage the speaker. The output devices of the amplifier can also be damaged resulting from unequal current flow causing one of the push pull devices to overheat and burn out.

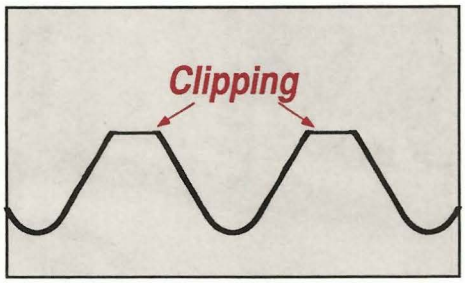

Fig. 2: Clipping on a sinewave causes a raspy (squarewave) sound from the speaker.

Clipping:

Clipping on a sinewave can occur when you overdrive an amplifier, and one of the peaks of the signal reaches the maximum level and starts to flatten out. This type of problem can easily be noticed by supplying a sinewave to the input of the amplifier and monitoring the output with an oscilloscope. A transistor biasing problem, component failure in the power supplies, or a defective driver stage can cause clipping.

Protection circuit trip:

Most modern stereo power amplifiers use some form of protection circuit to help protect both the amp and the speakers (Figure 3). Some protection circuits monitor the DC voltage on the output, others use a thermal sensing circuit to protect the amp from overheating. Some amplifiers may even use both methods. By monitoring the output, you can tell what the amplifier was doing prior to shutdown to help find the problem.

Open Load Testing Of An Amplifier

Many manufacturers recommend that an open load test be done immediately after major servicing has been done on the amplifier. This helps assure that extensive damage will not be caused by excessive current being drawn through the outputs. The PA81 STEREO POWER AMPLIFIER ANALYZER provides an OPEN load setting on the IHF DUMMY LOADS control for doing this test (Figure 4).

You should supply a 1 kHz sinewave input signal to the amplifier and monitor the speaker outputs with an oscilloscope as the input level is

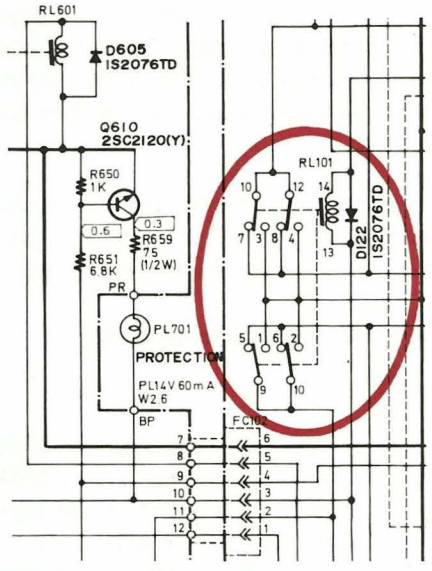

Fig. 3: Many high-power amplifiers use a protection relay to remove the load from the output transistors when a failure occurs.

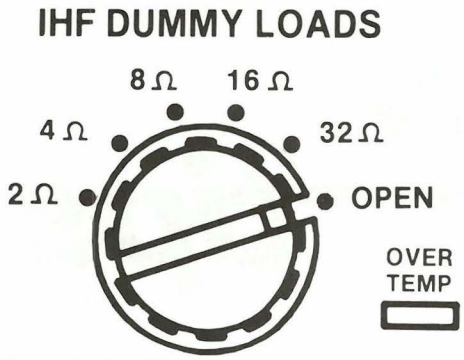

Fig. 4: Set the IHF DUMMY LOADS control to the OPEN position for open load testing of an amplifier.

increased. The output waveform should be clean and free from distortion until the input level is set to produce normal clipping. At that point, the output should not have any oscillations or ringing.

To "open-load-test" a power amplifier with the PA81 STEREO POWER AMPLIFIER ANALYZER:

1. Connect the output speaker terminals of the power amplifier to the 250W IHF DUMMY LOADS inputs of the PA81.

2. Set the IHF DUMMY LOADS control to the OPEN position. Set both RANGE switches in the AUTO position.

3. Connect the TO CH A SCOPE INPUT and the TO CH B SCOPE INPUT to a dual channel oscilloscope.

4. Apply power to the amplifier, and increase the 1 kHz sinewave input level until clipping or distortion is seen on the scope. The output wave should look identical in shape to the input and clip at both peaks at the same time for both channels.

If everything tests normal, turn the amplifier power to minimum and add the proper loads to the output to test the amplifier under load.

Use The PA81 For High-Power Testing

For 500 or 5000 watt operation, place the 250W DUMMY LOADS in parallel. Set the IHF DUMMY LOADS to the value that when paralleled equals the output impedance of the amplifier. (ex. 16 ohms in parallel with 16 ohms equals 8 ohms) Add the RMS power displayed on both meters to find the total output power.

You can measure 2500 watts RMS per channel (5000 watts if paralleled) with an optional dummy load accessory. Contact your Area Sales Engineer for information on this accessory **(1-800-SENCORE).**

Volume control: Listen to the quality of the amplifier's reproduced audio on two separate built-in speakers.

DC Balance: Monitors the DC voltage at the output of the amplifier, and opens the loads whenever the level is greater than 1 volt DC. The indicator LED tells you which channel caused the trip.

IHF Input Filters: Choose the band of frequencies that are to be measured. Use the BAND PASS 200Hz-15KHz position to remove the low frequency hum and high frequencies such as the FM stereo pilot (19 kHz).

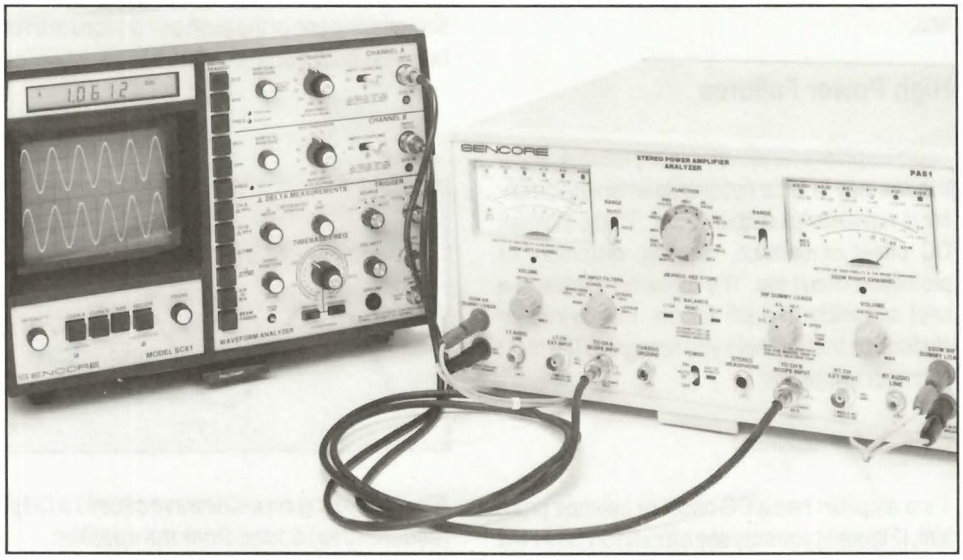

Fig. 5: Use the PA81 STEREO POWER AMPLIFIER ANALYZER and an oscilloscope to test the output of an amplifier at full power.

To CH A Scope Input And To CH B Scope Input:

Use these jacks for monitoring distortion and clipping with your oscilloscope. These outputs are also used when monitoring the amplifier's output for distortion when doing the open load testing.

To test audio amplifiers under load with the PA81.

1. Connect the power amplifier speaker outputs to the PA81's 250W IHF DUMMY LOADS inputs.

2. Set the PA81's IHF DUMMY LOADS selector switch to match the output impedance of the amplifier.

3. Connect the PA81's scope outputs to a dual channel scope's inputs, to monitor crossover and clipping distortion.

4. Set the PA81's FUNCTION switch to the IHF DUMMY LOADS RMS WATTS positon.

5. Set the IHF INPUT FILTERS switch to the BAND PASS 200 Hz-15 KHz position.

6. Increase the output level until you notice any distortion on the scope. Read the level on the meters of the PA81 STEREO POWER AMPLIFIER ANALYZER. This is the undistorted RMS power of the amplifier. Compare your results to the published specifications of the amplifier.

For More Information
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