

SMD

Amplifier Dyno

AD-1

Owner's Manual



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The Purposes and Benefits of SMD / D'Amore Engineering Amplifier Dyno AD-1

- Quickly and accurately measure the true RMS power output of a stereo receiver, head unit, automotive audio amplifier, home audio amplifier, or pro audio amplifier in its intended environment.
- Measure Class A, A/B, B, D, G, H type amplifiers
- Locate deficiencies in a automobiles electrical system
- Locate electrical deficiencies in home or venue
- Locate deficiencies in amplifier power and speaker wiring
- Show power gains after improvements to the system are made
- Use to set gains, find crossover points, detect equalization of frequency response and detect distortion

What is Included?

- The Amplifier Dyno (AD-1)
- Calibrated Test Tone CD
- 12V Power Harness
- (2) Dual Banana Jack to Bare Wire Adapters
- Mono Mode Jumper
- This Manual
- The Truth

About the Design

The AD-1 was created as a tool that would provide someone who is not an electrical engineer the ability to accurately and reliably test an audio amplifier's true output power.

The AD-1 was designed such that it can be used on a test bench for a fixed installation, or on a mobile test cart for In-Vehicle testing. The unit operates from a 9 - 26 Volt DC supply, that can provide up to 3 Amps of current. In this way, when testing automotive amplifiers, the AD-1 can power itself from the same power supply that feeds the amplifier. This allows the user to measure a automotive audio amplifier in the vehicle.

When used to test home or pro audio amplifiers, the AD-1 should be powered from a small DC supply which meets the requirements listed in the specifications.

In vehicle measurement makes it very easy to find deficiencies in the automobile's electrical system. These deficiencies (battery, wiring to amplifier, wiring to speakers, fusing, distribution, and alternator) can be located and corrected allowing the AD-1 to illustrate the exact gain in power that was made by correcting said deficiencies.

If the AD-1 is going to be used on a test bench to test automotive type amplifiers, you will need a 12V power supply that can provide the maximum current that the amplifier will consume. A good rule of thumb is 100A per 1000W of amplifier power for a Class D amplifier or 100A per 800W of amplifier power for a Class A/B, B, G or H amplifier.

About the Design (cont.)

The AD-1 can measure a single-ended output or differential (BTL, bridged) output amplifier. The AD-1 can measure 2 channels at a time in Stereo Mode into 7 different impedances (8, 4, 2.7, 2, 1.6, 1.3, 1.0 ohms resistive). In Mono Mode it can measure 1 channel into 7 different impedances (4, 2, 1.3, 1.0, 0.8, 0.6, 0.5 ohms resistive). Purely resistive loads were chosen as these place the highest demand on the amplifier. Inductive and capacitive reactive loads are usually used by an engineer during the design phase of an amplifier to test the amplifier for stability in the design only.

The load bank design of the AD-1 is based on components used on light rail systems and bullet trains as the brakes for the train! They can handle high temperatures and repeated use and should provide many years of service. The temperature of the load bank is continuously monitored by the on board computer. The computer will employ the cooling fans if necessary and if for any reason the load bank overheats the computer will pause operation of the AD-1 until the load bank temperature is safe. It is normal for the sides and bottom of the AD-1 to get hot during use. **DO NOT BLOCK THE VENTS, THE FANS, OR REMOVE THE FEET.** This is imperative for the AD-1 to operate safely.

Measurement of power is accomplished via the onboard computer, balanced instrumentation amplifiers, high speed analog to digital converters, and our patented analog distortion detection system (DD-1).

Specifications

Power Requirements: 9.0 V_{DC} - 26 V_{DC}, 3 A

Maximum AC Input Voltage on Front Panel Inputs:
140 V_{RMS} (200 V_{PEAK}), each channel

Power Handling in Stereo Mode *:

2,500 Watts X 2 into 8 ohms
5,000 Watts X 2 into 4 ohms
5,000 Watts X 2 into 2.7 ohms
6,000 Watts X 2 into 2 ohms
7,500 Watts X 2 into 1.6 ohms
9,000 Watts X 2 into 1.3 ohms
12,000 Watts X 2 into 1.0 ohm

Power Handling in Mono Mode *:

5,000 Watts X 1 into 4 ohms
10,000 Watts X 1 into 2 ohms
10,000 Watts X 1 into 1.3 ohms
15,000 Watts X 1 into 1.0 ohm
15,000 Watts X 1 into 0.8 ohms
18,000 Watts X 1 into 0.6 ohms
24,000 Watts X 1 into 0.5 ohms

* Must use included test tracks as these are time based power limits.

Using Certified Dyno Mode

A Certified Dyno run will increase the amplifier's output power until more than 1% harmonic distortion appears on the output. The AD-1 will only read power that was made while the distortion was less than 1%. If you have a noisy or dirty amplifier or noisy system this test may not work well for you. You will know if you have this problem because the wattage displayed will not increase steadily, it may increase in big increments or not increase at all. Additionally the distortion LED will be illuminating. In this case you should find and correct the distortion problem with the audio system, or use the Uncertified Dyno Mode. The B+ voltage that is displayed on the screen corresponds to the B+ voltage at the amplifier at the exact moment that the last highest clean power reading was taken.

Note: The amplifier's gain must be set such that it has at least 5dB of gain overlap, and the source volume must be set so that it will not distort with a 0dB track. These can be setup using our DD-1 tool if you own one, or you can use the built in DD-1+ feature of the AD-1. See the DD-1+ section for instructions on setting up the gain structure of a system using the built in DD-1+.

1. Connect the AD-1 power input harness to the B+ and Ground terminals AT THE AMPLIFIER'S POWER INPUT. (if measuring a home or pro audio amplifier connect them to a 12V supply which meets the requirements listed in the specifications section)
2. Switch the power on via the power switch on the front panel of the AD-1

Using Certified Dyno Mode (cont.)

3. Connect the amplifier's speaker outputs to the inputs on the AD-1. Polarity is not important.
4. Insert the test CD into the source unit connected to the amplifier. (can also use test tracks ripped to mp3 or other high quality digital formats and played from portable media device)
5. Cue up track 4 for low frequency amplifier testing or track 9 for full range amplifier testing. Start track and **pause** it.
6. Set volume of source unit to maximum undistorted level.
7. Select Certified Dyno Mode on the main menu.
8. Select Mono or 2ch mode. If using mono mode be sure to connect the mono mode jumper (included).
9. Select load impedance for dyno run
10. Select START DYNO and **unpause** the track. (The track contains 5 seconds of silence followed by the 10 second dyno sweep, followed by 5 minutes of silence so the operator has time to record the measurement and stop the track).
11. The AD-1 will display the true maximum RMS power per channel that was produced with less than 1% harmonic distortion, and the corresponding B+ voltage for the measurement.

Using Uncertified Dyno Mode

A Uncertified Dyno run will increase the amplifier's output power until clipping of the output signal is reached. The B+ voltage that is displayed on the screen corresponds to the B+ voltage at the amplifier at the exact moment that the last highest clean power reading was taken.

Note: The amplifier's gain must be set such that it has at least 5dB of gain overlap, and the source volume must be set so that it will not distort with a 0dB track. These can be setup using our DD-1 tool if you own one, or you can use the built in DD-1+ feature of the AD-1. See the DD-1+ section for instructions on setting up the gain structure of a system using the built in DD-1+.

1. Connect the AD-1 power input harness to the B+ and Ground terminals AT THE AMPLIFIER'S POWER INPUT. (if measuring a home or pro audio amplifier connect them to a 12V supply which meets the requirements listed in the specifications section)
2. Switch the power on via the power switch on the front panel of the AD-1
3. Connect the amplifier's speaker outputs to the inputs on the AD-1. Polarity is not important.
4. Insert the test CD into the source unit connected to the amplifier. (can also use test tracks ripped to mp3 or other high quality digital formats and played from portable media device)

Using Uncertified Dyno Mode (cont.)

5. Cue up the track that corresponds to the frequency you wish to test the amplifier at. Any track from 3 - 11 may be used.

Track 3 = 25Hz	Track 4 = 40Hz	Track 5 = 63Hz
Track 6 = 100Hz	Track 7 = 250Hz	Track 8 = 500Hz
Track 9 = 1kHz	Track 10 = 4kHz	Track 11 = 10kHz

Start track and **pause** it.

6. Set volume of source unit to maximum undistorted level.

7. Select Uncertified Dyno Mode on the main menu.

8. Select Mono or 2ch mode. If using mono mode be sure to connect the mono mode jumper (included).

9. Select load impedance for dyno run

10. Select START DYNO and **unpause** the track. (The track contains 5 seconds of silence followed by the 10 second dyno sweep, followed by 5 minutes of silence so the operator has time to record the measurement and stop the track).

11. The AD-1 will display the true maximum RMS power per channel that was produced right before clipping of the signal occurs, and the corresponding B+ voltage for the measurement.

Using Dynamic Power Mode

A Dynamic Power Run will send a burst sine wave signal through the amplifier to measure the amplifier's ability to produce the dynamic peaks contained in music. The AD-1 will read the highest clean power that was produced during a burst. The B+ voltage that is displayed on the screen corresponds to the B+ voltage at the amplifier at the exact moment that the last highest power reading was taken.

Note: The amplifier's gain must be set such that it has at least 5dB of gain overlap, and the source volume must be set so that it will not distort with a 0dB track. These can be setup using our DD-1 tool if you own one, or you can use the built in DD-1+ feature of the AD-1. See the DD-1+ section for instructions on setting up the gain structure of a system using the built in DD-1+.

1. Connect the AD-1 power input harness to the B+ and Ground terminals AT THE AMPLIFIER'S POWER INPUT. (if measuring a home or pro audio amplifier connect them to a 12V supply which meets the requirements listed in the specifications section)
2. Switch the power on via the power switch on the front panel of the AD-1
3. Connect the amplifier's speaker outputs to the inputs on the AD-1. Polarity is not important.

Using Dynamic Power Mode (cont.)

4. Insert the test CD into the source unit connected to the amplifier. (can also use test tracks ripped to mp3 or other high quality digital formats and played from portable media device)

5. Cue up track 1 for low frequency amplifier testing or track 2 for full range amplifier testing. Start track and **pause** it.

6. Set volume of source unit to maximum undistorted level.

7. Select Certified Dyno Mode on the main menu.

8. Select Mono or 2ch mode. If using mono mode be sure to connect the mono mode jumper (included).

9. Select load impedance for dyno run

10. Select START DYNO and **unpause** the track. (The track contains 5 seconds of silence followed by 10 seconds of burst tones, followed by 5 minutes of silence so the operator has time to record the measurement and stop the track).

11. The AD-1 will display the true maximum RMS dynamic power per channel that was produced before clipping of the signal occurs, and the corresponding B+ voltage for the measurement.

Setting System Gain Overlap with built in DD-1s

By using the internal DD-1 distortion detectors of the AD-1, a system's gain structure can be properly set. If you own the SMD / D'Amore Engineering DD-1 tool and are familiar with it you can use the internal DD-1s that are built into the AD-1 in exactly the same manner. Use your current DD-1 CD and same procedures required with the DD-1.

1. Switch on the power to the AD-1
2. Do not make any selections on the main menu
3. Connect the amplifier's outputs to the AD-1. (Polarity is not important)
4. Follow the same gain setting procedures for our DD-1 tool. (DD-1 manual and CD available on our website on the DD-1 page)

Setting System Gain Overlap with DD-1+ Mode

Unlike our DD-1 tool which enables the user to set gain overlap at 40Hz and 1kHz in 5dB increments, our new DD-1+ technology allows the user to set the gain overlap in a continuously variable manner from 0dB to 15dB of gain overlap.

1. Switch on the power to the AD-1
2. Select DD-1+ on the main menu
3. Connect the amplifier's outputs to the AD-1. (Polarity is not important)
4. Set source volume to minimum, tone controls flat. Set amplifier gain to minimum. Set crossover to bypass or full range if available. (If setting a low frequency amplifier which a crossover that is not defeat-able, set the frequency to the highest numerical setting)
6. Play track 12 for low frequency amplifiers or track 13 for full range amplifiers.
7. Increase source volume until the distortion LED remains illuminated. Then reduce level until the LED goes dark. This is the source unit's maximum undistorted volume setting. (some source units will not distort, even at max volume setting. This is ok, leave it at max volume)

Setting System Gain Overlap with DD-1+ Mode (cont.)

8. Once source unit's maximum undistorted level is found press NEXT.

9. Now increase the amplifier gain until the distortion LED remains brightly illuminated, then press NEXT.

10. Change track to 14 for low frequency amplifiers or track 15 for full range amplifiers. Then press NEXT.

11. Now adjust the gain control on the amplifier until the desired gain overlap is displayed on the AD-1.

12. Select DONE or EXIT when finished.

Meters Mode

Meters mode has many uses, one of them is illustrated below. Basically Meters mode is a 2 channel AC voltmeter that is calibrated in decibels (dB) for audio use. Once understood you will find many other uses for this feature including gain matching, finding crossover points, setting crossover points, testing EQs and so on.

EXAMPLE: Looking at the frequency response of the factory EQ or crossovers in a automotive system

1. Switch on the power to the AD-1
2. Connect the amplifier's outputs to the AD-1 inputs
3. From the main menu select METERS mode.
3. Using a SMD / D'Amore Engineering IM-SG or other sine wave generator plugged into the preamp / headunit AUX in, play a frequency that is in the center of the range in question. Example: For a full range output, inject a 1kHz tone into the AUX input.
4. Adjust the volume until the AD-1 reads around 10dB
5. Press the RELATIVE button. This will set this frequency and level as the 0dB REFERENCE.
6. Now without adjusting the volume, sweep the frequency up or down on the IM-SG or signal generator while observing the reading on the AD-1.
Congratulations, you have just built a spectrum analyzer!

Troubleshooting:

Problem:

Solution:

Problem:

Solution:

Problem:

Solution:

Problem:

Solution:

Track list on AD-1 CD:

Track Number	Contents	Duration
1	40 Hz Burst	5:15
2	1 kHz Burst	5:15
3	25 Hz Slide	5:15
4	40 Hz Slide	5:15
5	63 Hz Slide	5:15
6	100 Hz Slide	5:15
7	250 Hz Slide	5:15
8	500 Hz Slide	5:15
9	1 kHz Slide	5:15
10	4 kHz Slide	5:15
11	10 kHz Slide	5:15
12	40 Hz DD-1+ Reference	5:00
13	1 kHz DD-1+ Reference	5:00
14	40 DD-1+ Overlap	5:00
15	1 kHz DD-1+ Overlap	5:00

Limited Warranty

D'Amore Engineering warrants this product to be free of defects in materials and workmanship for a period of one year.

This warranty is not transferrable and applies only to the original purchaser from an authorized D'Amore Engineering dealer. Should service be necessary under this warranty for any reason due to manufacturing defect or malfunction, D'Amore Engineering will (at its discretion) repair or replace the defective product with new or remanufactured product at no charge. Damage caused by the following is not covered under warranty: accident, misuse, abuse, product modification or neglect, unauthorized repair attempts, misrepresentations by the seller. This warranty does not cover incidental or consequential damages. Cosmetic damage due to accident or normal wear and tear is not covered under warranty. **Warranty is void if the product's serial number has been removed or defaced.**

Any applicable implied warranties are limited in duration to the period of one year beginning with the date of the original purchase. No warranties shall apply to this product thereafter. Some states do not allow limitations on implied warranties; therefore these exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

If you need service on your D'Amore Engineering product:

All warranty returns should be sent to D'Amore Engineering accompanied by proof of purchase (a copy of the original sales receipt). Warranty expiration on products returned without proof of purchase will be determined from the manufacturing date code. Non-defective items received will be returned COD. Customer is responsible for shipping charges and insurance in sending the product to D'Amore Engineering. Shipping damage on returns is not covered under warranty.

**To obtain service worldwide please e-mail
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Warranty@DAmoreEngineering.com**

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