

SMD

Distortion Detector

DD-1+

Owner's Manual



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The purpose of the DD-1+ Distortion Detector.

The purpose of this tool is to enable the user to set the gain of an audio amplifier to match the source unit's output level, quickly and accurately.

Proper gain overlap setting of a system ensures that no matter how high the volume of the headunit is, the user cannot excessively overdrive the system and cause damage to the amplifier or speakers.

Proper gain overlap setting also ensures the end user is getting everything possible out of his/her system while minimizing unwanted noise. The DD-1+ can also be useful for detecting distortion in the audio signal caused by poorly designed or malfunctioning audio equipment.

If you are familiar with our original DD-1 tool, the new / additional features of the DD-1+ are:

1. Fully variable gain overlap setting from 0.0dB to 15.0dB
2. Ability to check the gain overlap setting of an amplifier without making adjustments to it. (Great for checking a customer's system if it returns for warranty reasons or a tune up) Also a great way to sell a tune up.
3. Input voltage capacity raised to 200Vrms (40,000 W into 1 ohm)
4. RMS AC voltmeter built in for reference

What is included?

- The Distortion Detector (DD-1+)
- Protective silicon rubber boot
- Calibrated Test tone CD
- Harness
- This manual
- Pride of ownership

About the design

When you pick up the DD-1+, know that you are holding a precision piece of equipment. If treated as such it should provide you with many years of reliable service. We have chosen a 9V battery as a power source for a few reasons:

- They are readily available
- Isolating the DD-1+ from the vehicle's electrical system for power, guarantees that it will only measure what it is supposed to measure; distortion in the audio signal, not noise in the charging system

We chose an RCA input because:

- It makes it pretty easy to measure the output of a headunit directly, if you choose to do so
- Should the harness become damaged it is easily replaceable or repairable in the field

Specifications

Everyone hides these in the back of the book. We are proud of our specs, so we are put them up front.

- The distortion detection circuitry is 100% analog, digital microprocessing system used for display and calculation of overlap
- Distortion Detection trigger level > 1.0% Harmonic Distortion
- 3 stage autoranging for wide range of input signal from 1Vrms – 200Vrms. (40,000 Watts at 1 ohm)
- Auto-shut off timer 8 - 10 minutes after ON button is pressed
- Battery self-test and display of condition when DD-1+ is initialized

Power requirements

Pull the silicon rubber boot off of the unit by starting at one end and pulling off towards the other end. On the back side you will see the battery compartment. Slide battery compartment cover off towards bottom end of unit to reveal the 9V battery compartment. Insert a fresh 9V battery, make sure the wires are routed around the battery. (If they are under or on top of the battery the door may not close properly) You are ready to go. **Do not run this unit off of any power source other than a 9V battery. Wall adapters are electrically noisy, as are vehicle electrical systems.**

Measuring a headunit only

1. This procedure will determine where the maximum unclipped volume setting of the headunit is. This is accomplished by setting the bass, treble to zero; and any EQs and crossovers in the headunit to flat. Later, when you set the amplifier gain(s); you can reset these to where you feel the customer will set them, or where you will set them for your own system.
2. Next you need to connect the DD-1+ to the headunit's outputs. Just plug the RCA outputs into the RCA input of the DD-1+. If you are using speaker level outputs from the headunit, use the included harness. Red to speaker (+) and Black to speaker (-).
3. Play track 1 on test CD, turn the volume control up until you see the 40Hz Detect displayed.
4. Continue turning up the headunit and you should see the voltmeter begin to measure the signal (**the headunit needs to be able to output at least 900mV to register on the display**).
5. Slowly continue turning up the headunit until the Distortion LED illuminates, then turn headunit down slowly until it goes out. Note the volume setting.
6. Next change the track to track 2. Repeat the steps 3-5 above using the 1kHz signal.
7. Now take the noted maximum volume settings from the 40Hz test and the 1kHz test and average them. This is your maximum undistorted volume setting for the headunit. (Some headunits will not distort even at maximum volume, this is a good thing.)

Finding a headunit's max clean volume setting through an amplifier (recommended method to find maximum clean headunit volume)

1. This procedure will determine where the maximum unclipped volume setting of the headunit is. This is accomplished by setting the bass, treble to zero; and any EQs and crossovers in the headunit to flat. Later, when you set the amplifier gain(s); you can reset these to where you feel the customer will set them, or where you will set them for your own system. This time we are going to use the amplifier to boost the signal of the headunit. The DD-1+ can measure the headunit's distortion THROUGH the amplifier!
2. With the headunit connected to the amplifier, connect the DD-1+ input to one of the amplifier outputs using the included harness. **Red to speaker (+) and Black to speaker (-).**
3. Turn the gain of the amplifier to its minimum position
4. Set crossover switch to Flat. (Note if this is a subwoofer amplifier and there is no crossover switch to set to flat, turn the crossover frequency to the highest frequency setting).
5. Play track 1 on test CD, turn the volume control up until you see 40Hz Detect displayed.
6. Continue turning up the headunit and you should see the voltmeter begin to measure the signal (**the signal needs to at least 900mV to register on the display**).
7. Slowly continue turning up the headunit until the Distortion LED illuminates, then turn headunit down slowly until it goes out. Note the volume setting.

8. If you have a full range amplifier, change to track 2. Repeat the steps 3-5 above using the 1kHz signal.

9. Now take the noted maximum volume settings from the 40Hz test and the 1kHz test and average them. This is your maximum undistorted volume setting for the headunit.

Setting the gain overlap of a full range amplifier

1. This procedure should only be done AFTER you have ensured the headunit puts out a clean undistorted signal, AND you know where the maximum undistorted volume setting is.
2. Turn the gain setting of the amplifier to minimum
3. Set crossover to full range / all pass/ bypass
4. Disconnect all speakers connected to the amplifier. (This has already been calculated into the equation and provides 1-2 dB more gain overlap on unregulated power supply amplifiers and 0dB more gain overlap on regulated power supply amplifiers).
5. Using included harness, connect DD-1+ to output of amplifier. Connect the red harness lead to the Left Speaker (+) terminal, connect the black to speaker (-) terminal.
6. Play track 2 on test CD
7. Set the headunit's bass, treble, EQ's, crossovers to flat
8. Set the headunit's volume to the maximum undistorted volume setting that was measured with the DD-1+ previously (page 7)
9. 1kHz Detect should be displayed along with the voltage reading of the signal.

10. Slowly turn up the amplifier's gain setting until the Distortion LED illuminates continuously. **Leave Gain Setting such that Distortion LED remains on, then PRESS "READ" button.**
11. Change track to 4 on test CD, DD-1+ will show current gain overlap setting.
12. Adjust the gain control on the amplifier until the desired gain overlap setting is achieved.
13. You are now finished with the gain setting of this amplifier. Now disconnect the DD-1+, connect the speakers to the amplifier, and set the crossover to the desired position. See *Where do I set my crossovers section* if you need help with this.
14. Congratulations, you have just set the gain like a Pro.

Setting the gain overlap of a subwoofer amplifier

1. This procedure should only be done AFTER you have ensured the headunit puts out a clean undistorted signal, AND you know where the maximum undistorted volume setting is.
2. Turn the gain setting of the amplifier to minimum
3. Turn the crossover frequency control to it's highest frequency setting.
4. If you have an infrasonic filter (sometimes erroneously called *Subsonic filter*) control or switch, set it to it's lowest frequency setting or "off".
5. If you have a "bass boost" switch set it to where you think it will be set when used.
6. If you have a bass boost (EQ) knob or level control knob, set it to where you think it will be set when used.
7. If the system has a remote Bass Level control set it to maximum.
8. Disconnect all speakers connected to the amplifier. (This has already been calculated into the equation and provides 1- 2dB more gain overlap on unregulated power supply amplifiers and 0dB more gain overlap on regulated power supply amplifiers).
9. Using included harness, connect DD-1+ to output of amplifier. Connect the red harness lead to the Speaker (+) terminal, connect the black lead to the Speaker (-) terminal. (Note: if amplifier is bridged or strapped to another amplifier the procedure remains the same. If amplifiers are "linked" then you just need to set the gain on the Master)

10. Play track 1 on test CD
11. Set the headunit's bass, treble, EQ's, crossovers to flat
12. Set the headunit's volume to the maximum undistorted volume setting that was measured with the DD-1+ previously.
13. The unit should display 40Hz Detect, along with the voltage reading of the signal.
14. Slowly turn up the amplifier's gain setting until the Distortion LED illuminates continuously. **Leave Gain Setting such that Distortion LED remains on, then PRESS "READ" button.**
15. Change track to 3 on test CD, DD-1+ will show current gain overlap setting.
16. Adjust the gain control on the amplifier until the desired gain overlap setting is achieved.
17. You are now finished with the gain setting of this amplifier. Now disconnect the DD-1+, connect the speakers to the amplifier, and set the crossover to the desired position. See *Where do I set my crossovers section* if you need help with this.
18. Congratulations, you have just set the gain like a Pro.

Checking the gain overlap setting (without making adjustments)

1. Disconnect speaker wires from amplifier to be checked and connect DD-1+ to amplifier's speaker outputs. Red probe to speaker (+) terminal and Black probe to speaker (-) terminal.
2. Set headunit volume to known max undistorted setting. (if unknown ask customer or unplug RCA from amplifier and connect to DD-1+, following instructions for Measuring Headunit Only on Page 6)
3. Once headunit is set to max undistorted volume, play track 1 if checking subwoofer amplifier or track 2 if checking full range amplifier.
4. DD-1+ should now be showing either 40Hz Detect or 1kHz detect and the Distortion LED should be illuminated. Press the READ button.
5. Change track to 3 for subwoofer amplifier or track 4 for full range amplifier.
6. DD-1+ should now be displaying the current gain overlap setting. This is useful for checking a customer's system after it has left the shop and returned at a later date to ensure that the settings have not been tampered with.
7. If the gain overlap setting needs to be adjusted, it can be done at this point by simply adjusting the gain control of the amplifier.

Troubleshooting:

Problem: The Distortion detected LED is always on even when switching to the overlap setting track.

Solution: Make sure all EQs and Bass, Treble ect. are set to Flat or 0. If problem still exists, headunit may be defective and not able to produce a clean signal. Replace headunit.

Problem: Can't get 40Hz or 1kHz Detect to display

Solution: The headunit may not be able to put out the required 1.0 Vrms to be within the operating range of the DD-1+. See section **Measuring the Headunit Through an Amplifier.**

Problem: The Distortion detected LED is still on

Solution: Make sure amplifier gains are all the way down, if the Distortion detected LED is still on; the amplifier may be defective. Try another source unit, if it doesn't change the problem replace amplifier.

Problem: While setting gains the Distortion detected LED blinks on then off.

Solution: This is not a problem at all, this is an artifact of the DD-1+ distortion detection circuitry being 100% analog and thus REALLY FAST. DD-1+ detects distortion in the signal when the auto ranging circuit is switching ranges, and sometimes any “scratchiness” of the gain control while turning the control will trigger the distortion indicator. When this happens the signal **IS actually** distorted for a few milliseconds. The DD-1+ is capable of measuring such distortions lasting just milliseconds!

One should interpret the distortion LED staying on continuously as the level you are looking for when setting gains.

Problem: The DD-1+ keeps turning off

Solution: The DD-1+ has an auto turn off timer, it will operate for 8-10 minutes after the “ON” button is pressed. This is to prevent it from eating your battery when you forget to turn it off.

Where do I set my crossover frequency?

This could be debated for days, and it really comes down to user preference. Here are some guidelines for the novice as a good place to start. If you hear the full range speakers “popping” or “bottoming out” when you play it at high volumes after using value in the chart below, turn up the crossover frequency until it stops.

Speaker Size	12dB/oct High Pass	24dB/oct High Pass	12dB/oct Low Pass	24dB/oct Low Pass
3 – 4 inches	250Hz	200Hz		
5.25	160Hz	125Hz		
6.5	125Hz	100Hz		
6x9	100Hz	80Hz		
8, 10			100Hz	125Hz
12			80Hz	100Hz
15,18			63Hz	80Hz

Where do I set my infrasonic (subsonic) filter?

Again this is up for debate, here are some starting points for the less experienced.

Speaker Size	Sealed or 4 th order bandpass with 12dB/oct filter	Sealed or 4 th order bandpass with 24dB/oct filter	Ported or 6 th order bandpass with 12dB/oct filter	Ported or 6 th order bandpass with 24dB/oct filter
8	35Hz	30Hz	Just below tuning frequency of port	½ octave below tuning frequency of port
10	30Hz	25Hz		
12	25Hz	20Hz		
15,18	Not needed	Not needed		

Track list on DD-1+ CD:

Track	Title	Duration
1	40Hz -0dB	5 Min
2	1kHz -0dB	5 Min
3	40Hz overlap	5 Min
4	1kHz overlap	5 Min

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
D'Amore Engineering at
Warranty@DAmoreEngineering.com**

D'Amore Engineering
DD-1+ Owner's Manual Rev. 1
2019
Camarillo, California