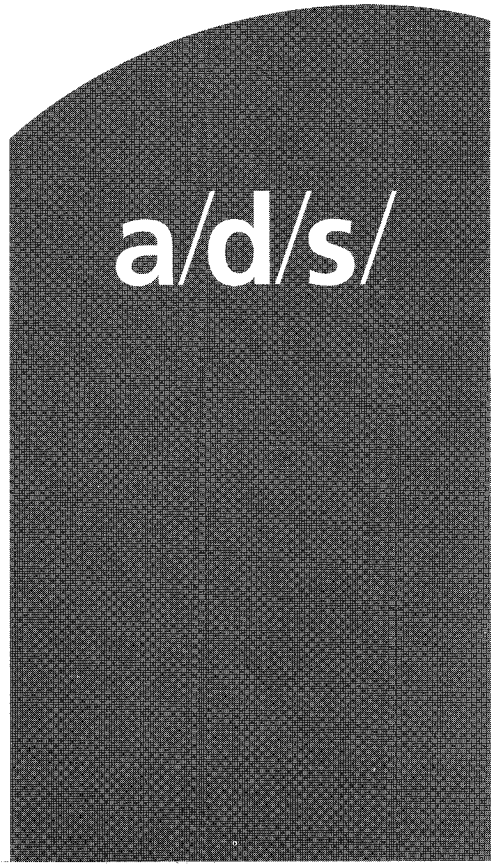
RS8, RS10, and RS12 reference subwoofers information manual



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Introduction

Thank you for selecting an a/d/s/ RS series subwoofer for your car stereo installation. These very low Q, low resonance drivers are simply the best available for the automobile. Bass extension, detail, and transient response are remarkable. Their dual voice coil design provides system design flexibility not possible with single voice coil drivers. Narrow voice coil gaps and suspension systems that allow long, linear cone throw enable these subwoofers to out perform other much larger drivers. The compact RS8 delivers performance far beyond what you'd expect from an 8" driver. The RS10 outperforms most 12" woofers. And the performance of the RS12 makes the use of a larger diameter driver entirely unnecessary.

The RS Series subwoofers provide "reference class" performance in extremely small sealed enclosures. The RS8 performs best in sealed enclosure between 0.35 ft^3 and 0.75 ft^3 in volume. The recommended sealed enclosure for the RS10 ranges from 0.5 ft^3 to 1.0 ft^3. A sealed enclosure between 0.75 ft^3 to 1.5 ft^3 in size is best for the RS12. The RS Series subwoofers can also be used in single reflex bandpass enclosures. Although slightly larger in size, single reflex bandpass enclosures can yield higher sound pressure levels.

The power capacity of the RS Series subwoofers is equally impressive. The RS8 handles up to 200 watts RMS *per voice coil*. The RS10 handles up to 250 watts RMS *per voice coil*. The RS12 handles up to 300 watts RMS *per voice coil*.

Getting the most from your subwoofers

The RS series subwoofers are designed for optimum in-car performance in small acoustic suspension (sealed) or single band pass enclosures. In designing the RS series, and in our enclosure recommendations, we have taken the effects of the acoustic loading of the vehicle interior cavity into account. This loading significantly boosts very low bass response of a speaker installed in a car, compared to the response of the same speaker used in a large room. Conventional enclosure design software usually does not take this into account when predicting enclosure response. So if you are using this type of enclosure design software, you may get different predicted response than that shown in this manual. The enclosures recommended in this manual are proven designs that deliver excellent in-car performance.

Wiring the dual voice coils

One of the key features of the RS series subwoofers is their dual 6 ohm voice coil design. This feature provides a wide range of installation options which are not available with conventional single coil woofers. There are several ways you can connect the RS series woofers to a system. Whic yiu should use depends on the capabilities of your amplifier and the number of woofers being used.

continued

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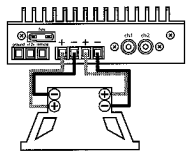
Wiring the dual voice coils – continued

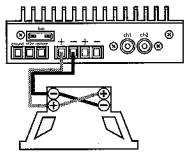
A single woofer can be driven by a stereo amplifier. Simply connect the two pairs of terminals on the RS series subwoofer the two amplifier channels as shown in Diagram 1a.

Diagram 1a



6 per channel

Diagram 1b



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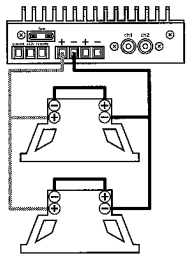
You can also use a single RS series subwoofer with a mono or bridged amplifier by connecting the two voice coils in parallel and in turn to the amplifier as shown in Diagram 1b. The parallel 6 ohm voice coils will present an acceptable load to an amplifier rated for 4 ohm operation when used as a subwoofer below 100 Hz.

The most common system configuration is a pair of woofers driven by two channels of amplification. These two channels may be either stereo or mono, depending on the settings of your amplifier and crossover. For the stereo application we recommend connecting the two voice coils of each woofer in parallel, and connecting each woofer to an amplifier channel as shown in Diagram 1b. Even with mono operation, this is recommended over the alternative of a bridged amplifier connection. That is because the individual channel connections provide better damping, which improves the amplifier's control over the woofer. This produces the best bass impact and detail.



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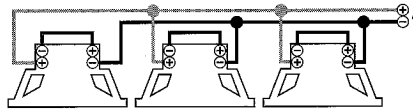
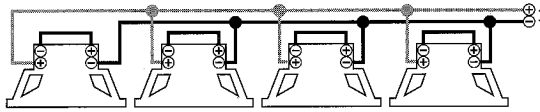
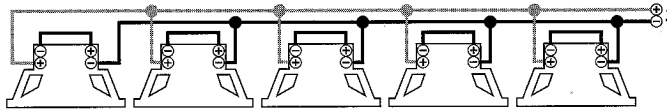
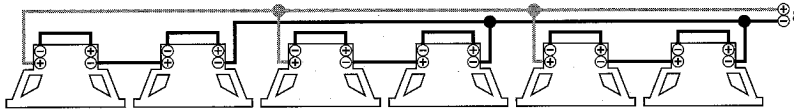
See the remaining diagrams for recommendations on the best way to connect more than two woofers and the resulting impedance.









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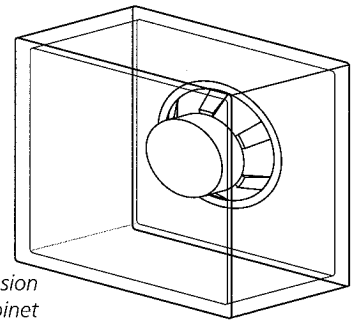
Acoustic suspension systems

Sealed enclosures, also known as acoustic suspension systems, provide extremely accurate musical reproduction. They are easy to construct and provide the most consistent results. Maximum bass level is somewhat lower than "tuned" vented systems. But the gradual response roll-off of these systems lets them provide deeper bass response in the automotive environmnet. Acoustic suspension systems also typically provide the best musical detail and definition.

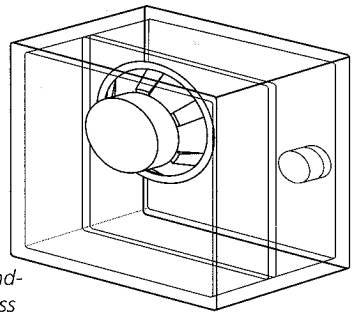


acoustic suspension cabinet

Single reflex band-pass systems

These systems provide accurate musical reproduction with high efficiency and reduced mid-bass distortion. In a single reflex bandpass system the woofer does not radiate sound directly. Its sound output goes into a chamber that has a tuned port. Output from the woofer exits this chamber into the listening environment through the port. The system is simply a sealed enclosure with an acoustical filter.

Single reflex bandpass systems offer two advantages. They are often easier to install because only the port must be vented into the passenger compartment, not the woofer. In addition they can be "tuned" to provide higher efficiency over a specific bandwidth. This tuning reduces the motion of the cone compared to a sealed enclosure, thereby allowing potentially higher sound output without the woofer reaching mechanical limits.



band-pass cabinet

Enclosure construction recommendations

We recommend that smaller enclosures be built with 3/4" thick medium density fiberboard (MDF). Enclosures larger than 1.5 cubic feet can benefit from using 1" thick MDF. Use internal braces to minimize panel resonances. Cabinet panel joints should be glued liberally with carpenter's wood glue and then screwed together with drywall screws. Drill pilot holes for the screws to avoid splitting the wood. After the glue dries, seal the joints with a bead of silicone sealant. (Hot melt glue also works well.) Place the supplied gasket under the woofer mounting flange to prevent air leaks around the driver. Ports (where applicable) should be made of PVC pipe or thick-walled spiral wrap cardboard tubing. Chamfer both ends of the port to minimize turbulence. Sealed chambers should have a 50% loose fill of fiberglass insulation. Vented chambers should have a 1" thick fiberglass lining attached to every wall except the front baffle. This fiberglass is the same type used for house insulation, however be sure to get the un-backed type.

For more specific recommendations for cabinet construction, contact your authorized a/d/s/ dealer. They are equipped to evaluate *your* vehicle and *your* listening habits and suggest an installation that will meet your requirements.

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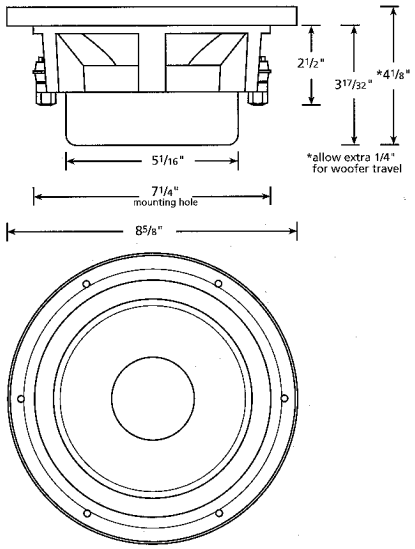
RS8 Reference Subwoofer

Specifications

Free air resonance	f_s=	22.5 Hz
Equivalent volume of compliance	V_{as}=	3.11 ft³
Total damping	Q_{ts} =	.23
Electrical damping	Q_{es}=	.25
Mechanical damping	Q_{ms}=	3.8
Piston Area	S_d=	32.75 in²
Peak linear excursion	X_{MAX}=	±0.25"
Peak excursion	X_{MAX}=	±0.45"
Sensitivity (2.83V RMS at 1M)		92dB paralleled, 86 dB series
Recommended amplifier power		20 watts minimum, 200 watts maximum
DC resistance		5.6 per coil, 2.8 paralleled
Impedance		6.0 per coil, 3.0 paralleled
Volume of air displaced by woofer		.046 ft³



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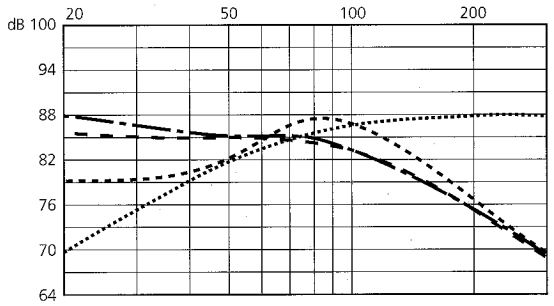
Enclosure recommendations

Sealed enclosures

V_B = .25 cubic foot
F_o = 86.7 Hz
Q_{tc} = .812

V_B = .60 cubic foot
F_o = 55.6 Hz
Q_{tc} = .540

V_B = 1.0 cubic foot
F_o = 44.8 Hz
Q_{tc} = .441



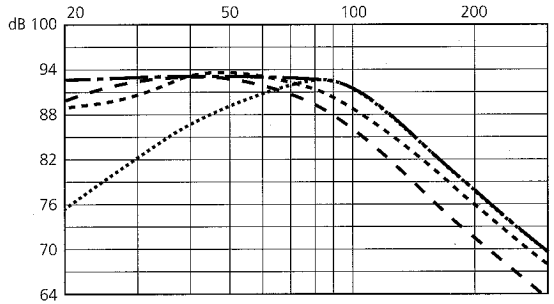
In car response with 2nd order low pass crossover at 100 Hz referenced to 2.83 VRMS input at 1 meter

- ---------- in 0.25 ft³ enclosure
- – – – – – in 0.60 ft³ enclosure
- – · —— in 1.00 ft³ enclosure

Response in a room without a crossover

- ..... in 0.60 ft³ enclosure

Bandpass enclosures



In car response with no low pass crossover referenced to 2.83 VRMS input at 1 meter

- ---------- in 0.56 ft³ sealed / 0.32 ft³ vented enclosure, 4" port, 18" long
- – – – – – in 0.75 ft³ sealed / 0.35 ft³ vented enclosure, 3.5" port, 16" long
- – · —— in 1.0 ft³ sealed / 0.30 ft³ vented enclosure, 4" port, 15.6" long

Response in a room without a crossover

- ..... in 1.0 ft³ sealed / 0.30 ft³ vented enclosure with a 4" port, 15.6" long

Note: All enclosures are gross volumes, calculations account for woofer volume.

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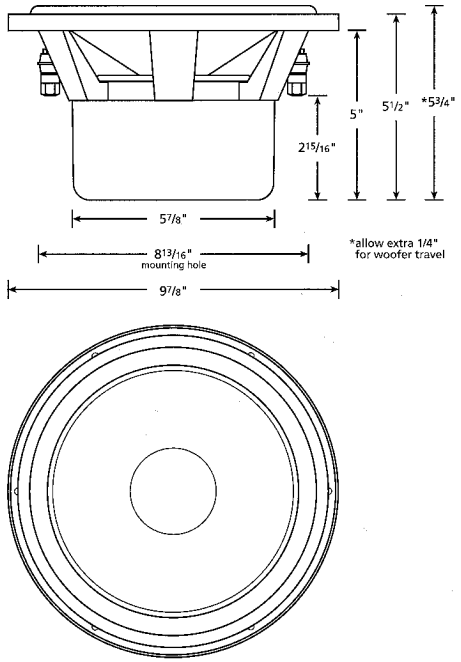
Sound. As it should be.

RS10 Reference Subwoofer

Specifications

Free air resonance	f_s=	18.2 Hz
Equivalent volume of compliance	V_{as}=	9.18 ft³
Total damping	Q_{ts} =	.15
Electrical damping	Q_{es}=	.16
Mechanical damping	Q_{ms}=	4.40
Piston Area	S_d=	50.2 in²
Peak linear excursion	X_{MAX}=	±0.25"
Peak excursion	X_{MAX}=	±0.50"
Sensitivity (2.83V RMS at 1M)		96dB paralleled, 90 dB series
Recommended amplifier power		20 watts minimum, 250 watts maximum
DC resistance		5.6 per coil, 2.8 paralleled
Impedance		6.0 per coil, 3.0 paralleled
Volume of air displaced by woofer		.079 ft³



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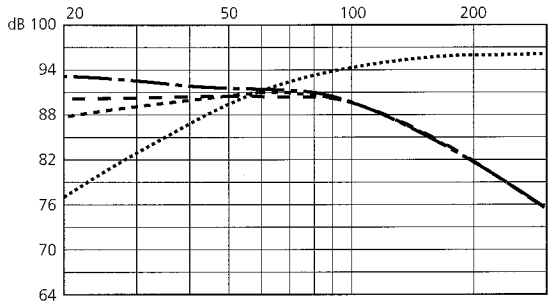
Sound. As it should be.

Enclosure recommendations

Sealed enclosures

V_B = .50 cubic foot	V_B = .75 cubic foot	V_B = 1.25 cubic foot
F_o = 83.1 Hz	F_o = 66.7 Hz	F_o = 51.9 Hz
Q_{tc} = .647	Q_{tc} = .529	Q_{tc} = .417



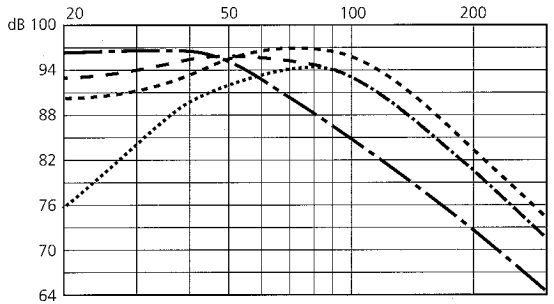
In car response with 2nd order low pass crossover at 100 Hz referenced to 2.83 VRMS input at 1 meter

- in 0.50 ft³ enclosure
- in 0.75 ft³ enclosure
- in 1.25 ft³ enclosure

Response in a room without a crossover

- in 0.75 ft³ enclosure

Bandpass enclosures



In car response with no low pass crossover referenced to 2.83 VRMS input at 1 meter

- in 0.47 ft³ sealed / 0.47 ft³ vented enclosure with a 4" port, 7.28" long
- in 0.65 ft³ sealed / 0.47 ft³ vented enclosure with a 4" port, 11.34" long
- in 1.46 ft³ sealed / 0.64 ft³ vented enclosure with a 4" port, 19" long

Response in a room without a crossover

- in 0.65 ft³ sealed / 0.47 ft³ vented enclosure with a 4" port, 11.34" long

Note: All enclosures are gross volumes, calculations account for woofer volume.

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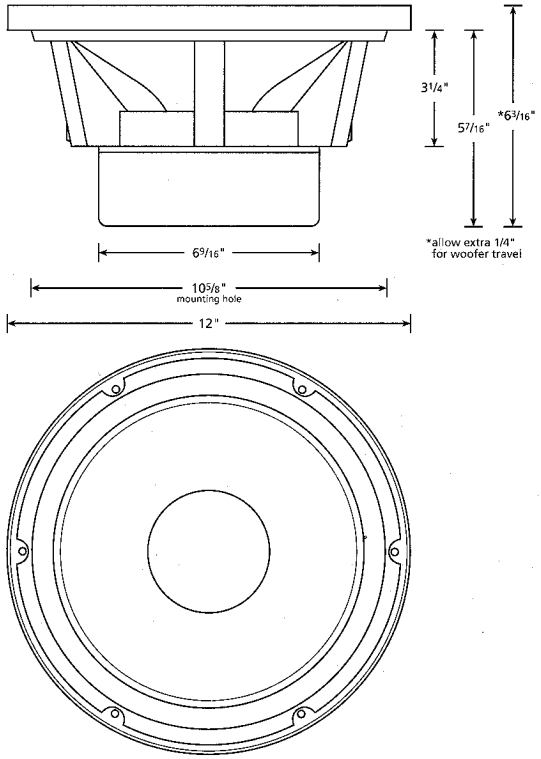
RS12 Reference Subwoofer

Specifications

Free air resonance	f_s=	16.8 Hz
Equivalent volume of compliance	V_{as}=	11.65 ft³
Total damping	Q_{ts} =	.18
Electrical damping	Q_{es}=	.20
Mechanical damping	Q_{ms}=	3.42
Piston Area	S_d=	76.1 in²
Peak linear excursion	X_{MAX}=	±0.27"
Peak excursion	X_{MAX}=	±0.55"
Sensitivity (2.83V RMS at 1M)		95dB paralleled, 89 dB series
Recommended amplifier power		20 watts minimum, 300 watts maximum
DC resistance		5.6 per coil, 2.8 paralleled
Impedance		6.0 per coil, 3.0 paralleled
Volume of air displaced by woofer		.125 ft³



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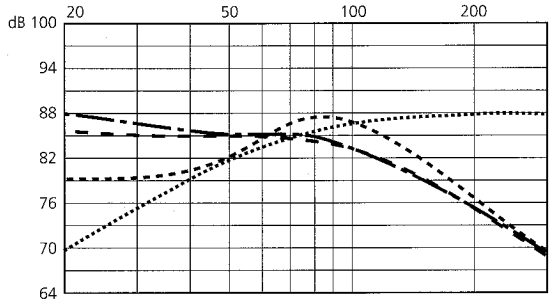
Enclosure recommendations

Sealed enclosures

V_B = .60 cubic foot
F_o = 81.1 Hz
Q_{tc} = .682

V_B = .90 cubic foot
F_o = 64.3 Hz
Q_{tc} = .551

V_B = 1.25 cubic foot
F_o = 54.2 Hz
Q_{tc} = .469



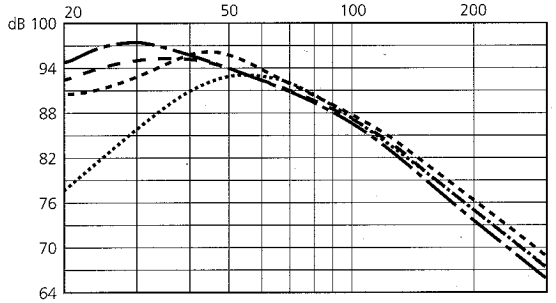
In car response with 2nd order low pass crossover at 100 Hz referenced to 2.83 VRMS input at 1 meter

- in 0.25 ft³ enclosure
- in 0.60 ft³ enclosure
- in 1.00 ft³ enclosure

Response in a room without a crossover

- in 0.60 ft³ enclosure

Bandpass enclosures



In car response with no low pass crossover referenced to 2.83 VRMS input at 1 meter

- in 0.60 ft³ sealed / 0.60 ft³ vented enclosure with a 5" port, 19" long
- in 0.92 ft³ sealed / 0.65 ft³ vented enclosure with a 5" port, 17.7" long
- in 1.12 ft³ sealed / 0.60 ft³ vented enclosure with a 5" port, 24.2" long

Response in a room without a crossover

- in 0.92 ft³ sealed / 0.65 ft³ vented enclosure with a 5" port, 17.7" long

Note: All enclosures are gross volumes, calculations account for woofer volume.

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Warranty Information

There are two things you **must** do to ensure trouble free service in the event you need warranty repairs.

1 - Keep your original sales receipt in a safe place. A copy of the receipt will be **required** to obtain warranty service.

2 - Be sure your retail dealer has written the **date**, the **model number**, and the **serial number** of the Product on the receipt.

To give yourself an extra measure of protection, make a separate record of the information about your purchase and keep it in a safe place. In the event you misplace the sales receipt, your dealer may be able to give you a copy.

Take a moment now to read the terms of your warranty. Check to be sure your sales receipt is dated and has the Product model number and serial number on it. Then put it away in a safe place.

When shipping a Product in for service:

- Enclose a copy of your original sales receipt that has the date, the Product model number and serial number (if applicable) written on it.
- Always ship Products in the complete original packing material.
- Avoid shipping Products via the Postal service. If you must use the Postal service, be sure to register and insure the package.

a/d/s/ Limited Warranty

Analog and Digital Systems, Inc. (a/d/s/) warrants to the original consumer purchaser of the a/d/s/ Products described in this manual, that the Product will be free from defects in materials and workmanship for a period of one (1) year after the date of purchase. If the product is installed by an authorized a/d/s/ retail dealer, the warranty is extended for an additional two (2) years, a/d/s/' sole obligation under this warranty shall be to provide, without charge, parts and labor necessary to remedy the defects, if any, that appear during the warranty period.

This warranty is the sole and exclusive express warranty given with respect to the Product. All other express warranties are hereby excluded. Neither a/d/s/ nor the authorized dealer who sells the Product is responsible for indirect, incidental, or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion 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.

IMPORTANT – Keep your original sales receipt. Be sure the retail dealer has written on it the date, model number, and serial number (if applicable) of the Product. This information is required for warranty service.

This warranty is limited to:

- Products purchased from authorized a/d/s/ retail dealers in the United States. a/d/s/ will supply a list of authorized dealers on request.

In order to obtain warranty service you must:

- Return the Product, freight prepaid, to the a/d/s/ dealer from which it was purchased, an authorized a/d/s/ independent service agency, or to a/d/s/. If necessary you may call a/d/s/ Customer Service Department for the names and addresses of authorized independent service agencies in your area.
- Provide proof of purchase in the form of a copy of your original sales receipt. The date, model number, and serial number (if applicable) of the Product **must** be written on the sales receipt.

This warranty does not cover:

- Damage that is the result of misuse, abuse, accident (including but not limited to damage by water), faulty hookup, defective or maladjusted associated equipment, or the use of the Product with equipment for which it was not intended.
- Cosmetic defects that appear more than thirty (30) days after the date of purchase. Cosmetic damage caused by improper handling is also excluded.
- Products that are used for commercial purposes.
- The cost of removing or reinstalling the Product.
- Damage that occurs while the Product is being shipped to whoever will service it. See the information above regarding shipping procedures.

This warranty is void if:

- The Product identification or serial number label is removed or defaced in any way.
- The Product is serviced or repaired by any one other than a/d/s/ or an authorized a/d/s/ dealer or service agency.

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