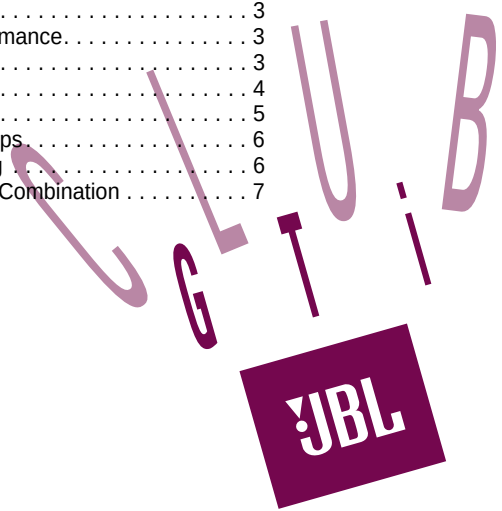
GTi Automotive
Intercooled Subwoofer
Application and Installation Guide

Table of Contents

Staple or clip your original bill of sale here ▼



Welcome to Club GTi

Thank you for purchasing one of the finest automotive subwoofers that JBL has ever produced. As a GTi competition series owner, you are a member of a select group of people who enjoy the most advanced mobile audio products available. We call this group “Club GTi.” By sending in the customer information card, that you will find packaged with this product, we will automatically register you as a Club GTi member which will give you access to exclusive Club GTi apparel and other special offers we will make available from time to time. We suggest you fill the card out at your earliest convenience.

Also, be sure to save your sales receipt in a safe place. It will be necessary to use this document as proof of purchase should you need warranty service.

Autosound at its Best

The GTi Subwoofer is built to meet the same rigorous standards of construction and performance that have long established JBL’s renowned home and professional speaker systems. The GTi Subwoofer achieves its exceptional performance with leading edge technologies that push the performance envelope in automotive sound.

The exceptional sound of the GTi Subwoofer comes from an Aquaplas coated fiber cone for extra stiffness and resonance elimination. The cone motion is controlled by a synthetic rip-stop suspension which resists tearing for safe, effortless high-power use. The cone is driven by a massive motor structure utilizing a 3" or 4" edge-wound OFC copper wire, high temperature fiberglass, voice coil. This motor structure includes JBL’s patented Symmetrical Field Geometry (SFG) to create a uniform magnetic flux field through the coil and thus lower distortion. The frame and cone are contained in a high strength die-cast aluminum frame for maximum rigidity and higher magnetic energy concentration on the coil.

What does all this technology add up to? A driver with smooth frequency response, excellent transient response, high output efficiency and high power handling in a rugged package able to deal with the rigors of high performance car audio. The result is exceptionally powerful, dynamic and accurate sound reproduction that cuts through the road noise and provides a solid musical foundation.

Unleash Maximum Performance

Because this is a high performance product which may be used in many different configurations, we strongly recommend that you have the subwoofer professionally installed to unleash its full performance potential. However, if you feel you have the skills necessary to build a subwoofer box, read the following information on enclosures before proceeding.

Enclosure Basics

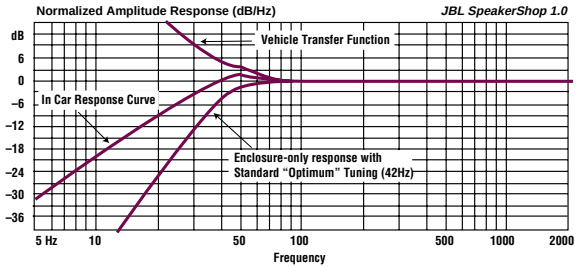
The enclosure you build plays a profound role in the performance of your subwoofer. The size and vent tuning frequency, where applicable, determine the low-frequency performance and output capability of the subwoofer system. Your GTi subwoofer will provide excellent performance when used in Sealed, Vented, Infinite Baffle, and Band-pass applications that are properly designed. Each of these applications have limits and advantages that should be considered.

GTi woofers are most commonly used either in Vented enclosures or Infinite Baffle. Instructions which follow will give you a simplified design method to build a Vented enclosure for your subwoofer. Another option is the Infinite Baffle (free air) installation which doesn’t require complex design and construction, and can sound very good when solidly installed. However, because there is no enclosure to control cone motion, the power handling and maximum output level of an Infinite Baffle installation is reduced from that of a Vented enclosure. Refer to the “Points on Power Handling” section for more information.

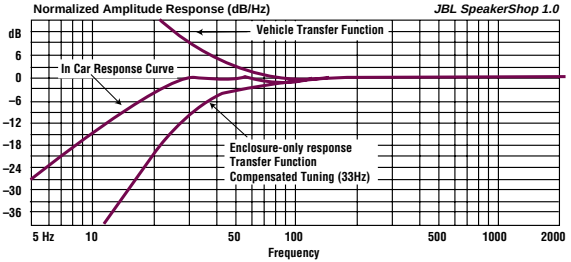
For more complex designs, such as single and dual-vented Band-pass types, we suggest you optimize your design with JBL SpeakerShop, a speaker system design software for a P.C. running Microsoft Windows, available from your JBL dealer. If JBL SpeakerShop or a similar program is not available, the JBL Customer Service department will be happy to assist you.

Vehicle Acoustics

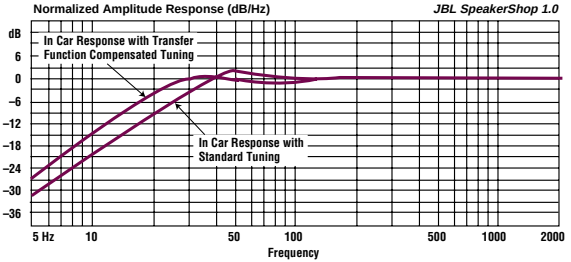
The acoustics of your vehicle also influence bass performance tremendously. Fortunately, the small interior volume of most cars and trucks boosts low bass output enough to allow for smaller enclosure sizes while still achieving good bass performance. As a general rule, below 50-80 Hz (depending on interior size), bass response increases at a rate which approaches 12dB per octave as the frequency decreases. This adds a significant bass reinforcement to the actual output of the subwoofer. If this rise in bass is not addressed in the design of your enclosure, bass performance may be boosted to the point where it is actually too strong for some tastes. For others, there is never too much! The enclosure design recommendations which appear on the specification sheet for your particular model, were chosen for optimum in-car performance. You may find them to be different than the recommendations from formulas used to design enclosures for in-home or professional sound-reinforcement applications. These "Transfer Function Compensated" tuning recommendations result in small enclosures with excellent in-car low frequency performance.



This graph shows the effect of vehicle transfer function added to an enclosure using "standard" tuning. Note the peak at 50Hz, with a –3dB point of approximately 31Hz.



This graph shows the result of tuning the enclosure to compensate for the effects of the vehicle transfer function. Note that the in-car response is smoother and the –3dB point moves down to approximately 22Hz.



This is a comparison of in-car response curves with and without transfer function compensated tuning.

Enclosure Design

Follow the simple steps below to design an optimum ported box for your GTi driver.

1. Determine the maximum enclosure size available for your installation by measuring and multiplying the height x width x depth (in inches) and then dividing by 1728. This will tell you exactly how many cubic feet your enclosure will be.

2. To determine the volume of an irregularly shaped box, divide the box into sections, calculate the volume of each section individually, then add the separate volumes to determine the total box volume. Here are some useful formulas to help you calculate volumes:

USEFUL FORMULAS
1 cubic foot = 1728 cubic inches
1 cubic foot = 28.32 liters
1 liter = 0.353 cubic feet = 61 cubic inches = 1000cm^3
Radius = 1/2 diameter
Box volume = height x width x depth
Volume of triangular box section = 1/2 base x height x length
Volume of tubular duct = area of circle x length
pi (π) = 3.1416
Area of circle = pi (π) x $radius^2$
Diameter of circle = 2 x area / pi (π)
Area of square = height x width

3. Now that you have calculated the internal box volume, you should subtract the DRIVER DISPLACEMENT (listed on the specification sheet) while also subtracting approximately 0.1 cubic feet for the port tube (if one is being used). If you'd like, you may calculate the exact displacement of the port tube by utilizing the formula listed above (Volume of tubular duct).

4. Using the GTi Enclosure chart (shown on your GTi driver specification sheet), choose a desired box volume on the vertical chart axis, which fits within the size limit you have established. Draw a line across from this point until it intersects the recommended tuning frequency. Draw a line down to the horizontal axis and read the corresponding tuning frequency. We have drawn an example on the chart.

5. Use the Port Nomograph on the Driver Specification sheet to determine the port diameter and length based on the enclosure volume and tuning frequency determined in step 4. Follow these steps to determine the port.

Port Dimension Calculation

1. Draw a line from the chosen enclosure volume to the desired tuning frequency. Continue this line until it intersects with the Lv/Sv construction line (Lv = port length, Sv = port opening surface area). This is called the construction point.

2. Draw a horizontal line starting from the construction point straight through the chart. Note that the Lv/Sv axis also appears at the right of the chart to help keep your line parallel all the way across the chart.

3. Select the curved line with the port diameter you would like to use. Locate the point where this curved line intersects with your horizontal construction line and draw a vertical line from this point down to the bottom of the chart.

   NOTE: Try to use a port tube no smaller than 1/3 the diameter of your speaker. Using a smaller diameter port can result in "whistling" or "breathing" noises.

4. The required port length is found at the point where the vertical line you've drawn intersects with the scale at the bottom of the chart.

   NOTE: The recommended port tube dimensions should be considered a starting point. Since it is impossible to predict "in-car" response exactly, you may find that a port length slightly longer or shorter than that recommended may produce slightly better results. Experiment!

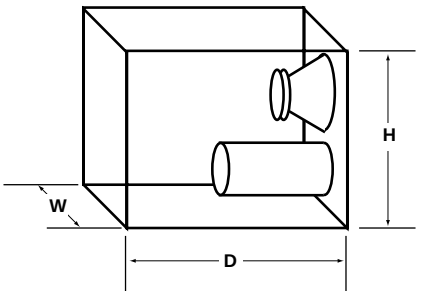
Lay out plans for your box using the information determined in the above steps and the box construction tips listed on page 6.

Enclosure Construction Tips

The GTi Subwoofer will only sound as good as the enclosure it is mounted in. Build an enclosure that meets the guidelines listed below and you will get the high performance bass you sought when you stepped up to GTi.

1. Box Dimensions - Try to choose subwoofer enclosure dimensions (height, width and depth) which are not equal or multiples of each other. This will minimize standing waves and resonance in the cabinet. Example: Ideal - 26"h x 17"w x 10"d; Not ideal: 30"h x 15"w x 9"d (30 is a multiple of 15).

2. Enclosure Material and Thickness - Use MDF or particleboard at least 3/4" (19mm) thick. With high powered amplifiers or subwoofers of 12" diameter or larger, use 1" (25mm) thick MDF or particleboard.



3. Joint Construction - All joints should be glued and screwed (no nails). The cabinet should be airtight and must include adequate bracing to minimize resonance.

4. Fiberglass Application - Apply a 1" blanket of fiberglass or polyester to interior walls (except the baffle board) of all vented enclosures. For sealed enclosures (no ports) fill the entire volume with fiberglass or polyester (12-16 oz. per cubic foot). If you do not wish to use damping material then make the box size 10% larger than recommended by the graphs.

5. Ports - Construct port tubes from PVC pipe or cardboard tubing with a wall thickness of at least 1/16". The end of the port tube must be kept one port diameter away from either the inside of the box or any surfaces in the car.

If a port tube is not available, you may also construct a square/rectangular vent. Changing the shape of the vent will not effect the length as long as the surface area of the opening stays the same. We've supplied a chart that lists some standard dimensions for square/rectangular vents.

AREA		CIRCLE DIAMETER		VENT (h x w)
3.14 sq. in.	=	2"	=	1.75" x 1.75"
7.07 sq. in.	=	3"	=	2" x 3.50"
12.57 sq. in.	=	4"	=	2" x 6.25"
19.63 sq. in.	=	5"	=	3" x 6.50"
28.27 sq. in.	=	6"	=	3" x 9.50"

Points on Power Handling

The power handling of any subwoofer is related both to its ability to dissipate heat and to the maximum cone excursion limits.

• Too much electrical power can cause the wire in the voice coil to overheat and burn out.

• Too much cone motion can cause the cone to mechanically limit and damage the subwoofer.

• Depending on the subwoofer model, the GTi motor structure can easily handle an amplifier rated to deliver from 300 – 600 watts of continuous power. This is an electrical rating dependent upon an enclosure design which keeps the woofer cone from reaching its mechanical limits when the amplifier delivers high power. Properly designed Vented and Band-pass enclosures are capable of this control.

• At the same power levels Infinite Baffle designs (no enclosure, sometimes called “Free-Air”) allow greater cone motion and the power rating of the subwoofer must be reduced to reflect this (see the specifications). At the same power levels Infinite Baffle subwoofer installations will have much longer cone excursion than subwoofers mounted in an enclosure.

• Sealed enclosures exert some control over excursion as a result of the air inside the enclosure acting as a spring against the woofer cone motion. Large enclosures typically allow higher excursion than smaller boxes.

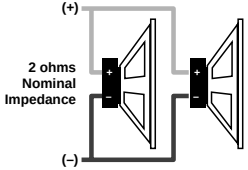
• Vented and Band-pass enclosures have the lowest excursion as a result of the port tuning effects. However, vented enclosures will allow for high excursion outside the port tuning range. Single-tuned Band-pass enclosures provide the lowest overall cone excursion.

See the specifications sheet for details on the GTi subwoofer power handling capabilities in different enclosure configurations.

Speaker Connection and Combination

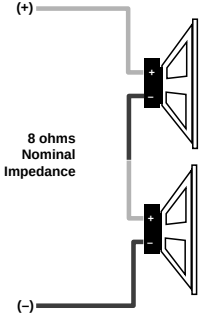
GTi subwoofers are 4 ohms nominal impedance. If you are connecting two speakers in parallel to an amplifier channel, make sure your amplifier will drive a two ohm load.

Parallel Wiring



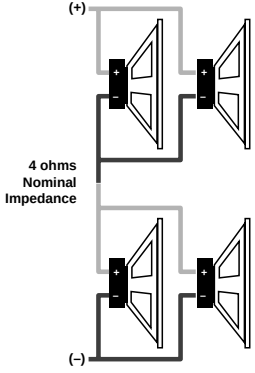
Series Wiring

If your amplifier will not drive a two ohm load, we recommend that you connect the two speakers in series to create an 8 ohm load as shown here.

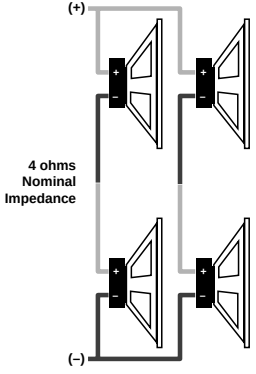


Four woofers can also be wired (as shown below) in parallel/series or series/parallel so that the amplifier will see four ohms nominal impedance.

Parallel/Series Wiring



Series/Parallel Wiring



Please consult your JBL dealer for information on more complex speaker combinations.

JBL Consumer Products, Inc.
80 Crossways Park West
Woodbury, NY 11797

8500 Balboa Blvd.
Northridge, CA 91329
1-800-336-4JBL

A Harman International Company

NMGP/N:323967-001 9/95