V18:2005:12

car audio AND ELECTRONICS

THE LEADING MONTHLY MOBILE A/V SOURCE

Electronically reprinted from December 2005

TEST REPORT | COMPONENTS

POLK AUDIO SR6500

NEW TECHNOLOGY, INCREDIBLE AUDIO REPRODUCTION EQUALS PURE EXCELLENCE

MSRP: $899.00

TEXT: BOB MORROW

PHOTO: BEN OH

Every now and then one of the tried-and-true, well-established speaker manufacturers comes out with a new flagship offering. This time around I had the distinct pleasure of auditioning a new entry from Polk Audio, the $899 SR6500, 6 1/2" convertible component set.

FIRST IMPRESSION

Upon opening the large box containing the SR6500 set, I was greeted with a very attractive group of components and installation hardware consisting of a pair of 6 1/2" low-frequency drivers with perforated metal grills, a pair of sophisticated-looking passive crossovers and a pair of tweeters a bit unorthodox in appearance. The latter contains five different mounting options: flush mount, surface mount, angled surface mount, coaxial, and angled coaxial mount. If you can't find what suits your needs in this array, you must have a very unique application. All of these mounting options are illustrated in the easy-to-understand owner's manual included with the speakers.

INSTALLATION

The woofers should be relatively easy to install as they are just over 2 1/2" (2 9/16" to be exact) and have 19 holes in their bolt pattern to cover just about any application you could come up with. They require a 5 5/8" cutout and have a very small neodymium magnet structure which will definitely aid in mounting these woofers in tight quarters. The frame is made of cast aluminum and features an integrated, finned magnet cover to draw damaging heat away from the voice coil, thereby increasing power handling and reliability. By the way, power handling is rated at 125 watts continuous, 250 watts peak and has a 4 ohm system impedance rating.

The cones of these woofers are made of APP, which stands for aerated polypropylene. In short, according to the 23-page white paper I received with this set, APP is a proprietary material consisting of a "crunchy" exterior on each side of the cone for stiffness and a "chewy" air-injected foamy center for good internal damping, all in the quest for an acoustically inert sonic signature. The woofers employ a removable phase plug to help ensure great off-axis midrange response, and to facilitate the creation of a coaxial arrangement of the tweeters for a

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very high-end point-source driver when coupled with the audiophile-grade crossovers included with this set. The woofers use an injection-molded butyl rubber surround for longevity and improved damping, and a 1 1/2" diameter, low-mass, high-temperature, glass-epoxy former for the voice coil. The large diameter voice coil contributes to robust bass output and high power handling.

The SR6500 tweeter is a ring radiator design, an advanced technology used in high-end audiophile home speakers costing as much as $35,000. Most tweeters don't employ a phase plug, but that's one of the unique attributes of this high-frequency driver. The phase plug helps in off-axis response, which is a particularly good thing in car audio, because in almost every scenario the tweeter must be mounted off-axis in the listening environment. I could probably write an entire article just on the technology of the tweeter, but suffice to say, this tweeter gets the job done, and then some!

The crossovers are a little large, but that's because of the high quality components used throughout. They employ air core inductors and all capacitors are of the 1% tolerance Mylar variety. The resistors are also quality 1% tolerance pieces. There's a Zobel network included to ensure a flatter impedance curve and more accurate high-frequency response, to say nothing of making your amp's job a lot easier. Roll-off slopes are 12dB per octave on the low frequency section, and 18dB per octave for the tweeter. There's a four-position (+1dB, 0dB, -1.5dB, -3dB) level adjustment for the tweeter, and the capability of bi-amping the system is handled with jumpers, rather than switches that might corrode and degrade performance.

LISTENING

The Polk SR6500 speakers were driven by two pairs of bridged channels of an Esoteric E7056 amp at 200 watts per channel, linked with IXOS RCA cables to a DENON R1 CD receiver. Pure and simple.

Blues

I started off with B.B. King's "Stormy Monday." Anyone who read my last review will remember that B.B. King is one of my all-time favorite vocalists from any genre, and when he's backed up by a crew like the GRP All Star Big Band, well let's just say it's "chills up the spine" time. The SR6500's sounded very smooth and ultra detailed on this selection, with good imaging and a wide, stable soundstage. B.B.'s guitar sounds came through like he was in the room with you and there weren't any notes that jumped out and bit your ears—just smooth, lifelike music. The stage had good depth and the images of the instruments on that stage seemed almost life-size. These speakers also reproduced bass quite convincingly. A small subwoofer would be all you'd need to really make this system came together. Even at low levels the detail isn't lost, but as expected, the low bass starts to fade. At moderate to high volume levels the bass reappears, and the speakers don't exhibit any breakup or ear-fatiguing harshness. Quite a performance!

Vocals

I put in Rebecca Pidgeon's "Spanish Harlem" for a good listen to vocals. This has to be one of the hardest selections to get right. Female vocals and piano are very hard to reproduce with a natural timbre and no harshness. First thing I noticed was the full sound of the upright bass; almost enough to make me think someone hid a subwoofer in the room! Pidgeon's vocals were nicely centered and appeared to be coming from a source no larger than a pair of human lips, yet sounded lifelike and full. During the instrumental break it sounded as though the maracas were deep stage right; the string section, farther forward stage left; and the guitar, front and center. The piano was also faithfully reproduced without any hint of harshness, and there's a nice sense of room ambiance usually not heard on this selection when played on speakers inferior to the Polks. Matthew & Co. (that would be Matthew Polk) seem to have done their homework.

Jazz

Details, details, details. Holly Cole's "Je Ne T'aime Pas" starts off with an acoustic bass line that sounds as if it's live, not recorded—the Polks were very detailed in their delivery of every little nuance. You could even make out the buzz as the string is released and vibrates against the neck of the bass. There was great low-end extension too! Cole's voice conveyed all the emotion without harshness or sibilance, and the piano sounded life-size. Even as the intensity built, things didn't get out of hand, maintaining smooth, realistic reproduction. The upper range of the acoustic bass sounded full without any breakup. You could even tell that the bass was bowed toward the end of the selection. The image of a small, intimate jazz club came through loud and clear and made me feel like I was front row center in the audience. I could almost tell what fragrance Cole was wearing. If you put a lot of thought and care into the installation of these components, you'll be rewarded with true audiophile sound.

Rock

I chose Robben Ford's "Tell Me I'm Your Man" for the rock genre. The drum kit at the beginning of this selection sounded as if it were in the same room with you. There were very realistic impact and dynamics, one of the benefits of light, stiff speaker components. Ford's voice was nicely placed out front where you'd expect it to be, and there was remarkable bass extension, even without a subwoofer. All images were stable and properly positioned on a broad, lifelike stage and were presented with a convincing sense of room ambiance. The

SUBJECTIVE SCORE CHART

	Points Possible	Polk Audio SR6500
Overall Sound Quality	20	16
Tonal Balance (above 80Hz)	10	08
Low-Frequency Extension	10	09
Clarity at Low Volume	10	07
Clarity at High Volume	10	08
Image Stability	10	08
Listening Fatigue (moderate volume)	10	09
Flexibility/Ease of Installation	20	15
Total Subjective Score	**100**	**80**

Ratings: 01 Poor 05 Average 10 Superior

MUSIC SELECTION

Music Type	Points Possible	Polk Audio SR6500
Blues	20	16
Vocal	20	17
Jazz	20	17
Rock	20	16
Classical	20	15
Total	**100**	**81**

Ratings: 01 Poor 10 Average 20 Superior

"As of November 2005 the Sound Quality score of 80 awarded to the Polk Audio SR6500 is one of the highest scores the editors of Car Audio and Electronics have ever given a component speaker system."

cymbals had a detailed shimmer and Ford's guitar was intense and smooth, without any fatiguing over-brightness. I rarely audition speakers that make a rock 'n' roll guitar sound this smooth.

Classical

Classical recordings are very complex, and detail can very easily be lost as they often are in Vivaldi's "Flute Concerto in D." The Polks faithfully captured even the smallest detail in this full orchestral recording. I heard a very believable hall ambiance and I could picture the positioning of the different instrumental sections almost as if I were looking at a photograph. Then the spotlight focuses on a lone flute soloist. I could make out the breathing of the flutist and even heard the closing of the keypads on the flute. The fugue portion starting at roughly 1:40 was particularly interesting as it pits a solo violin, solo flute, harpsichord and cello against each other, and all the instruments sounded as if they were right in front of you on a large stage in a large concert hall. Very impressive, indeed!

CONCLUSIONS

Through the use of cutting-edge materials and technology, Polk Audio has created a set of audiophile-grade components that rival some of the best home speakers I've heard in the areas of detail, dynamics and imaging. If you can handle what I consider a reasonable retail price of $899 for these speakers, you'll be rewarded with years of listening enjoyment. If $899 is too steep for your budget, I would heartily recommend saving up until you can afford these. You won't be disappointed if you're looking for detail, realism and, above all, smoothness. Kudos to Matt and the engineers at Polk Audio!

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Polk Audio SR6500

By Pat Turnmire
Photography: Ben Oh

I have a confession I feel I should make before you read any more of this article. I design products for a factory in China. We build great products for home and car audio, a few of which you see gracing the pages of CA&E. That's not what I am confessing though. My confession is that I tried to get Polk to build the SR6500 in the factory that I work with. In fact I made a special trip to China to meet with them, went through their qualification program and jumped through more hoops to get their business than I have ever gone through. In the end though, they decided to use a factory that they had more experience with (sigh).

Seeing these speakers brought up very mixed feelings: a little disappointment because I really wanted to work with Polk and I wasn't afforded the opportunity; a little curiosity because I thought the design was great from the specs and drawings I saw; and finally, a little jealousy that there are engineers in the business that are this good.

If you are short on time and don't want to read all the details, here is what I am going to say at the end of all of this: "The Polk Audio SR6500 component sets are the best component sets and coaxes I have tested. The best performance, the best cosmetics, the best engineered and so far the only thing I have seriously considered putting in my own car," and I hate to install. If you want to know why, keep on reading, it's pretty interesting...

I know a good bit about what it takes to build a product for Polk. It's documented in a few hundred pages of testing standards, product description statements, production standards, internal quality control standards, even standards, standards. These are all written by some of the best engineers, product managers, purchasing managers and manager managers in the business. If you think this is the way most big companies in the audio business work, especially the car audio business, it's not. Polk may have products built in Asia, but they control every part of the process as if it were being done next door. Their system pretty much guarantees that a product is going to exactly meet a consumer need, is going to perform according to the specification, and that every product shipped to a dealer and put in a customer's car is going to meet the specification. In a world of mostly amateurs, these guys are the real deal. "The Polk Audio Signature Reference SR6500 is the ultimate expression of Polk's 22-year experience of developing superior performance mobile speakers. We drew upon several exclusive Polk technologies to produce a speaker system with the best performance, flexibility and fit in Polk's history of mobile loudspeaker design. It is designed with the serious listener in mind-a listener who is serious about the accurate reproduction of music and movie soundtracks in a mobile environment." This is from their white paper and was the first paragraph in the "Product Description" that they gave out to potential vendors like me. Talk about a mission statement!

Like the product, the white paper is the best I have seen-go to their site and download it even if you don't buy the speakers. Its one of the best no-BS articles on speaker technology one could read. The woofer is a combination of very cool materials and great engineering. The cone is made of "aerated polypropylene" which is essentially standard mica-filled PP (polypropylene) that has been puffed up with air to make a honeycomb-like structure. It's light, stiff and very well damped. It's also not a lot more expensive than a conventional PP cone, just a lot better. Because it is convertible, the woofer uses a phase plug when the coax post is not in place. If this is done well (and it is), the response can actually be better than a conventional woofer with a dust cap. The basket is cast aluminum with a spider that is almost as large as the cone. This gives a very long linear compliance range (more on this later). The basket serves as a heatsink for the neodymium motor structure. The coil, at 30mm, is larger than most component woofers, which gives it a higher power handling and ultimately a better coax response (more on this later too). The woofer is also easy to install. It's shallow and has 19 mounting holes that will fit virtually every Euro, Asian and American mounting system in the last 15 years. With two supplied spacer rings it will even fit shallow door panels like Subaru Imprezas and Honda Civics.

For the tweeter, Polk decided to use what is considered one of the best tweeters in the world. Made by Vifa, this tweeter is actually used in high-end home systems that cost over $35,000-no kidding. Polk's position is that it's tough to build really good tweeters, especially in China, and a product of this quality should use the best. Vifa has a factory in China that sells OEM, so it was probably an easy call. The tweeter is pretty remarkable. It uses a very unusual (and patented) design called a ring radiator. It's basically two concentric donuts connected to a bullet in the center, and a voice coil where they join (pictures are worth a thousand words, so check out www.polkaudio.com for a good look at the tweeter). The tweeters have low resonance, great high-frequency range and are ruler flat. Maybe even more important, is that "golden ears" everywhere all agree: This is one of the best-sounding tweeters ever made, period! Polk of course has added their magic to the tweeter as well. A few little tweaks here and there, a very slick mounting system, the best convertible coax mechanism I have ever seen and a cool rubberized paint coating on the plastic parts that give it a very high-end feel. The crossover is every bit as cool as the woofer and tweeter-a beautiful mix of cast and injection molded parts make up the housing. All of the crossover parts are the high quality you would

expect, without resorting to the ridiculously expensive and highly questionable. This last sentence is the core of what impressed me the most about this product. It's uncompromising in every place that matters without spending too much to get there.

On to the testing...

Parameter Testing

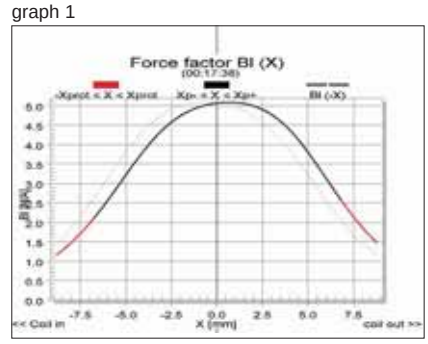
My testing setup has changed dramatically with the addition of the Klippel Distortion Analyzer. I still use the ACO Pacific 1/4" microphone, lab amplifier and IEC baffle, however all of the testing is done through the Klippel now. It is the "be all-end all" analysis tool for the loudspeaker engineer. The Klippel is revolutionizing loudspeaker design in virtually every application. Check it out at www.klippel.de. In fact Polk was one of the first companies to purchase a Klippel system and they have made great use of it in the design of this product. Their white paper goes into great detail about how they use it and how most other speakers on the market that don't are inferior. They actually show tests they have done on their competition and the Klippel makes it really easy to see the difference. My testing starts with "Small Signal Parameters" for the woofer. If you have been following the last year's reviews, you know that I actually measure "Small Signal" at a more realistic level than traditional tests. Small signal for the Klippel system can be measured as the highest voltage before the speaker starts to become nonlinear. For the Polk Audio woofer this was at 2 watts, which is a pretty good starting point considering the very high efficiency of the speaker. The key parameters are listed in the chart below.

Parameter

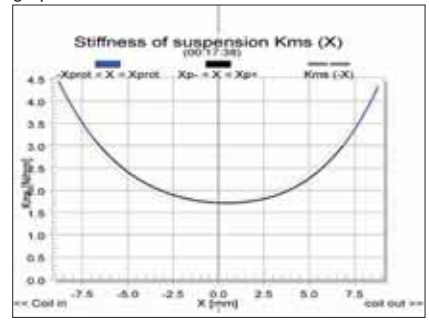
Small signal 2 watts

Re (Ohms)
3.59
Qms
12.68
Qes
0.86
Qts
0.8
Fs (Hz.)
62.6
Vas (l)
10.65
Cms (mm/N)
0.41
Efficiency at 2.83 volts (dB)
90.23

graph 1



graph 2



So how do these stack up?

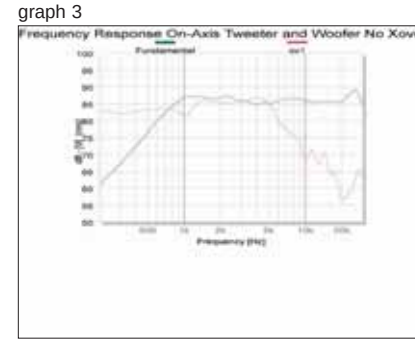
These are, in my opinion, perfect. The Qts is ideally damped-not too low and dry and not too high and peaky, The Fs is low enough to give good midbass and the efficiency is high enough to keep up with good-sized woofers with lots of power.

Klippel testing has given us a new way to look at a speaker's linearity under power. The non-linear Motor Force (BL [X] and Compliance (Cms [X] are graphical representations of what the speaker is doing while it is playing. They tell us if everything is balanced and working together. Both of these curves should be centered on the X(mm) 0 line and have essentially the same shape on either side of this point. The dashed lines on the graphs are the mirrors of the actual test and make it easy to see if the curves match the ideal.

The Bl (X) curve (Graph 1) for the woofer is almost perfect, with a shift of about 0.4mm. This is the best that I have tested with a linear range over 4mm. The Cms (X) as seen in Graph 2 is perfect. There is no offset and the shape is perfectly symmetrical. More importantly, the two curves are perfectly matched. They track each other over the entire range of the linear travel.

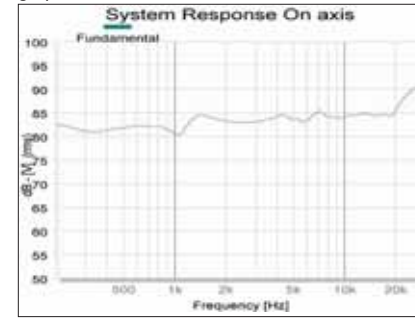
The Bl (X) and Cms (X) curves can also be used to predict the maximum excursion for the speaker (Xmax). It is defined by Klippel as the point at which the compliance or Bl nonlinearities create 10 percent harmonic or intermodulation distortion. This happens when the Bl has dropped to 82 percent of its x=0 value (XBl) or Cms has dropped to 75 percent (Xc). For the

graph 3

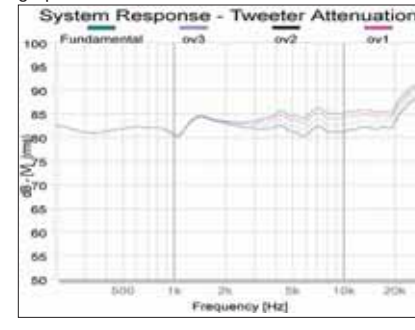


graph 4

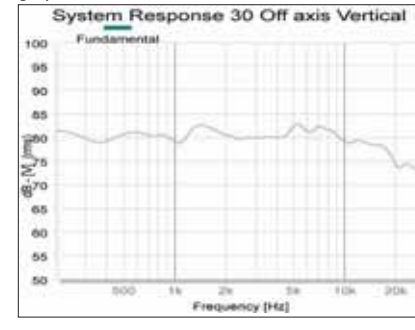
graph 5



graph 6



graph 7



SR6500 woofer the XBl point is 4mm and the Xc point is 4.6mm. These numbers mean that you can use this component set full range with a medium-sized amp and get decent bass, or you can use them with a subwoofer and active crossover and they will simply rock.

Frequency Response

I start by measuring the speakers without crossover to see what the exotic materials were bringing to the table. Graph 3 shows the woofer and tweeter response on-axis. This is pretty much textbook stuff-unbelievable flat tweeter response, great woofer response with a slightly rising shape and no breakup problems on the top end. The wide overlapping range from 1kHz to 6 kHz means that the crossover can be effective and give a smooth transition on- and off-axis.

Graph 4 shows the individual responses together after that crossover, also textbook stuff. The 3.2kHz crossover point offers perfect symmetry. The tweeter is a little hotter so there is good versatility.

Graph 5 shows the system response on-axis. This is as good as it gets. A (very) small dip at 1kHz probably caused by an edge hole on the woofer is the only deviation from a flat line. Even this dip is way smaller than most 6 1/2" woofers.

Graph 6 shows the three tweeter attenuation settings available by changing the + lead of the tweeter at the crossover. The settings include a +1, 0, -1.5 and -3 dB.

I test component sets and coaxes on-axis and both vertical and horizontal off-axis to see if the crossover design is flexible enough to work in the wide variety of car audio installation positions. This is where most component sets fall apart. If the crossover isn't designed well, the on-axis response may look great, but the off-axis response will be awful. This is where the SR6500 really shines.

Graph 7 shows the response 30 degrees off-axis with the tweeter mounted above the woofer. If you leave the tweeter facing the same direction as the woofer, you get a slight roll-off above 10kHz, as shown in the graph. However if you use the included angled plates to aim the tweeter, you get the same perfect response that you get on-axis.

Graph 8 shows the tweeter mounted next to the woofer (horizontal). This by far the harder of the two off-axis positions because of the additional time delay difference between components. In this test I used the angle tweeter mount and reversed the phase of the tweeter as suggested in the manual. Again this response is pretty much perfect.

I also test harmonic distortion at 1/2 rated RMS power to get some idea of where the limits are in the system. The SR6500 is rated higher than most component sets I have tested. My tests at 60 watts showed very low distortion levels-below 3% in the mid and upper band.

Because the SR6500 is convertible to a coax, I decided to mount the tweeter and see just how bad it got. You see coaxes have the disadvantage of playing havoc with the woofer's response by putting a big chunk of plastic in front of it and having the tweeter mounted at the end of a post that creates huge amounts of diffraction. The end result is huge peaks and valleys in the response curve. This of course is the reason that component sets sound better than coaxes.

Graph 10 of the coax response, off-axis 30 degrees just like it would be in a car, completely blew me away. The response is flat with the exception of a very small dip at 3kHz. The tweeter is still smooth and there are virtually no diffraction dips. This is the best coax response I have seen. I have spent some time figuring out what they did and my guess is that it is a combination of the smooth tweeter post and combination of large woofer voice coil diameter and relatively small diameter tweeter fascia diameter. If you want a truly high-end speaker but need to have a coax, this is truly a no-compromise solution.

Graph 11 shows a system impedance that is smooth and easy on any amplifier (of course).

So what is my final opinion based on the tests?

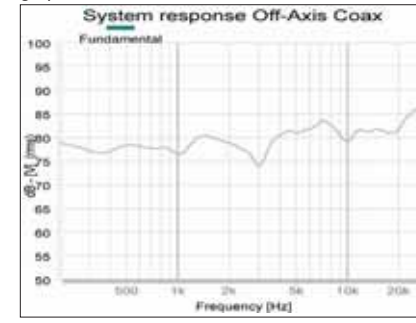
On-Axis Response
10
Off-Axis Vertical
10
Off-Axis Horizontal Mount
10
Flexibility (above 3 averaged)
10
XBL
9.9
XC
10
Distortion
9.9
Parameters
10

Here it is: The Polk Audio SR6500 component sets are the best component sets and coaxes I have tested: the best performance, the best cosmetics, the best engineered, and so far the only thing I have seriously considered putting in my own car. If these seem expensive to you at $899, save your money and get the best. If these seem inexpensive to you and you are considering spending more-even a lot more-save your money. It doesn't get any better.

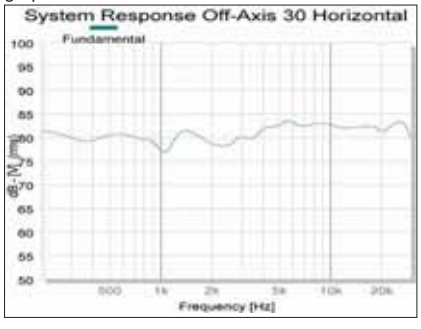
Polk guys, if I get to keep these, they are going in my truck. If I have to send them back, I am buying two pairs-one to put in my truck, and another to take apart and copy for my next customer. -PT

For the subjective portion of this test report, read the December 2005 issue.

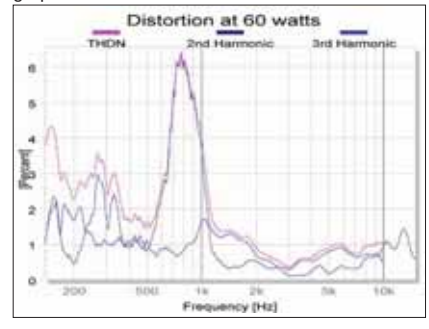
graph 10



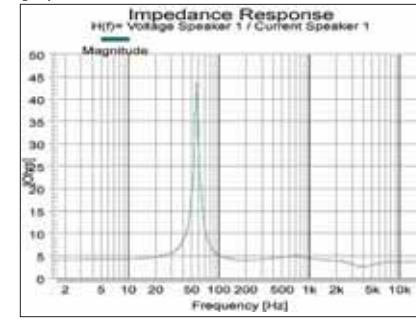
graph 8



graph 9



graph 11



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SR6500
Signature Reference Series

polkaudio®

6 1/2" Component & Coaxial System

Driver Features:

Removable Phase Plug
For smooth, flat frequency response even off-axis. Remove the phase plug and replace it with either a straight or angled tweeter mounting post to transform the SR6500 into the absolute best coaxial speaker on the planet.

Butyl Rubber Surround
Further damps cone resonance for wider response and lower distortion. High resistance to UV and temperature extremes means long life and reliability.

Neodymium Magnet Structure
Finite Element Analysis (FEA) design makes the powerful neodymium magnet more linear for lower distortion and higher definition. Small Neo magnet makes the SR6500 easier to fit into more locations and vehicles.

Die Cast Aluminum Basket
For greater resistance to resonance.

2 1/2" Mounting Depth
Ensures easy installation into virtually any car.

1 1/2" Voice Coil
For better power handling and bass output.

Aerated Polypropylene Cone
The mid/bass driver cone is aerated polypropylene in which air is injected into polypropylene to produce a honeycomb structure that serves to stiffen and damp the cone without adding mass. This is the same cone technology employed in Polk's critically acclaimed LS*i* Series audiophile-grade home speaker line.

U.S. & Euro Mounting
Hole patterns to line up with any vehicle.

Polyimide Former
For high thermal stability (rated to 220°C), high power handling and low mass.

Cooling Fins
Act as heat sinks to increase power handling and reliability.

Vent Holes in Basket
Equalize air pressure on both sides of the spider for more linear travel, flatter frequency response and lower distortion.

Oversized Flat Spider
For better linearity.

4-Way Gold Plated Input Terminals
Corrosion resistant terminals accept Fast-ons, spade lugs and bare wire.

Tweeter Features:

22mm Ring Radiator Tweeter
Ring radiator tweeters have inherently few performance-robbing resonance modes. The result is flat, extended **frequency response beyond 40kHz,** low distortion, excellent dynamics, exceptional detail and transparency.

High Frequency Waveguide
Prevents phase cancellations for smooth, uniform frequency response and wide dispersion.

Neodymium Motor Structure with Faraday Cap
The copper "Faraday Cap" on the pole piece flattens the impedance curve, lowers distortion, extends and improves high frequency response.

Neodymium Magnet
Tiny and powerful makes this tweeter ultra-efficient.

Crossover Features:

Zoebel Network
Flattens the system impedance curve for more efficient power transfer and flatter response.

Air Core Inductors with oxygen free copper wire, for wider dynamic range, contrast and punch.

Mylar Capacitors
For better damping factor.

1% Tolerance Resistors & Capacitors
for perfect unit-to-unit consistency.

4-Position Tweeter Levels:
+1, 0, -1.5, -3.

Tweeter Protection Circuit

Gold-Plated Connectors

Cast-Aluminum Heat Sink

2nd Order Low Pass Filter

3rd Order High Pass Filter