

SUB 12 AND SUB 15

*“The three ‘L’s’ are the driving force behind Paradigm’s subwoofer research ... **Louder, Lower-Frequency, Lower-Distortion bass.**”*

– Paradigm Design Team

High-end gear has a reputation for being outrageously priced, but don’t be fooled. Sometimes, even the priciest gear delivers performance that is nothing to write home about. Today, more than ever, the Price-to-Performance ratio of a product must remain top of mind—and that’s where Paradigm shines; why we have been voted #1 for 19 years*. Our SUB 12 and SUB 15 are perfect examples ...

A natural evolution in our lineup of award-winning subwoofers, they benefit from our years of research into the mechanics of producing louder, lower-frequency, lower-distortion bass. In fact, the three ‘L’s’ are the driving force behind our ongoing commitment to refining and improving the performance of our subwoofers.

The unique amplifier/driver configuration in SUB 12 and SUB 15 allows these subs to play louder and lower than any other subwoofers in this price range, and still cost less! And unlike many designs on the market, not a hint of low-frequency extension or output was sacrificed to keep their size compatible with today’s living spaces. A comprehensive range of input and control facilities make setting up the subwoofers a snap.

Finally, since the room itself (dimensions, dead spots, archways, even furniture!) can have a dramatic impact when even the finest subwoofers are perfectly positioned, Paradigm also offers a solution for the problems of the room! SUB 12 and SUB 15 are designed to be used with the critically acclaimed Paradigm® Perfect Bass Kit** (PBK-1™) which adjusts for the room’s negative effects on a subwoofer.

*Rated #1 Price/Value by the distinguished publication *Inside Track*.

**Paradigm® Perfect Bass Kit (PBK-1™) sold separately. Details on page 27.



High-Excursion Bass Drivers

These proprietary drivers were designed, engineered and manufactured by Paradigm in North America: 12" (308 mm) in the SUB 12 and 15" (380 mm) in the SUB 15. With unwanted resonances, standing waves and micro-distortions non-existent, these subwoofers display incredible definition, awe-inspiring dynamics, lightning-fast speed and gut-wrenching power.

- **Mineral-Filled Co-Polymer Polypropylene Cones with RCR™ Resonance Control Ribs:**

Engineered for very high power, the high-stiffness design is intrinsically low in distortion, allowing the bass cone to respond instantly to the starts and stops of even the leading edge of changing bass notes.

- **Large High-Pressure Die-Cast Aluminum Chassis**

- **Dual-Voice-Coil Design! 3-Inch (76 mm) Aluminum Voice Coils:**

Wound on high-temperature Kapton® formers in an oversize configuration, the multi-layer voice coils provide exceptional linearity and motor strength.

- **Advanced Multi-Layer Polyurethane-Composite Elliptical Surrounds and Dual Oversize Spiders:**

Optimized using Finite Element Analysis (FEA), a highly advanced tool for component design, the surrounds' multi-layer composite matrix, with its high-tech surface treatment, encourages staggering peak-to-peak excursion—with exceptional linearity and cone control.

- **Large Aluminum Shorting Rings:**

Situated around the voice coil, the rings not only improve linearity and heat dissipation, they also help reduce voice coil inductance and distortion.

- **Proprietary AVS™ Airflow Ventilation System Cooling:**

Large built-in ribs increase the heat dissipation surface, providing forced-air cooling during large musical transients and chassis convection cooling at all other times.

- **Extruded-Aluminum Center Heatsinks:**

Provide internal forced-air cooling to drive heat away from the FEA-optimized pole piece, increasing power handling while reducing distortion.

- **35-lb (15.8 kg) Magnet Assemblies Boast Balanced Field Geometry:**

FEA-optimized to produce a powerful high-density symmetrical magnetic forcefield while minimizing inductive distortion. Transient and phase response, power handling and output linearity are all exceptional.



Input and Control Facilities

Input Facilities:

Low-Level Input – RCA: Allows connection from the RCA (S/E) Left and Right or Sub/LFE Outputs of your Preamp/Processor or other suitable low-level source.

Low-Level Input – Balanced XLR: Allows connection from the Balanced XLR Sub/LFE Output of your Preamp/Processor or other suitable low-level source. This input provides the lowest noise and distortion. It is particularly important for long cable runs where noise and distortion could degrade performance.

Control Facilities:

Auto On/Off: Eliminates the need for a manually operated power switch. Turns the subwoofer on when there is an input signal. If no signal is present, after a period of time it turns off.

Trigger On/Off: Allows the subwoofer's power on/off to be controlled by components that have a trigger output (preamp/processor, etc.).

Subwoofer Cut-Off with Bypass Option: (Continuously variable 35 Hz – 150 Hz) Controls the sub's upper frequency cut-off and can be set to match the low-frequency roll-off characteristics of your system's speakers.

Bypass Option allows you to bypass the built-in cut-off control to let your preamp/processor's or receiver's internal bass management provide the crossover function.

Subwoofer Level Control: Balances the subwoofer level with that of the other speakers in your system.

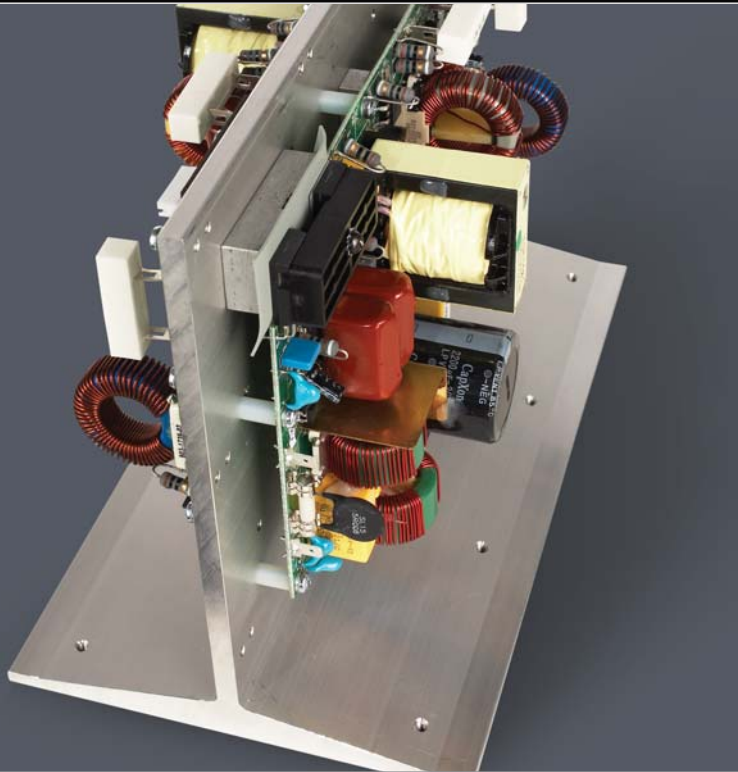
Phase Alignment: (Continuously variable 0° – 180°) Accurately synchronizes your subwoofer and front speakers through their bass frequency overlap region.

USB Port. Allows for:

- Connection of the optional Paradigm® Perfect Bass Kit (PBK-1™), sold separately;
- Future upgrades to subwoofer software.

Shown in Rosenut: SUB 15

DUAL ULTRA-CLASS-D™ AMPLIFIERS



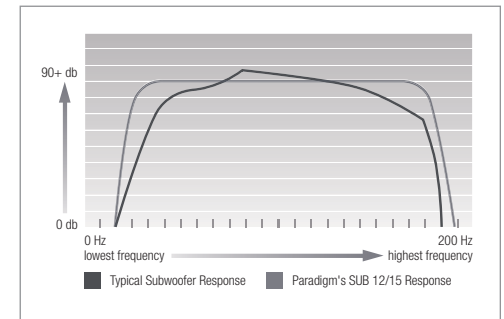
Small Form Factor. BIG POWER!

Designed, engineered and manufactured by Paradigm in North America, this unique design features dual state-of-the-art Ultra-Class-D™ amplifiers housed inside one cabinet. State-of-the-art component parts:

- Dual Efficient Ultra-Class-D™ Amplifiers with Switching Power Supplies:**
 Boast more than 90% efficiency! Optimized to completely control the operation of the bass driver. Prodigious total output: 3,400 watts of Dynamic Peak Power; 1,700 watts (850 watts each amplifier) of RMS Sustained Power.
- More Power from a Smaller Package. How to achieve this?**
 One of the things to consider is the choice of transformer. Our low-noise, ultra-high-power, yet compact transformer (0.4 lb / 0.18 kg) is ideal. Unlike the large and heavy transformers in a linear power supply, it boasts an ETD-core developed particularly for applications that require high power in a small format. Yet the transformer is only part of the advanced system on each of these amplifiers. The switchmode power supply benefits from: highest quality MOSFET transistors, noise-suppression networks and an advanced control circuit. The result is tremendous current with ultra-quiet operation.

- Proprietary Amplifier Temperature Sensors:**
 Maintain the safe operating temperature of the dual amplifiers, even under extreme operating conditions.
- Advanced Short-Circuit Protection:**
 If current through the MOSFETs exceeds an internally preset limit, a Silicon Controlled Rectifier (SCR) disables the output stage. Essentially a 'latching' device, the SCR will not allow the output stage to be re-enabled until power is reset. Reaction time is typically within 10 μ s.
- Novel Adaptive PWM (Pulse Width Modulation) Power Processor:**
 Minimizes distortion and optimizes efficiency. Conventional Class-D designs have very low power supply rejection. Paradigm's Ultra-Class-D™ design inherently rejects variations in the power supply.

Paradigm's Own Digital Signal Processing (DSP) Design: Sophisticated mathematical algorithms 'shape' the sub's frequency response, ensuring accurate, consistent and musical bass without audible distortion, even when the subwoofers are playing at the loudest levels:



USB interface for optional Paradigm® Perfect Bass Kit (PBK-1™) and future updates to software installed on your subwoofer



- Full-Bridge Ultra-Class-D™ Design Output Stage:**
 Operates from split power supply rails ensuring exceptionally low distortion. The high-quality output filter inductors with super-efficient toroidal cores, four high-quality MOSFET transistors on each amplifier (each capable of carrying 65 amps of continuous current), and a noise-suppression network play a significant role. Not only does this design increase the speed of the switching, it also dramatically increases switching efficiency.
- Precision Components and Dual-Sided Military Spec (FR-4 rated) Glass/Epoxy Circuit Boards:**
 Superior 'Reference' quality performance with an enviable degree of reliability over the long term.



Less Heat, More Power, No Noise!

It's one thing to house two 850-watt Ultra-Class-D™ amplifiers in a single cabinet, it's quite another to ensure that all of that power is harnessed for effective and efficient delivery, without a maelstrom of unwanted sonic side effects.

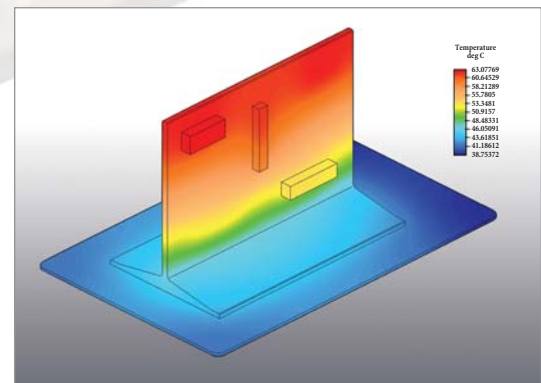
Our sophisticated R&D facilities held the answer. We enjoy a number of highly advanced tools for component design. One of these is Finite Element Analysis (FEA), an invaluable process when monitoring a design for efficient heat dissipation or performing stress analyses.

Using FEA, the 'T-shape' center aluminum extrusion to which each amplifier is attached was optimized to obtain exceptional heat dissipation away from the amplifiers (see diagram below). An FEA modal frequency analysis was also done to ensure the entire assembly is free of unwanted resonances and vibrations.

Even the correct size and thickness (3.2 mm) of the amplifier panel was calculated to obtain optimal heat dissipation-to-size ratio. Finally, a fully sealed preamplifier board cover (inset bottom left) eliminates the possibility of air leaks.

Close-up of unique 7-mm thick FEA-optimized high-grade aluminum 'T-extrusion' (see left)

'T-extrusion' shown below without amplifiers to illustrate design effectiveness ...



Cross-Cut Tunnel Bracing™

Conventional enclosures store energy. At various frequencies, the enclosure vibrates (like a tuning fork) at audible levels for a short period of time. These uncontrolled vibrations smear the sound, resulting in a loss of accuracy and clarity. Superior high-end bass performance, the caliber for which Paradigm® Reference subwoofers are known, requires a supremely rigid and sonically inert cabinet. But how to achieve this in a cabinet slated to hold not one, but two ultra-powerful amplifiers, as well as a large state-of-the-art driver? The solution ...

- Medium Density Fiberboard (MDF) composition throughout;
- A thick 1" MDF front baffle provides additional rigidity;
- Critically placed internal damping fiber provides excellent absorption of any stray rear wave or internal standing wave energy;
- The fully veneered cabinet also adds rigidity.

Finite Element Analysis (FEA) played a major role, yet again:

- Size, thickness and location of the tunnel bracing in relation to overall size and weight of the cabinet were optimized using FEA;
- Size and position of the cross-cuts along each brace were also FEA-optimized to obtain the most effective 'strength-to-air' surface area.

Driver chassis and amplifier panel were physically recessed into the cabinet to maintain the clean lines.

SPECIFICATIONS

www.paradigm.com



SUB 12



SUB 15

Design	Single high-excursion driver, sealed enclosure, patented built-in Ultra-Class-D™ power amplifier, USB port	Single high-excursion driver, sealed enclosure, patented built-in Ultra-Class-D™ power amplifier, USB port
Amplifier: High-Current, Discrete Output	3,400 watts Dynamic Peak / 1,700 watts RMS	3,400 watts Dynamic Peak / 1,700 watts RMS
Amplifier Features	Auto-On / Off, Trigger-On / Off, soft clipping, electrical shorting protection, thermal protection	Auto-On / Off, Trigger-On / Off, soft clipping, electrical shorting protection, thermal protection
Bass Driver(s)	305-mm (12 in) RCR™ mineral-filled co-polymer polypropylene cone	380-mm (15 in) RCR™ mineral-filled co-polymer polypropylene cone
Low-Frequency Extension*	16 Hz (DIN)*	12 Hz (DIN)*
Subwoofer Cut-Off Frequency	Variable 35 Hz – 150 Hz; Bypass Option	Variable 35 Hz – 150 Hz; Bypass Option
Sub / Sat Phase Alignment	Variable 0° – 180°	Variable 0° – 180°
Line-Level Input	RCA (S/E) Left and Right or Sub-Out / LFE or Balanced XLR. From Sub-Out / LFE-Out of preamp/processor or other line-level source	RCA (S/E) Left and Right or Sub-Out / LFE or Balanced XLR. From Sub-Out / LFE-Out of preamp/processor or other line-level source
Line-Level Input Sensitivity	100 mV mono	100 mV mono
Line-Level Input Impedance	RCA: 10k ohms; XLR: 20k ohms	RCA: 10k ohms; XLR: 20k ohms
Height, Width, Depth (Heights include feet for SUB 12 and SUB 15)	44.3 cm x 40.7 cm x 54.6 cm 17-7/16 in x 16 in x 21-1/2 in	49.5 cm x 49.5 cm x 55.9 cm 19-1/2 in x 19-1/2 in x 22 in
Cutout Dimensions: (h x w)	n/a	n/a
Minimum Mounting Depth**	n/a	n/a
Minimum Internal Volume	n/a	n/a
Matching Paradigm® X-Series Amplifiers Required (sold separately)	n/a	n/a
Weight (Unpacked)	39.9 kg / 88 lb each	46.7 kg / 103 lb each
Finish(es)	Cherry, Rosenut, Black Ash, Piano Black	Cherry, Rosenut, Black Ash, Piano Black