



MERIDIAN

Range Rover Evoque

Meridian in-car audio



Meridian – the Sound of Range Rover Evoque

Meridian and Range Rover both share a British heritage. They also share a common desire to push the boundaries of experience, and a common ability to develop technology to conquer new challenges.

The driving experience is changing. Today, we regularly spend more time listening to music in the car than we do at home. So when Range Rover sought to create a truly class-leading listening experience for their customers setting new standards in automobile entertainment, they came to Meridian.

Conventional consumer audio systems, whether in-home or in-car, have followed a traditional pattern in which the power amplifiers supply a full-range audio signal to the loudspeakers, where a passive crossover divides the signal into frequency bands to be supplied to woofer and tweeter. This approach requires a number of significant compromises in the design of the system, including the need for excessively large power amplifiers to overcome the lower efficiency of passive systems, and the need for the passive crossover to employ components chosen for their power-handling capacity rather than their audio quality.

Thirty years ago, Meridian developed some of the first active loudspeakers available, going on to use digital signal processing (DSP) to create crossovers that would be impossible – or prohibitively complex or expensive – to realise in the analogue domain, and becoming the first consumer audio manufacturer to do so.

Meridian DSP-based digital active loudspeakers use a fully-digital crossover followed by digital to analogue converters (DACs) to drive individual amplifiers which power the loudspeaker drivers directly, maximising efficiency and allowing a level of performance usually associated with loudspeakers at least four times the size.

The Systems

Meridian and Range Rover have designed two powerful and unique in-car audio systems for Evoque.

The **Meridian Sound System** is a 380-watt, 12-channel stereophonic system featuring 11 loudspeakers including a special dual-channel subwoofer.

The **Meridian Surround Sound System** is a full 15-channel stereo/surround system running 825 watts and driving 17 loudspeakers mounted around the vehicle

System Highlights

Ground-breaking digital in-car entertainment system, custom-designed for Evoque

12-channel, 11-speaker stereo Meridian Sound System and 15-channel, 17-speaker Meridian Surround Sound System available

Digital Active loudspeaker system featuring Meridian DSP Loudspeaker technology

High sound output level with minimal distortion

Full frequency range with deep bass extension

Advanced DSP-based Dynamic Volume Control automatically compensates for ambient noise levels

Exceptionally high efficiency, power-to-weight ratio and compact size

Meridian Cabin Correction uses fine-tuned DSP to match vehicle interior acoustic space

Meridian Audio Limited

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cabin, including centre and surround loudspeakers.

In addition to Dolby PLIIx and DTS Neo:6, the Meridian Surround Sound System incorporates the unique Trifield™ system which decodes stereo information to drive multiple loudspeakers for a clearer, more stable stereo image wherever you sit. It delivers involving, enveloping surround-sound as well as an impressive stereo image for everyone in the vehicle.

Both systems deliver exceptional sound, with crystal-clear highs and full, deep bass. Both use specially-selected, road-rugged materials and employ the most advanced digital technology. They also both support an extensive range of sources – such as inputs for iPod® or other personal stereo player, USB media, and other compatible sources in addition to the built-in DAB radio and CD/MP3 disc sources.

Loudspeakers

The loudspeaker drivers used in the Range Rover Evoque have been specifically designed and developed by Meridian engineers, in collaboration with Jaguar Land Rover's drive unit suppliers.

Bass and midrange drivers feature mica-filled polypropylene cones. The mica filling adds both stiffness and damping, which helps to ensure a smooth frequency response throughout the operating bandwidth. To minimise total weight while delivering the highest possible performance, low-mass materials have been specifically-selected for the drivers. Low moving mass drive units store less energy and provide better transient performance as the voice coil and cone can respond rapidly to input signals.

The materials selected are also very stable and thus ideal for use in an automotive environment where extreme conditions are commonly encountered.



The tweeter features an ultra-light aluminium alloy dome to maximise efficiency and provide extended high frequency performance. Again, a low moving mass design provides superb transient handling and negligible distortion across the operating bandwidth of the driver.

All the drivers used in Meridian's Evoque sound systems feature powerful neodymium magnet assemblies. These combine high, uniform magnetic field densities with low mass, improving efficiency while once again keeping weight at a minimum.

The materials selection process has resulted in a series of drive units that, taken together, deliver tight bass, coupled with a very natural mid-range and high frequency performance. As a result, less filtering and compensation is required in the electronics, resulting in superior sound quality throughout the system.

Meridian Audio pioneered the use of active loudspeaker technology, in which the amplifiers that power the drive units are co-sited in the loudspeaker enclosure and the crossover is carried out at line level (or digitally in the case of a Meridian DSP Loudspeaker system). This is seldom physically possible in the automotive environment, but the same principle applies,

in that the loudspeaker drivers are directly connected to the amplifier outputs and as tightly controlled as possible, while digital crossover technology maximises system efficiency.

The amplifiers themselves are driven by high-precision digital-to-analogue converters, the signals being derived from DSP-based crossover designs which exhibit very tightly-defined characteristics that are either impossible to realise or prohibitive in conventional analogue designs. This makes it possible to create extremely precise crossover filters that achieve a high level of matching with the frequency responses of the drivers for a smooth, full-range response.

DSP Active Loudspeakers are ideal for the automotive environment. They are exceptionally efficient, typically requiring significantly lower power levels – conventional passive systems with speaker-level crossovers waste a significant proportion of the amplifier power as heat. They can also deliver higher sound pressure levels with the benefit of driver protection, and extended frequency response, especially at low frequencies. Meridian calculates that a DSP Active Loudspeaker system can typically deliver the same performance as a conventional system with loudspeakers approximately eight times the volume.



Four of the Range Rover Evoque loudspeaker drivers (not to scale).
L to R: 25mm HF, 100/25mm coaxial, 165mm LF. Top right: cutaway of the subwoofer assembly.

Range Rover Evoque In-Car Audio System

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Making the cabin a listening space

The advanced DSP capability provides the ability to provide other features too, notably Meridian Cabin Correction. Derived from the Meridian Room Correction system employed in Meridian's advanced home entertainment surround controllers, Cabin Correction tunes the audio system precisely to the acoustics of the vehicle cabin.

The interior of any vehicle presents significant acoustic challenges to the audio systems designer, with various resonances and problem areas. It is, however, a known, fixed environment – and thus can be compensated for. A series of sophisticated digital filters tunes out resonances and standing waves in the vehicle cabin and these are an integral part of the DSP driving the system.

Consistent listening

The Dynamic Volume Control feature of the system constantly monitors ambient noise levels in the cabin. As a result, when that level changes – for example as a result of a change of road surface, or a window being opened – the system can automatically compensate by varying the system volume, and thus providing the listener with a consistent listening experience in which the ratio between audio system volume and ambient background is always balanced as desired.

All the best seats in the house

The Meridian Sound System is a multi-speaker stereo system, while the Meridian Surround Sound System additionally offers surround sound decoding. In addition to the Dolby PLIIx and DTS Neo:6 systems, the Meridian Surround Sound System incorporates Trifield technology, a system unique to Meridian in the consumer

electronics field. Trifield takes a stereo signal and “decodes” it for multiple speakers. In particular, it uses the centre front loudspeaker of a surround array and the surround speakers to create a stereo image that is not only much more stable than one created simply by left and right: it is also remarkably stable in all locations in the vehicle.

Trifield is based on a unique British surround-sound invention, Ambisonics – and both have been included in Meridian home entertainment systems for many years: Meridian was a prime mover in implementing the system in the home environment. Unlike conventional surround systems, Ambisonic technology doesn't simply feed one channel to one loudspeaker. Instead it decodes the entire sound field and

generates a specific loudspeaker feed for each loudspeaker in the array, so that they all work together to create a coherent surround image. Trifield does exactly the same, but derives its source from a stereo signal, giving it new life.

Because the stereo signal is decoded to multiple loudspeakers around the vehicle, the image that listeners experience is not only more stable, it is essentially similar wherever you are seated in the vehicle. In the case of a normal stereo system with only left and right loudspeakers, the stereo image you experience tends to be pulled into the nearest loudspeaker. If you sit on the left, it's pulled to the left, and if you compensate by adjusting the balance, listeners on the right, for example, will hear the image pulled even further to the right.

Range Rover Evoque Outline Specifications

25mm Tweeter

Nominal Impedance:	4Ω
Power Handling RMS:	25W
Power Handling Max:	50W
Sensitivity (1W/1m):	88 dB ± 2dB
Resonance Frequency:	1.4 kHz
Operating Freq Bandwidth:	3 – 20 kHz
THD @ 10W:	< 1%

100mm Midrange

Nominal Impedance:	2Ω
Power Handling RMS:	70W
Power Handling Max:	100W
Sensitivity (1W/1m):	87 dB ± 2dB
Resonance Frequency:	115 Hz
Operating Freq Bandwidth:	200 Hz – 5 kHz
THD @ 10W:	< 2%
Linear Excursion:	± 2mm

165mm Bass

Nominal Impedance:	2Ω
Power Handling RMS:	70W

Power Handling Max:	100W
Sensitivity (1W/1m):	89 dB ± 2dB
Resonance Frequency:	60 Hz
Operating Freq Bandwidth:	60 Hz – 3 kHz
THD @ 10W:	< 2%
Linear Excursion:	± 3mm

200mm Subwoofer

Nominal Impedance:	2 x 2Ω
Power Handling RMS:	2 x 70W
Power Handling Max:	2 x 100W
Sensitivity (1W/1m):	80 dB ± 2dB
Resonance Frequency:	37 Hz
Operating Freq Bandwidth:	30 Hz – 120 Hz
THD @ 10W:	< 2%
Linear Excursion:	± 6.5mm

Amplifier:

Amplifier Type:	Class D with feedback.
Channels:	12 or 15.
Power Rating (0.2% THD):	380W or 825W.



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Some systems attempt to deal with this simply by placing a speaker in the dashboard and feeding it with a left/right mix. This, however, is not a very convincing solution and tends to narrow the stereo image.

Meridian's Trifield system, however, uses all the loudspeakers in the vehicle, working in concert to deliver a superb stereo image, spread naturally across in front of the listener instead of being drawn into the doors.

This applies to listeners in the rear of the vehicle as well. The surround speakers are used to derive a stereo image too, so the experience is very similar to that in the front of the vehicle, with stable imaging that is much less listener-position-dependant than in a conventional stereo or surround system.

Wherever you sit in the Evoque, you're sitting in the best seat in the vehicle as far as music listening is concerned.



- Tweeter 25mm
- Midrange 100mm
- Co-axial 25/100mm (Meridian Surround System only)

- Bass 165mm
- Subwoofer 200mm (under seat)

Loudspeaker types and locations in the Meridian Sound System and Meridian Surround Sound System.

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