Autosound 2000 Test Lab Report on OEM vs. Aftermarket Head Units

OEM Car Audio Systems versus Aftermarket Decks
By David Navone with Tests by Richard Clark

Head Unit Manufacturer	Popular Name Brand Medium Priced Japanese Deck	Ford Visteon OEM Deck	GM Delco OEM Deck
Model Info	Recently Reviewed in Car Sound Magazine	CD-6 via Soundgate LOCHVA	4185 via Soundgate LOCHVA
Max Output Level	3.1 V @ 14.9% THD+N	4.0 V @ 7.6% THD+N	4.5 V @ 10.0% THD+N
Max Undistorted Output	2.5 V @ 0.6% THD+N	3.4 V @ 1.0% THD+N	3.9 V @ 0.8% THD+N
Usable Dynamic Range	-93 dB	-82 dB	-93 dB
Output Impedance	300 Ohms	1030 Ohms	1042 Ohms
Deck's Internal Amplifier Max Undistorted Output	7.7 V @ 1% THD+N	7.3 V @ 1% THD+N	8.4 V @ 1% THD+N
Watts/Channel @ 4 Ohms	14.7 Watts	13.3 Watts	17.6 Watts

I started installing car audio components back in the early 1960s when most of the stock vehicle sound systems (OEM or Original Equipment Manufactured) consisted of an AM radio. A few OEM systems featured AM/FM tuners with a trendy Front – Rear fader control that allowed the sound level to be shifted to the full front, full rear, or anywhere in between. The first aftermarket sound-enhancing component I installed was a Motorola spring-operated reverberation unit that hung under the rear deck and added "jazz hall" DSP effects. With installation, this accessory could cost as much as the OEM radio and speakers.

When the OEM tuners were upgraded to play 2-channel stereo, the aftermarket added under-dash 4-track tape players. This was around 1965 and really launched the car audio industry. The only speakers that were available were replacement speakers for elevators, grocery stores, TVs, and home stereo systems. By the 1970s, aftermarket speakers were added to our sales counters and the 8-track tape player made its debut. The OEMs tried to catch up by delivering in-dash AM/FM-Stereo/8-track players and Quad Surround systems, but then the Japanese designers figured out how to drastically reduce the size of their audio components. This meant that more features and benefits could be jammed into the cavernous dash cavities of American vehicles. So the aftermarket ruled through the 1970s.

There were times of great concern for aftermarket car audio. For instance in 1977, the very popular Dodge van added a teardrop to the right side of the dash cavity. How could the aftermarket fit a rectangular head unit into a teardrop hole? The answer was an installation "fit-kit" and the entire accessory industry was jump-started. Around this time General Motors added a CB radio to their AM/FM-Stereo/8-track player. This would be a very difficult system to upgrade. However, GM soon figured out that this head unit could be very expensive to repair. So the

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aftermarket breathed a sigh of relief and began yanking these chrome boat anchors and replacing them with aftermarket decks such as the very high quality Blaupunkt 2001.

In the 1980s, the OEMs consistently lost out to the aftermarket in the features and benefits department. Many car audio shops traveled to dealerships to replace factory decks with aftermarket components. My shop was called Rolling Sounds because we rolled our vans out to dealers – including Japanese Datsun and Toyota dealers – and installed upscale aftermarket components. Our average installed price was around $250.00, (about 1 K in todays money) which got tacked onto the price of the car. My shop is still in business today, but there are no longer any Rolling Sounds installation vans. The business has changed.

The 1990s brought us OEM systems that are integrated into steering wheels, air conditioning systems, warning lights, factory anti-theft systems, etc. Not only that, but the features and benefits of some OEM systems cannot be easily duplicated in the aftermarket. For instance GM's Driver 1 or Driver 2 preset preferences and steering wheel controls make swapping head units a difficult decision. Also many OEM in-dash decks can play a CD and a cassette. Upgrading such a deck can be a really tough decision. In fact, many OEM head units are being left in the vehicle and aftermarket system designers are interfacing components to the factory deck. There are shops that lament the fact that they can't upgrade the factory deck, but with many new vehicles, the OEM deck will probably remain in the car until it hits the wrecking yard.

A2TL Tests New OEM Decks

But is replacing a modern deck with an aftermarket deck really an "upgrade?" Car Sound Magazine's Forums have been alive with questions about interfacing new OEM decks with aftermarket components. Questions about "sacrificing quality by using an OEM head" have prodded our Autosound 2000 Test Labs into examining the electrical differences between aftermarket decks and OEM decks.

For our tests we chose a new Visteon OEM deck, a new Delco OEM deck and a mid-line priced Japanese deck. (We recently reviewed this popular deck in Car Sound). The Visteon deck utilizes a 6-CD changer (CD-6) and the Delco deck is the 4185. We tested the OEM decks with a high quality interface attached in the same manner they would be used in a typical OEM upgrade. We chose Soundgate LOCHVA OEM interface devices for the tests because Rob Putman at Soundgate is our AutoMedia Magazine OEM Interface Editor. The tests were our standard specification measuring programs in the Audio Precision System II.

As we all realize, an important spec is the Maximum Undistorted Signal Level, which was 2.5 volts in the Japanese deck, 3.4 volts in the Visteon deck and 3.9 volts in the Delco deck. These readings were taken just under clipping and notice that the distortion figures are 1% or less. Distortion of less than 2% on musical program material is impossible to hear so the 1% spec is excellent.

The useable dynamic range is the difference between the noise floor and the maximum undistorted output. The Japanese deck yielded a specification of 93 dB, the Visteon deck came in at 82 dB and the Delco deck measured 93 dB. The maximum theoretical dynamic range for a 16-bit CD is 96 dB. This means that these specifications are excellent – especially for a car audio component that must contend with road – wind – vehicle noise.

The last specification we measured was the output or source impedance. The Japanese deck measured a respectable 300 ohms. Both the Visteon and Delco decks had very low output impedance measurements (less than one ohm) because of their speaker level outputs, but with

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the OEM interface devices installed, the specs were a little over 1000 ohms for each deck. Is this a bit high for car audio?

Output Impedance Specs

In Noise Troubleshooting 101, we learned that a high output impedance could be a source for noise. The output impedance can be thought of as a resistance (actually impedance) in series with the signal. For those readers who hate Ohm's Law, we have can say, "The highest voltage will be developed across the highest resistance." This means that a high source impedance could allow a higher noise level to be produced across that resistance. This last statement is also the key to the potential problem for noise.

Since the output impedance of the speaker leads of the OEM decks themselves is certainly very low, there will be very low noise levels produced on the signal path leading to the OEM interface devices. The only possibility for noise appears at the OEM interface device and on the output of the OEM interface device. This means that the speaker level signal should be routed close to the input of the aftermarket amplifier. (We recommend Unshielded Twisted Pair signal cables for this task.) Then the OEM interface device should be installed at the input of the aftermarket amplifier. If the installation is done correctly, a source impedance of 1000 ohms over a short path of 6" or so will not present a problem.

Installation

If you're in a noise situation; install the LOC very close to the input of your aftermarket power amplifier. Then run small gauge speaker wires from the + and – speaker terminals of the OEM speakers all the way to the LOC. The factory speaker can then be removed, or left in place. The speaker wires can be #26 AWG or smaller because there no reason to install large wires to feed the LOC. Always leave the adjustment pots on the LOC at their MAXIMUM level, unless there is a good reason to lower the signal level. Remember, in audio, there is no substitute for a high signal level, so leave the LOC level at the Max.

Conclusions

The specifications of the OEM decks, connected to the OEM interface devices, proved to be as good, if not better, than a mid priced aftermarket deck. The majority of aftermarket car audio decks only yield around 2.0 Volts rms of signal. When comparing the 8 Volts from the GM and Visteon OEM decks connected via the LOC, the difference is a whopping 4 times more signal level. In this case, the OEM decks are much better than the aftermarket decks.

It's important to correctly install the OEM interface devices, but once in place, the electrical differences in the signal are certainly not noticeable because signal quality of the OEM decks has improved incredibly in the past 10 years. The only limiting factor here is the quality of the LOC used to connect the outputs of the OEM system into aftermarket components. Choose a quality LOC and your OEM factory system can be 4 times better than the majority of systems fed by a typical aftermarket deck!

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