MS-8 comes with the pre-amp/amp, a small display, a wireless remote control, a binaural microphone and a setup CD.

MS-8 will have 8 speaker level inputs, 8 line level inputs and an iPod input. The inputs are summed to provide a full-range 2-channel signal. If 6 or fewer inputs are required, then the last 2 can be used for an additional aux input.

There are no digital inputs. Why? Because the real benefit of digital input is "no noise". The downside to providing one is that for 99 percent of users, it's more hassle than it's worth and will cause a great deal of confusion. Not too many people understand that the connector doesn't determine the signal. What I mean is, if we put a toslink input and a user hooks up a toslink output, it will only work is the signal is compatible. DVD-Audio isn't available on a digital output, DVD signals are 48k, PCM is 44.1, home-made digital audio can be anything. The signal from tuners is often only output on the RCAs. For the vast majority of users, there is no benefit and too much opportunity for disappointment. As far as noise goes, our inputs are differential, so the commoon mode noise rejection is super high. There won't be any noise.

There are 8 input channels, so the 8 speaker level inputs and 8 line level inputs are basically in parallel. You can use any combination.

Once the signals have been combined and un-EQed (for a flat 2-channel signal), the signal is processed with Logic7. That provides signal steering for a center channel (if you have one--if not, no problem) and processing for side and rear channels. L7 works on any 2-channel source and is our version is written for cars rather than live-in rooms, so it sounds MUCH better than any of the encoded formats in a car. The 2-channel downmix of any encoded DVD or DVD-A disc will play back in full surround. If good-old 2-channel is what you want, L7 is defeatable and the channels are fully configurable (there are 8 output channels and they can be pre-amp channels or powered channels--20W x 8 at 4 ohms, 30W at 2 ohms). You can have 3-way front, a center and a sub, 2-way front, rear and a sub...whatever you want to do.

The electronic crossover that's built in is fully configurable. You can assign any channel to be anything and it includes an EZ setup mode and an advanced mode. In EZ setup, you tell each channel the speaker location (front right, for example), then you tell it what speaker is connected (6" full-range). It sets the crossover point. In advanced mode, you tell the channel the location (right front) and then assign a filter type (HP, LP, BP) and then you set the filter frequency (you can assign any value between 20 at 20kHz) and the slope (1st-4th order).

After the crossover setup is completed, you move on to the EQ. You put on the microphones (they look like airline headphones but contain mics instead of speakers) and insert the CD. The display will give you some instructions to sit in the driver's seat and look at the left mirror and press "go". the unit will make a quick sweep of all 8 output channels. Then it will ask you to look forward and will make another sweep. Finally, it'll ask you to look to the right--another quick sweep. You can measure only the driver's seat or up to 4 seats. After the measurements are made (takes about 5 minutes) the unit will calculate the frequency response, level and arrival time for all 8 channels in each seat and crunch some numbers (another 30 seconds or so). It auto-tunes the car with 48 measurements per seat (up to 4 seats). It will output a tuning optimized for the driver, passenger, compromise between driver and passenger and one for the rear seats. If you use a center channel, both front seats will sound the same and the image will be great for rear seat passengers too.

After the auto-tuning is done, it will allow you to change the target curve. You can call up a

31-band EQ tool and make whatever changes you want. Unlike a regular EQ, you don't have to find an RTA and tune the car with the EQ, you just draw the curve you want to hear and press "go" and it does the work in implementing your curve. Then you can switch back and forth between your curve and the automatic one and continue making changes until you're satisfied. The curve you draw will always be adjusted in level so that the maximum number of bits are available to describe the signal (optimized for dynamic range). Once you save the curve, you can access any of the settings optimized for any seat using the remote control and the display.

You can turn Logic7 on and off, adjust the level of the center channel, use a balance control, fader, 3 or 11-band graphic EQ or adjust the level of the bass. THe bass control isn't a gain control for the subwoofer output, it's a filter that works with the crossover and applies the right amount of bass to ALL channels so the illusion of bass up front isn't destroyed when you turn up the bass.

Answers to some likely questions:

1. You don't have to use the unit's volume control. You can use the one in the head-unit if you want to.
2. Maximum input voltage on the RCAs is 2V and 15V on the speaker level inputs. The signal is converted directly into digital after the preamp buffer, so a high signal level is far less important in this device than in conventional ones. The input is fully differential, so there won't be noise. I suggest speaker level connections because they are COMPLETELY isolated from ground.
3. The automatic EQ isn't exactly parametric or graphic. It's a very powerful algorithm that works on the impulse response to adjust both time and frequency response. It's amazing and does in about 30 seconds what I can do with an 80 band parametric EQ, crossover, time alignment and a serious analyzer in about 3 days.
4. The display doesn't have to be mounted. If you don't want iPod control or the ability to adjust after setup, you can unplug the display and use MS-8 as a "black box".
5. The unit is small--about 8.5" x 11" x 2.5"
6. Price will be about $800...TBD
7. The software is updatable via USB and a PC.

Andy from Harman giving more details on the MS-8 and comparing it with the PXE-H650.

From Audiogroupforum.com

"There are lots of differences (between Alpine H650 and MS-8). First, MS-8 is more expensive.

Some technical differences are:
1. MS-8 includes power for speakers.(Note- Alpine 660 now has this)
2. MS-8 includes a center channel output and a matrix surround processor (Logic7), which is more about fixing the image for the passengers than about reproducing an audio equivalent to a roller-coaster ride. The Apine doesn't include a center output and doesn't include that image processing.
3. The MS-8's crossover is fully configurable. It'll support any system of 8 channels or fewer, including 7.1, 5.1, 3.1, or the standard car-audio 2-channel bi-amped or tri-amped

front stage and a sub. anything is possible, since all the channels can be anything, but crossover setup is manual in MS-8. It's automatic in the Alpine, but it's less configurable. The outputs are fixed.
4. MS-8 includes an auxiliary input and a remote control and display which allows you to make some adjustments after setup and includs a volume control for those pesky OE systems that include dynamic "bass elimination" (many GM).
5. MS-8's subwoofer level control is a shelf that's applied to all the channels through the crossover and the bass management algorithm. It'll preserve the impact in the front of the car AND add bass.
6. The automatic equalizers are completely different. The Alpine uses a 512-tap filter, which also equalizes phase and sets time alignment. It also includes some spatial averaging for multiple microphone placements (6). When you equalize with the Alipine, the first microphone placement sets the time alignment and the rest of the placements are used to smooth the frequency response over most of the car's interior. Multitap filters that operate in real time are a relatively new possibility. In years past, multitap filters in real time were only a hope, since there weren't many microprocessors that could process all that information quickly enough. The benefits of usiing a multitap filter are that they can be very precise and they equalize phase as well as magnitude since they operate on the impulse response measurement. For one tiny point in space, they can also eliminate the sound of plenty of reflections, but their ability to do that accurately diminishes in larger listening areas, since the effects of reflections at high frequencies can be very different even a few inches away from the original microphone position. The other important thing to note about multitap filters is that the 512 "bands" are distributed in a linear fashion rather than logarithmically. That means the resolution is fixed across the audio band. 512 taps gives you roughly 40 Hz resolution. That means you get 2 adjustment bands between 20 and 100Hz and 25 bands between 10k and 20k. Multitap filters, by default place more adjustment possibilities in the high frequencies than in the low frequencies because of the linear distribution of those "bands". That's the only drawback. The Alipine allows you to select from several target curves for adjustment after the automatic setup.

One more note about multitap: They are the shiznit for headphone EQ, because the "listening space" is fixed. With multitap EQ, you can add the reflective properties of a completely different space and transform the listening area to a completely believable representation of a much larger space. With speakers, that isn't possible yet because both of your ears hear both speakers and moving your head helps you determine the location of sounds (just like when your dog cocks his head when he hears a sound he doesn't recognize--we do the same thing, it just doesn't look so ridiculous).

MS-8's EQ is different. We also use a spatial average, but we use a binaural measurement system and 3 mic positions PER LISTENING POSITION. That gives us 6 measurements per seat for each of the 8 channels plus a time alignment adjustment for each seat. Once the setup is done, you can choose an optimization for any seating position and switch between them. For frequency response EQ, we make standard frequency response measurements, eliminate the phase measurement, average the measurements), calculate the phase response of the average, turn the measurement into an impulse response measurement, apply 8 biquads (filters) to the impulse response according to the target curve and the crossover settings using a very complicated and sneaky algorithm that I can't divulge because we're applying for a patent. The result is a VERY powerful EQ that can be implemented on a relatively inexpensive DSP for each channel and leave plenty of space to use the same algorithm on the eletrical signal of the MS-8's input for flattening of the input signal. The distribution of the bands is logarithmic and makes a completely adjustable target curve easy to implement and accurate. Each speaker location is equalized separately and, because of the spatial average, the acoustic sum of the channels matches the target curve. Once setup is complete, you can fine tune the car using a 31-band drawing tool. You draw

the curve you want to hear and the MS-8 implements it and allows you to audition your changes vs. no EQ and vs. the automatic implementation of the predefined target.

Both pieces of equipment are technological marvels and they both include input channel summing and signal conditioning, crossover and EQ). MS-8 includes more stuff (center channel, Logic7, amplifiers, a display and remote, equalization memory and multiple seat optimization, center channel output and automatic input configuration--MS-8 will figure out what you've connected to the input regardless of polarity), but it should. It's more expensive.

Which one sounds better? You'll have to be the judge.

One last note: Both of these products are super-important and may help to revive the industry and get new customers interested in making their cars sound great while preserving their factory user interfaces. They have both been long development processes with plenty of invention and innovation, software development hiccups and decisions about which features to implement. Both products will require some new thinking on the parts of installers and salespeople about how one implements great audio. Simple 2-channel audio isn't dead, but these kinds of advancements make better listening experiences possible using a new set of rules.

Wow...another super long thread about MS-8.
I think most of the questions about the product have been answered here, thanks to someone pasting responses from the now almost dead carsound forum. Thanks for that.
I agree that there haven't been many room correction algorithms that work well, but the one in MS-8 is a good one. There's a huge difference between room EQ in a room and room EQ in a car. Correcting response in a room with real speakers really requires two different kinds of measurements--a near field measurement of each speaker and a correction scheme for that and a second set of spatially averaged measurements for correcting room modes. In a car, we can combine this into one, since the seating positions are fixed and since the speakers are very close to the listeners (compared to a room). There's so little delay between direct sound and reflections (the time and magnitude) are so close that we hear them all as speakers. In rooms, it's important to differentiate between the two.
Can a person do a better job of tuning than MS-8? I can and I'm sure there are a few others who can too, but MS-8 has been designed to make everyone's car sound better--people like my mom who love music but don't know anything about audio--and for installers to implement. I can do a better job than MS-8 but in order to do it I need lots of bands of parametric EQ (currently I have 176 biquads available for eq and crossover), time alignment, phase shifting parametric all pass filters, separate gain control of all speakers, Logic 7, a mic array and multiplexing mic preamp, an RTA with 1/24 octave resolution, an analyzer than can measure impulse responses and phase, and a couple of weeks.
MS-8 includes all these capabilities and does about 90% of the job in about 10 minutes.
Regarding the debate between Car PC and MS-8: A car PC can include many if these tools all kludged together (except Logic 7). A car PC is like a basket full of groceries and MS-8 is like a great meal.
Why am I building a car PC?
1. Because i'm a glutton for punishment

2. Because the aux adapter I use from USA-SPEC screws with the CAN bus in the car and prevents the steering wheel track up and down button from working properly
3. Because I'm tired of having an iPod controller screen stuck to the top of my dash
4. Because Gary Biggs is building a new car with a MAC Mini as a head unit, asked me for help in figuring out how to configure it and he got me hooked.
5. This is the biggest reason: Our DSP engineers are constantly working on new algorithms to do this and that (top secret) and we need a way to evaluate and car-optimize them as VST plug-ins before they become embedded solutions for home audio.

In a car that bass management is tricky, unless the left and right are time aligned. The bass from the center that's sent to the left and right will only reappear in the center of the image if the speakers are equidistant or time aligned. That's the facts and there ain't no 2 ways about it. You won't lose the signal, but the placement of the sound will suffer. That's why it's really important to install a good center. A pair of tweeters in the rear view mirror or stuck to the top of the dashboard are NOT a center channel.

Yeah, the BMW included the Logic7 system. What we'll recommend is that all the signal processing (especially spatial processing) that can be defeated in the factory system should be defeated. Logic7 always has an off switch. Bass and treble fader and balance ought to be set flat or center. Then, MS-8 will do its thing. For OE systems that include DVD audio or video, we'll suggest theat the user should choose the 2-channel downmix of the DVD, which mixes in all of the surround stuff into the 2-channel mix. Then, MS-8 will decode that and play the audio in full surround.

It's always better with a center and I'd go with a 4" rather than nothing, unless you don't care at all about the passenger's seat. Then no center is required. I prefer the surround speakers in the sides. That tends to widen the stage a bit, but rear is fine too.

If you want to bi- or tri-amp the front or center, you can always use outboard amplifiers that include crossovers to achieve that. Side and rear speakers can be driven in parallel from the rear outputs of the MS-8.

The BMW is set up that way, sort of. The front mids and highs use a pair of pre amp outpus ad a 4-channel amplifier. THe 8's under the seats are used as midbass and are driven by another amplifier connected to two outputs. THe sides and rears are fed by two channnels of MS-8 through another outboard amp. The center uses a passive network, an outboard amp and an output channel from MS-8 and the sub uses the last one. It works great.

No, you don't have to use MS-8's volume control. During setup, the display will help you determine what the maximum volume control setting on the head unit you should use to avoid clipping the inputs or sending a bunch of distortion through the processor. Many of the dynamic EQs included in cars are designed to overcome ambient conditions and those don't change when you install aftermarket gear--like road noise, etc. Bass cut provided by some Delco systems can be annoying because the EQ setting for high volume may be bass heavy at lower volumes.

The short version of the answer is, "Sure, it'll sound fine if you use the OE volume control."

The long version is that in that car, it'll be fine and you probably won't hear the difference. There's no reduction in bass response provided by the OE DSP at high volumes, like there is in some other cars, especially GM. One other point that I'll explain in the interest of completeness but that won't be audible is that the inputs to MS-8 feed a/D convertors almost directly. They're designed to recieve some maximum voltage. Ideally, best resolution can be had when the signal peaks match that voltage. During setup, MS-8's display will ask you to turn the volume up until the level of the test signal meets that condition. If you want to use the MS-8 volume control, that's where the head unit's control should be kept. If you use the OE control, it's best not to turn the volume up higher to avoid clippping the A/D's input. Turning the volume down, just means that fewer bits are used to describe the audio signal. It's no big deal and I've been listening to and competing with a system thhat functions similarly. Deatil and resolution are definitely not the weak points in my system and any one who has heard it can attest. If you get hung up on the whole audiophile thing, then using the MS-8 control preserves the resolution of the analog to digital conversion, but the reality is that the convenience of using the OE control outweighs the need to satisfy some technical goal that can be measured but that doesn't degrade the experience. Fortunately, MS-8 includes both options.

Anyway, the EQ in MS-8 isn't a multi-tap filter (like the Audyssey), nor is it a standard parametric EQ or a graphic EQ (like Cleansweep). It's something far more bizarre. It works great, and with 8 biquads per channel can do more work than 512 taps. It doesn't EQ phase separately from frequency magnitude, but in my experience, that isn't necessary so long as you have a center channel and a matrix or some other center signal extraction method or time alignment. MS-8 has both.

One thing that's important to remember when you're setting crossovers with conventional gear is that what appears to be a gap may, in fact, not be a gap. Here's an example (but without pictures, because I'm lazy today).

Let's say you cross your subs over at 100Hz and your mids over at 200Hz. Both slopes are 12dB/octave. When the output of the subs is precisely the same level as the output of the mids, the subs are down 3dB at 100Hz and the mids are down 3dB at 200 Hz. At 150Hz, both are down 6dB. Now, adjust the input sensitivity of the sub amp, so it sounds like you have bass. Let's say you boost it by 12dB. Now, the sub is up 12dB at maybe 80Hz and below, up 9dB at 100Hz and at 0dB at 200Hz. Now where's your crossover point?

200Hz.

MS-8 avoids this problem by providing one crossover frequency setting for the sub and the midbass, adjusting the final slopes and frequency automatically using the acoustic EQ and then providing a bass shelf filter as a subwoofer level control which is applied to all the

channels through the crossover. That way, the midbass and the subwoofer get the appropriateamount of boost at the right frequencies to add bass to the system while maintaining the proper crossover point so the bass doesn't become boomy and direectional. It works great and I have that process running as a VST plug-in in my car now.

et's make this easy and say a biquad is a filter that can be configured to be a high pass of just about any alignment; low pass of just about any alignment, parametric EQ of nearly any frequency, gain and Q; notch, high shelf; low shelf or phase shift. The MS-8 assigns the filter type and values (frequency, Q and gain) based on the measurements it makes and the algorithm (predefined process or set of instructions for making decisions written as code) that determines how the decision will be made. So, for the purposes of this discussion, MS-8 has 8 opportunities per channel to implement something that does part of the job of fixing the channel's response. The details of how it makes the decisions are proprietary, patented and too difficult for me to try to explain.

Some of it is manual and some is automatic. The user enters the crossover frequencies and assigns the channels. Then the user helps MS-8 make its measurements by placing the microphones and pressing "Go". MS-8 adjusts the EQ and, consequently, optimizes the crossovers and slopes for proper acoustic performance. Then, if you want to make adjustments, you get a 31-band EQ. The 31-band EQ is a separate set of filters that you can use to draw whatever curve you want.

Unlike most 31-band graphic EQs, the response tracks the settings precisely. What many users expect is that if they boost all the sliders by 12dB, that the response should be flat, but boosted by 12dB across the spectrum. This is almost never the case, because making the filter Qs narrow enough to do that makes the response look like a comb. Making the filters wider provides more gain than one would expect when adjacent bands are boosted. Also, adjacent band boosts and cuts are rarely executed by conventional EQs as one would expect. The math used in MS-8's 31-band EQ adjusts adjacent bands automatically so that the curve you draw is the curve you get. This is a big deal, by the way.

For those of you who have an EQ laying around, plug it into your sound card. Make it a loop-back. Generate some pink noise and look at the response as you make adjustments. You may not like what you see and it's one of the reasons that tuning with a conventional 31-band EQ and using a 31-band RTA rarely results in great sound.

The whole point of MS-8 and the point at which it differs most from every other processor that's come to market so far is that it's intended to provide a bunch of tools you can use easily to be successful in making your car sound great. It's not intended to be the tool corral at Home Depot, where almost anything is available, but it's up to you to learn how to use it. If we just took the on-chip library from the TI DSP we're using and added a GUI, this product would have been finished three years ago, but it would have been just like every other DSP EQ/Crossover. There would have been a bunch of people who can pronounce "equalizer" and who have heard the terms "Butterworth", Linkwitz-Riley" and "All-pass filter" raving about the resolution of the available adjustments, but the success rate in making cars sound great and, consequently, the sales rate for the product would have been just as dismal as every one of its predecessors.

This industry doesn't need more tool boxes, it needs more carpenters and more folks who are willing to step up to provide real solutions. Giving a guy with no arms a garden hoe and a shovel doesn't get the carrots planted.

I used to be one of those control freaks too and burdened the engineers with a thousand requests for a back door...until I discovered that the prototype version of MS-8 could do in a few minutes what it takes me weeks to do-and it does a better job.

"Placing the microphone" means putting it on your head and sitting in the driver's seat, turning your head from side to side according to the prompts, and moving to the other seats (if you want optimizations for those seats too). No change there.

Yup. 10 runtime presets. Once the auto EQ has been run, there's no need to do it again. The correction filters for the car don't change when you add your own spin with the 1/3rd octave EQ.

MS-8 doesn't downmix the 5.1. I will upmix the 2-chanel downmix on the DVD, though. Select the 2-channel downmix in the DVD player's menu and Logic7 will play the DVD back in full surround designed to be appropriate for the car (instead of your living room).

The Auto EQ measures the distance (acoustic) to all the speakers connected to each of its outputs. Then it EQs the combinations of channels that are assigned to each spatial location (right front, left front, center, left side, right side, left rear, right rear and sub). If you choose the driver's seat listening position, time alignment is optimized for that seat, just as it is with other systems. If you choose the passenger's seat, it's optimized for the passenger's seat. If you choose "front seats", then the left and right time alignment is defeated, but individual driver time alignment remains (midbass to tweeter, for example).

Obviously, with no center channel, this works like any other time alignment scheme. Only one seat can be optimum. A center image in a stereo system depends on mono information arriving at precisely the same time, at the same level and with the same frequency response from both speakers. If you have a center channel and Logic 7, a great center image no longer depends on this because mono information is steered to the center speaker. If the center speaker has the same bandwidth and the same frequency response as the front right and left, it'll work fine. The driver's seat and the passenger's seat will sound the same.

What if your center speaker won't play below 300 Hz and you have to rely on a phantom center image for sounds below 300 Hz? MS-8 steers information below the center channel high pass filter to the right and left and eventually the subwoofer so nothing is missing. However, the left and right midbass wont be time aligned for either seat.

Is it a big deal? Not really, unless you plan to use only a pair of tweeters as a center channel.

Car audio enthusiasts typically prefer a strong and stable center image and OE consumers

are less critical regarding imaging. There's an ongoing fight about where the center image should appear. I believe--after 25 years of building cars for customers--that it should appear in the center of the dashboard (or the hood, if possible) no matter which seat you sit in. Some of the folks who build OE systems believe the center image should be directly in front of each listener. MS-8 is tuned so that the center is in the center. If you like it the other way, it's simple to adjust--just turn the center channel down a bit in the menu.

MS-8 is not going to do everything perfectly--it wont peel apples or make gold out of a rock from your front yard--it isn't designed to be all things to all people. If you believe that you have to have a high-end D/A convertor or you have some other highly technicalREQUIREMENT, you may find that another product meets your needs. MS-8 isn't some gold-plated, gold-PCB, million-dollar connector laden class-A multi-channel amplifier with all kinds of super esoteric crap designed to appeal only to enthusiasts. Those kinds of products make regular folks like me afraid to try audio as a hobby. I don't believe that in order to enjoy listening to a great sounding system, one has to be endowed by God with some heightened sensory perception and to be so enthusiastic about the gear that one would read (and take seriously) all the flowery prose intended to make religion out of science.

MS-8 is designed to make a great sounding system available to anyone who wants it at the most reasonable cost possible. There's plenty of high-end thinking packed into the little box and none of the components are compromised in the interest of shaving cost. We also haven't included any esoteric junk that inflates the cost for limited return. This is an exercise in reaching the point of diminishing return in parts cost and providing performance and ease of use that are without equal. If you're willing to stretch a bit in your opinion of what is and isn't required for great performance, MS-8 will be fun and eye-opening for you.

I'm expecting another iteration in the mail on Monday to begin final testing of input use cases--testing of UN-EQ, Logic7, all of the audio controls, etc, while the engineers finish coding the auto EQ for the TI610 DSP. Once that's done, we'll send the design to our validation team for final testing against the product spec-to be sure there are no noises or misbehavior.

This thing has taken so long to develop that there's no way we're going to skimp on validation. I can only imagine the backlash if we release something that hasn't been fully tested and we can't provide an answer to all questions regarding setup or use in various systems.

If the DIY spirit is about doing things yourself with parts you find at radio shack at great cost in money and time and you're a hardcore DIYer, MS-8 isn't for you. This thing is designed to be a tool that nearly anyone can use to be successful in building and setting up a great sounding system or improving an existing but not-so-great-sounding one without having to spend thousands of dollars on esoteric drivers, fiberglass kick panels, additional amplifiers (unless you require a car that plays much louder than a premium factory system), ridiculous interconnects and speaker cables, etc, etc, etc. If the DIY spirit is about finding tools and gear that allow you not to be dependent on a retail installer who claims that all of that is necessary to have a great sounding car, then MS-8 is what you need and will be worth the wait.

Less,

I'm sorry that MS-8 won't meet your requirement for a digital input. We didn't remove that from the spec because of the cost of the input, we removed it because the inclusion of a digital input would have caused a bunch of confusion for many consumers who use that as a qualifier, but who are unable to understand its use. MS-8 runs at 48k. PCM is 44.1. Alglrithms that are designed to provide spatial processing don't freak out because the samples don't match, but digital EQ does. The real benefit of digital input is noise immunity and we've chosed to deal with that in other ways.

Because the device doesn't include a feature YOU require doesn't mean that it's a low-end POS designed only for neophytes and the rest of the unknowing mainstream. It means that we've made a conscious decision to provide a device that does what it does and provides a high quality experience for those who wish to build a system for it. There are far too many "technology" devices that include every option and attempt to appeal to every use case and every consumer. Those devices often do many things poorly and notthing well at the expense of cost and complexity of setup. That sounds like a bad deal and one that I'm not signing up for. Building a device that does what it does well is the most important criterion for a succssful MS-8 and that's why it's taking so damn long to finish it. Sorry about that, but getting it right and providing clear instrucions for being successful in using it are the right decisions.

The fact that MS-8 doesn't meet your criteria simply means that your use case falls outside of the use cases that we are determined to satisfy with a high quality experience. That doesn't make it a low end piece of gear or indicate that the brand made a decision to not to appeal to skilled users. Your criteria set the bar for your purchase decision, but not for all skilled users.

The autotune in MS-8 is designed specifically to do cars, where there is no reverberant field and where all reflections are early reflections. In a car, there's no need to distinguish between speaker response and room response, because we hear it as one response. EZ-SetEQ, which is a feature of some of the higher-end HK receivers is based on the same basic process and uses a similar algorithm. but includes a near-field measurement designed to correct speaker response and an additional set o fmeasurement designed to correct room modes.

Here are a few cool features that might go unnoticed:

1. The subwoofer level control is a shelf filter that's applied to all the channels through the crossover instead of the usual gain control that most everyone else uses as a sub level control. The benefit is that once you get the bass sounding like it comes from the front (oh yeah, that's automatic) you can adjust the subwoofer level all you want and it never sounds boomy and never gives away its location. We were listening in the lab and we moved the subwoofer all over the place, ran the auto EQ each time and no matter the location, it always disappeared into the sound of the rest of the speakers. No amount of sub level adjustment with the shelf filter made the location any more obvious.

2. The 31-band EQ precisely tracks the curve you draw with the "sliders". With most graphic EQs, adjusting two adjacent bands in the same direction (say +6dB) will give you quite a bit more boost at a frequency in between the two sliders. If the filter Qs are narrow, you'll get two peaks at the proper amplitude, but with a hole in the middle. The EQ in MS-8 adjusts all the adjacent bands automatically to precisely match the curve you draw. This is a big deal

and no other car audio EQ that I know of includes this "math". If you want to see what happens with a regular EQ, hook one up to your analyzer. If you use a PC and sound card, just connect it in a loop, play some pink noise and adjust a bunch of the sliders--you'll be shocked. If you find one that does what MS-8s EQ does, I'll be shocked.

3. The UN-EQ not only flattens the response, but it also removes any channel delay present in the OE system.

I've explained these features in previous posts, but they've basically been little additions to my wish list and today I saw them all working--and working perfectly. Ahhh...like Christmas for a little kid.

he target response is fixed. The autotune EQs to match the target. If you don't like the target, you adjust the sound using the 31-band EQ. It's not exactly done the way Mike explained it, but the end result is the same.

There's no need to plug in some high-end microphone. The reason that high end microphones still exist for measurement (and I'd be willing to bet they won't exist for much longer) is that before computerized test equipment, the accuracy was only as good as the flatness and bandwidth of the microphone. Now that analysis is done as software, the hardware isn't so much of an issue, provided the flaws are linear. The microphones that come with MS-8 are good panasonic-type electrets, which are the ones that are used in many other measurement microphones. MS-8 includes a mic correction filter, that makes them measure flat, despite their being mounted in a pair of headphones cases. Plugging in some high end mic is unnecessary and would result in poorer performance. The only advantage might be the ability to make the measurements at ridiculously high levels, but that's just not necessary.

Yes, you can tweak the crossovers if you want, but you MUST run the EQ again after making those adjustments. Fortunately, that only takes a few minutes. You'll find that there's less need to set preposterously low crossovers for midbass, midrange and tweeters with MS-8.

The biggest difference and the one that will make MS-8 a better tool for making cars sound great is that all of that work that you're used to doing with crossovers, a bunch of EQ channels and delay settings are done automatically. The setup process is a serial process because everything is optimized once you finish the measurements. Setting crossovers is a matter of driver safety and potential output level, but you just make suggestions with the settings you input. The crossover points you choose are the ones that get implemented, but the response shapes are dictated by the combination of the EQ, which is applied before those filters, and based on an average of 6 measurements and the filter settings you choose.

All of the trial and error that IS current car tuning with conventional tools is eliminated and replaced by a process that knows the measurements and, through an algorithm (a list of instructions that aid the machine in making decisions), determines which solution set is most appropriate for fixing the acoustic problems. It WILL do a better job than any manual process at arriving the best possible optimization of the system, according to accepted

science, the preset target frequency response and the requirement that the car has an image where the center is in the center of the dash, the stage is in front of the listener and the bass sounds like it comes from the front. Of course, that science doesn't take your preference into account and that's why we provide the tools that you'll need and want to make changes according to your preference.

It cannot fix a really shitty system, but it can do a better job of making even a shitty system sound better than another process. The use cases that it will support are based on reasonable and realistic system design. The minimum supported system is a simple stereo system--2-channels. A stereo system can be up to quad-amped, but the subwoofer output is a mono signal (2 output channels are available). I fyou insist on stereo bass, then you can tri-amp the stereo system. If you use rear speakers, subtract 2 channels from the channels available to do the rest. If you use a center channel, subtract one more. With MS-8, there's little benefit in separate channels for tweeters. The ease of crossover adjustability in tuning is moot--since you're not tuning and time alignment is unnecessary up there. MS-8 sets the levels and the response shapes via the EQ. We provide the ability to use separate channels for those who want that, but the addition of a center channel or rear or side speakers is a FAR better upgrade.

When we started designing this thing, I told the engineers that the auto-tune was fine, but that i wanted a back door to the target response and all of the filters because I believed my process, performed manually, would provide better results. Now, I know that was BS. It DOES provide my results because it's my process built in a little box that thinks much faster than I can and can sort through all the possible optimizations in a few seconds. It isn't a compromise.

Gain potentiometers, clipping indicators and all things like that are specificaly EXCLUDED from the definition of the product. We don't want users to have to fuss with all of that. Here's how it works, described as simply as I can do it.

If you have speaker level outputs from your radio or factory amp, you connect them to the speaker level input connector. Factory amplifiers (the vast majority of them) us the same kind of output amps, so MS-8's speaker level inputs are designed specifically to work with them with no additional adjustment. The line level inputs are also fixed and designed to work with most head units. Line drivers shouldn't be used--the idea is to make this easy.

The setup CD is not pink noise. It's a specific collection of tones and it's different in the left and right channels. The UN-EQ is designed to look for CORRELATION between the incoming signal and what it's expecting to receive (it knows the signal it's looking for). Linear changes to that signal--like a different frequency, phase or delay allw that correlation and are things that can be fixed. Non linear distortion--like clipping--prevent that correlation. A a bunch of nasty noise will too. No signal will also fail to correlate. Clipping from the head unit will also cause it to fail to correlate. When you're adjusting the volume during setup, the display will tell you whether the signal is too high, too low, too far right or too far left. Once it gives you the OK, then you know the level at which there's clipping--whether that's from the head unit or the inputs of MS-8. You make a note of that level on the head unit and that becomes your new "max volume"--if you're playing a signal with all high bits. For quieter recordings, you can use more volume control. For the most precise playback possible, you'd set the head unit volume there and leave it. Then, you'd use the MS-8's remote control for volume. That isn't necessary, though. You can use the head units volume control all you want, provided you can live with the occasional clipping that may happen if you turn the control

up too far.

The benefit here is that you don't have to adjuct a bunch of imprecise potentiometers and the unit can determine the point of clipping regardless of which component is clipping.

Go with the largest single midrange you can find and add a tweeter (half of a 5" component system would be great). If that's not an option, use a 4" or a pair of mids and a tweeter. If you have a bunch of extra amp channels and an external crossover, biamping is OK. If you don't, I suggest a passive for the center.

I find that the best use of MS-8's 8 channels in a car is:

Biamped front (4)
Center (1)
Sub (1)
Sides and/or Rears (2)

If you do sides and rears, run them in parallel.

If you use a 2-way speaker system in front, use separate channels for mids and tweeters. If you do a 3-way, use separate channels for the midbass and a pair of channels for mids and tweeters, together with their own crossovers (passive or active). If you do that, cross the midbass as high as you can stand--1k works well so long as they are 6" or smaller. Our ears aren't good at determining the location of sounds from 1k to 3k, and above 3k, level is the most important criterion. This arrangement provides accurate delay measurements and settings for the midbass and will fix the mids and tweeters using EQ.

Since you'll be using a center speaker, the steering and that speaker will reduce the importance of time alignment for frequencies above the center-channel's cutoff and TA will fix it for lower frequencies using the midbass in the doors.

The curve drawing comes after the Auto EQ. You can make changes to the sound AFTER the machine does its work. Setup goes like this:

1. Input Setup: Calibrate the input signal by inserting the setup disc and adjusting the volume until you get the level and balance "OK" indication. Then you press OK and it runs the auto Un-EQ. That whole procedure takes less than a minute.
2. Output Setup: You tell the machine via a menu what system you have.

a. Whether you have a sub and whether it uses 1 or 2 of MS-8's outputs and then you choose a subsonic filter frequency and slope and then a low pass filter frequency and slope.
b. Whether your front system is a 1-way, 2-way or 3-way. The high pass filter frequency is chosen when you choose the sub low pass filter. Then yo choose crossover filter frequencies and slopes for the midbass to midrange and midrange to tweeter (if you have a 3-way). If

you only have a 2-way, then you choose the crossover frequency and slope between the mid and tweeter.
c. Whether you have a center channel and whether it's a 1-way or 2-way. Then you chosse the center high-pass filter frequency and slope and the crossover filter frequency and slope between the center mid and tweeter (if yo have a 2-way center).
d. Whether you have surround speakers and whether they are 1-way or 2-way. THen you choose the HPF and slope and the crossover between mid and tweeter (if you have a 2-way).
e. Whether you have side surround speakers. Then you choose the HPF.

MS-8 counts the number of channels you use and eliminates choices you can't make because you've rin out of channels. You MUST have at least a front stereo system. Then you can add speakers to make up whatever system you have.

f. Then you tell MS-8 which output channel is connected to the various speakers you identified in the previous steps. This whole procedure is pretty quick too, especially if you have any clue about what you're doing. You CANNOT input overlap or underlap between the sub and the midbass/midrange, midbass and midrange, and midrange and tweeters. Before you freak out and decide that the whole unit sucks because you can't input ridiculous crossovers, know that all of the crossover slopes and frequencies are adjusted when the Auto EQ runs. It works. Plus, the usual need for underlap of sub and midbass crossovers is handled another way--which works much better, anyway.

Once you've set up the outputs, an output diagnostic runs and you can output pink noise to each of the outputs (FR, FL, C, RS, LS, RR, LR and S) to be sure you've set things up correctly.

3. Acoustic calibration: You put the microphone on and press "Go". The unit makes 4 sets of sweeps in each seat (you must do one seat, but you can do all 4 if you wish) and prompts you to turn your head between the second and third and between the third and fourth to get a spatial average. The first set of sweeps sets the channel delays and the second through fourth are for frequency response.

4. Press "done" and enjoy.

Once those steps are complete, you can turn logic 7 on and off, adjust the center, balance, fader and sub levels, adjust bass midrange and treble and draw a new curve with the 31-band EQ. Since the channels have all been matched by the auto EQ, you only need to draw a new curve and it's applied to all the corrected channels.

THe subwoofer level control is a shelf that's applied to all the channels rather than an output level control for the sub amp. That's why no overlap or underlap is necessary in the crossover. This works great too.

Once setup is done, you can use MS-8's volume control or the control on the head-unit.

The MS-8 setup will help to determine the maximum useable output form the head and since the MS-8 (measured without EQ) is unity gain on the RCA's, you'd simply put in a test tone, plug the head into the amps directly, set the gains conventionally on the amps, plug MS-8 back in and go on with the tuning.

We've confirmed that the automatic acoustic EQ works with all supported use cases--and it sounds great. We've tweaked the target to provide a little more bass than I like, but the user menu includes a control to reduce and increase it.

We've added a "bypass input setup" to the setup menu, so if you have an aftermarket radio, you can bypass the Un-EQ part of the algorithm if you have a full-range output from the radio.

We've also discovered, in all of this testing, that CD transports and pickups are sometimes good and sometimes not so good. The algorithm that detects left and right and picks the impulse peaks to determine polarity and factory time alignment works PERFECTLY, so long as the CD player clocks at 44.1k. That might seem like a "given", but in reality, it isn't. We've discovered inexpensive and expensive aftermarket decks that don't clock at that rate and even some high-end OE systems that are off by enough to wreak havoc with signal correlation at high frequencies.

We're hot on the trail of a fix for that and should have some working code that eliminates that problem in short order.

What we're most interested in is a simple installation procedure that doesn't require any user troubleshooting, and in the interest of that objective, we've eliminated the audio-sensing turn-on, and have opted for a REM IN terminal that should be connected to the head unit's REM OUT connection. If that doesn't exist, then REM IN must be connected to the car's ACC terminal. MS-8's REM out terminal should turn on ALL the other devices in the car except the radio. For OE systems that don't include a REM wire for amp turn-on (some CAN-BUS and MOST systems), connecting MS-8 to ACC will suffice. We'll include a turn-off delay that's programmable to help eliminate any audible pops.

The signal on the setup CD is an MLS. MS-8 "knows" the sequence on the disc and the algorithm is triggered by a pattern of silence, then noise in one channel, then noise in the other channel. In order for it to figure out precisely what the difference is between what it would see if the response was flat between 20Hz-20kHz and what the response really looks like, it has to see the right number of samples. If the clock is wrong and the sample rate isn't 44.1k, the correct number of samples doesn't appear. MS-8 freaks out and part of the algorithm gets confused. We'll have that fixed soon.

Also, I suggest nothing below 100Hz in the rear for Logic7, because the rear channel polarity is part of how signal is steered to the rear. When the signal is steered to the front, the rear channels aren't in phase. Keeping the bass out of the rear channels preserves the placement of mono low frequency signals in the front center. The highpass filter frequency for the rears can be chosen at a frequency below 100Hz, for those who won't use L7.

I always suggest splitting up the channels in a three-way front speaker system--a pair of

channels for the midbass and another pair for midrange and tweeter. If you'll use a 2-way in the front, then there's no need for that, unless you have the extra channels.

The system in the BMW included all the stock speakers in their locations. We added tweeters to the rear doors and to the center channel. The tweeters in the rear probably aren't absolutely necessary, but the tweeter in the center channel is. All of those useda simple capacitor on the tweeter--nothing fancy. The rear and side speakers were run by separate channels of a 4-channel amplifier, but were fed with the side outputs of MS-8. Separating side and rear is nice, but we opted to use the under-seat subs as midbass on separate channels instead of doing a full 7.1. It worked great. Subwoofer is a pair of W12GTi woofers in a box in the trunk.

We defeated the factory Logic7 in the dead unit's menu and used MS-8s L7. THey are tuned a little differently--mosty with regard to the level of the center channel and steering angle computation. I believe the MS-8 version is better for folks who are used to aftermarket systems. The primary goal of L7 in MS-8 is to provide a rock-solud center image in the CENTER of the dash and a sense of ambience (rear) depending on the recording. For those who find the center to be too "center", we've included a level control so you can it turn that down a bit.

Left, Right and Center steering helps to minimize the need for generating a phantom image in the center, but it can only work for frequency ranges that are included in the L, R, and center. If you have a big midbass driver in the center and in the left and right, then time alignment of the midbass drivers is less important. If you'll use a smaller center speaker and depend on the left and right midbass drivers to generate a phantom center in those frequencies, then it will be helpful to be able to time align those speakers for a particular listening position. That's the reason that we opted to use the separate channels in Gary's BMW. The center speaker is only a 4" and left and right midbass are 8" speakers under the seats. It works great. Because the center speaker is small, the midbass image is better in the seat for which the optimization is selected, but the compromise between the front two seats was good enough to win IASCA.

The cure for mystery is investigation. I've spent 25 years investigating this. If you'd like to benefit from those 25 years and additional technical contributions from real scientists who have turned the benefit of those years into a product that works, get an MS-8 when it comes out and just follow the instructions. If you'd prefer to figure out how and where to bury a bone through trial and error, rejecting the canon of knowledge that exists for humans who can read and share information, buy an MS-8 and throw away the installation manual and do a thousand experiments. Or...buy another processor and throw away the manual and do a thousand different experiments. MS-8 won't allow as many experiments as some of the others that don't include any automation, though. If installation and constant tweaking are the "end", then you may be happier with a car PC. If installation and tweaking are the means to the end, then MS-8 and its instruction manual will be the right product for you.

No, the bass has to be generated by M-8. The processing inside the box takes about 8mS, so if you run some signals around MS-8, they'll be out of synch. You'll want to use MS-8's

sub level control. It's much better and will preserve the blend between the midbass and the sub to keep the bass up front even when you boost.

As I indicated, we didn't investigate a bunch. Certainly, cheap decks are likely to be worse. However, this poor performance isn't going to be audible when you listen to CDs. The reason it's important for MS-8 is because we rely on this for high-performance UN-EQ, but only during setup. The algorithm assumes that what it sees from the CD is in fact what it sees. For aftermarket decks that include full range stereo pre-outs with MS-8, it doesn't matter. You just skip UN-EQ in the setup.

For OE decks with EQ and factory amps with crossovers, UN-EQ is important and we've seen expensive systems with bad clocks and cheap systems with good clocks. Fortunately, this issue is fixed inside MS-8.

f you want to do a full 5 or 7.1 system and bi-amp fronts, centers or rears, the additional processing can provide individual time alignment for those speakers and the additional high and low pass filters needed to implement such a system. The EQ in MS-8 is pretty powerful, but if you wanted to get things close and let MS-8 finish the job, that'll work too. You should use the bass control in MS-8 because it beats all others in terms of maintaining a stable illusion of bass up front--unless the boost you apply is out of hand.

Remember, though, that all channels must run through MS-8 to avoid latency isues.