μDIMENSION

Acoustic Research

GLOW DSP8

GERMANY

Instruction Manual

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Considerations

Thank you for purchasing the DSP8 reference digital amplifier system with integrated DSP technology.

The DSP8 is a state of the art 8 channel digital amplifier system with a first of its kind full open architecture digital sound processor available for the car audio market. Even with the compact size of the DSP8 and careful consideration to speaker selection the DSP8 offers you the opportunity upgrade your vehicles OEM and/or aftermarket audio system and to custom tailor the sound to your personal likings with audiophile precision.

Practice Responsible Listening

The DSP8 in conjunction with the right components is capable of playing at high volumes well above 85dB for extended periods of time. Your ears are very delicate, prolonged exposure to sound pressure levels above 85dB will cause damage to your hearing. If you have ever been to a party or to a concert where loud music was played, you may have experienced Temporary Threshold Shift (TTS). This temporary loss of hearing can become permanent if exposure is done on a regular basis. If this happens, you will never hear fully again. We highly recommend and urge you to limit your exposure to volumes above 85dB.

Please take note that your state has laws governing the volume of an audio system in a vehicle and your system may exceed this governed level. Please be aware of all local, state and federal laws in your territory.

Installation Instructions

The DSP8 is designed for in most cases a easy installation process into a wide variety of vehicles. Due to the changing nature and wide combinations of audio systems and electrical systems in vehicles worldwide certain provisions and vehicle specific considerations may be necessary to obtain optimum quality and performance of the DSP8.

To Ensure proper operation of your new purchase, please follow the instructions and suggestions located throughout this manual.

Before You Begin

Please check the suitability of the installation before you begin. Do not cut an portion of the cars structure. Pay close attention to what is behind the vehicles panels or carpeted area you are considering to mount your newly purchased product. Often vehicle manufacture will hide wires, computers or other electronic devices in the exact areas your wish to install in.

Installation, tuning and calibrations of the DSP8 is not recommended for novice or inexperienced installers. If you do not have experience with automotive electrical and mechanical systems please contact a professional installer. Paying a qualified installer is almost always cheaper than paying a dealership to repair your car.

Picking a Location For Your Amplifier

Your DSP8 must be securely mounted to a solid surface. Please select a location in the trunk or passenger compartment of your vehicle that will continuously be dry and free of moisture and allow for adequate airflow to provide cooling to your amplifier. Do not mount the amplifier to any area that may be effected by excessive vibration (like a subwoofer enclosure).

Supplying enough Power

Your amplifier does NOT make power. Amplifiers convert existing power, or current from your vehicles electrical system and turn into musical energy. Simply stating, It takes power to make power. If the amplifier cannot receive the power it needs it will no produce its full factory specified output.

If the voltage of your vehicles charging system drops too low even the most expensive of audiophile rated amplifiers will drop below their rated output. Make sure your charging system is in good working order. If you are unsure if your charging system is working properly have it tested by a qualified professional technician or take it to a certified authorized dealership.

Connecting the Ground

WARNING: NOT FOLLOWING THIS DETAIL CAN CAUSE YOUR DSP8 TO NOT FUNCTION PROPERLY, INDUCE NOISE INTO YOUR SYSTEM, CAUSE DAMAGE TO SYSTEM COMPONENTS AND CREATE POSSIBLE COMMUNICATION ISSUES WITH YOUR COMPUTER INTERFACE!

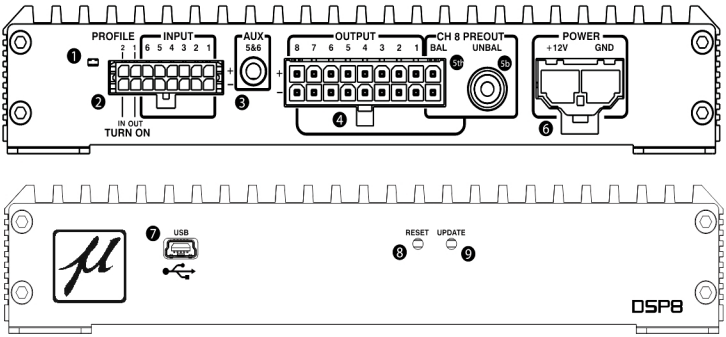
The ground wire should be connected directly to the chassis of your vehicle. Find a clear location on vehicles inner body or chassis nearest to your amplifier and remove all paint, sound deadeners and other coverings exposing bare metal. Using a #10 or larger screw to secure it to this location. ***NEVER USE A SEAT BOLT OR VEHICLE BOLT AS A GROUNDING POINT!!***

Remember the ground wire must carry the same high current as the positive power wire. Make sure to use the same gauge of ground wire as your power wire. Make sure that the ground wires from your vehicles battery to the body meet or exceed the gauge of your amplifiers power and ground wire leads.

Tune Safely

Do not try to do all of the system tuning in a single session. It is good practice to spend only an hour or so tuning a system at any single session, and to use several or many sessions to complete the process. The human hearing system can become fatigued when concentrating on critical listening for extended periods, so breaking up the tuning process into several shorter sessions over a several day period will be much more effective, and usually yields better results.

Identifying the Installation features of your DSP8



1. Power Status LED (On/Off)

2. Input Harness Port

3. Auxiliary 3mm Unbalanced Input (Replaces Channel 5 & 6 on main input harness)
   Use of this input is activate thru the PC interface. When used channel 5 & 6 RC A input is disabled. Use for auxiliary devices such as Mp, Navigation etc.

4. Speaker Out Harness Port

5a. Balanced RCA Output (Channel 8 Mono RCA Output)
   This RCA output is linked to the channel 8 output network controls. X-over, EX, Delay and output trim controls are all assigned thru the PC interface. (Do not use if connected to 5B)

5b. Unbalance RCA Output (Channel 8 Mono RCA Output)
   This RCA output is linked to the channel 8 output network controls. X-over, EX, Delay and output trim controls are all assigned thru the PC interface. (Do not use if connected to 5A)

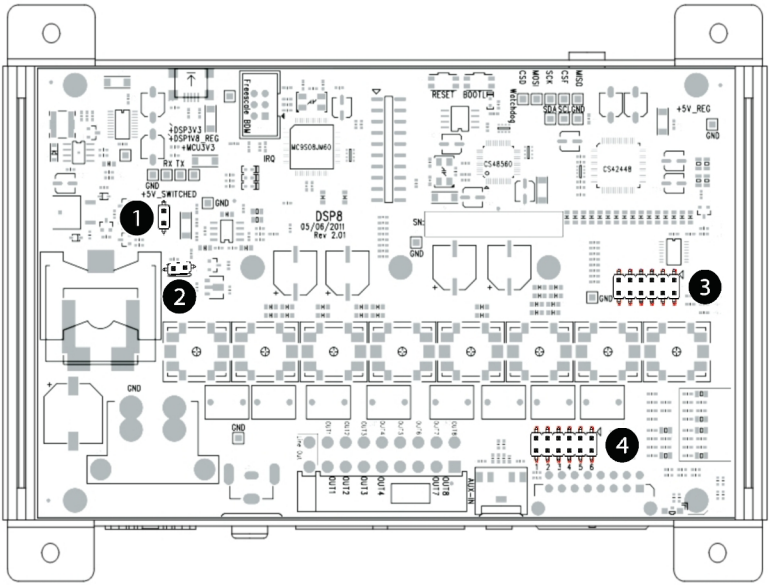
6. Power Plug Port

7. USB Port (PC Connection)

8. DSP Reset Button

9. Manual Update Button (Future Function, Currently not Functional)

Identifying the Jumper configurations of your DSP8



1. Jumper installed disable Auto Turn ON/OFF Functionality

2. Jumper installed disable Turn OFF (For testing purpose only)

3. Jumper installed sets which Input is used for CH 5 & 6

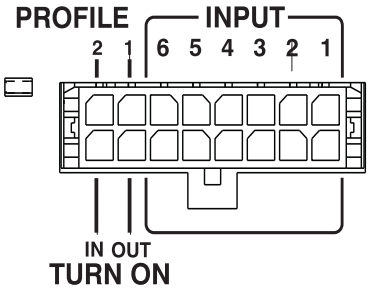
4. Jumper installed attenuates the input for High Level Speaker Level loads on each of the 6 Channels.
   Jumpers go in the same order as the Input header.
   Channel 1 is on the left most pins.
   Channel 6 is on the right most pins.

DSP8 Input Harness Port-

Because of the wide range of head units used in vehicles worldwide, both OEM and aftermarket the DSP-8 has one of the most flexible input configurations available. This section will cover a variety of applications and the information needed to connect the DSP8 into your vehicle. Please be advised that some vehicles can require special installation wiring and or custom passive loading devices depending on the electronic design of the output of your source unit.

Low Level (RCA) input-

The DSP8 by factory default comes prepared for low level RCA input capable of accepting 6 channels of balanced Low Level RCA inputs up to 4 Volts RMS with an selectable optional 3.5mm unbalanced input for portable media storage devices.



Turn On Input/Output -

Input - 12 switched signal on input turns on the DSP and its internal amplifier.

Output- The DSP8 has a processor controlled turn on circuit for your additional subwoofer amplifier. This dedicated output circuit is capable of driving amplifiers up to 220ma at 12 Volts and is capable of being delayed and controlled thru your PC interface.

Profile 1-

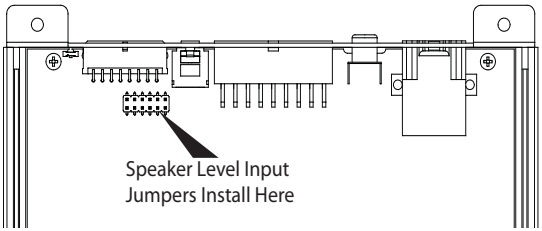
When triggered and sustained with 12V+ the DSP will automatcally change to the alternate profile (Preset 2) without the need to use the PC. When the circuit is opened and seperated from 12V+ connection the DSP8 returns to the main profile (Preset 1)

Profile 2- Not Functional (Future feature) Do Not Connect

DSP8 Signal Input (High Level/Speaker Level)

If your installation requires the continued use of your factory radio the DSP8 has a flexiable “Manual Set” Hi Level/Low Level input stage.

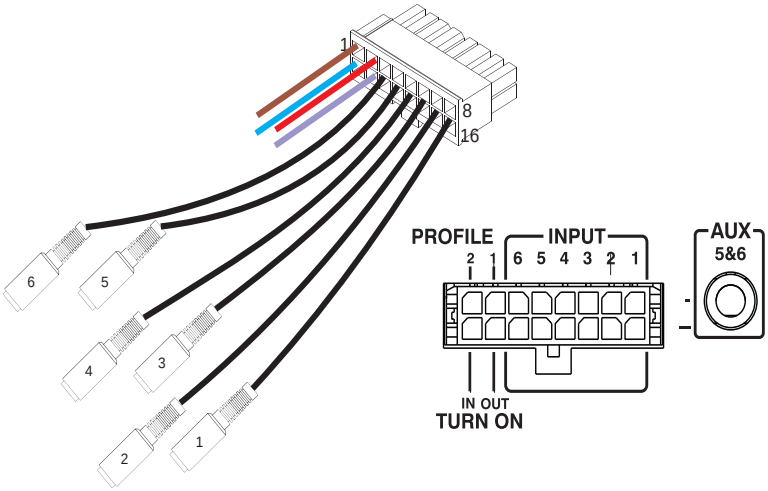
To achieve this opration you will be required to open up the bottom of the DSP8 and configure the intrnal jumpers as directed below. (Jumpers provided in packaging of DSP8) Next cut and remove the RCA plugs off the end of the cables and direct solder your OEM speaker connecitons to the dedicated inputs of the DSP8



If your factory radio does not have a dedicated full range (20Hz-20kHz) signal output you will need to retrieve the dedicated frequency signal leads (Highs, Mids, Lows) and connect to all 6 channels of input on the DSP8. Next using the onboard input signal VU meter and the input Codec sensitivity control level match all three dedicated signals till they produce a single full range signal input. (See Setup, Tuning and Adjustment)

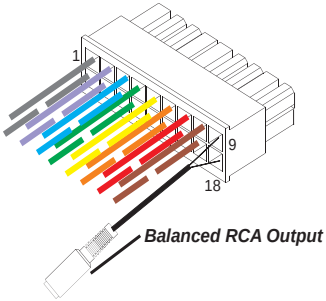
Note: some factory systems require loading of the outputs to achieve nominal operation. To simulate a load on the outputs of your factory radio install a 30 ohm 5 watt resistor across the positive and negative speaker leads of each factory channel and then connect to the assigned inputs of the DSP8. This should work on most instances where loading is required but may require different values depending on the exact electrical needs of your factory system

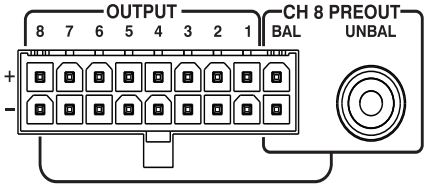
DSP8 Input Harness



Pin 1 - (Brown Wire) Profile 2 lead wire (NOT USED)
Pin 2 - (Red Wire) Profile 1 Lead
Pin 3 - Channel 6 RCA +
Pin 4 - Channel 5 RCA +
Pin 5- Channel 4 RCA +
Pin 6- Channel 3 RCA +
Pin 7- Channel 2 RCA +
Pin 8- Channel 1 RCA +
Pin 9- (Blue Wire) Turn on input lead
Pin 10- (Violet Wire) Turn on output lead
Pin 11- Channel 6 RCA +
Pin 12- Channel 5 RCA +
Pin 13- Channel 4 RCA +
Pin 14- Channel 3 RCA +
Pin 15- Channel 2 RCA +
Pin 16- Channel 1 RCA +

DSP8 Output Speaker Harness Port





Pin 1-	(Grey)	Channel 8 +
Pin 2-	(Violet)	Channel 7 +
Pin 3-	(Blue)	Channel 6 +
Pin 4-	(Green)	Channel 5 +
Pin 5-	(Yellow)	Channel 4 +
Pin 6-	(Orange)	Channel 3 +
Pin 7-	(Red)	Channel 2 +
Pin 8-	(Brown)	Channel 1 +
Pin 9-	Balanced RCA Output RCA +	
Pin 10-	(Grey w/Black Stripe)	Channel 8 -
Pin 11-	(Violet w/Black Stripe)	Channel 7 -
Pin 12-	(Blue w/Black Stripe)	Channel 6 -
Pin 13-	(Green w/Black Stripe)	Channel 5 -
Pin 14-	(Yellow w/Black Stripe)	Channel 4 -
Pin 15-	(Orange w/Black Stripe)	Channel 3 -
Pin 16-	(Red w/Black Stripe)	Channel 2 -
Pin 17-	(Brown w/Black Stripe)	Channel 1 -
Pin 18-	Balanced RCA Output RCA Shield	

Balanced RCA Out- For use on most OEM subwoofer amplifiers
Unbalanced RCA Out - For use on aftermarket subwoofer amplifiers
(Channel 8 output group is limited to one function. Using balanced and unbalanced outputs and/or with/without Channel 8 speaker output can cause damage to your DSP8 and will not be covered under warranty)

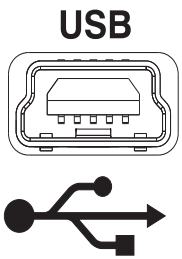
Connecting to your PC

Now that you have installed your DSP8 into your vehicle it is time to start setting up your system. After you load the DSP8 software to your computer you will connect your PC to the DSP8. The DSP8 software is compatible with 32Bit and 64 Bit computers running the Windows XP, Wndows Vista and Windows 7 operating platforms.

Please note that not all computers are the same and may require full updates to your computers USB interface. It is recommended that if you have trouble connecting to the DSP that you disconnect all USB devices and then plug the DSP8 into your PC and then turn on the software.

Connecting to the DSP8 -

Using a USB to USB Mini cable, plug your laptop into the DSP8. (It is recommended that cables be no longer than 6ft in length as longer lengths can cause issues resulting in not being able to connect to your DSP8 or potential faulty communication during your tuning session not allowing the features to function correctly).

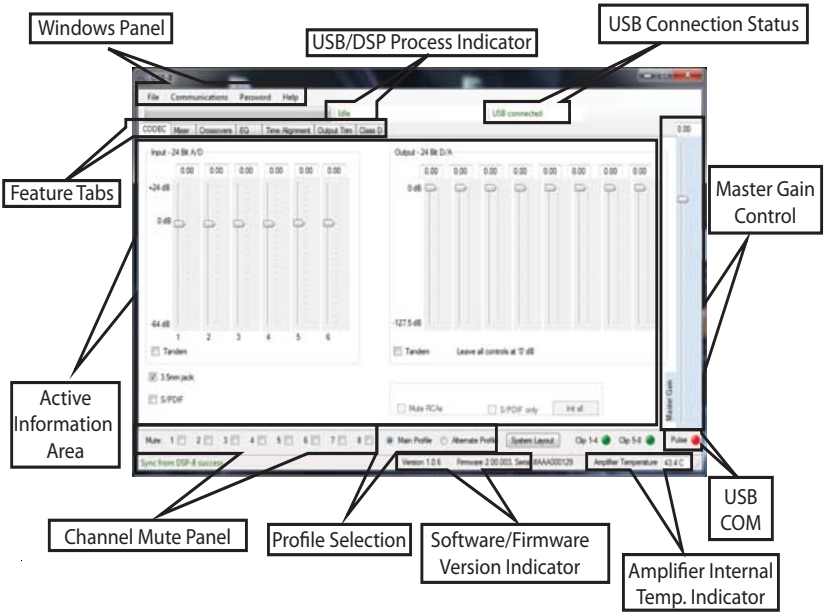


For more information on updating your computers USB drivers or operating system please contact your computers manufacture or Microsoft update for additional information

Other Requirements-

If this is your first time using the DSP8 Software you may be prompted to load and install Microsoft .Net Framework. This is required for operation and function of the DSP8 and its software package.

Getting to know your User Interface



Tuning Features-

- Arrow key adjustment on most adjustable tuning features
- Real time interaction between DSP and PC
- Onboard real time digital signal meters for precise signal alignment for most any application (includes input signal, dsp output, amplifier output signal and more
- PC save setting file allows user to save thousands of custom tune and setting files to your PC with the ability to recall and load them into multiple vehicles in seconds
- Fail safe USB connection protocol gives users the safety no processor lockups or freezing no matter what happens during the tuning process.

Windows Panel -	Firmware Update Panel, PC Database access for saving tunes or loading user made custom tunes
Feature Tabs-	Selection tabs to access each of the DSP8's high resolution tuning features
Active Info Panel-	Displays all adjustable controls and settings of the current project in use.
Chan. Mute Panel-	Alows user to mute ante combination of channels
Profile Selection-	indicator and selection buttons to toggle between preset profiles currently active on the DSP
Software Firmware-Version Indicator	Displays the active version of the user interface as well as the operation version of DSP8 firmware
Amplifier Temp-	Active internal circuit temperature display for the DSP, built in amplifier and other circuits.
USB Com Status-	Flash pulse indicator confirming active 2-way communication between the DSP and PC
Master Gain-	Master output level control of the DSP8's internal amplifier.
USB Connection-Status	Active confirmation of hardwire connection via USB device for user interface.
USB/DSP Process-Indicator	Verification window for active processes between pc and DSP8 whn making setting changes.

Synchronizing your PC to the DSP

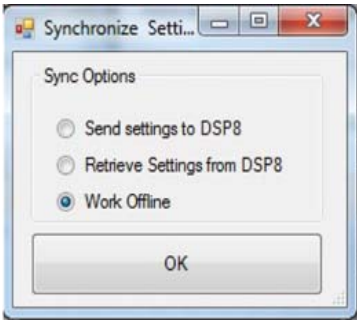
In order to make accurate changes in the custom tune menu's of the DSP8 you must first make sure that the PC and DSP is reflective of the actual settings between the components.

Every time you start to connect your computer to the DSP8 you will be prompted to select a Sync direction ensuring that from the very first adjustment your adjustment are properly reflected on your user utility. Your selections at startup will be as follows-

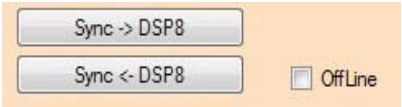
Send Settings to DSP8 - Allows you to select a previously saved settings file form you computers hard drive and load it onto the DSP8

Retrieve Settings-from DSP8 Retrieve's all setting files from the DSP8 and matches your computer to their position allowing you to continue customizing the tune from the point previously left off on that particular unit.

Work Offline- Allows user to make adjustments or build predetermined setup files without changing the state of the setting on the DSP.



Startup Option Menu



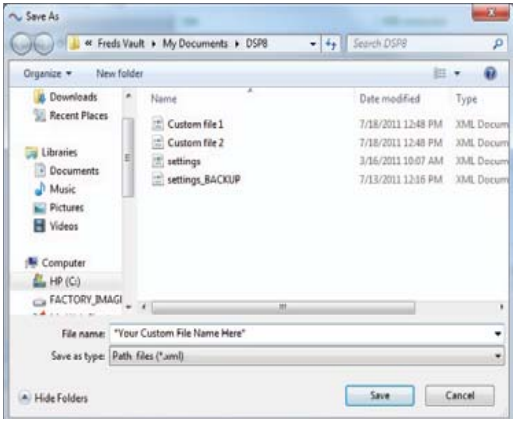
System can be Sync'd anytime in the EQ panel by selecting on the appropriate buttons above at any time.

Saving + Retrieving Setup Files with your PC

The advantage to using a PC based sound processor is that you are not limited to the presets available on the user utility. The DSP8 incorporates a multi tiered file management system that enables the user to save thousands of complete setup files on his/her hard drive.

The process is very simple. After you have finished making all of the necessary adjustments to your DSP8 locate and open the “File” tab in the upper left hand corner of the user utility. Then Click the “Save Settings As” listing and you will be directed to a system file window where you can custom name the settings as well as if desired select a custom location on your hard drive for where to save it (Not Recommended).

To retrieve saved files on your PC click on the “File” tab in the upper left had corner of the user utility. Then click the “Open Settings” listing, then highlight the desired file listing and click “Open” and your user interface will reflect your saved settings file in its entirety. Once the file is uploaded be sure to go to the EQ panel and click on the Sync>DSP8 button so that the DSP and sound will reflect these newly imported settings.



Password Protection and File Security

To achieve a world class sounding audio system you need a world class tune. These tunes can take many hours if not days or even weeks occupying many hours of time invested to create that personalized musical experience.

To protect this timely investment the DSP8 is equipped with a fully encrypted programmable password protection system. This system allows the use to custom set a unique cap sensitive access code that assures them that nobody can make unauthorized or undesired possibly system damaging changes to their DSP8.

Setting a Password-

In the top header of the user utility find and click on the tab listed as “Password”. Once accessed you will be prompted into the Password panel allowing you the options to set and verify a unique password of your choice.

IMPORTANT

Once you set a password you will not be able to use the SYNC<DSP8 feature not allowing you access to the stored file on the DSP8 or the ability to modify the current operating file from its current settings. MAKE SURE YOU SAVE YOUR SETTING FILES TO YOUR PC JUST IN CASE YOU NEED TO RELOAD THE FILES. Passwords must be matched for PC and DSP to gain access to existing files.

Restoring the system to factory default-

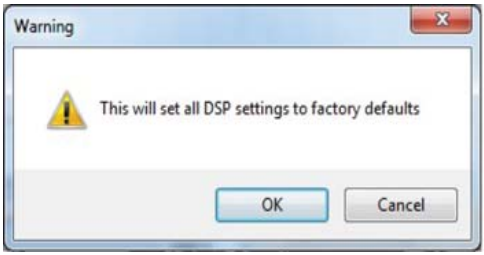
If you have lost or forgotten your password and wish to erase and clear the set encrypted security feature from your DSP the only way to achieve this is to reset the DSP to factory default settings. Please be reminded that doing this will clear the entire DSP and you will loose all custom settings stored on the DSP.

If you need to “Restore to Default” please follow these steps...

Step 1- Access the System Password panel thru the header on the top of the user panel.

Step 2- Once prompted with the Password panel, find, locate and click on “Clear Password”

Step 3- You will then be prompted with a warning screen notifying you that you will loose all settings and restore the system to factory default



After restoring to default you may proceed with either importing a settings file or starting a new custom settings file from scratch.

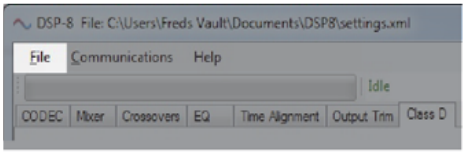
Firmware Update

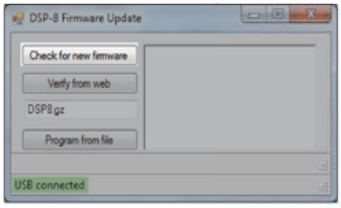
From time to time you as we improve the hidden technology with the DSP you may be required to update the systems with the latest and greatest firmware update.

Your user interface is designed with a trouble free simple operation updater that will allow you to update the firmware without ever having to download, transfer, save, or log into any difficult to access website to update your DSP.

With your DSP8 installed and software loaded we recommend that you before you start tuning that you update your DSP8's firmware. Following the steps below will make this easy and painless. (Please note that the very first time you attempt to update your DSP8's firmware you will be required to manually load the appropriate USB boot loader included in your software package. See USB boot loader update)

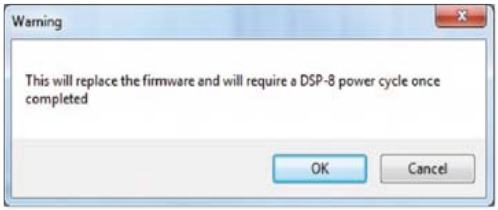
Step 1 - locate and click on the "Check for firmware updates" button located within the "File" tab in your windows interface panel to activate the Firmware updates panel



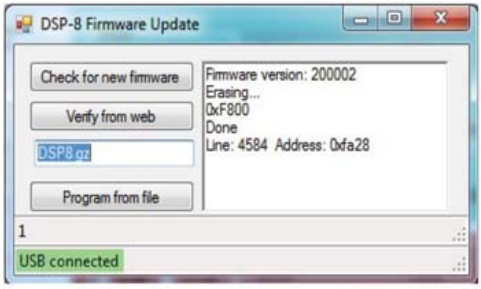


Step 2- If you have already manually updated your USB boot loader with the DSP8 driver click on the button "Check for new firmware". If not, please proceed to page 18 of this manual for instructions on how to update your USB boot loader

Step 3 - Next a new window will pop up advising you that upon completion of the firmware update you will have to power cycle (Power off and then back on) to fully update the system. Click “OK”



Step 4 - Once you have accepted the requirement to power cycle the DSP8 you will be prompted with a pop-up window indicating the beginning of the firmware update process.



******* IMPORTANT NOTICE!!!!!! *******

During the firmware update process do not unplug your PC from the DSP8, turn off or alter the power level to the DSP8, attempt to disrupt the firmware update process or turn off your computer. Doing so will cause the update to fail and will lock up your DSP8 requiring it be sent back to the factory to be reprogrammed and unlocked

Step 5 - Your firmware update is now complete. Please power cycle your DSP8 (Turn of then back on) and you will hear music once again and you will be able to enjoy your new updates.

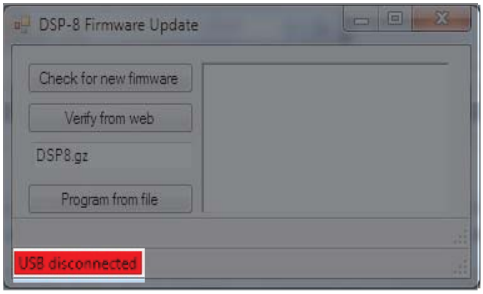
Manually Installing the USB Boot Loader

When you install your user software and fire up the DSP8 for the first time we recommend that you update the firmware before making your initial settings.

Rest assured your DSP8 is current ready to be installed in your vehicle but this process makes sure your DSP8 is up to date with any updates that may of occurred while in transit from the factory to your authorized retailer.

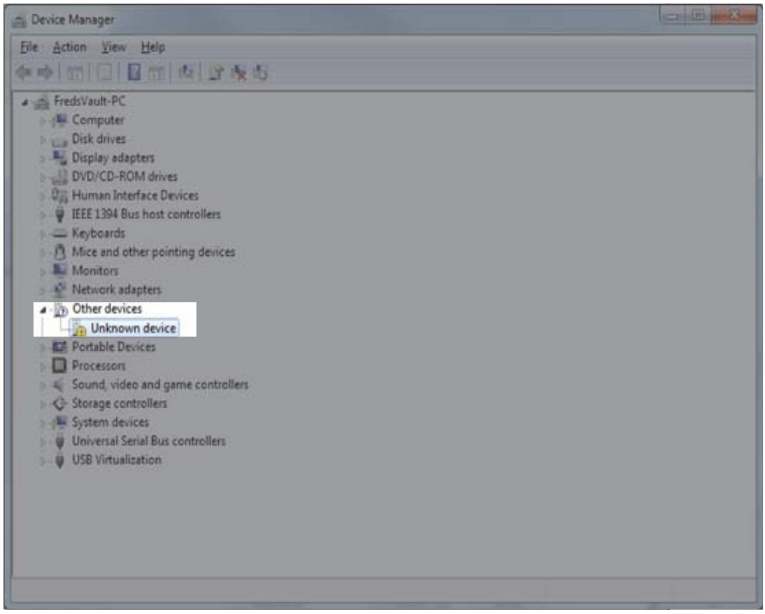
Due to the complexity and variety of operating systems and computer manufactures on the worlds market manually installing the USB boot loader although a very defined process and maybe confusing is the best solution to allow for a bullet proof procedure to accomplish this.

Step 1- Upon entering the firmware update tool you will notice in the lower left corner that it shows in red “USB Disconnected”. This connection notice is in reference to your systems ability to use this individual feature for loading and updating the firmware on your DSP8 and not in actual reference if your computer is actually connected to the DSP8.



At this point with your firmware update tool open your computer has already identified the inability to make the appropriate connection and will read the processor as missing the required driver for this application.

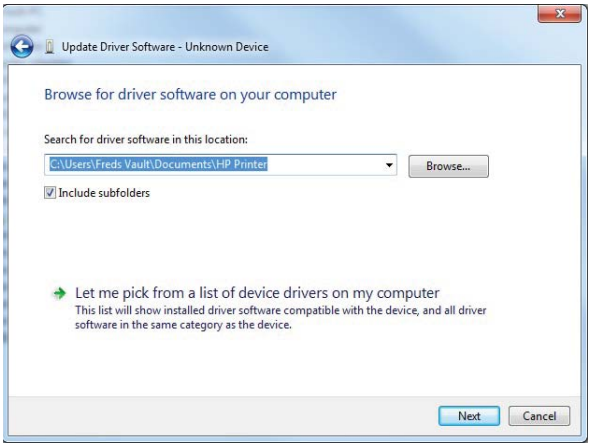
Step 2 - Cick on your Windows Desktop “START” button and proceed to the control panel menu on your operating system. Once in the control panel then click on your device manager.



Step 3 - Once in the device manager click on the tab listed as “other devices” and you will see a listing marked as “Unknown Device”. Right click on this listing “Unknown Device” and proceed to step 4

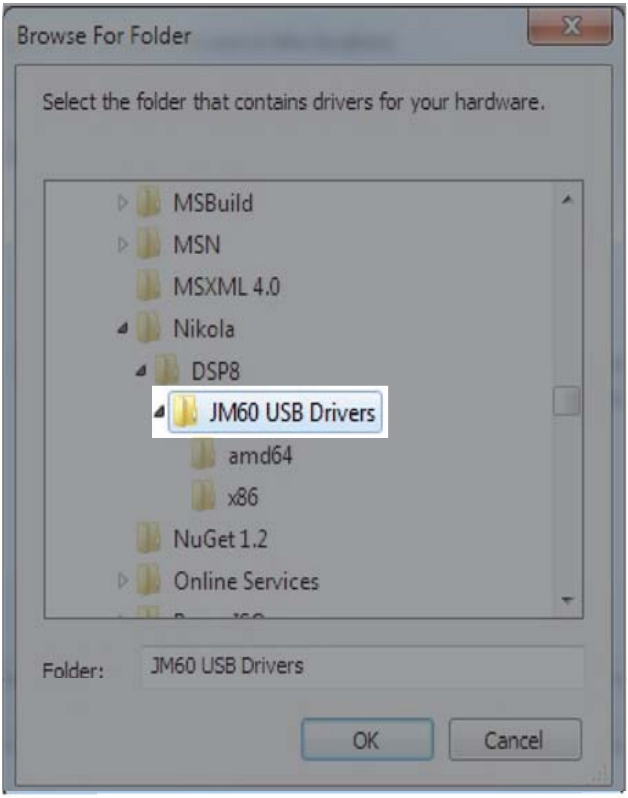
Step 4 - After right clicking on “unknown device” select the option listed as “update driver software”. Once this option has been selected you will be prompted to search for the driver software. Select the option highlighted below listed as “Browse my computer for driver software”

Step 5 - You will now be directed to a file browser panel. Click on the button listed as “Browse” and proceed to the next step



STEP 6- You will be prompted with a map of your computers database. Take note that you will be loading an entire folder named “JM60 USB Drivers” and not the files in the folder. You will find the required driver folder in the following location.

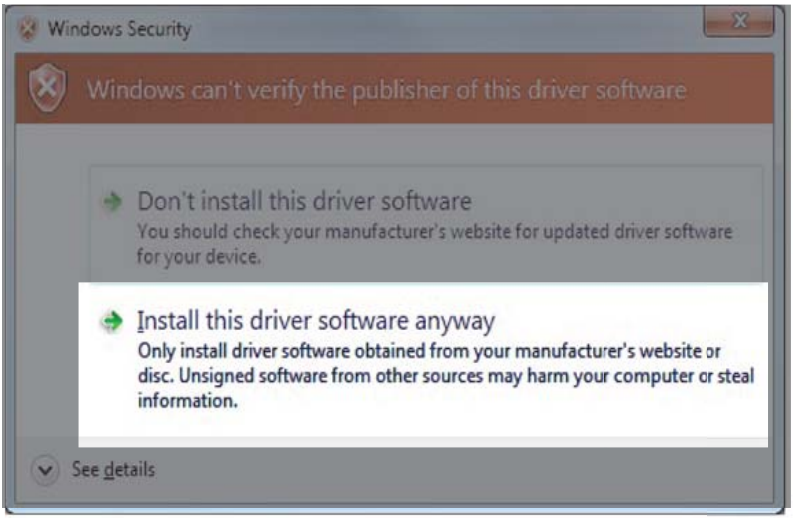
32bit operating systems - C:\Program Files\Nikola\DSP8
64bit operating systems - C:\Program Files (x86)\Nikola\DSP8



SELECT THE ENTIRE FOLDER..... DO NOT SELECT THE INDIVIDUAL FILES!!!

Step 7- With the JM60 Folder selected click “OK” and then on the update screen you will see the address for the correctly selected file in the location window. Now Click “Next”.

After clicking next you will be prompted for authorization to give permissions to install the new driver. Please click the “Install driver software anyway”. You are now finished with your USB driver Update. Rest assured you will never have to do that again unless you attempt to update firmware on another computer.



After the update has been completed it is recommended that you power cycle your DSP8 and now begin the firmware update process located on page 14.

Other Controls

Channel Muting-

Full time individual channel muting is available on your user utility no matter what settings screen you might be in allowing you to mute one or multiple channels at any time.

Simply hover your mouse indicator above the desired channel and click on the check box to mute or unmute the channel

Master Gain-

The DSP8 master gain is not an input sensitivity gain to the DSP8 main unit or a Master Volume Control! This control is specifically assigned to the input of the amplifier portion of the DSP8 allowing the user to increase the overall sensitivity and ultimately achieving an increased volume level.

**** IMPORTANT****

Misuse and excess levels of this control can result in poor sound quality, unwanted levels of system noise and even possibly severe system component damage.

Please use this control responsibly!

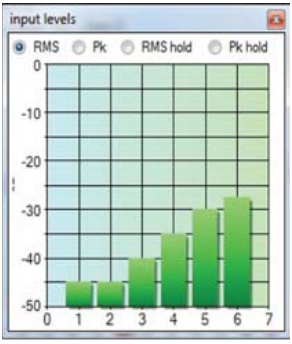
V.U. Meters

The DSP8 microprocessor has an advanced diagnostics and signal monitoring system built into the user interface allowing the user to monitor and test the individual settings of each channel at different spots thru the audio path within the DSP and the signal passing thru it.

V.U. meters can be used to level match frequency dependent input signals for signal summing capability, monitoring signal coming from the head unit, verification of settings throughout the DSP, and much much more!

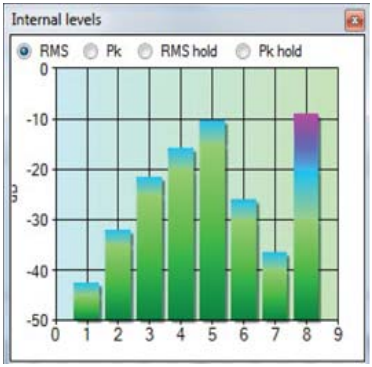
Input V.U. Meter

- Monitor signal level of all channels of signal into the DSP8
- Verify signal output from source
- Level match input signals from frequency dedicated outputs of factory radios to sum multiple channels into 1-8 channels of full range full bandwidth signal for aftermarket applications.
- Detect signal distortion being generated from the source unit preventing premature clipping of the systems sound.
- Optimize input levels to help achieve maximum volume with minimal artifacts and noise floor.



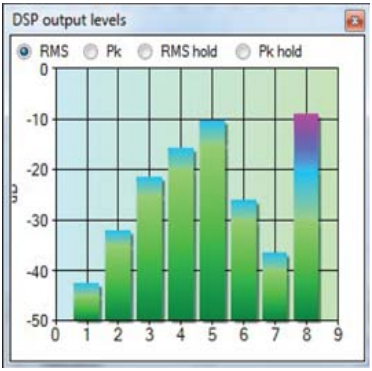
Internal V.U. Meter

- Used to verify mixer configuration and level settings.
- Confirms channel assignment and signal levels into the crossover section of the DSP



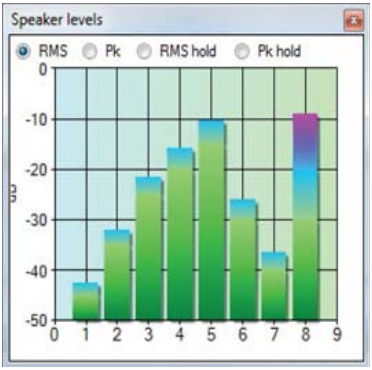
DSP Output V.U. Meter

- Monitors dynamic signal levels post DSP going into the amplifier stage of the DSP8
- Warns user of possible speaker damaging distortion levels by indication of clipped and/or distorted signals as a result of settings in excess within the DSP



Speaker Output V.U. Meter

- Confirms and verifies signal output on assigned channels.
- actively reports signal output levels and with color coded graphs identifying distorted signal coming out of the amplifier stage of the DSP8
- Can be used as a diagnostic tool to identify damaged speakers with confirmed channel output.



Section 3 - Tuning Your System

Intro-

This manual is designed to familiarize the reader with some very important system tuning concepts and considerations. It will not give specific control adjustment details related to the specific inputs, outputs, and controls incorporated in the Arc Audio DSP8, but rather will cover more of a broad, overall theory for tuning your audio system, helping you to formulate a game plan in you approach towards the specific design and tuning of your audio system.

While this manual is a valuable source of information, it can not possibly cover every factor and/or combination of factors that can affect overall system sound quality. A comprehensive detailed analysis of all possible factors that can/will affect how the system sounds would be prohibitively large, and beyond the scope of this manual.

To truly maximize your knowledge and system design/tuning skills, we recommend you go a step further, with study beyond the basics that are presented in this manual. The reference section lists some excellent sources (books, technical papers, seminars, etc) from which you can learn much more about all of the topics covered in this manual, as well as the many additional topics that also have a significant effect on audio system performance. (i.e. speaker placement, acoustical treatments, specific vehicle parameters, etc).

Now, let's get to the basic areas that the DSP8 can directly affect, and get your audio system on its way to sounding awesome!

Initial Considerations

1) What it takes to make a system sound the best

One thing that is absolutely essential to understand is that simply installing high quality audio gear does not ensure that the system will sound great. Sure, it is essential to use high quality equipment, and the DSP8 with its tremendously capable features will make your job a lot easier. But the end results are only partly determined by the equipment used. Your skills, knowledge, and installation/tuning abilities, financial considerations, as well as how much time can be allotted to the design, fabrication, and final tuning of the system, will play the most important parts in determining how the system will perform.

The procedures and basic guidelines detailed in this manual can give you a logical approach by which you can tune most mobile audio systems when using the DSP8. We have filtered this information into as generic an approach as possible, so that it can be used on just about any system. These are proven recommended practices, not necessarily hard and fast rules and/or requirements that must be used on every system.

After you gain experience, you will likely modify these techniques to meet the specific requirements necessary for each system you take on. You may eliminate steps not needed, modify the techniques, and create different ways to accomplish what is needed. Our intent is to give you a solid, proven approach towards audio system tuning. The end goals will determine what steps are needed and the specific techniques required.

For example, a basic OEM system upgrade might only require basic crossover setting, input mixer and output level setting, and simple equalization.

On the other hand, an ultra-performance competition system will require the use of every control available in the DSP8, and each control may be adjusted many times during the fine tuning process in order to get the system dialed in for the very best performance.

2) Know and Understand the Equipment

Make sure you're familiar with all of the features of the system components you'll be using. You should know what all of the controls on the DSP8, on the amplifiers, in the head unit, on the passive crossovers, and on any other components do before attempting to do serious system tuning. All too often, (and believe me I've done it myself) we figure we'll just figure it out as we go. Sometimes we're successful, but often, we spend a lot more time "figuring it out" when it would have been much quicker and easier to read the manual first. R.T.F.M… Read The Factory Manual…

Once you acquire a lot of experience, it is easier to take some short cuts. But even if you're totally familiar with the components and the type of system being tweaked, it's a good idea to follow a standard procedure. The results will be much more consistent and you will work faster too.

3) Your Ears and Audio Reference

A good system tuner will have a very good aural reference on which to rely when tuning audio systems. If you are trying to tweak a system for the best overall sound quality, but do not have the experience listening to live music, and also to recorded music on high quality home or studio sound systems, then it will be impossible to accurately tune a vehicle's audio system.

Remember, we're listening to music, which is supposed to be fun! Enjoy it!

4. Listen, Listen, Listen

Always listen to the changes you are making to the system tuning after each adjustment, or short series of adjustments. If the changes are not improving the sound quality, don't be afraid to back up and try something different. And remember that you can save multiple different settings, and then switch between them to compare which ones sounds the best. Remember to use this capability! It can make your job much easier!

5. Differing Opinions

Get as many different opinions as possible about the system's sound quality. Everyone listens to the same things, but each of us keys on different parts of the system's performance that we perceive as a problem. Some may focus on the female vocalist, others on the sub-bass, some on the piano, etc. Very few listeners can give a complete and total analysis of an audio system, so it is best to get opinions from multiple different people. Additionally, the one person that is primarily responsible for tuning the system will be very close to the system, primarily focusing on the things he/she has been trying to improve. Therefore, they may miss some areas of the system performance that can be improved, which will likely be picked up by someone else that isn't so close to the system.

Do not try to do all of the system tuning in a single session. It is good practice to spend only an hour or so tuning a system at any single session, and to use several or many sessions to complete the process. The human hearing system can become fatigued when concentrating on critical listening for extended periods, so breaking up the tuning process into several shorter sessions over a several day period will be much more effective, and usually yields better results

System Tuning Functions

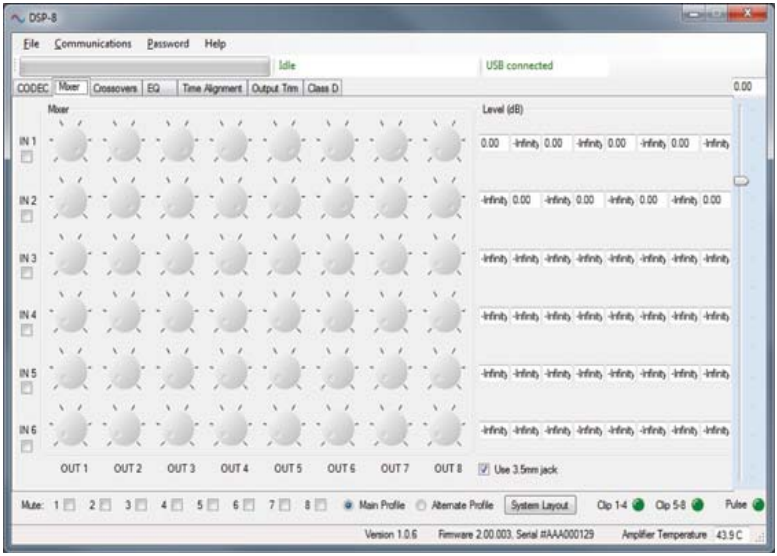
Input and Output Level Setting-

To ensure the highest overall audio system signal-to-noise ratio and dynamic range performance, the signal level controls on every component in the system should be set so that the highest possible un-distorted signal levels are maintained at every step in the signal chain, from the signal source through every component, including the amplifiers.

A complete description on setting audio system signal levels and gain structure is explained in Appendix A, Level Setting and Gain Structure. We recommend that you read and fully understand this information first, so that you will understand the overall theory and procedures involved in proper level setting. This will allow you to maximize signal level performance through your entire audio system.

One of the very best benefits of using the DSP8 is that it has input and output level controls that will make it very easy to adjust these parameters within the processor. It also has a peak level indicator, which is designed to show you the actual signal level relative to the maximum possible undistorted level possible. Throughout the tuning process using the DSP8, always keep the signal level indicators at the front of your consideration list. What ever you do with the signal levels within each section of the processor, try to keep the maximum levels right at the clipping limits, indicated by a red “light” in the overall level indicator.

Input Mixer and Polarity



The DSP8's input mixer can allow you to do several key things in regards to optimizing system sound quality that can not be done as easily, if at all, in other ways and/or with other types of signal processors.

The mixer can re-combine frequency band limited OEM source outputs into full range signal channels that can be better utilized by the DSP8. The mixer can also allow you to create special signals to be used for center channel, rear-ambient channels, and other possible special use signal requirements.

Note: While the mixer is a very powerful and advantageous tool to have in your arsenal, be careful to use it properly! Correct implementation of the mixer can allow you to create an excellent sounding audio system. However, incorrect mixer usage can cause very undesirable, negative effects on sound quality.

The use of an RTA is the easiest way to confirm proper channel combination(s) thru a mixer. This technique can give you a quick visual indication of the signal frequency response, using pink noise as the source signal and connecting the DSP8 output to the RTA line level input. While it is possible to do everything by ear, an RTA will make this part of the setup and tuning process much faster and easier.

Operating the Mixer-

Operation and Adjustment of the mixer settings can be done thru tree different tasks depending on which will suit your personal and application needs the best.

1) Double click on the numerical channel entry on the right hand side of the user utility will allow you to cycle the value of the individual adjustment between Off (-100) and On (0).

2) Manually enter the value of the desired adjustment in the individual channels numerical value window readout on the right hand side of the user utility

3) Use your mouse by hovering over the desired dial representing the channel you wish to make adjustment on and rotate the dial to the desired value.

Initial Settings and Tuning

This chapter will get you started on system tuning. The key here is to set everything in the DSP8 so that the speakers are protected from frequencies that could damage them, the gain structure and signal levels are optimized to ensure maximum signal levels, and everything is set to be neutral within the crossover, EQ, and delay sections.

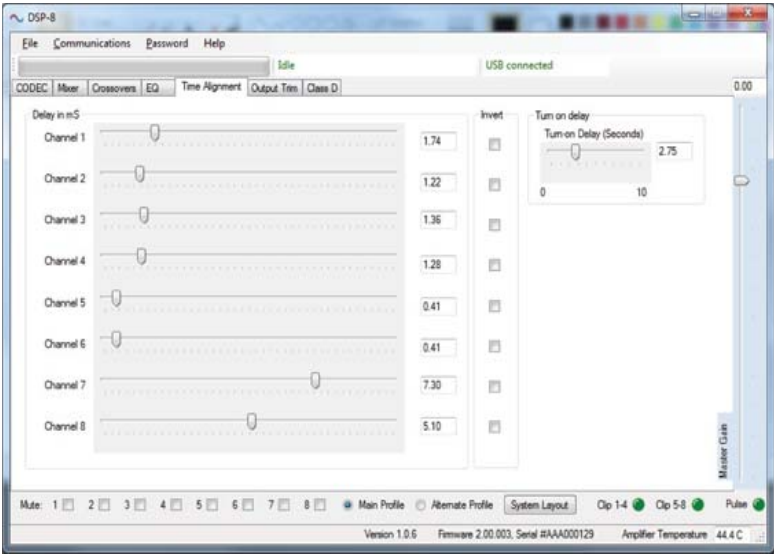
Input Mixer Levels and Polarity

One of the great features in the DSP8 is the signal level indicator, which will allow you to adjust the input and output levels without the need to use the oscilloscope.

To accomplish this, you must use an appropriate test tone. You must first ensure that the source unit output levels are set to their maximum un-distorted levels.With the source unit and any other devices in line prior to the DSP8 set to their maximum undistorted output signal levels, it is now possible to set input and output levels within the processor.

Begin by setting the main signal level control to the 0 dB setting. Set the signal input to the processor from the source unit at its maximum undistorted level. Using the 1 kHz 0 dB down signal, adjust the input gain control for each input to be used so that the signal level just lights up the first red bar on the indicator. Do this for each input

Output Levels

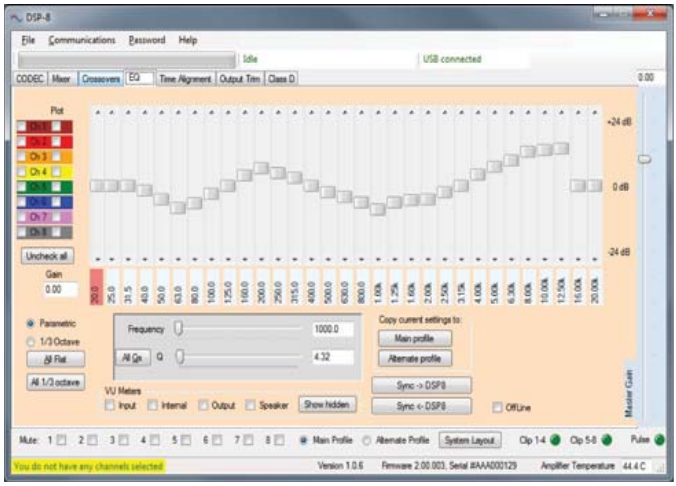


Before adjusting the output levels, make sure the EQ is bypassed temporarily. You must also use an appropriate frequency test tone for each output. Remember that the crossover will limit the frequency response to the frequency range above the high-pass frequency setting, and/or below the low-pass frequency setting for each output channel. So, using the 1 kHz test tone will not work for a subwoofer or tweeter output channel because it is not in either of their band limited frequency ranges. For the tweeters, a 4 kHz test tone might work, and for the subwoofer, a 40 Hz test tone might be more appropriate.

With the appropriate track selected, simply adjust the output level to again trigger only the first red indication on the output level indicator.

As you adjust the system for relative levels between the subs, midranges, tweeters, etc, you may need to reduce some outputs relative to others. Remember that you have set the levels to their absolute maximum possible with minimal clipping/distortion, so any additional level changes, whether it is in the equalizer or an input or output level, needs to be a reduction in level. Any increases in level may send the signal into undesirable clipping and potentially audible distortion.

Initial EQ Settings



If the signal source is an aftermarket unit, you can usually assume that the signal output frequency response is flat throughout its frequency range, and no initial EQ adjustments will be required at this point. However, make sure all equalizer controls and loudness compensation are turned off.

However, if an OE source unit is being used, then you must determine if the OE source signal outputs are full range or band limited, and if the frequency response is flat and smooth or if it has equalization applied. Many OE source units have some level of equalization incorporated in their outputs to correct for the very poor response characteristics of the factory speakers.

In your aftermarket audio system, the speakers will be much higher quality than even the best OE speakers, and you do not want any OE source “corrective” equalization affecting the signal. Hence, you will want to start by adjusting the EQ to neutralize the factory equalization on the signal coming from the OE source unit. You will likely apply

more EQ adjustments to the system later to compensate for acoustical correction necessary to optimize the desired sound quality, but we want to start with a clean, smooth signal during initial system setup.

So, when the RTA is connected to the processor outputs to confirm the proper utilization of the mixer for re-combining channels, you can also verify and correct the initial frequency response if needed. To accomplish this, route the mixed input signal to a channel within the DSP8 with the crossover section set to all-pass (i.e. no crossover). With the RTA connected to this channel output, adjust the EQ so that the displayed response curve is relatively flat and smooth across the entire frequency range.

Start by pulling down peaks first. Don't boost anything on the EQ until you determine that is the only way to flatten out the response in that frequency region.

At this point, the system is not ready for fine tuning the EQ. Let's save the EQ fine tuning until after we have dialed in the other DSP8 settings in the crossover, delay, and output sections. Quite often, much of the work necessary to tailor the frequency response can be accomplished with the crossover, delay, and output speaker polarity and level adjustments.

****

Very Important: If you decide to boost a particular frequency to fill in a hole in the response, watch the RTA display carefully when making the adjustments. If the display show a consistent corresponding increase in level (i.e. you push up a slider 3 dB and see a 3 dB increase on the corresponding RTA band), then you can assume the EQ can be used to help to correctly fill that dip in response.

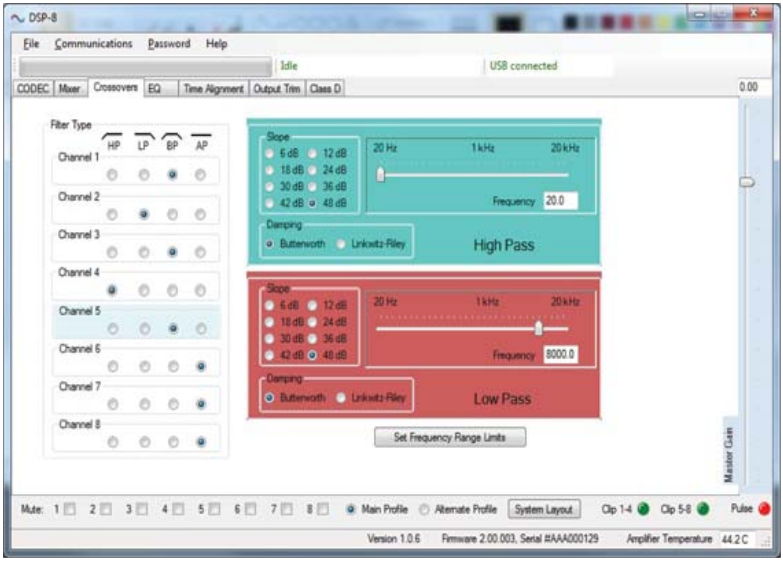
However, if you increase the level of a particular band, but do not see the same increase on the RTA display, then you can not use the EQ to "fix" that particular response problem. In this case, the dip is likely

caused by a cancellation in the response. This can be due to multiple speakers playing the same frequency but having them out of phase at the microphone location. It could be caused by a reflection off a hard surface, where the direct sound arrival from the speaker and the reflected sound off the hard surface arriving slightly later combine to cancel the response at that frequency.

Regardless, if the frequency response shown on the RTA display does not move in direct correlation with the changes being made on the EQ controls, you will not be able to correct the problem with EQ. You will need to use speaker polarity, crossover frequency/slope, signal delay, etc. to correct the problem. If you determine it is due to a reflection off a hard surface, physical adjustments to the speaker placement, moving or modifying the hard surface, etc, may be required.

In the end, you may choose not to address some frequency response issues. As always, use your ears to confirm what actually sounds the best. Just because an RTA gives you a particular visual frequency response on the display does not

Initial Crossover Setting



The initial crossover setup step is really basic. All of your initial crossover settings can be fine tuned later. Right now, you just want to set the crossovers to protect the speakers, and be within the designed operational frequency range for each. You will make more detailed, fine-tuning adjustments later.

Subwoofer crossovers are very straight forward in theory. In general, it is good practice to set the subwoofer upper frequency limit to the lowest frequency at which the next speaker above it can reproduce, whether it is a midrange or a mid-bass speaker.

If a dedicated mid-bass speaker set is used, start by crossing them over with the subwoofer as low as the mid-bass speakers can play. This should be somewhere between 40 and 80 Hz. At the upper end of the mid-bass range, the frequency can be varied as required to achieve the best results. This can be determined by a

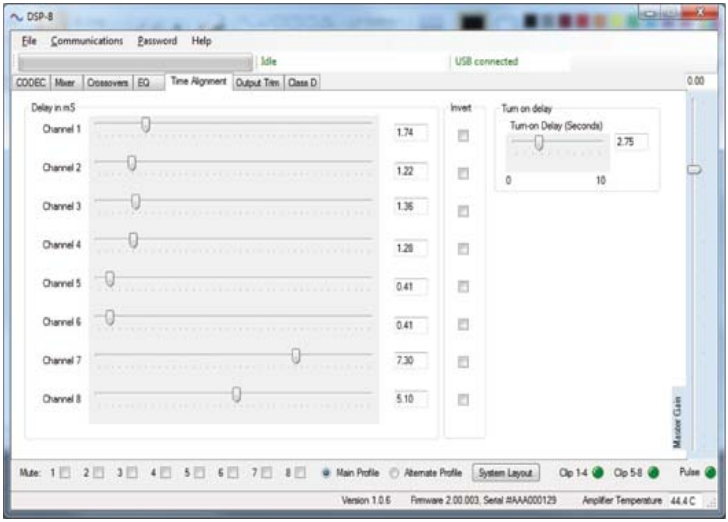
combination of listening to the system while adjusting the crossover, and looking at the response on an acoustical analyzer (RTA or other measurement system). In general, a dedicated mid-bass driver's upper frequency limit will be between 125 and 250 Hz.

If there is no dedicated mid-bass speakers being used, then set the crossover between the subwoofer and the midrange outputs to the lowest frequency the midrange is capable of reproducing (probably between 70 and 100 Hz).

When using the active crossover in the DSP8 to separate the midrange and tweeter frequency ranges, simply set the midrange low pass and tweeter high pass frequencies to the speaker manufacturer's recommended tweeter crossover frequency.

The initial crossover slopes can generally be set as desired at this point. Start with the slopes all set to the same value; 24, 18, or 12 dB/octave is recommended for getting started. You can make adjustments to each of the crossover slopes later while making fine tuning adjustments.

Initial Signal Delay / Speaker Polarity



When getting started, we recommend that the speaker outputs polarities all be set in polarity. It is just a good starting point from which you will fine tune later.

As for signal delay, you can look at the physical relationship between the different speakers and make rough approximations to initially set delay. For example, use a tape measure to verify the distance from each speaker in the left channel (tweeters, midrange, mid-bass, etc) to the driver's head position and calculate 34,32cm/ms. Determine which one has the longest path length, and delay each of the other speakers an approximate amount so that all of their arrival times will be approximately the same. (We recommend initially setting both the left and right channels the same.)

If a center channel and/or rear speakers are used, measure their path lengths, and adjust their output delays similarly.

In the fine tuning process, these values will be adjusted. For now, we just want to be near the ball park, if not in it.

Adjusting the actual signal delay can be accomplished in several manners, similar to adjusting equalization. Often, the processor manufacturer's instructions will provide a good set of guidelines to follow when tweaking their products. What will be presented here are general guidelines and considerations to make the job easier.

The tools you can use to help tweak the signal delay include all of the frequency response measuring tools; an RTA, a Time-Energy-Frequency analyzer, etc. But as always, the most valuable tools in the arsenal are your ears!

If the processor manufacturer has specific tuning techniques spelled out in the product manual, use it first. If that yields acceptable results, then you're almost home free. Regardless of whether or not you use the manufacturer's recommendations, you should use the available tools to verify the results.

An RTA can be used for tweaking delay in essentially the same manner as for equalization. In fact, while tweaking delay, you will likely find that also tweaking the EQ, and possibly the crossover also, will yield the best overall results.

Before adjusting the signal delay on any speaker, study the speakers as installed, and determine which speaker is probably the closest to the listener, which is next closest, etc. Using a tape measure is not the most accurate tool, but it can get close enough for determining approximate path lengths from each speaker to the listener's ears. When measuring this way, try to approximate a measurement from the center of the speaker's voice coil to the listener's ear. The center of the voice coil is a closer approximation to the acoustical center of the sound produced by a speaker than the front of the speaker cone, or any other point on the speaker. (The actual acoustic origin varies for every speaker, relative to frequency and output level.) Write down all of the estimated path lengths, and

determine which speaker is the furthest from the listener's ears. For single seat SQ system designs, this will be done for all speakers in the system relative to the single speaker furthest from the driver's head location. For multiple seat SQ system designs, you will do this for each channel of the system independent of the other channels.

Now, calculate the difference in distance between the furthest speaker and each of the other speakers, and write the values down. These numbers will be a starting point to enter in the signal processor for delay values on each speaker

Setting Delay by Ear

This step can be accomplished regardless of whether an RTA has been used to initially tweak the delay settings or not. Using the RTA might help get a little closer to optimizing the delay settings in a shorter amount of time, but in the end, your ears should be used to do the final tweaking and analysis as to the success of your efforts.

Sit in the designated listening position, and play some familiar reference music, preferably something simple like spoken voice, and/or music with only one vocal and maybe a few instruments, through only the channel being adjusted. Choose one of the speakers on that channel as a "reference" on which the delay will not be adjusted. Now, listen critically to the sound, and at the same time, adjust the delay for each of the other speakers on that channel, sweeping it from above the original setting to below, several times. Sweep the setting slowly so your ears have a chance to pick up the minor changes occurring as you make the changes. Listen for the stability of the images, the apparent height of the image, and the overall tonal balance. The apparent image will likely shift in multiple directions, and become more and less coherent with different settings. If there are only two speakers on a particular channel (i.e. midrange and tweeter), then it is fairly easy. If there are three or more speakers

on that channel, start with the delays on the two speakers in the lowest frequency ranges (i.e. mid-bass and midrange), and work up in frequency through the delays.

When the first channel sounds as good as possible by itself, move on to each of the other channels, and use the same procedure for each.

When all of the channels have been adjusted individually, it is time to adjust them relative to each other. For systems with only a single seat SQ requirement, start with the left and right front channels, listening to music with a known center image in the recording. Now, adjust the delay on the near side channel so that the apparent center image moves to dead-center in the soundstage. Then, turn on the center channel (if one is used), and adjust it's delay so that the center image is as focused as possible, and the overall tonal balance is best.

An RTA can also be used to look for the best overall frequency response, but it is quicker to do this step by ear. And, you will have to check it by ear after using the RTA anyway.

For a multi-seat position SQ system, after each channel has been set individually, look at the delay settings for each pair of matching speakers on the left and right front channels. If there are significant differences between, for example, the midranges, you will need to listen to the system with all of the speakers in both channels playing, and adjust the delays on the midranges to the same setting, which should be somewhere between the values determined for each channel individually, to yield the best overall SQ. You will need two experienced listeners, one in each front seat for this part of tweaking the delays. This can get tricky and sometimes confusing. The idea is to set the delays to the same value for both mids, both tweeters, etc. and listen for the best compromise delay settings for both seats, as the delay setting is swept between the high and low values determined before. The end result will likely be a compromise delay setting, and possibly neither seat will be maximized for SQ. But, both seats can sound very good, and neither will have a significant SQ advantage over the other.

Trouble Shooting

DSP8 does not turn on	-Check and verify main fuse, ground connection and remote turn on lead.
No sound from DSP8	-Verify mixer is set correctly. -Un mute all channels. -Verify DSP8 is seeing speaker connection in the Class D tab of the user utility. -Power DSP8 Off and On
My DSP8 doesn't sound like my settings on the user utility.	-Go to the EQ panel and press “Sync>DSP8” so the PC and DSP8 are matched in settings
My computer wont connect to the DSP8	-Disconnect all unnecessary USB devices. -Update your PC’s USB drivers and operating system. -Make sure you have Microsoft .Net installed on your computer. -Be sure to turn on the DSP8 first, then connect the USB cable followed by starting the user software *(See Page 11)*
My computer says USB not connected when doing firmware update-	-Make sure you have manually installed your USB boot loader driver to your PC. *(See Page 20)*
Profile 1 wire does not change settings-	*-Make sure that this wire see’s switched and held 12v+ to change to the alternate profile setting.*
Profile 2 wire not working-	*-This wire currently has no function.*
My ears are Hurting and things aren't sounding	*- Chances are you are a music lover and have been in the vehicle for an extended length of time tuning. Take a break and give your ears a rest.*

DSP8 Checklist and Specifications

Please use this simple and easy to use check list to make sure you have everything properly installed and updated to ensure that your first use of the DSP8 is a smooth one.

- ☐ 1) Install DSP8 and mount to a secure location.
- ☐ 2) Connect all power, ground, signal and speaker leads.
- ☐ 3) Install the user utility software onto your PC.
- ☐ 4) During installation of PC download and install Microsoft .Net drivers for successful installation and interface with the DSP8.
- ☐ 5) Turn on the DSP8
- ☐ 6) Plug in the USB to your PC and the DSP8
- ☐ 7) Start your user interface software
- ☐ 8) Manually load the USB Boot Loader Drivers for firmware updates via your PC.
- ☐ 9) Update your DSP8's firmware with the easy to use firmware update utility.

Technical Specifications

• Output Power @ 4 Ohm	35 W/RMS
• Output Power @ 2 Ohm	50 W/RMS
• Frequency Response	10 Hz - 24 KHz
• Signal to noise ratio	> 105 dB
• Damping factor	> 100
• Input Sensitivity	RCA 0.2 - 6V
• Fuse	20 A (external)
• Size	177 x 102 x 33 mm
• Weight net	720 g
• Additional features	72Bit DSP

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μ DIMENSION

Europe

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EASCA

EUROPEAN AUTO SOUND ASSOCIATION