ZAPCO

DSP and OEM Integration
Owner's Manual

Before operating the unit, please read this manual throughly and retain it for future reference.

Owner's Manual

Contents

Mission Statement

Zapco is Dedicated to the Pursuit of Audio Fidelity

Our passion, our "Driving Force" is to design and manufacture car audio products of unsurpassed quality, to provide unparalleled support and service for these products and to conduct business in a manner that will enhance the quality of life for all involved

Experience

There is absolutely no substitute for experience; that is a simple fact of life. Another simple fact is that for over 30 years, Zapco has been the leader in defining quality standards for the car audio industry. These years of experience have led to a thorough understanding of the challenges that are unique to the world of car audio. Zapco's relentless quest for sonic purity consistently yields imaginative designs that utilize the most innovative technologies. The resulting products set the criteria by which all others in the industry are judged.

Feel the passion, hear the quality, know the performance and reliability by making Zapco the *"Driving Force"* in your car audio system.

Sonic Purity

Our dedication to sonic purity requires that the highest quality internal components are used.

Resistors

All resistors (other than power resistors) are 1% precision low noise metal film. This is a key reason why **Zapco** products have the industries' best low noise specifications, and why you won't see as much fluctuation in our test certificates as you will with other brands. Precision resistors also reduce distortion and improve channel matching.

Capacitors

Capacitors are similar to batteries. Like a battery, they store energy and have electrolyte (internal fluid). Also like a battery, a capacitor can have a very limited life. "Computer grade" capacitors for example, are reliable only in cool environments with very little current applied to them. Only the best high current and high temperature capacitors should be used in an auto-sound application. Although these capacitors typically cost five times as much as those commonly used in other brands, Zapco insists that no audio degradation will occur over time

Zapco Signal Processing

Zapco virtually created the concept of high sound quality processing in the late 70's when we created the PEQ. This was a high voltage preamp/EQ with an audiophile input stage and 9 bands of equalization for each channel. It brought a whole new level of performance to car sound. In the 90's the name was changed to SEQ and the unit is still sought after today after in the used audio market.

In the 80's we took processing to another new level with the PX. This was the first audiophile quality preamp EQ with a multi-order crossover. In addition, all four EQ bands were parametric, so now you could customize the EQ parameters to you car. The result: By the late 80's even non-Zapco dealers had to have a source of PX's for all their competition.

The next leap was in the 90's, when Zapco introduced the SX, (later to become the SX-SL). This unit expanded the Parametric EQ to 5 bands, added dual high pass and three way band pass crossovers, added variable crossover slopes, ands bass-to-highs balance.

In 2004 Zapco Introduced the DSP-6, stand-alone, PC controlled Digital Signal Processor. We also introduced the DC Reference line of Amplifiers. These were the first ever PC controlled amplifiers, with on-board DSP's for each and every channel. The DC Reference amps were controlled by the revolutionary Zapco DPN control network that allowed a single PC screen to control each amplifier in the system separately and to apply memory settings globally to the network.

In 2012 Zapco introduced the DSP-Z8 Digital Processor. The DSP-Z8 added two more output channels, increased the signal delay resolution, added muting by channel or channel pair and added a voltage actuated EQ band to each channel. The DSP Z8 also added Speaker level input for OEM integration accepting input level as high as 22 Volts to handle the most powerful of factory stereo amplifiers.
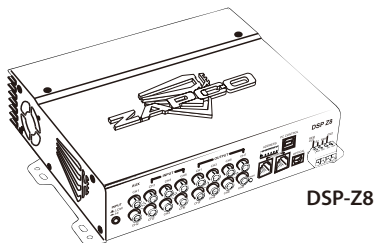
Zapco Digital 2015

The DSP-6 and then the DSP-Z8 were designed to complement the Zapco Digital Programming Network which allows an entire system of Zapco DC series amps and stand alone DSPs to be controlled by a single PC screen.

For 2015, Zapco presents the DSP-Z8 III and the DSP-Z6 III. These two new DSPs are designed for the customer who is running non-DC amps like the Zapco Z-Series or Studio Series amps.

These new models have exactly the same features as the DSP-Z8 but do not network with the DC Series amplifiers. The two new models use a smaller compact chassis that shares a look with the Z-series amps. The difference between the two new models is simply the number of channels. The DSP-Z8 III has 6 channels of input and 8 channels of output while the DSP-Z6 III has 4 channels of input and 6 Channels of input.

All three Zapco DSP models share the same feature set to provide all the tools you need for fast efficient tuning of your sound system
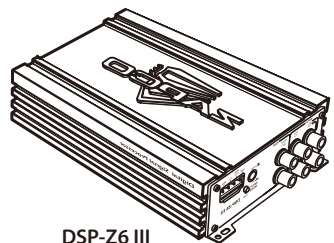
In this manual we will take you through the programming and control functions of the Zapco Digital Signal Processors and the on-board DSP in the Zapco DC Series of DSP controlled amplifiers as well networking operations of Zapco's DPN system.
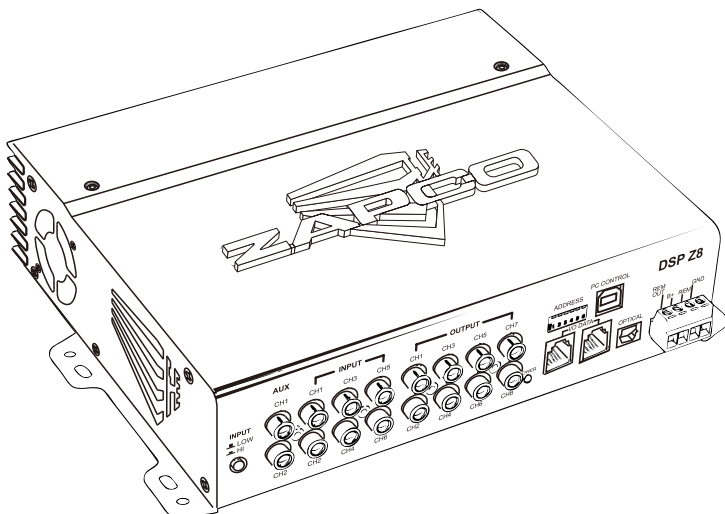

DSP-Z8
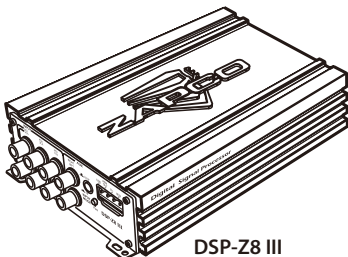
DSP-Z8 III

DSP-Z6 III

DSP Control Method

Zapco DSP units are controlled by PC. The Zapco DPN program provides the system for control of the Zapco Digital functions. You load the program included with your digital product onto a PC and program all functions directly from the single, easy to use, screen.

DSP-Z8
Digital Signal Processor Compatible with Network Opperation

The Zapco DSP-Z8 is a stand-alone, eight channel Digital Signal Processor. It has all the DSP functions of the Reference Digital amps, and, like the DC Series amps, the DSP-Z8 is compatible with the Digital Programing Network which allows a single PC screen to control all amps on the network. We will explain more in the next section

The RCA inputs allow you to use the DSP-Z8 with any after market head unit, and two auxiliary inputs allow an extra source by either RCA or SPDIF Digital. The DSP-Z8 and all Zapco DC Series amplifiers will also accept balanced speaker level signals from a factory amplified system to add high-end sound to factory stereos.

The Zapco Digital functions include Input Sensitivity (Gain), Output , Crossover, Parametric Equalization, and Time Delay. Each Reference Digital piece also has an Input Commutator, which allows you to chose which input channels will be used for which processed output channels. The Commutator also allows input pairs to be summed for a 2-channel mono input to any output channel. In addition, you can combine input channel pairs together to sum their signals into a single full range signal pair , for integrating actively crossed over signals from a factory stereo system.

DSP-Z8 Front Pannel

All connections for the DSP-Z8 are on the front panel
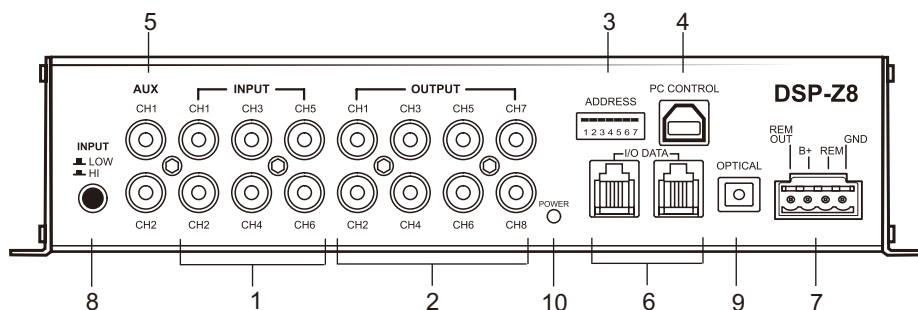
1) **Main RCA Inputs-** Six channels of input are available through RCA connectors*.

2) **RCA Outputs-** 4 sets of RCA Connectors provide eight channels of output.

3) **Networking DIP Switch-** Six position DIP switch is used to address the unit and assign it a node on the Zapco Digital Programming Network. (Only when used with DC-Series amplifiers)

4) **USB Port-** Like all Zapco DSP products, the DSP-Z8 has a USB port to interface with a PC for all DSP programming functions. Always use the supplied USB Cable

5) **Auxiliary Input-** A pair of RCA connectors provide a preamp level auxiliary input

6) **Data Connectors-** Two RG connectors provide Data in/out for network cables and for a dash remote

7) **Power Connector-** 4-Pin Provides Power, Ground, +12V RemTurn On, and Aux +12 volt out **

8) **Input Low / High-** Choose Low level for preamp or digital input or Hi level for OEM speaker level input

9) **Optical input-** Digital Input for SPDIF optical connector (TossLink cable)

10) **Power-on Indicator LED**

Note: To use speaker level inputs from a factory stereo, simply attach RCA connectors to the factory speaker wires (up to a 22v signal). Assure that the DSP or amplifier is in High Level input mode and attach the speaker wires at the RCA receptacles.

**Note: The Zapco DC Series also has DC-offset sensing for automatic turn-on. If you use speaker level inputs from a factory stereo the DC product will turn on automatically and also provide +12v trigger output to turn on other components.*
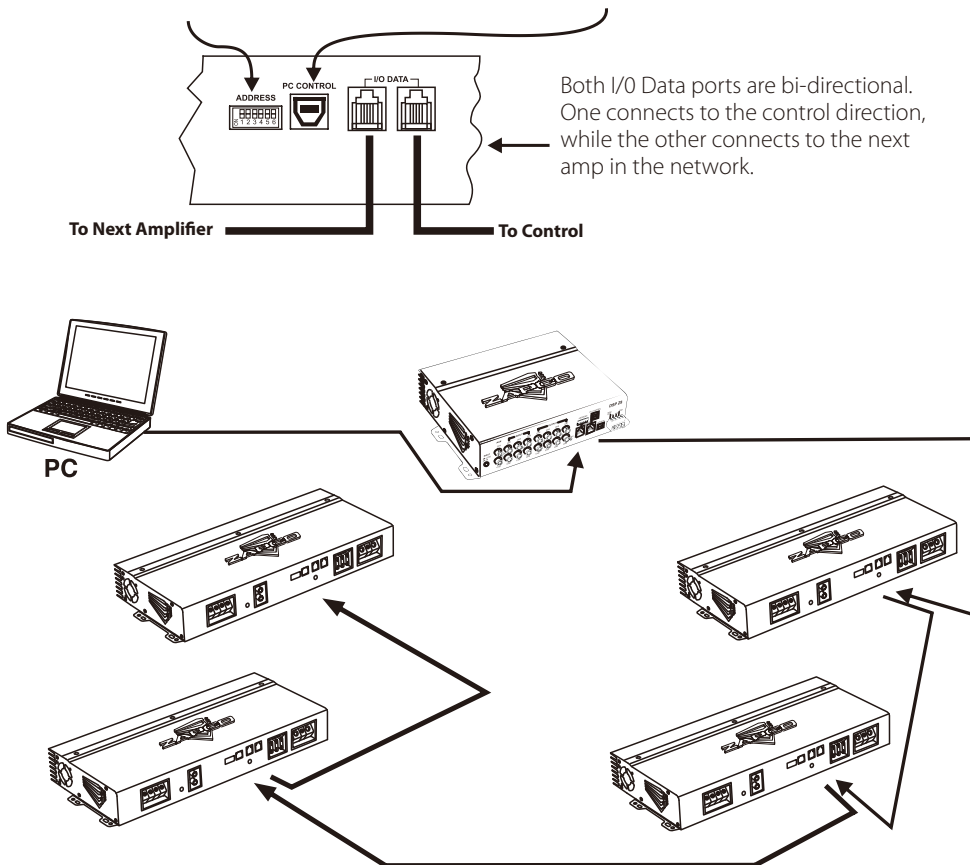
The DSP-Z8 and the Digital Programming Network

All Zapco DC series amplifiers, and the Zapco DSP-Z8, stand-alone Digital Signal Processor incorporate Zapco's exclusive Digital Programming Network (DPN).

This network allows the user to program all amp functions of all DC amps in the system, using a single PC screen. Each Digital Control product has a USB interface. This allows you to plug a PC into any unit on the network and control the entire network.

The amp's DIP Switch allows you to address each amplifier to it's own location on the network. Then when you call up the amp for programming, it will even identify itself by its location and its model number.

USB input allows a PC to be hooked directly to the amp with a standard USB cable. The DRC-SL also has a USB port so the PC can be plugged in at the dash,without disturbing the installation.

Both I/0 Data ports are bi-directional. One connects to the control direction, while the other connects to the next amp in the network.
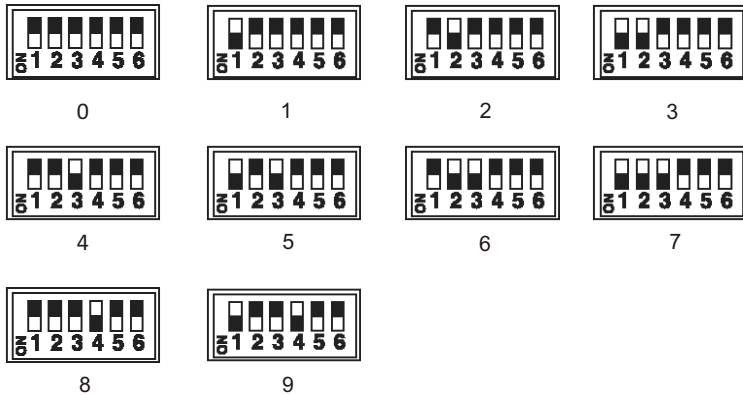
Addressing Components on the DPN

The Digital Programming Network consists of 10 amplifier/DSP nodes numbered 0 through 9.

The DIP switches on each DC amp and DSP-Z8 are used to address each device within the network

Note: Turn all amps off before setting address switches

Binary numbering for nodes on the programming network

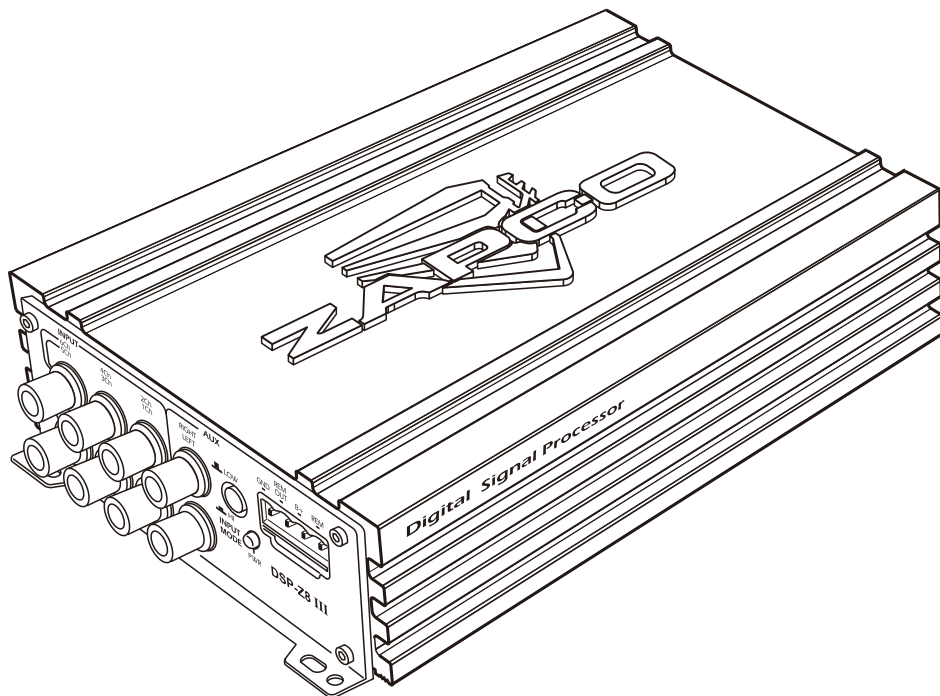|			
0	1	2	3
4	5	6	7
8	9		

Up to 10 devices can be addressed using the DIP switch. Only the first 4 pins are for addressing the devices. Pins 5 and 6 are not used.

Note: If you are using your DSP-Z8 by itself and not in a network, you will not need to use the DIP switches at all.

DSP-Z8 III

The Zapco DSP-Z8 III shares all the functions of the DSP-Z8 accept the networking capabilities.

The DSP-Z8 III however has a much smaller chassis that is designed with a similar look to the Zapco Competition amps and the Zapco Analog competition processors. With the new chassis dimensions the DSP-Z8 III has input and output connections on opposite ends of the unit.

The RCA inputs allow you to use the DSP-Z8 with any after market head unit, and two auxiliary inputs allow an extra input by either RCA or SPDIF Digital. The DSP-Z8 III , like the other Zapco DSP's, The Z8 III will also accept balanced speaker level signals from a factory amplified system to add high-end sound to factory stereos.

The Zapco Digital functions include Input Sensitivity (Gain), Output , Crossover, Parametric Equalization, and Time Delay. Each Reference Digital piece also has an Input Commutator, which allows you to chose which input channels will be used for which processed output channels. The Commutator also allows input pairs to be summed for a 2-channel mono input to any output channel. In addition, you can combine input channels together to sum their signals into a single full range signal pair for integrating actively crossed over signals from a factory stereo system.

All DSP functions may be applied to each channel independently or they may be applied in stereo pairs.
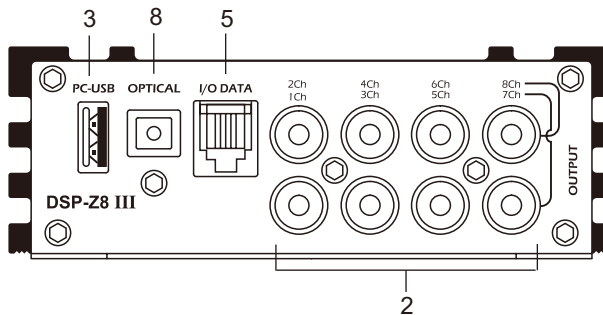
DSP-Z8 III Connections

Power / Input End
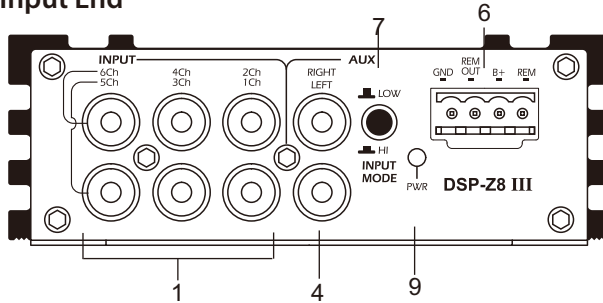
Control / Output End

1) **Main RCA Inputs-** Six channels of input are available through RCA connectors*.

2) **RCA Outputs-** 4 sets of RCA Connectors provide eight channels of output.

3) **USB Port-** Like all Zapco DSP products, the DSP-Z8 has a USB port to interface with a PC for all DSP programming functions. Always use the supplied USB Cable

4) **Auxiliary Input-** A pair of RCA connectors provide a preamp level auxiliary input

5) **Data Connector-** The RG connectors provides Data input a dash remote

6) **Power Connector-** 4-Pin Provides Power, Ground, +12V RemTurn On, and Aux +12 volt out **

7) **Input Level selector-** The Low level for preamp or digital input or Hi level for OEM speaker level input

8) **Optical input-** Digital Input for SPDIF optical connector (TossLink cable)

9) **Power-on Indicator LED**

   * Note: To use speaker level inputs from a factory stereo, simply attach RCA connectors to the factory speaker wires (up to a 22v signal). Assure that the DSP or amplifier is in High Level input mode and attach the speaker wires at the RCA receptacles.

   ** Note: The Zapco DC Series also has DC-offset sensing for automatic turn-on. If you use speaker level inputs from a factory stereo the DC product will turn on automatically and also provide +12v trigger output to turn on other components.

DSP-Z6 III
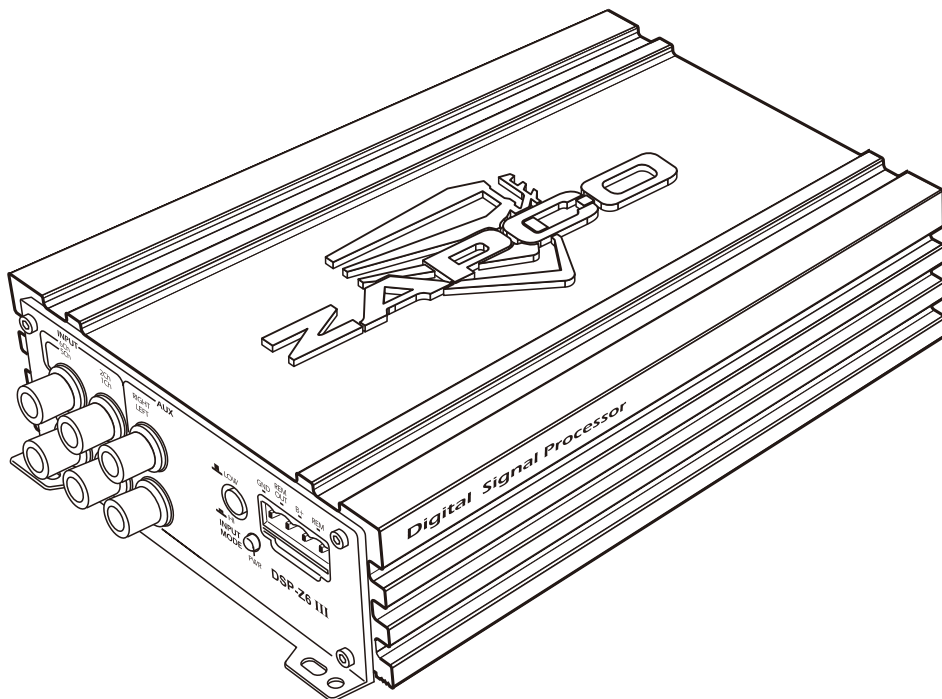
The Zapco DSP-Z6 III shares the smaller chassis and dimensions with the DSP-Z8 III. The difference is that the DSP-Z6 III has 4 channels in and 6 channels of output.

It has a similar look to the Zapco Competition amps and the Zapco Analog competition processors. With the new chassis dimensions the DSP-Z8 III has input and output connections on opposite ends of the unit.

The RCA inputs allow you to use the DSP-Z8 with any after market head unit, and two auxiliary inputs allow an extra input by either RCA or SPDIF Digital. The DSP-Z6 III , like the other Zapco DSP's, The Z6 III will also accept balanced speaker level signals from a factory amplified system to add high-end sound to factory stereos.

The Zapco Digital functions include Input Sensitivity (Gain), Output , Crossover, Parametric Equalization, and Time Delay. Each Reference Digital piece also has an Input Commutator, which allows you to chose which input channels will be used for which processed output channels. The Commutator also allows input pairs to be summed for a 2-channel mono input to any output channel. In addition, you can combine input channels together to sum their signals into a single full range signal pair for integrating actively crossed over signals from a factory stereo system.

All DSP functions may be applied to each channel independently or they may be applied in stereo pairs.
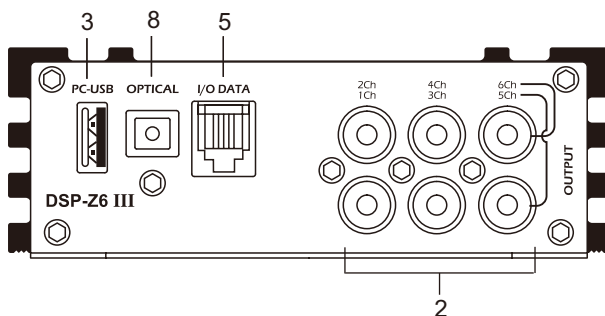
DSP-Z6 III Connections

Power / Input End
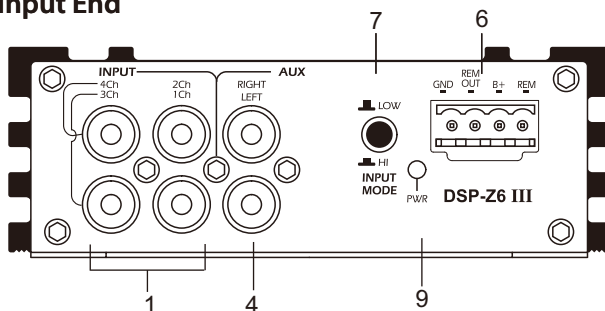
Control / Output End

1) **Main RCA Inputs-** Six channels of input are available through RCA connectors*.

2) **RCA Outputs-** 4 sets of RCA Connectors provide eight channels of output.

3) **USB Port-** Like all Zapco DSP products, the DSP-Z8 has a USB port to interface with a PC for all DSP programming functions. Always use the supplied USB Cable

4) **Auxiliary Input-** A pair of RCA connectors provide a preamp level auxiliary input

5) **Data Connector-** The RG connectors provides Data input for a dash remote

6) **Power Connector-** 4-Pin Provides Power, Ground, +12V Rem Turn-On, and Aux +12 volt out **

7) **Input Level selector-** The Low level for preamp or digital input or Hi level for OEM speaker level input

8) **Optical input-** Digital Input for SPDIF optical connector (Toss-Link cable)

9) **Power-on Indicator LED**

   * Note: To use speaker level inputs from a factory stereo, simply attach RCA plugs to the factory speaker wires (up to a 22v signal). Assure that the DSP or amplifier is in High Level input mode and attach the speaker wires at the RCA receptacles.

   ** Note: The Zapco DC Series also has DC-offset sensing for automatic turn-on. If you use speaker level inputs from a factory stereo the DC product will turn on automatically and also provide +12v trigger output to turn on other components.

The Zapco DPN Program for PC
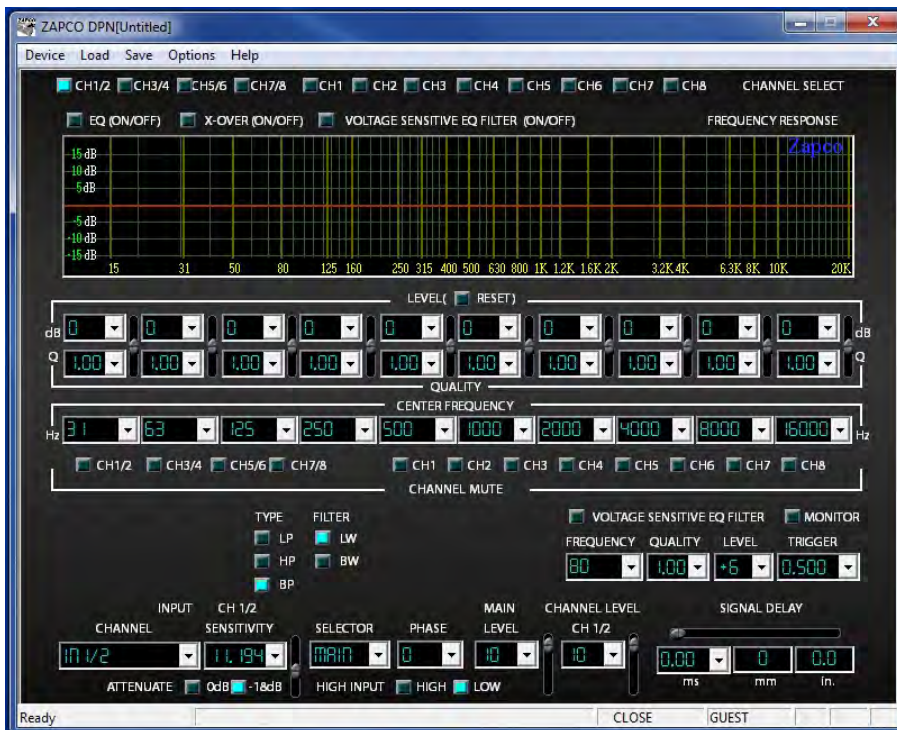
A program disk was provided with your Zapco DSP. The program will work on any Windows OS from W-98 forward, including W-7, W-8, and W-10 64bit systems.

To install the program, insert the CD and explore the disk to the file "Read Me First" Take a moment to learn what you need to know about COM Ports before you load the program. Then you can put the file *Zapco DPN (V - - -) Install* on your desktop. Open the file Zapco DPN (V- - -)Install and follow the directions to load the program.

Once the program is installed you can click on the Zapco DPN icon to open it. Your first action then is to click on **Options** at the top and choose **Login.** The password is **Zapco** spelled with a capital Z.

The PC programming screen has 5 sections. They are (top to bottom) Channel Select, Function/Graph, Equalizer/Mute, Crossover/VSEQ, and Output Channel controls, at the bottom. We will consider these sections individually and we think you will find the controls very user friendly.

There are numerous drop-down menus at the arrow points in the DSP screen. You can use the drop-down arrows to make choices, or simply highlight the box you want to change and type in your choice manually. Most small boxes are switches and are switched by placing the mouse over them and clicking. You will also find that you can click into most adjustments and use your scroll wheel to change the values.
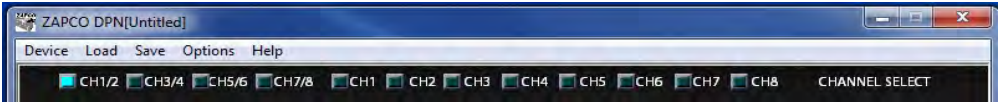
1) Channel Select: The top section of the PC screen allows you to determine which channels you will be programming. You can adjust the channels individually, or in stereo pairs as required. Simply move the mouse to your choice and click it on. The active channels will light up.
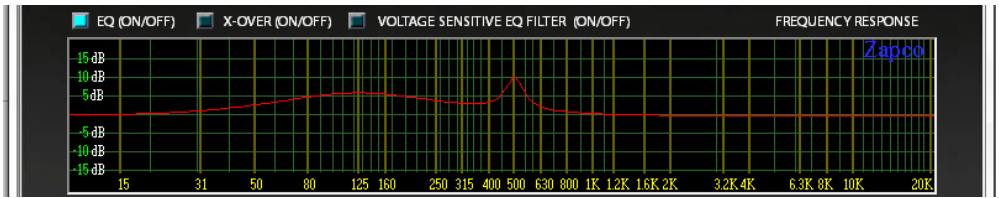

2) Function/Graph: In this section you can turn the processing functions on or off to compare the sound of your modified response to the unprocessed sound by clicking the buttons above the graph on of off with your mouse. You can also monitor the graph to see, in real time, how your adjustments will affect the input signal.

3) Equalizer: In this section you can make the adjustments to the parametric equalizer. The top row sets the level of boost or cut at the center frequency, up to ±15dB. The next row sets the Q (shape) of the equalization. A low Q affects a wide range of frequencies while a high Q affects a narrow range of frequencies. The Graph screen will let you see how the value of Q will affect your response. Note in the graph section the wide boost at 125Hz (Q1) and the narrow sharp boost at 500Hz (Q10). The bottom row of the EQ screen sets the center frequencies. The EQ section is a true parametric EQ. We have set factory defaults at about 1 octave intervals. However you can alter the center frequencies to fit the requirements of your car. with the drop-down menu or by typing in the frequency you want.

Mute: Under the EQ controls are the mute buttons which allow you to temporarily turn off some of the active channels. This is very handy in tuning when you want to hear the response of an individual channel. you can mute by Channel pairs or by individual Channel.
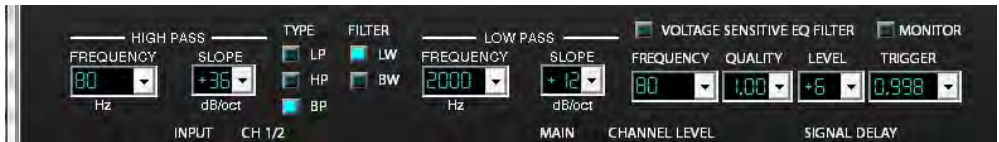
4) Crossover: For each channel, when you have turned on the crossover function, you can choose to run a High pass, a Low pass, or a Band pass crossover. You can also choose a crossover slope of 6dB,

12dB, 24dB, or 36dB per octave, from the drop-down menu, and you can choose to use a Butterworth or a Linkwitz-Riley filter. The High Pass is used for High frequency drivers and the Low Pass for woofers. *Note though,* that in a Band Pass, the High Pass is the <u>bottom</u> of the band pass and the Low Pass is the <u>top</u> of the band pass.

Voltage Sensitive EQ: You can set one parametric EQ filter for each channel or channel pair that will come on only then the system reaches a pre determined volume. This is most often used in factory integration when the factory system rolls off the bass frequencies to protect the factory woofer.
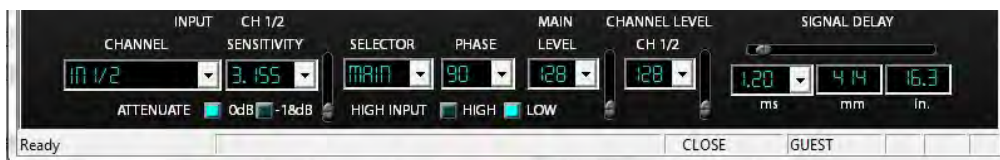
5) *Output Channel Controls:*   This lower section of the screen contains the Input Commutator, Source Selector, Phase control, Output levels, and signal Delay controls.

Input Channel- At the top of the screen you picked the channel you would adjust. Here you can pick which signal you will use as input for the chosen you are adjusting. For example- If you are adjusting channels 3/4, you can use 3/4 as the stereo input, but you could also use input channels 1/2 as the source for output channels 3/4 (if you have only a 2 channel input). In fact your choices for 3/4 are 3/4 (stereo), 3+4 (Sum Mono, 3 (Channel 3 only Mono) or 4 (Channel 4 only Mono. Or you can also use 1/2, 1+2, 1only or 2 Only You can assign the same channel pair as input to all the channels.

For OEM Integration- channels 1/2 also give you the option of combining 3 sets of actively crossed over signals into a single full range stereo signal that all can share. This lets you combine highs, mids, and lows from a factory system into a single stereo output and eliminate the factory crossover.

Sensitivity- After picking the inputs for your channels, you can set the channel's sensitivity for maximum signal with minimum noise. *(See Level Matching in the Notes section at the end of this manual)*

Input Selector- Allows you to choose from the Main input, the Analog Aux-in, or the Digital SPDIF input

Phase- The DSP-Z8 lets you adjust the signal phase of each channel in 15° steps.

Main Level- Main level limit for all channels. Normally this should be at 128 ... unless you have too much volume.

Channel Level- Each individual channel or channel pair is also adjustable. These to should be set at 128 to begin, and then you can back off the channels that are too loud compared to the others (like small mid-ranges or tweeters)

Signal Delay- Signal Delay is probably the most valuable factor requiring a digital processor. Adjusting the arrival time of a signal adjusts for poor listening position far more effectively that simply using gain or balance controls. With the Zapco Digital pieces this is an easy operation:
1) Measure the distance from your head (at your listening position) to each speaker in millimeters or inches.
2) Note the distance of the farthest speaker.
3) Add to each speaker the inches need to equal the furthest speaker, and note how many inches are needed for each.
4) Now just dial in the delay to match the added inches for each speaker and your delay is set.
   (See Bringing the Woofer In in the Things You Should know section at the end of this manual)

Program Upgrades

The Zapco Digital Programming Network is an evolving entity. As it evolves we can issue program updates. If there are firmware upgrades we will issue a Install application which you can place on your desktop. *Before doing the update, make a note of the COM port the DSP is using. You will find the COM port at the bottom of the GUI screen on the right side.*

Close the DPN GUI, but keep the DSP turned on and connected to the PC.

The two-step upgrade process is straightforward as below.
A) Update the PC Program:
      1) Put the new version *Zapco DPN (V -.-.-.-) Install* application file on your desktop <u>but do</u> <u>not open yet.</u>
      2) In PC's *Control Panel* > *Remove Program* > Locate the old Zapco DPN at the bottom of the list and click and *Uninstall.*
      3) Now, return to desktop and click on the new Zapco DPN Install file and follow the directions to install the new program version. (Wait at the end for DOS to finish installing the drivers)
B) Update the DSP with a new .Hex file to match the PC program update:
      1) Open Zapco Updater
      2) Click Open File and navigate to the new *.hex* file. Open the .hex file and it will appear in the Updater screen.
      3) Next, verify that the COM Port number is correct. If it is not then pick the correct one from the drop-down list. Click "Open COM". The Com Port will turn blue and "Start Update" light will glow blue. You are ready to update.
      4) Turn the stereo off and then back on. When the DSP cycles off and back on the Update will start.
You will see the update progress in the top LED Bar and also in the bottom "*message*". When the *message* says it is finished you can click "Close COM" and then close the update screen.

Update screen when it opens
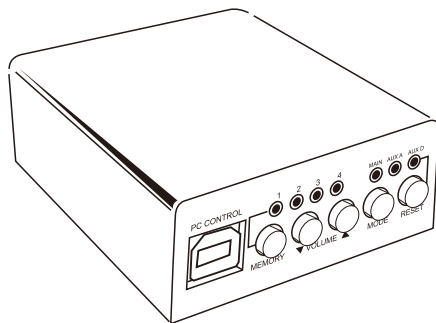

Update screen ready:
Hex file at File Open location
Com is Open (Blue)
Start Update light on

Update is Finished

The Zapco Z8-R

Optional
DSP-Z8 Dash Remote

The Zapco Z8-R is an optional Dash Remote available for those who will use the auxiliary inputs of any of the the Zapco DSP models.***** The Z8-R allows auxiliary functions to be accessed without the need to have a PC connected to the system while on the road. (Safety First Please)

First, the Z8-R provides a switching system (MODE button) so the user can toggle between the Main-In, the analog RCA input (AUX A) and the Digital SPDIF input (Aux D). Three LED indicators let the user know which input is currently active.

Since almost all digital inputs will be full gain out from the source, using the digital input will require a remote gain control. A pair of Up/Down buttons allow you to control overall volume in 1/2 dB steps. Again: Digital inputs are usually full gain, so you must take care to avoid surprises and dangerous distractions of abrupt volume changes. We highly recommend that if you are using the Aux-D input in your system, you should set your head unit to maximum unclipped output (usually about 3/4 volume), and use the Z8-R as your main volume control. This way switching from Main input to Aux-D input will not cause severe volume changes.

The Z8-R also provides memory switching. The DSP-Z8 lets you set up several global tuning systems for different types of music or for different listening needs (Say for sitting and listening to the music or when you need background music without bass for when the kids are in the car). With the Z8-R you can change which memory setting is active at any time, without the PC connected. Four LED indicators let you see at a glance which memory setting is active.

The Z8-R has a USB connector on the front panel. If you have the Z8-R mounted in the dash or in the glove box, you can plug your PC into the system for tuning right from the front seat. Note that when the PC is connected directly to the Z8-R, the remote itself will not work

The Z8-R also has a "reset" button. This button will only be used only if the system should need to be updated with future program changes.

Updating the Z8-R : If you the update DPN program in your DSP-Z8 then you will also need to update

Updating the DPN
for the Z8-R Dash Remote
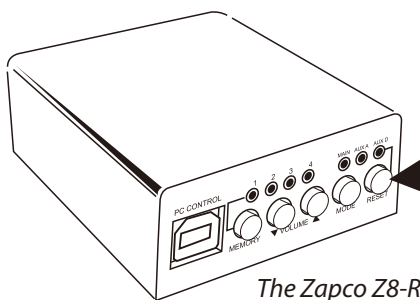
Reset Button
for use to update the
DPN program

The Zapco Z8-R

the Z8-R . Updating the Z8-R is similar to updating the DSP-Z8 but there are some differences.

First: Remember you can **not** connect the PC directly to the Z8-R remote during the update procedure. The PC must be connected directly to the PC

Zapco Z8-R Update procedure:
1) Be sure the system is turn on. *You will not turn it off during this procedure.*
2) Connect the PC to the DSP-Z8 using the supplied USB cable.
3) Connect the Zapco Z8-R to the DSP-Z8 using the supplied 6 conductor RG (Phone) cable.
4) Open the DPN and note the number of the COM port that the DSP is using.
5) Close the DPN program and open the Zapco Updater.
6) Assure that the updater is set to the correct COM port. If not then choose the correct COM port using the drop-down list.
7) Click FILE OPEN and navigate to **ZapcoDash.Hex** Click Open or just double click the ZapcoDash.hex file to open.
8) Now the ZapcoDash.Hex file should be next to the FILE OPEN block.
9) Click COM OPEN and the com port block will turn blue and the "start update" light will come on.
10) Now tap the Reset button (see above) and the update will begin
11) When the update is finished, you can close the updater

Things You Need to Know
To Get the Most from Your Zapco DSP

Assigning a Com Port to the DPN

The Zapco DPN digital control program is designed to run on ports 1 through 10.

If you have had your computer for some time and you have had many devices plugged into it at various times, it is possible that COM ports 1 through 10 have been used, or that for some other reason, the DSP did not load to a Com between 1 and 10.

If this happens the program will not work. When you start the program the top row of LEDs on the splash screen should stop at one of the ports numbered 1 to 10.   If the LEDs do not stop and if they move directly from the left side to the right side, you will need to assign a new port number to the program and DSP.

This is a very simple operation:
- Go to Control Panel
- Choose Hardware and Sound
- At the top right under Devices and Printers find and choose Device Manager
- In the Device Manager list find Ports (COM&LPT)
- In Ports find USB Serial Port (Com?) and see the Com Port number i.e. (COM13)
- If the COM number is higher than 10 you will need to re-assign the COM Port
    - a. Open USB Serial Port (COM?)
    - b. Choose at the top "Port Settings"
    - c. Choose in the lower portion "Advanced".
    - d. At the top of Advanced you will see the port assignment and a drop-down list.
    - e. Open the list and choose a port number below 10. (Do not worry if the list says the port is already in use. You can ignore that **.) I usually use a port between 5 and 9.
    - f. Say OK and OK and close the device manager. You are now in a working port.

** *About ports:* When you plug a USB device into your computer, windows assigns a port. However, when you remove the device, windows does not release the port. So if you have plugged 10 USB devices into your computer since you have had it then you may have all of the first 10 ports marked "In Use", *even if nothing is currently connected to the computer,* so the DSP will go to a higher port and you have to re-assign the port.

Note to consumers: After you assign a port, the DSP will always go back to that same port, *so you will only have to do this one time.*

Note to Zapco Dealers: The computer Zapco uses for tuning has had many more than 10 DSPs connected to it. So: We have to re-assign the port now for every DSP we connect to this computer. If you tune many different customer's DSPs, you will need to assign ports more often also.

Signal Level Settings

Correct level setting is critical to getting the best possible sound with the least amount of noise.
Neither the Input Sensitivity nor the Output Level controls are intended as volume controls. They are designed to allow you to set up the DSP with your head unit and amps for maximum performance.

1) Turn all amplifier gains down to minimum
2) To start you want to set the "*Main Level*" and each of the "*Channel Levels" to 128* which is the maximum. Any reduction in these levels is reducing the signal to the amplifiers and increasing the noise level.
3) For an aftermarket head unit you can set the Input Sensitivity to 3.155. If you are using a speaker level input start Input Sensitivity at 9.976.
4) Using your loudest loud music, turn the head unit up to about 3/4 volume. If you hear distortion before you get to 3/4 volume then one of two things. You have Sensitivity too low and need to raise it up... or more likely you have a distorted head unit.
   Once the head unit is at 3/4 volume you want to slowly reduce input sensitivity until you hear clipping (distortion). With most head units today this could be as low as 1 or even less. When you begin to hear distortion raise the sensitivity back up one notch at a time until the distortion is gone. This is you maximum clean signal.
5) If, after this setting you still need more volume then you can increase the gain at the amplifier.

Remember: Using the amplifier gain to increase volume will make both noise and distortion more likely and it will reduce the dynamic range of the music

Voltage Sensitive EQ

For OEM Integration this can be a huge blessing. More and more car makers each year are using active equalization in their sound systems. The most common type of active equalization is the roll-off of bass frequencies at high volumes. Car makers do this to protect their weak woofers from damage and to keep bass distortion out of the system. So as you turn up the head unit of many factory head units the bass drops off in relation to the rest of the sound. Even if you add amplifiers the bass roll-off is still there. The voltage sensitive EQ allows you to compensate for this. Every car is different do your car will take some experimenting. But for most cars if you set the VSEQ band to 30Hz with a Q of 1.50 and 15dB of boost you will get a pretty close re-equalization curve.

Then turn on the VSEQ button above the graph and set the Voltage trigger at about 6 volts and turn the head unit up until you hear the bass drop out. Now slowly reduce the voltage one step at a time until you hear the bass pop back in. Now every time you hit that volume level the bass will come in to counteract the factory roll-off.

When Tuning a System

 Tuning a system to have the proper response in a car requires a Real Time Analyzer. There are many available for smart phones. They are not as accurate as the big expensive ones but they are adequate for a quick tune. Play a pink noise disk (you can also download pink noise from the internet. Turn it up fairly loud and look at the RTA. The best way to make adjustments is to dial the EQ into the frequencies of the peaks and reduce them. Boosting frequencies is not as effective, as it stresses the amplifiers. So instead of boosting the low spots to bring them up, reduce the high spots to bring them down.
Equalization Rule: *Cut, don't Boost***.**

Bringing In the Woofer

Setting the signal delay is fairly straight forward. Measure the distance of each speaker to the position of your head in the car. Then add delay distance to each speaker so the apparent distance to each speaker is the same. Of course in almost all vehicles the farthest speaker will be the woofer and you will need to make all other speaker distances match the woofer distance as below.

30 +120

70 +80

100 +50

40 +110

120 +30

50 +100

150
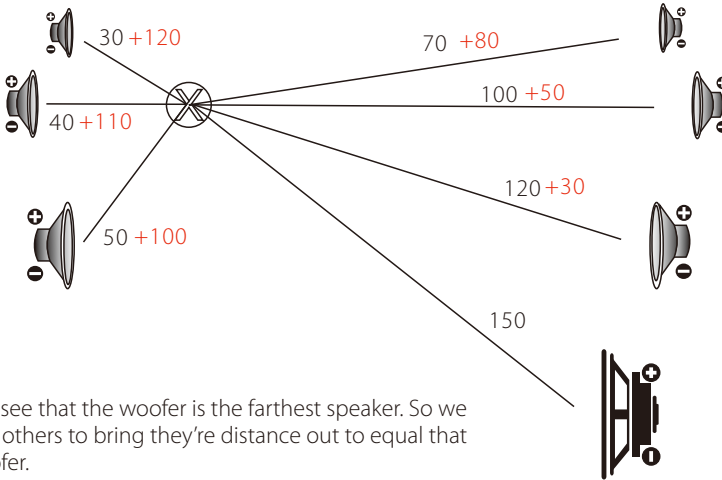
It's easy to see that the woofer is the farthest speaker. So we add to the others to bring they're distance out to equal that of the woofer.

After we add the delay all the drivers will have the apparently
the same distance from the listeners head. The problem remains though that the woofer may still sound like it's coming from the back of the car. The villain here is the wavelength of the bass notes from the woofer. Bass notes are very long, often longer than the car and it can be difficult to get the wave to arrive at the right time.

After you set the delay you should try two things to help bring the bass forward.
First: Reverse the phase of the woofer. Listen first 0° and then change the phase 180° and listen again. Listen for solid mid-bass as well as deep bass. Use the phase that works best in your car.
Second: Move the woofer farther away from the listening position. You do this by adding an equal amount of delay to every channel *except* the woofer. You can use your presets for this.
Save completed settings to preset 1.
Then add 5ms to every channel (except the woofer) and save to preset 2
Then add 7ms and save to preset 3
Then add 9ms and save to preset 4
You may have to try it several times but you will likely find that one delay setting will make a big difference in the *apparent* location of the woofer.

DSP Specifications and Features

Functions	DSP-Z8	DSP-Z8 III	DSP-Z6 III
Main RCA Input Channels	6	6	4
Other Inputs	AUX 2CH & Optical Input		
Output Channels	8	8	6
THD + Noise			
Signal to Noise Ratio	90dB	96dB	96dB
Channel Separation	68dB	73dB	73dB
Auto on/off Defeat Switch function	no	Via jumper on PC board	
Parametric EQ/Channel	10 band	10 band	10 band
Adjustable LPF, HPF, BPF	Butterworth, Linkwitz Switchable		
Crossover Point	20Hz~20KHz , Slope : 6dB, 12dB, 24dB, 36dB		
Phase Shift	Increment of 15 degrees (0, ,,,,180)		0, 180
Channel Summing Input	1/2/3/4 & 1/2/3/4/5/6		1/2/3/4
Voltage Sensitive EQ Filter	Yes	Yes	Yes
Channel Mute Button	yes	yes	yes
Channel Time Delay	0.01ms and up to 7.6m		
Adjustable Sensitivity	0.5V ~22V		
Input Voltage	9V ~ 16V	8V ~ 16V	
Input Impedance	10K ohm	10K ohm	10K ohm
Output Voltage	4.5V	3.5V	3.5V
Output Impedance	570 ohm	690 ohm	690 ohm
Size (mm) W/H/L (L w/feet)	180x55x220(250)	120x41x200(230)	120x41x200(230)
Dash Remote / Presets	Dash Remote / 4	Dash Remote / 4	Dash Remote / 4
High/Low Switch	Yes	Yes	Yes

Modesto, California USA
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