ST-X DSP III SERIES

PC Control Program

(v.1.02)

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

Table of Contents

The ST-X DSP III GUI Program

Opening

Before beginning the setup be sure all signal sources are turned fully down so there is no volume until after the crossovers are set

The control program (GUI) for the ST-X DSP amplifiers is the same functionally for both the 4-Ch ST-4X DSP and the 6-Ch ST-6X DSP except for the number of channels. Both will have a default system in the channel designation column but since you have complete control over all functions, you can use all channels as they best suit your individual system.

Loading the GUI: Download the GUI (Graphic User Interface) from www.zapco.com, if you have not already done that, and load the GUI from the .exe file.

Connecting the PC: Connect the PC to the ST-X DSP amp using the supplied USB cable. NOTE: The ST-X DSP GUI is very forgiving about PC Screen resolution. However the ideal resolution 1600 x 900 optimal on most PC's.

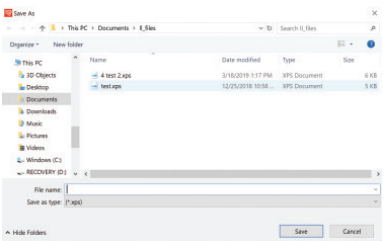
Navigation Bar

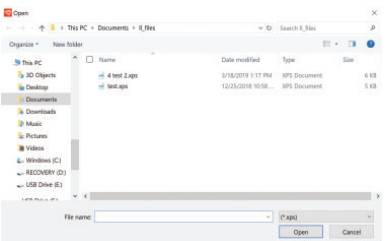
At the very top of the Screen you will find the Navigation bar. At the left is the connection indicator. When you open the program while you are connected to the DSP it will automatically link so you can use the GUI. If connection is lost it will show Not Linked.

Next is **Ch Setup**, which is where you will tell the program what inputs and outputs you are using. To begin you need to define your system. Fixed 2-Ch inputs (Toslink and Digital {BT}) will apply left channel information to all odd number output channels and right channel information to all even numbered output channels.

The analog input is for Aftermarket head units and OEM (factory) head unit adaptions. These can be 2-Ch, 4-Ch, or 6-Ch RCA inputs. There are also 4-Ch of Speaker level inputs for OEM Integration. The SUM button will combine highs and lows from a 2-way factory system to make a single full range signal for processing. The Custom/Sum lets you determine your on configuration. After you have chosen you input you can move on the using the GUI.

Save, Lets you save to a file on the PC or to a preset in the Processor. After you spend valuable time setting up and tuning the system, you won't want to lose the setup, so you always want save your setup to one of the available presets. And for a backup and to keep extra presets you should save all your setup and tunes to a file on your PC.



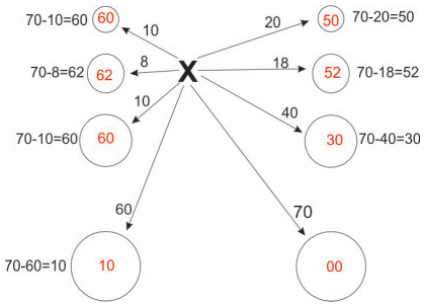


When you Save to File you will be taken to a folder on the PC so you can choose a name for the tune and click Save. **Load**, of course, works just the opposite. Click load from file and you will go to the same folder, pick the desired preset, and click Open. At the right side of the Navigation bar is the setting icon. This will only be used if there is a firmware upgrade at some future point in time.

The Main Screen

The main screen has upper and lower sections. The upper section is where the original system setup will take place, while the lower section contains the equalization controls and the frequency graph.

Delay: At the left of the main GUI Screen is the Delay section. Since you can not sit directly in the center of the car, the program can delay the arrival time of near speakers so it will sound as though you are right in the middle of the car. Setting delay is quite straightforward. The purpose is to make every speaker the same distance from you, so you are in the middle.
1- Measure the distance between each speaker and where your ears will be in the actual listening position.
2- Identify the farthest speaker.
3- Add distance to each of the other speaker so that ALL speakers have the same distance. You do this by subtracting each of the shorter speaker distances from the longest. (see example below)



In this example, the longed speaker distance is 70" so we subtract each of the other speakers from 70 and enter the results in the Delay chart.

After you have entered the distances in cm or inch you can click ms to see the delay in milliseconds.

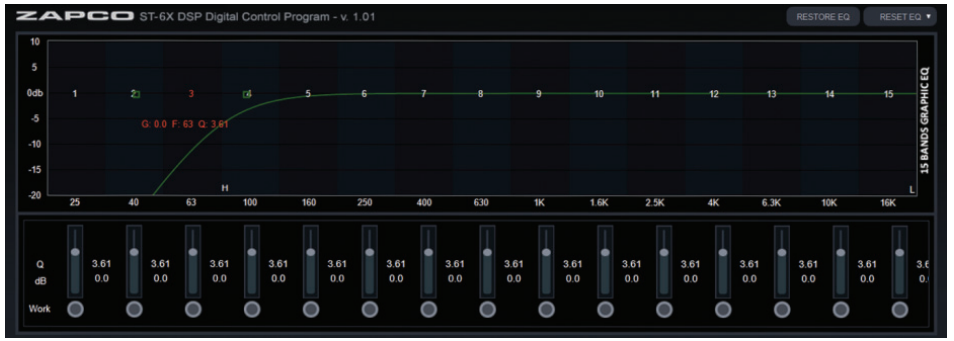
Channel/Crossover: The next section holds the channel selection and Crossover.

You can select a channel to tune by clicking on the desired speaker in the car diagram/Delay section or by clicking on its box in the DSP Channel column. You can pick channels on at a time or you can pick them by pair. Double clicking the dot between a pair of channels links that pair. Similarly, if one channel is already chosen and active, then clicking on the dot will pair them. This is important as you should always set crossovers by channel pair so the left and right speakers will be the same. It is also easiest to do initial equalization by channel pair.
Each channel has a High Pass (HP) and a Low Pass (LP) filter. You can control the frequencies of the filters by highlighting the FREQ box and typing in a value or by using the keyboard up/down arrows. You can choose the Shape of the crossover from Butterworth, Linkwitz-Riley, or Bessel and the Slope using the drop-down menus. The default crossovers are all 24dB/Octave Linkwitz-Riley. The best source for information on the proper crossovers for your own speakers is the speaker maker. He can tell you what crossover to use and also how much power the speakers can handle at different slopes and frequencies.

Phase/Level: The next section is for adjusting levels and checking Polarity to be sure all speakers are in phase with each other.

There are a number of systems for checking System Phase. If the systems speakers are not all in phase there will be issues you can not fix by tuning. You can see the section on System Phasing to see one method of Phase checking. The MUTE buttons allow you to turn off any speakers that you do not want to hear while you are tuning other speakers. You will also find a master level control here and a system MUTE button.

Equalizer: The lower section of the GUI is devoted to equalization.



Here are 15 bands of parametric equalization for each output channel and you can vary Frequency, Gain, and Q (the shape of the adjustment) for each band in several ways. Frequency: Each band is numbered. You can simply click onto a band button and drag it to where you want it. When you click onto a band there is a "Heads-up display" of the frequency, gain, and Q of the band. Any band that has been adjusted from 0dB is highlighted by the green dot under the band's slider.

Left: Band # shows in Red, as do the Gain, Freq., and Q. The green squares show the width (Q) of the filter. Right: you can click into the Gain or Q value box of any band and adjust using the up/down arrow keys.

Gain: Gain can be adjusted by using the up/down arrows when the band's EQ dot is highlighted. You can also click into the gain or Q rows of any band and adjust with the up/down arrows. You can move from one band to the next with the right/Left keyboard arrows.
Q Setting: Q can be set as above using the keyboard arrows. You can also make rough adjustments by dragging one of the green boxes in the EQ graph to make Q wider or narrower to affect a smaller or larger group of frequencies with your EQ adjustment.

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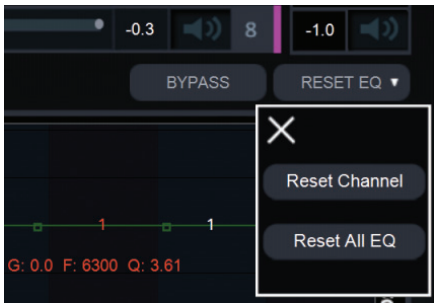


To aid the tuning process you can temporarily bypass a channels equalization. You can also reset one channel or reset all channel to default positions with no equalization.

System Phasing

Before you start the equalization you want to be sure the system is phased properly. Below we offer one system to help you phase the system.
Before equalization you should assure that all speakers are in phase as a system at the listening position. All speakers need to have the same polarity so they move the same direction at the same time. If they are not, you will not be able to get a proper tune. There are a number of methods for doing this. We offer one.

Tweeters: (A) Mute all speakers except the tweeters and play a high female vocal soloist. You should hear the voice at a single point near upper middle of the windshield. If the speakers are out of phase the voice will not be localized but will seem to come from everywhere. To test: Using the Phase buttons, change the phase of the right speaker and listen for the difference. Do this a couple of times as needed.
The position that puts the voice in a small single location on the window is the correct phase. (B) Note where the Tweeter center is located. It should be just slightly above and to the left of the center of the windshield (for left hand drive cars). If it is off to the opposite side of center or too fat to the left, and if you have measured correctly, then you have a gain difference and you can correct by a slight level adjustment reduce the right tweeter to bring it left or reduce the left channel to take it right. No more that 1dB or 2dB. Now the tweeters are set. From here on out you cannot change the levels or phase of either tweeter.

Mids, Mid-bass (woofers), and subs: Now mute the tweeters and un-mute the midranges. The process is the same for each pair of speakers. The sound should come from a single focused point near the center of the windshield. For midranges and larger drivers, you want to use a deeper male vocal. The larger drivers are much easier to tell the differences between in-phase and out of phase. Also, with the larger speakers you will hear a dramatic reduction of bass if the speakers are out of phase. So, for midrange and larger speakers you will look for a focused sound source in the wind-shield with stronger bass.
NOTE: Once each channel pair is adjusted, they cannot be separated. Any change of phase must be done by the pair.

Phasing the pairs: Again, listening to a single vocalist. Mute all channels again except the tweeters. Then bring in the midranges. If these pairs are in proper phase the sound should be near center in the upper part of the windshield. If they are not in phase the sound will be pulled down lower. You can reverse the phase of BOTH mids now and listen for the difference in the sound location. Choose the phase position that puts the sound high near the center.
Once you have these phased you can bring in the mid-bass with the same process. Again, the focus should be high in the dash. If the mid-bass is out of phase with the tweeters and mids then they will pull the sound down toward the floor.

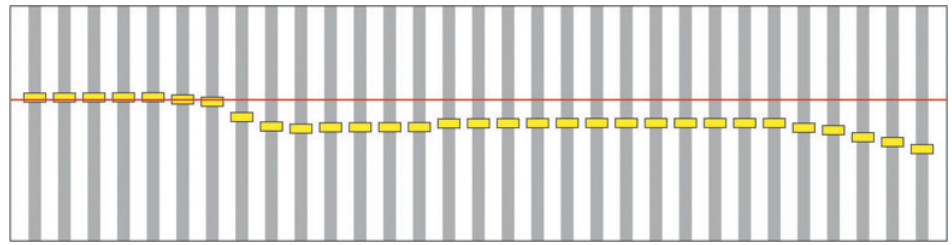
Woofers or Subs: There will be bass! You have phased the woofers, so we know there will be bass. What you need to listen for here is location, and mid-bass. (something with kick drums is ideal). Proper woofer phasing will work with the mid-bass drivers to give good solid, crisp mid-bass. Out of phase will result in a soft, low-impact mid-bass. Bass out of phase with the mid-bass will also be more located in the back of the vehicle while a properly phased bass will blend better into the front soundstage.

Tuning - The Simple Rules

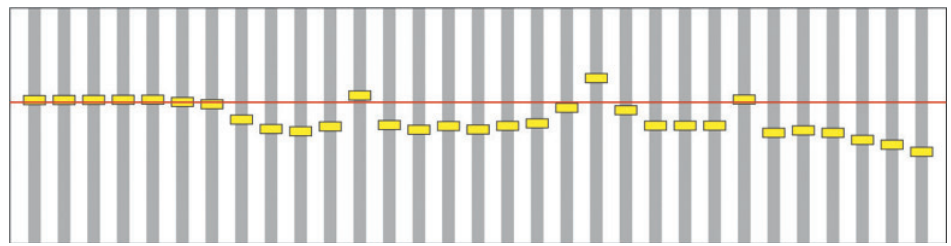
Before you can get what you want, you need to know what you want. In the graphs below, we look at some different response curves and what they mean and sound like.
Keep in mind that these illustrations are NOT what your EQ graph looks like. They are what your RTA looks like. If you have a flat response like below on your RTA, your EQ graph will have lots high spots and low spots to make the RTA graph look like that.

Flat is not the goal: Generally, a flat response will give a sound lacking in bass and will sound harsh on the high end and a little "thin" without a lot of body.

An Excellent response curve: Here is a curve that will almost always sound superb in a vehicle. The bass area as 3 to 4dB above the midrange and the highs slope off smoothly. This will have good solid bass and a smooth sound through the midrange and highs.



Problem Curve: Here is a problem curve. The small variations in blue are OK. They are 2dB or less and you likely will never hear them. However, the variations in the red circles are bad. While the ear is not so sensitive to dips in the response, it is very sensitive to peaks. The response peaks are what makes a speaker sound "harsh" and cause "ear fatigue" (You listen for a while then turn it off because it starts to irritate your ears). With this curve you want to pull down those peaks to put them in line with the rest of the signal response. Once that is done the system should sound just about right.



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