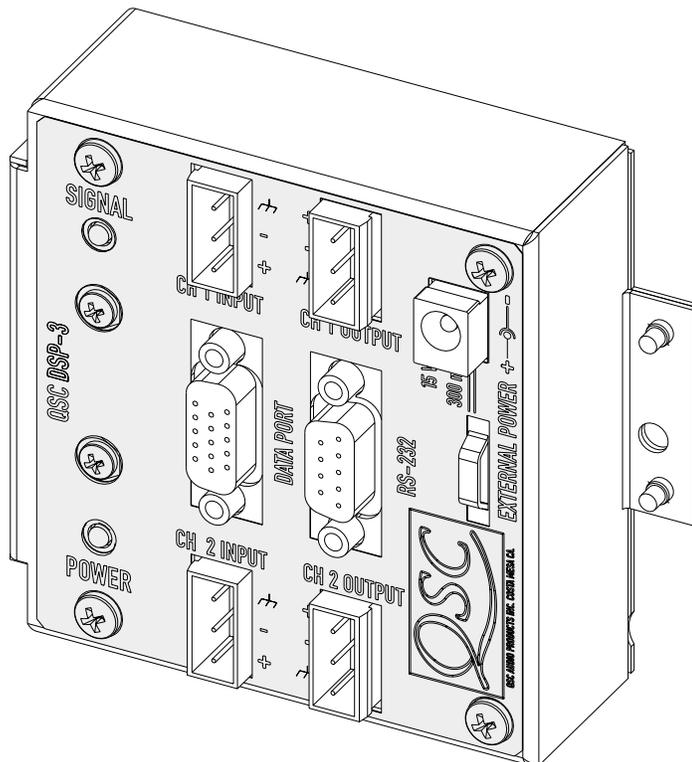




# DSP-3

## Digital Signal Processor

### Quick-Start Guide



TD-000094-00  
Rev.B



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## WARNING!

WHILE QSC HAS ENDEAVORED TO DEVELOP AND PRODUCE THE MOST DEPENDABLE AND ROBUST DIGITAL SIGNAL PROCESSOR (DSP) AUDIO PRODUCT FOR YOUR USE, DUE TO THE UNLIMITED AND POTENTIALLY DESTRUCTIVE (TO THE SOUND SYSTEM) CONFIGURATIONS THAT MAY BE APPLIED TO THE DSP BY THE USER, QSC CANNOT BE HELD RESPONSIBLE FOR DAMAGES RESULTING FROM ANY DEVIATION OR FAILURE BY THE USER TO STRICTLY FOLLOW THE RECOMMENDATIONS SET FORTH IN THE OWNER'S MANUAL FOR THE INTEGRATION OF THE DSP-3 AND SIGNAL MANAGER SOFTWARE WITH YOUR SOUND SYSTEM.

ALL RISKS ATTENDANT TO INTEGRATION OF USER-CONFIGURABLE DSP PRODUCTS WITH YOUR SOUND SYSTEM ARE ASSUMED BY YOU. WHILE QSC STRIVES TO SUPPLY THE HIGHEST QUALITY TECHNICAL SOLUTIONS FOR DIGITAL SIGNAL PROCESSING, IN NO EVENT WILL QSC OR ITS SUPPLIERS BE HELD LIABLE FOR ANY DAMAGES, CONSEQUENTIAL, INCIDENTAL, OR OTHERWISE, INCLUDING ANY CLAIMS FOR LOST PROFITS AND/OR SAVINGS RESULTING FROM ANY ATTEMPTED INTEGRATION OF THE DSP-3 AND SIGNAL MANAGER SOFTWARE WHICH DOES NOT STRICTLY ADHERE TO THE MANUAL'S RECOMMENDATIONS.

### Federal Communications Commission (FCC) Information

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

### IMPORTANT SAFETY INFORMATION: PLEASE REVIEW!

#### EXPLANATION OF GRAPHICAL SYMBOLS



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to humans.



The exclamation point within an equilateral triangle is intended to alert the users to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.



**CAUTION: To reduce the risk of electric shock, do not remove the cover. No user-serviceable parts inside. Refer servicing to qualified service personnel.**

**WARNING: To prevent fire or electric shock, do not expose this equipment to rain or moisture.**

#### SAFEGUARDS

Electrical energy can perform many useful functions. This unit has been engineered and manufactured to assure your personal safety. Improper use can result in potential electrical shock or fire hazards. In order not to defeat the safeguards, observe the following instructions for its installation, use and servicing.

# System Requirements and Power-on Default

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## System Requirements

To use QSC Signal Manager, you need the following hardware and software:

- IBM compatible computer, 200 MHz or greater Pentium Processor
- Windows 98/2000/ME or Windows NT 4.0 with service pack 6a or later
- SVGA display at 800 x 600 minimum resolution, 1024 x 768 recommended
- CD-ROM drive
- 32 MB or more of RAM
- 10 MB of free hard disk space
- An available RS-232 serial communications port (COM port) capable of 38.4k baud
- A male-to-female 9-pin serial cable (to connect the DSP-3 to available COM port)

## Power-on Default Configuration

- **The DSP-3, as shipped with its POWER-ON DEFAULT configuration, passes *unattenuated, full-range* audio from input to output (no level change). This may not be appropriate for your system. Turn amplifier gain down to its minimum useful settings until you are sure the DSP-3 is configured as you intend.**
- **The last applied configuration that is “running” in the DSP-3 when it is turned off becomes the active configuration again once the power is turned back on to the DSP-3. This ensures that the system “comes up” just as it was left last time it was powered down.**
- **Do not run your amplifier “wide open” (maximum gain) while making real-time adjustments to the DSP-3’s setup. The nature of the communication path between the PC and DSP-3 is inherently more complex than direct physical controls of an equivalent analog processing device. Unpredictable results may occur due to failure of the PC or the communications channel. Under such circumstances, damage to your drivers is possible if the amplifier gain is set for high power levels. Use the minimum useful gain settings while making system adjustments.**

# DSP-3 General Use Guidelines

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## **IMPORTANT! Please read before operating the DSP-3 with your audio system.**

The DSP-3 is a professional level DSP product that allows the user to produce virtually unlimited signal processor variations and configurations. Because of the infinite configuration possibilities of digital signal processing and the DSP-3, it is possible to create configurations that may result in unwanted signals or uncontrollable output

Signal Manager has no way of knowing if the DSP configuration you have designed will produce the results you intend to produce. You can create signal loops in your configuration that may oscillate and you may damage your sound system if you apply such configurations to the DSP-3. When applying an untested configuration or when designing or experimenting with the DSP-3, it is a very good idea to turn down the amplifier's physical gain controls. That way, you won't damage your speakers or create very loud sounds if you apply a configuration that doesn't do what you thought it would.

As a general rule, **DO NOT CREATE SIGNAL LOOPS!** Do not mix the output of a DSP object back into its own input! There is nothing useful to achieve by doing that, you will only create an oscillator that could damage you speakers. Also, **USE THE SINE AND NOISE GENERATOR OBJECTS WITH GREAT CAUTION!** These objects produce signals that can harm your speakers. Turn down the gain. If you don't hear a signal when you think you should, **DO NOT INCREASE THE GAIN!!!** If the signal isn't audible at lower levels, there is something else wrong. Turning up the gain to full exposes you and your system to the possibility that some loose connection somewhere will suddenly send a full-amplitude signal through your sound system.

Like all freely configurable signal processing tools, the DSP-3 will do what the configuration you design tells it to do, which may not be what you expect it to do, so use caution.



- **Do not run your amplifier "wide open" (maximum gain) while making real-time adjustments to the DSP-3's setup. The nature of the communication path between the PC and DSP-3 is inherently more complex than direct physical controls of an equivalent analog processing device. Unpredictable results may occur due to failure of the PC or the communications channel. Under such circumstances, damage to your drivers is possible if the amplifier gain is set for high power levels. Use the minimum useful gain settings while making system adjustments.**

# Quick Start

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This quick start section is for those users who want to get up and running with the DSP-3 and Signal Manager software as quickly as possible. It is in no way a substitute for reviewing the contents of the entire hardware manual. It is intended for people familiar with the equipment discussed and should be followed up with a review of the manual and the software help file.

This is the same material covered in the Signal Manager software help file, only presented on paper so that you may “get right to it.”

## 1

### TURN THE EQUIPMENT OFF & INSTALL THE HARDWARE

#### If you are using the DSP-3 with ...

#### Then you need to ...

QSC Powerlight2, CX, DCA 2-channel, 2-RU amplifiers (or later direct-mount applications)

Mount the DSP-3 to the amplifier by plugging it into the amp’s DataPort and securing it with the supplied hardware. External power may be required for older models (see Appendix).

QSC 4-channel CX & DCA amplifiers (or later models with full-featured DataPort that do not support direct mounting of the DSP-3)

Mount the DSP-3 remotely and connect a QSC DataPort cable between the amplifier’s DataPort and the DSP-3’s “backside” DataPort. External power may be required for older models (see top of page 2).

QSC Powerlight 6.0 or Powerlight 9.0

Mount the DSP-3 remotely and connect a **MODIFIED** QSC DataPort cable (male-to-female cable with pin #9 removed) between the amplifier’s DataPort and the DSP-3’s “backside” DataPort. Connect the external power supply to the DSP-3’s **EXTERNAL POWER** jack.

QSC Powerlight, all except 6.0 & 9.0

Mount the DSP-3 remotely and connect a QSC DataPort cable (male-to-female) between the amplifier’s DataPort and the DSP-3’s “backside” DataPort. Connect the external power supply to the DSP-3’s **EXTERNAL POWER** jack.

a non-DataPort amplifier (QSC USA, PLX or non-QSC models)

Mount the DSP-3 remotely. Connect the DSP-3’s **CHANNEL 1 OUTPUT** and **CHANNEL 2 OUTPUT** to the appropriate amplifier inputs (see p.18 for pinouts). Connect the external power supply to the DSP-3’s **EXTERNAL POWER** jack.

## 2

### CONNECT THE COMPUTER TO THE DSP-3

Use a 9-pin serial data cable to connect the DSP-3’s **RS-232** connector to the computer’s available COM port (the 9-pin serial port connector on the back of the PC). COM1 through COM4 are usable with the Signal Manager software. COM1 is the default port in Signal Manager; use COM1 for your connection if it is available. If not, you will need to select the appropriate COM port in the Signal Manager program *after* you install it in step 5.

# Quick Start

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## 3

### CONNECT THE AUDIO INPUTS

#### If you're using ...

the **CHANNEL 1 INPUT** & **CHANNEL 2 INPUT** connectors

the **DataPort** input (QSC CM16a or related products)

#### Then you need to ...

connect your input signal source to terminal block connectors (refer to page 18) and plug the connectors into the **CHANNEL 1 INPUT** and **CHANNEL 2 INPUT** receptacles.

connect the DataPort output from the CM16a (or other related DataPort product) to the **DataPort** input of the DSP-3. Use a QSC DataPort cable (male-to-male) for this connection. Refer to page 19.

## 4

### TURN THE AMP GAIN DOWN, POWER UP THE AMPLIFIER & THE DSP-3

**If the DSP-3 requires power from the accessory external power supply, apply power to the DSP-3 FIRST, then turn on the amplifier.** The power supply must be plugged into an operational AC power receptacle. Then plug the "barrel" connector (coaxial power plug) fully into the **EXTERNAL POWER** receptacle on the DSP-3. When power is properly applied to the DSP-3, the blue **POWER** LED will be illuminated. Use a plastic wire-tie (tie-wrap) to secure the accessory power supply's cord to the DSP-3's chassis; there is a metal tab on the chassis for this purpose.

**If the DSP-3 is powered by the amplifier's DataPort,** the amplifier must be connected to an operational AC power receptacle. Then turn the amplifier "on" using its power switch. The blue **POWER** LED on the DSP-3 will illuminate a few seconds after the amplifier's power switch is activated. If the DSP-3's blue **POWER** LED does not illuminate, you may have an older QSC DataPort equipped amplifier that requires use of the accessory external power supply (refer to the Appendix for complete application information).

# Quick Start

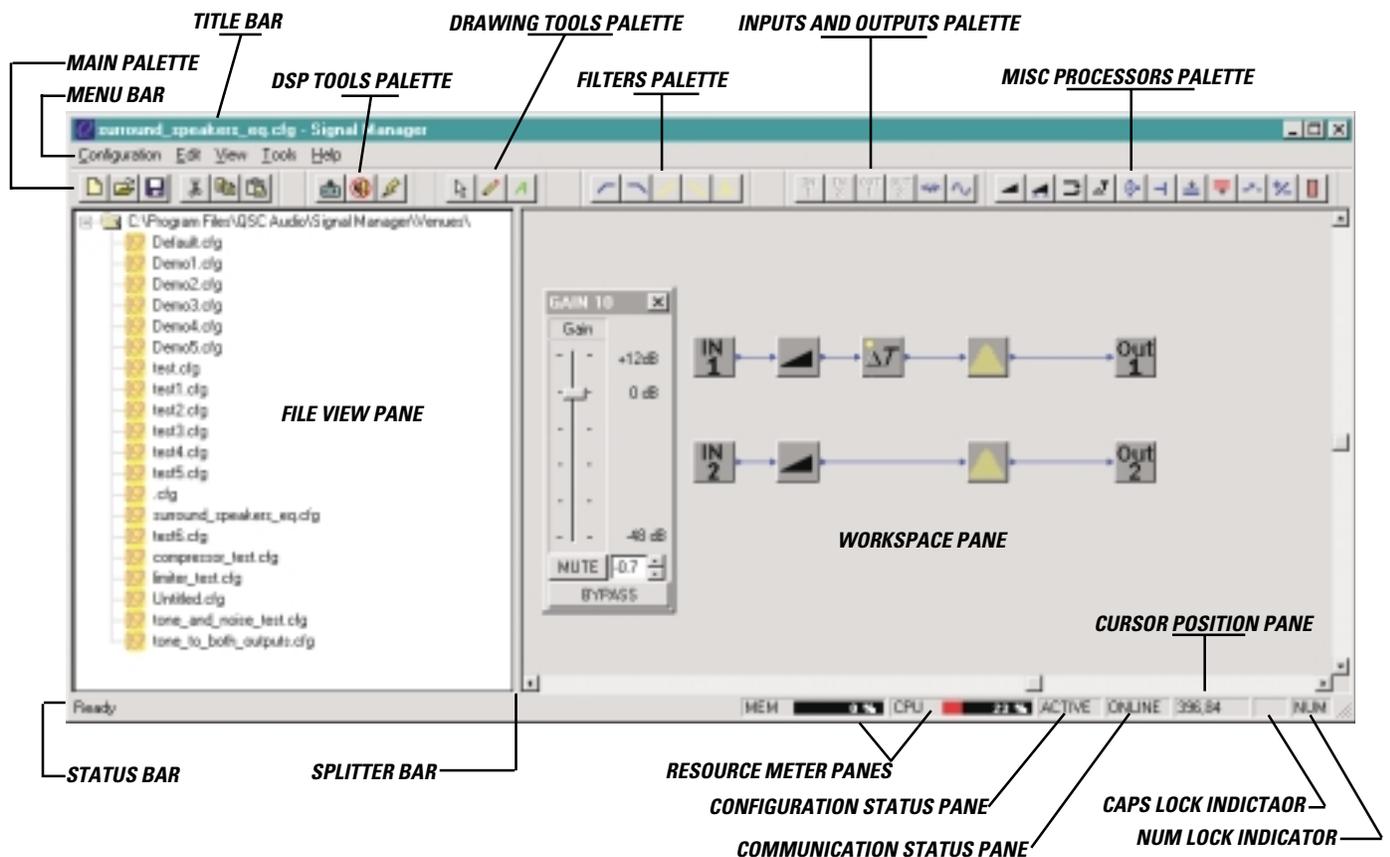
## 5

### INSTALL THE SOFTWARE

1. Place the QSC Signal Manager CD in your computer's CD drive (typically the D:\ drive). The installation program should run automatically after several seconds; **if it does not, then proceed with step 2:**
2. Run D:\Setup.exe (replace D: with the drive letter designator appropriate for your system) and follow the instructions displayed.
3. When the installation is complete, you will be presented with a screen that prompts you to view the "Readme" file. Please take time to read this- it contains important up-to-date information on the software.
4. After installation, you will have an icon on your computer's "desk top" labeled **Signal Manager**. Use this icon to start the application (double-click on the **Signal Manager** icon, this will start the program).
5. Using the Menu Bar (see below) at the top of the window, choose the "Help" item and read the software help section. The help system includes the contents of this hardware manual for "paperless" reference.
6. **IMPORTANT!** The DSP-3 is shipped with all of its presets configured to pass full-range audio signals through both channels. **THIS MAY NOT BE APPROPRIATE FOR YOUR SETUP! Be sure to configure any necessary crossovers, filters, etc. prior to applying audio signals to the inputs. Damage to equipment may result if these recommendations are not followed.**

### WHAT THE SIGNAL MANAGER APPLICATION LOOKS LIKE

This screen-shot is what a typical Signal Manager "configuration" looks like (example only):



# Quick Start

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## 6

### ESTABLISH COMMUNICATION BETWEEN THE DSP-3 & THE COMPUTER

At this point, you should have everything “up and running”. In the Signal Manager application, check the **COMMUNICATION STATUS PANE** (lower right corner of the Signal Manager window, see above).

**If the COMMUNICATION STATUS PANE indicates ...**

**ONLINE**

**Then you need to ...**

Do nothing! Your communication settings match the COM port you connected the DSP-3 to.

**OFFLINE**

Select *Tools* from the Menu Bar, select *Options*; the *Options* dialog box will open. Click on the *DSP* tab. In the *Serial Port Selection* field, click on the “down arrow” next to the port selection data window. A drop down list of COM1 through COM4 will appear. Select the COM port number that corresponds to the COM port of your computer that the DSP-3 is connected to. Click *OK* (at the bottom of the dialog box); the dialog will close. **Exit Signal Manager and restart it so that the newly selected COM port will become active.** The Communication Status pane should now indicate ONLINE if everything was connected and set up properly.

## 7

### MAKE SURE THE AMPLIFIER IS TURNED DOWN AND THAT YOU HAVE SUITABLE SPEAKERS CONNECTED FOR YOUR INTENDED CONFIGURATION

For familiarization with the DSP-3 and the Signal Manager software, we recommend that you use a pair of full range speakers connected to your amplifier and that the amplifier gain be reduced to the minimum useful setting. This will allow you to configure the DSP-3 almost anyway you desire while providing audio output to verify that the DSP-3 is doing as you intend. Small, high-power rated monitor speakers are perfect for the task.



***Better safe than sorry! Don't turn your amp all the way up; if communications between the computer and DSP-3 fail for any reason, unexpected output transients could damage your speakers***

## 8

### CREATE A SIMPLE DSP CONFIGURATION

- From the Menu Bar, select *Configuration, New*. If there was a default configuration on the Workspace, you will be prompted to close the “current” configuration first.
- Locate the Inputs and Outputs palette; left-click on the icon labeled IN1. Move your pointer into the upper left area of the Workspace and left-click the mouse again. The IN1 object should now be on your workspace.

# Quick Start

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- Now select the OUT1 icon from the same palette (left click on the OUT1 icon). Move your pointer into the upper right area of the workspace, in line with the IN1 object you just placed, and left click again. The OUT1 object should appear.
- Select the GAIN icon in the MISC PROCESSORS palette (it looks like a little wedge and is the left-most icon in this palette). Move your pointer to the workspace in between (and in line with) the IN1 and OUT1 objects; click the mouse button again. The GAIN object should appear.
- Go to the DRAWING TOOLS palette and select the DRAW (pencil) icon. Notice that the IN1 object has a small yellow-colored “node” on its right side. This is its connection node or the point that “wires” are drawn from. Similarly, note the same yellow-colored nodes on the GAIN and OUT1 objects. Draw a “wire” from the IN1 object to the left side of the GAIN object. Draw another “wire” from the GAIN object (right side) to the OUT1 object.



The DRAW tool works by clicking on one of the nodes that you want to draw a wire between, then, while holding down the mouse button, dragging the wire to the other node. You can change the drawing mode from click-drag-release wiring to click-click wiring in the *Tools, Options* dialog box; select the *Drawing* tab and make any desired drawing “behavior” changes.

- When everything is placed on the workspace and connected with “wires”, go to the Menu Bar and select Configuration, then Apply to DSP (or just click on the “Apply to DSP” icon in the DSP Tools palette). This will send your configuration (and any object parameter settings) from the computer to the DSP-3. The DSP-3’s outputs will be muted while the configuration is loaded. For complex configurations, this could take several seconds.
- If you have active audio inputs connected to the DSP-3 and the amplifier’s gain is sufficient, you will probably hear your audio material at this point. If not, double-click on each of the GAIN objects and increase the gain setting as required. Also in the *Tools, Options* dialog, the *DSP* tab has settings for input and output sensitivity for the DSP-3; these may require adjustment dependant on your particular set up.
- The *Communication Status* pane should indicate “ONLINE” and the *Configuration Status* pane should indicate “ACTIVE”. If you get an error message when applying the configuration to the DSP-3 (i.e. “Failed to connect to DSP-3”) check the cable connection between the DSP-3 and the computer’s COM port. Ensure that the correct COM port is selected in Signal Manager’s *Tools, Options, DSP* settings dialog box.
- Repeat the above procedure, this time using IN2, OUT2 and a GAIN object. This will give you a signal path with gain adjustment for channel 2. Be sure to “Apply to DSP”. This sends your updated configuration from your computer to the DSP-3.



The last applied configuration that is “running” in the DSP-3 when it is turned off becomes the active configuration again once the power is turned back on to the DSP-3. This ensures that the system “comes up” just as it was left last time it was powered down.



If you decide to edit an existing configuration, you will need to “unlock” the configuration after opening it. Just select *Configuration* from the Menu Bar, then select *Edit*. The palettes that were “grayed out” will now appear in their normal, colored state and you will be able to edit the configuration. After your editing is complete, select *Configuration* from the Menu Bar and then *Apply to DSP*.

**That’s it for the “Quick Start.” For more information, review this manual and the software’s help file.**

# Application Information

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## APPLICATION INFORMATION

As design improvements are continuous, the following information is subject to change. Contact QSC for current information.

QSC's DSP-3 Module has been designed to attach directly to the DataPort connector of QSC's CX, DCA, Powerlight, and Powerlight 2 series amplifiers. When attached to CX, DCA, and Powerlight 2 amps manufactured 08/99 and later, the module receives its power through the DataPort from the amplifier. Modules connected to earlier models of those just mentioned and all Powerlight amplifiers (the "non-2's") require an external DC supply (available from QSC).

**TO CLARIFY: CX, DCA, and PL2 amps made prior to August 1999 DO NOT provide adequate power supply voltage to the module, requiring the use of the same type of external DC supply** as used with Powerlight amplifiers. The amps in question will have a serial number PRIOR to **0899XXXXX**, where the first four digits of the serial number are the MMY Y datecode. Again, the modules WILL work with these amps just fine, but will require the use of our external power supply.

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• **Full feature set, Direct-mounting, No external power or special interconnect cables required** for the following QSC power amplifiers with serial numbers of **0899XXXXX** and later, where the first four digits of the serial number are the MMY Y datecode :

**CX series:** CX302–CX1202V (all)  
**DCA series:** DCA1222, DCA1622, DCA2422, DCA3022, DCA342  
**PL2 series:** PL224, PL230, PL236, PL218  
**PL2A series:** All

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• **Remote Mounting Required, QSC DataPort Cable required: Full feature-set, no external power required.**

**CX series:** CX204V, CX254, CX404  
**DCA series:** DCA1644, DCA1824

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• **Remote Mounting, QSC DataPort Cable and External Power required: Full feature-set.**

**PowerLight series:** PL1.0 through PL4.0 (all)  
PL6.0 and PL9.0 require modified DataPort cable between DSP-3 and amplifier.



***Powerlight 6.0 and 9.0 MUST have pin #9 removed from the amplifier-to-DSP DataPort Cable before use!***

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• **Remote Mounting and External Power required. No DataPort Connection possible, Power Limiting not available.**

**ISA series:** The ISA amplifiers have a "V2" DataPort that may be used for audio inputs only.  
**MX series:** **All**  
**PLX series:** **All**  
**RMX series:** **All**  
**USA series:** **All**

**ALL non-QSC amplifiers can be used with the DSP-3.**

# Sharing Configuration Files Between Different Computers

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## SPECIAL INFORMATION CONCERNING SAVED DSP-3 CONFIGURATIONS

**The computer which is used to create the DSP-3 signal flow configurations, and subsequently save them to disk, *should* be the same computer used to modify and adjust the DSP-3 settings in the future. Naturally, this might not always be the case. At the least, a copy of the DSP-3 configuration(s) should be saved to floppy disk, so the configuration files can be transferred to whatever computer(s) might be used to adjust or modify the DSP-3 module settings in the future.**

### The reason:

The Signal Manager software works in conjunction with the DSP-3 module to create specific signal processing algorithms for filters, delays, limiters, and the like. The algorithms are displayed on the computer screen as "configuration files", with graphical representations of each function and parameters. The user creates a signal chain, "wiring" together blocks of functions as needed for each particular audio channel or channels.

When you build a DSP-3 configuration from scratch, or load one from disk, and perform an "Apply to DSP" operation, the information downloaded into the DSP-3 module is NOT the graphical representation of what is displayed on the screen. The downloaded information consists of the compiled algorithm coefficients of the functions, i.e. "just the math". If building a new configuration from scratch, when you apply it to the DSP-3 you will also be prompted to save it to disk as a Configuration file. The path for this Configuration file is then associated with the compiled information that is applied to the DSP-3. A previously saved (to disk) configuration file may also be applied to the DSP-3, and that particular file path is associated with the algorithms now loaded in the DSP-3.

When you connect a DSP-3 to a computer, the Signal Manager software first attempts to locate and display the configuration file that has been associated with the algorithm coefficients currently running in the DSP-3, to correlate "what you hear" with "what you see". This would allow you to further adjust a delay or a filter parameter, for instance. If the correct file is located, based on the associated path name, the graphical configuration is displayed. If the file is not found (the file has been renamed, moved, deleted, or you are not using the same computer on which the DSP-3 was originally configured) the computer will display a message asking if you would like to load the Default configuration.

Answering YES will load the Default (factory) configuration TO THE SCREEN, but will not apply it to the DSP-3. Answering NO will merely display a blank workspace to the screen with no configuration loaded. At this point, what is displayed is NOT what is currently running in the DSP-3 memory.

IF YOU PERFORM AN "APPLY TO DSP" NOW YOU WILL OVERWRITE WHATEVER IS CURRENTLY RUNNING IN THE DSP-3! This is likely NOT what you want to do. Instead, locate the desired configuration file (from an alternate path or from floppy) using the Configuration->Open menu (Ctrl-O).

When the proper configuration file is displayed on the screen, go to the *Configuration->Edit* menu (Ctrl-E), followed by an *Apply to DSP* command (Ctrl-D). This will download the currently displayed configuration back into the DSP-3 (overwriting itself), allowing synchronization of what is displayed with what is running in the DSP-3. At this point, you may adjust parameters or modify settings as usual.

QSC engineers are currently developing an improvement to this process, in which the computer would always be capable of displaying the currently running configuration, regardless of the location of the configuration file (or lack of the file).

# Maintenance, Warranty & QSC Contact Information

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## Cleaning

The faceplate and chassis can be cleaned with a soft cloth and nonabrasive, mild cleaning solution. Products like Simple Green and Windex work well. Do not use powders or scrubbing pads of any type as they are usually abrasive and will permanently damage the finish of your DSP-3. Dampen a soft, lint-free cloth with the cleaning solution and wipe the DSP-3 down gently. Insure that cleaning solution does not get down into the connectors. Do not spray the solution directly onto the DSP-3 as it will penetrate into the connectors.

## User Maintenance

There is no user-level maintenance on the DSP-3. Contact QSC's Technical Services Department if service is required.

## Warranty Information

If the DSP-3 isn't working properly, please verify that a known good 9-pin serial cable is used between the DSP-3 and the computer. If proper operation can not be restored, the DSP-3 may require service. This must be performed by qualified service personnel. To obtain the location of you nearest QSC Authorized Service Center, please contact you QSC dealer or contact QSC's Technical Services Department.

## Disclaimer

QSC Audio Products, Inc. is not liable for any damage to speakers, amplifiers, or any other equipment that is caused by negligence or improper installation and/or use of the DSP-3 digital signal processor. Due to the inherent complexity of the communications between the DSP-3 and the host computer, QSC Audio Products, Inc. is not liable for any direct or indirect damage caused by computer communications failure.

## Product Warranty

QSC guarantees the DSP-3 to be free from defective material and/or workmanship for a period of three years from the date of sale, and will replace defective parts and repair malfunctioning products under this warranty when the defect occurs under normal installation and use—provided the unit is returned to our factory via prepaid transportation with a copy of the proof of purchase, i.e., sales receipt. This warranty provides that examination of the returned product must indicate, in our judgment, a manufacturing defect. This warranty does not extend to any product which has been subjected to misuse, neglect, accident, improper installation, or where the serial number and date code have been removed or defaced.

If the DSP-3 is returned to the factory for service, it should be sent in the proper QSC carton. If you did not save the original carton, ask your QSC dealer for one or call QSC to have one sent to you. This warranty does not cover shipping damage caused by improper packing or the use of improper shipping cartons.



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