DC1048

Operator's Manual Revision 1.21

Contents

DECLARATION OF CONFORMITY

We, the manufacturer:

XTA Electronics Ltd.,
The Design House,
Vale Business Park,
Worcester Road,
Stourport on Severn,
Worcestershire,
England
DY13 9BZ

acknowledge our responsibility that the following product:

Kind of equipment: Audio processor
Commodity Code: 8518408990
Type Designation: DC1048

is manufactured:

in accordance with EMC Directive 2004/108/EC,
in compliance with the following norm(s) or document(s):
Technical Regulations: EN55103-1:1996, EN55103-2:1996

and

in accordance with the Low Voltage Directive 2006/95/EC,
in compliance with the following norm(s) or document(s):
Technical Regulations: EN/IEC60065:2002 7th Edition

Signed: ....

Name: Alex Cooper
Position: Research and Development Manager
Date: January 2012

Important Safety Instructions

CAUTION: RISK OF ELECTRIC SHOCK.
DO NOT OPEN

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

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

WARNING: Apparatus with CLASS I construction shall be connected to a MAINS socket outlet with a protective earthing connection.

WARNING: To prevent injury, this apparatus must be securely attached to the rack in accordance with the installation instructions.

1. Read these instructions.

2. Keep these instructions.

3. Heed all warnings.

4. Follow all instructions.

5. Do not use this apparatus near water.

6. Clean only with a dry cloth.

7. Do not block any ventilation openings, install in accordance with the manufacturer's instructions.

8. Do not install near any heat sources, such as radiators, heat registers, stoves or other apparatus (including amplifiers) that produce heat.

9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fi t into your outlet, consult an electrician for replacement of the obsolete outlet.

10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.

11. Only use attachments/accessories specified by the manufacturer.

12. Use only with the cart, tripod, bracket or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from a tip over.

13. Unplug this apparatus during lightning storms or when unused for a long period of time.

14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as if the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

15. Do not expose this equipment to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the equipment.

16. To completely disconnect this equipment from the AC mains, disconnect the power cord from the mains circuit breaker.

17. This unit is fitted with a 3-wire power cord. For safety reasons, THE EARTH LEAD SHOULD NOT BE DISCONNECTED IN ANY CIRCUMSTANCE.

Instructions De Securite Importantes

ATTENTION: RISQUE DE CHOC ELECTRIQUE.

NE PAS OUVRIR

Le symbole représentant un éclair fléché dans un triangle équilatéral a pour but d'alerter l'utilisateur de la présence d'une "tension dangeruese" non isolée à l'intérieur du boitier, pouvant être d'une force suffisante pour constituer un risqué d'électrocution.

Le point d'exclamation dans un triangle équilatéral a pour but d'alerter l'utilisateur de la présence d'instructions importantes concernant le fonctionnement et la maintenance, dans la documentation qui accompagne l'appariel.

ATTENTION: Appareils de construction de CLASSE I doit être raccordé au réseau électrique via une prise de courant reliée à la terre.

ATTENTION: Pour éviter toute blessure, cet appareil doit être solidement fixé à la torture, conformément aux instructions d'installation.

1. Lisez ces consignes.

2. Conservez ces consignes.

3. Respectez tous les avertissements.

4. Respectez toutes les consignes d'utilisation.

5. N'utilisez jamais l'appareil à proximité d'un liquide.

6. Nettoyez l'appareil avec un chiff on sec.

7. Veillez à ne pas empêcher la bonne ventilation de l'appareil via ses ouïes de ventilation. Respectez les consignes du fabricant concernant l'installation de l'appareil.

8. Ne placez pas l'appareil à proximité d'une source de chaleur telle qu'un chauff age, une cuisinière ou tout appareil dégageant de la chaleur (y compris un ampli de puissance).

9. Ne supprimez jamais la sécurité des prises bipolaires ou des prises terre. Les prises bipolaires possèdent deux contacts de largeur diff érente. Le plus large est le contact de sécurité. Les prises terre possèdent deux contacts plus une mise à la terre servant de sécurité. Si la prise du bloc d'alimentation ou du cordon d'ali-mentation fourni ne correspond pas à celles de votre installation électrique, faites appel à un électricien pour eff ectuer le changement de prise.

10. Installez le cordon d'alimentation de telle façon que personne ne puisse marcher dessus et qu'il soit protégé d'arêtes coupantes. Assurez-vous que le cordon d'alimentation est suffisamment protégé, notamment au niveau de sa prise électrique et de l'endroit où il est relié à l'appareil; cela est également valable pour une éventuelle rallonge électrique.

11. Utilisez exclusivement des accessoires et des appareils supplémentaires recommandés par le fabricant.

12. Utilisez exclusivement des chariots, des diables, des présentoirs, des pieds et des surfaces de travail recommandés par le fabricant ou livrés avec le produit. Déplacez précautionneusement tout chariot ou diable chargé pour éviter d'éventuelles blessures en cas de chute.

13. Débranchez l'appareil de la tension secteur en cas d'orage ou si l'appareil reste inutilisé pendant une longue période de temps.

14. Les travaux d'entretien de l'appareil doivent être eff ctués uniquement par du personnel qualifié. Aucun entretien n'est nécessaire sauf si l'appareil est endommagé de quelque façon que ce soit (dommages sur le cordon d'alimentation ou la prise par exemple), si un liquide ou un objet a pénétré à l'intérieur du châssis, si l'appareil a été exposé à la pluie ou à l'humidité, s'il ne fonctionne pas correctement ou à la suite d'une chute.

15. N'exposez pas cet équipement au fait de tomber goutte à goutte ou au fait d'éclabousser et garantissez qu'aucun objet rempli des liquides, comme les vases, n'est placé sur l'équipement.

16. Pour complètement débrancher cet équipement de la conduite principale de courant alternatif, débranchez la corde de pouvoir du disjoncteur de conduite principale.

17. Cette unité est correspondue avec une corde de pouvoir de 3 fils. Pour les raisons de sécurité, L'AVANCE DE TERRE NE DEVRAIT ÊTRE DÉBRANCHÉE DANS AUCUNE CIRCONSTANCE.

Thanks

Thank you for choosing a DC1048 for your application. Please spend a little time reading through this manual, so that you obtain the best possible performance from the unit.

All XTA products are carefully designed and engineered for cutting-edge performance and world-class reliability. If you would like further information about this or any other XTA product, please contact us.

We look forward to hearing from you in the near future.

Unpacking the unit

After unpacking, please check the unit carefully for any damage. If any is found, immediately notify the carrier concerned - you, the consignee, must instigate any claim. Please retain all packaging in case of future re-shipment.
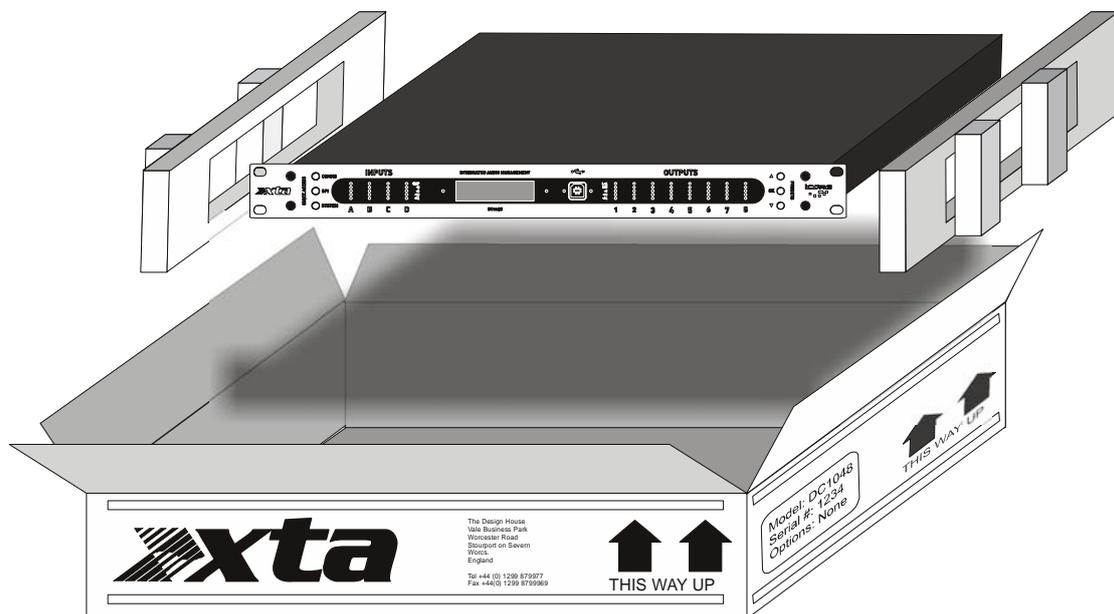
Introduction

Your DC1048 is a 4 input, 8 output audio processor, offering a selection of flexible features to configure and manage an installation audio system. These include matrix mixing of all inputs to outputs, input equalisation, output equalisation, output (speaker) crossovers, delays and speaker protection (limiters).

Input signal path:

Output signal path:

Each of the 4 inputs enters the mixing matrix and is routed to any of the 8 outputs as required through the adjustment of the relative levels:

Computer and network connections for remote control are catered for through a front panel USB socket and an RS485 multi-drop bus connector on the rear panel.

The simple user interface on the unit helps quickly set up the various basic comms options to facilitate connection to a computer for full, secure access to all the features and easy programming through iCORE, the software package designed for use with this and many more products.

Configurations can be saved within the unit for recall as required, either directly from the front panel, or via the computer. A real time clock is also built into the device so automated recalls at specific times/days can be set-up for complete set-and-forget operation.

A GPIO port allows simple remote preset recall, as well as connection to the WP-1048 touch remote wall panel.

Installation

Electrical Considerations

The DC1048 has been manufactured to comply with your local power supply requirements but, before connecting the unit to the supply, ensure that the voltage (printed on the rear panel) is correct, and that a mains fuse of the correct type and rating has been fitted.

If the unit's GPIO terminals are not terminated with screened cables fast rising transients from extreme RF fields, or ESD strikes over 4000 volts may cause disturbance to the status LEDs on the unit. This will not affect audio performance and will be corrected on the next power up cycle.

Make sure power outlets conform to the power requirements listed on the back of the unit. Damage caused by connecting to incorrect AC voltage is not covered by the warranty.

Mechanical Considerations

To ensure that this equipment performs to specification, it should be mounted in a suitable rack or enclosure.

When mounting the unit in a rack or enclosure, ensure that there is adequate ventilation. The cooling fan sucks cool air in through the LHS and blows warm air out of the RHS of the unit through the ventilating grills.

Take care when mounting other equipment in the same rack.

Please also refer to the maintenance section on page 57 of this manual.

Operation

Read all documentation before operating your equipment and retain all documentation for future reference.

Do not spill water or other liquids into or on the unit and do not operate the unit while standing in liquid.

Do not block fan intake or operate the unit in an environment that could impede the free flow of air around the unit.

If the unit is used in an extremely dusty or smoky environment, it should be cleaned of any collected debris at regular intervals. (Please also refer to the maintenance section on page 57 of this manual.)

Front Panel Indicators
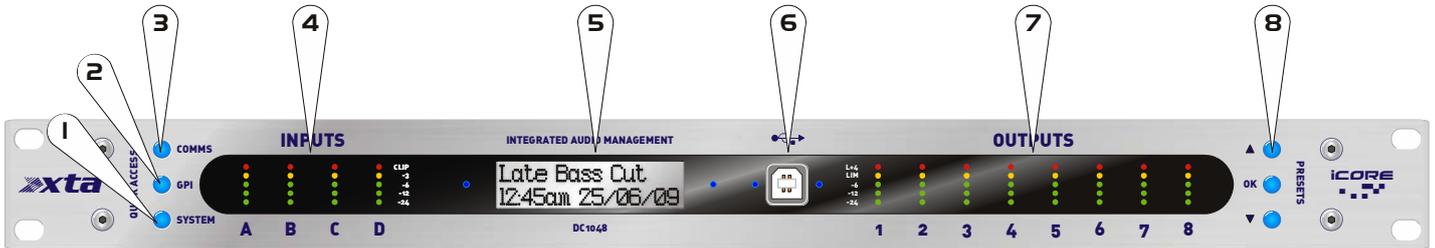
1: "System" Menu Button

Press this button repeatedly to cycle through the general menu options concerned with the general operation of the unit – see page 17 for list of options. Options are changed with the UP/DOWN keys and confirmed with OK. Menu exits automatically five (5) seconds after the last key is pressed.

2: "GPI" Menu Button

Press this button repeatedly to cycle through the menu options concerned with the setting up any General Purpose Interface connected to the unit– see page 17 for list of options and more details. Options are changed with the UP/DOWN keys and confirmed with OK. Menu exits automatically five (5) seconds after the last key is pressed.

3: "Comms" Menu Button

Press this button repeatedly to cycle through the menu options concerned with the remote control operation of the unit – see page 17 for list of options. Options are changed with the UP/DOWN keys and confirmed with OK. Menu exits automatically five (5) seconds after the last key is pressed.

4: Input Metering

The input meters read the level immediately post analogue to digital converter (ADC) and pre-signal processing (DSP). As such, they will indicate if the input level is clipping the ADC before any processing has been applied. If the clip LED is illuminated on any particular channel, reduce its level so that the –3dB LED lights on peaks. If all four CLIP LEDs illuminate, this indicates DSP clipping – check for excessive EQ filter boost on all channels.

5: LCD Status Display

By default, the LCD shows the current time and date, along with the name of the last recalled preset. Brightness of this display is automatically reduced when the unit is not being accessed after a preset time, adjustable under the "System" menu, along with the contrast.

6: USB Connector

The front panel mounted USB connector is used for remote control and configuration from a PC running iCORE, as well as firmware updates. The USB connection is configured under the "Comms" menu – see page 18 for more information about going on-line. For details about upgrading firmware, see the section on page 43.

7: Output Metering

The output meters show the level relative to the limiter threshold. The yellow LED on each channel illuminating when the limiter threshold is reached. The red LED indicates 4dB of gain reduction on that channel.

8: Preset Selection Buttons

In default mode, the UP(▲) and DOWN (▼)buttons will scroll through the list of stored presets. Pressing OK will immediately load the selected preset. When in a menu (having pressed a button on the left hand side of the panel) these buttons will adjust the currently selected parameter, with "OK" setting it to the displayed value and exiting the menu (after the 5 second preset delay).

Rear Panel Controls, Connections and Indicators
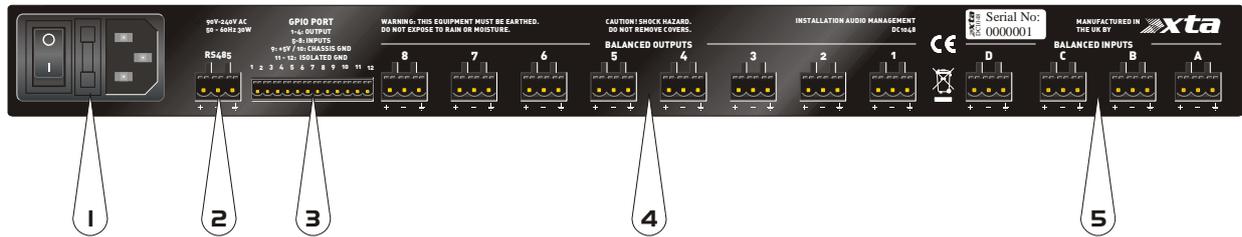
1: Mains Power Inlet and Power Switch

The mains fuse is also located here, between the switch and the power socket – only replace with the correct rated fuse.

2: RS485 Connection

To connect a network of DC1048 units, or to include this unit on a network of other devices, use this connection. The pin-out of this connector is:

Pin 1: Data A (+)
Pin 2: Data B (-)
Pin 3: Shield/Ground

The procedure for setting up a remote network is explained in detail starting on page 35 of this manual.

3: GPI Port

This port offers a set of input and output connections designed for use with the WP-1048 touch remote, or for connection to other third party remote control interfaces, to allow for closed contact preset recall.

4: Balanced Audio Outputs

The analogue outputs are wired as:

Pin 1: Signal Hot (+)
Pin 2: Signal Cold (-)
Pin 3: Shield/Ground

5: Balanced Audio Inputs

The analogue inputs are wired as:

Pin 1: Signal Hot(+)
Pin 2: Signal Cold (-)
Pin 3: Shield/Ground

Menus

Overview

The DC1048 has been designed to be quick to set up and simple to operate. To facilitate this, the options available for configuration on the front panel have been deliberately minimized and are explained in detail below.

COMMS Menu

Mode: Master	← Connect to USB on front
Slave	← Connect to RS485 on rear
OFF	← Disable remote comms
ID Number: 1 - 32	← Set address for remote access
RS Baud: 4800 - 15200k	← Baud rate for RS485 ONLY

GPI Menu

GPI: Alarm Mode	← Mem 1 recalled unless GPI says otherwise
Panel Mode	← Connect to a WP-1048 touch panel
Complx Mde	← Binary coded input for up to 16 presets
Simple Mde	← One wire per preset (4)
Disabled	← Ignore GPI inputs
Mem. Offset = 0 - 16	← Preset recalled is input + this number
TX Presets = No/Yes	← Transmit a recall message on RS485

System Menu

Sys. Lock: Full	← All front panel functions disabled
Menu	← Only preset recall allowed
OFF	← All access allowed
On Delay: 0 - 60 secs	← Time before audio output on power up
LCD Contrast: 0 - 10	← Adjust LCD contrast
LED Timeout: 5 - 90 secs	← Time for backlight and buttons to stay on

Remote Control and Initial Set-up

Overview

As the DC1048 is designed for installation applications, the control and set-up of all audio related parameters is performed under remote control using a PC or laptop running **iCORE**.   Please ensure you have downloaded the latest release of the software from our website, xta.co.uk, and have it installed on the computer.

There are various methods of connecting the unit to a computer. The simplest is via the USB socket on the front panel of the unit. Units may be cascaded to form a network using the RS485 connections on their rear panels. The first unit will relay information from the USB to the RS485 if required or, if the first unit cannot be located near the computer, a direct RS485 connection can be made to all units, using a suitable converter.

These three scenarios are explored in more detail in the following pages.

Direct USB Connection

Using a standard USB cable, a serial link can be established to any individual unit.

This connection is also used for upgrading the unit's firmware which **cannot** be done via an RS485 connection. **Attempting to do so may cause your unit to function incorrectly and result in it having to be returned to the factory!**

For more information about upgrading firmware, please see the section on page 43 of this manual.

Laptop or desktop PC
 running **iCORE**
software monitors and
controls unit.
**Baud rate must be set
to 115k!**

COMMS Menu
Mode: Master Connect to USB on front
ID Number: 1 - 32 Set address for remote access
RS Baud: 4800 - 15200K Not relevant for USB connection

Set the options in the unit's COMMS menu according to the diagram, that is

Master, ID 1.

Baud rate in the **COMMS** menu only affects the RS485 network, and the USB comms speed is fixed at 115200 (or 115k) so if using USB connection make sure baud rate at the PC is set to 115200.

The first time the USB cable is plugged into the PC, Windows will recognize the connection of new external hardware (a USB-Serial device) and prompt for device driver to be installed.

This may be obtained from our website, or directly from the Internet at this address:

http://www.ftdichip.com/Drivers/VCP.htm

Choose the virtual COM port (VCP) driver as appropriate to your operating system.

Note that, due to the nature of the USB protocol and the "hot swapping" nature of the system, if the unit is not powered up and plugged into the PC, the COM port connection will not be available.

Please confirm that the connection is made and the unit is on before continuing.

Having physically connected the unit, and installed the driver successfully, we now need to check the virtual COM port that's being used so we can match this with the COM port in **iCORE**.

With the lead *plugged in* **(the COM port won't show up if the unit isn't connected AND powered up!)**, use the shortcut of the Windows^{TM} key on your keyboard + the Pause/Break key to bring up the System properties window:
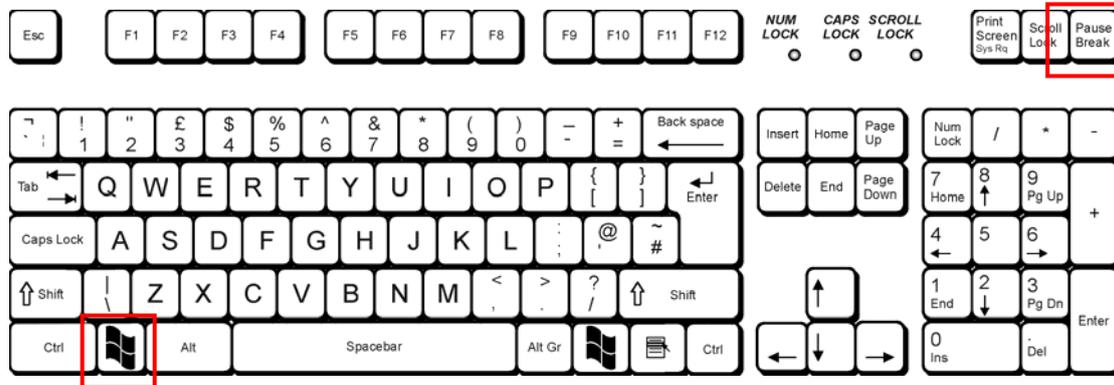
Press BOTH keys together! Alternatively you can get to the same place through *start* ⇨ Settings ⇨ Control Panel ⇨ System

Press the "Hardware" tab and then "Device Manager". This will bring up a window with a list of all hardware subsections of your computer, including the COM ports. Expand the section entitled "Ports" and locate the USB-Serial adapter. The COM port number it has been assigned is in brackets after the name.
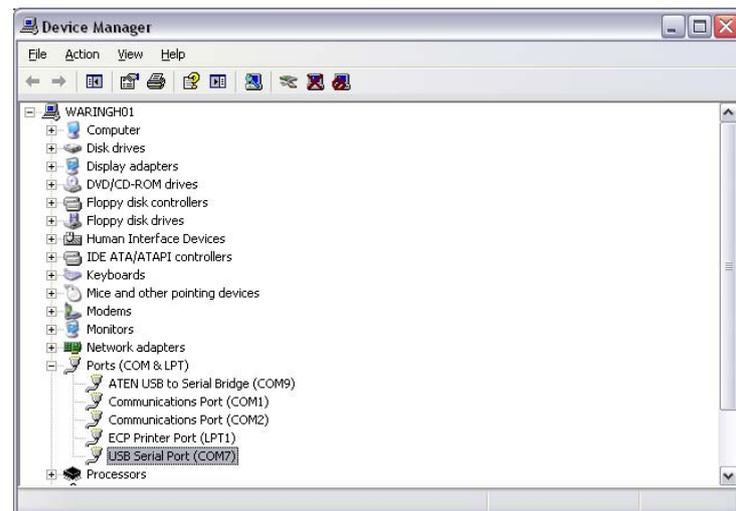
Make a note of this port number and then start **iCORE**.

Expand the window to fill your screen and then, from the menus, choose Tools ⇨Options, and select the Comms tab.

Make sure the COM port number selected from the drop down list matches the one discovered earlier.
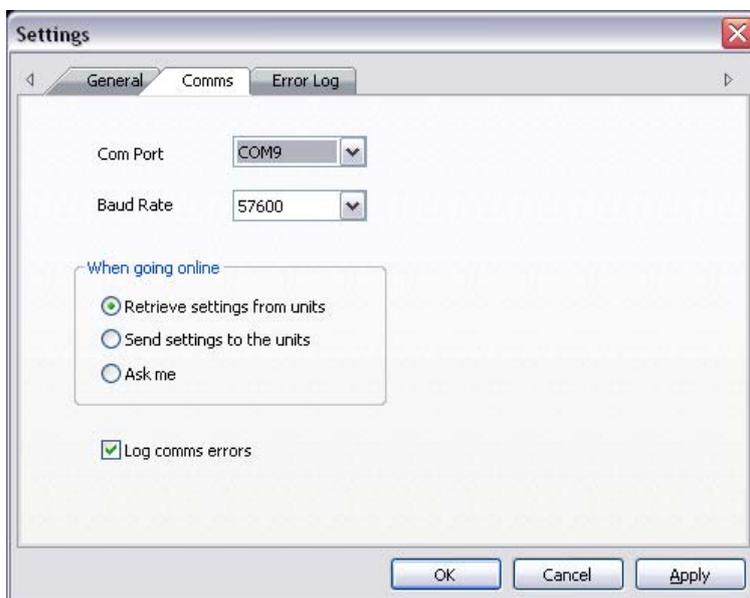
The baud rate must be set to 115k if using the direct USB connection.

The safest method of connection to avoid accidentally changing any device settings is to select "Retrieve settings from units" as this will upload all device(s) properties and parameters to the computer.

Having selected the COM port, this window may now be closed by clicking OK.

We can now scan for connected devices to find the unit. Either select Tools ⇨ Autoscan, or press the button on the toolbar. Assuming the ID has been set to 1 as suggested, it should be found almost immediately. You can press "Stop" once your unit is located.

Nonetheless, the entire process will take approximately 90 seconds to complete. As the search continues, the device view should begin to fill up with connected units. When complete, depending on what's connected of course, there should now be a "rack" of devices like this:
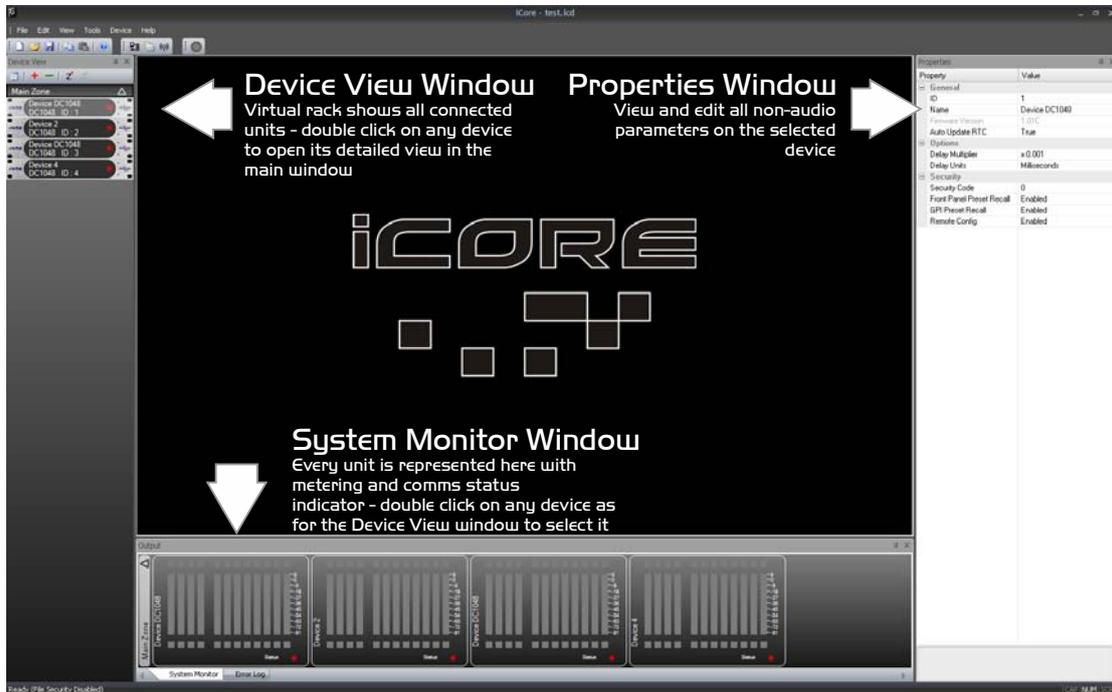
Layout of the Main Window

A double click on any device will display its "front panel" for editing of audio properties. Non-audio properties are shown in the "Properties" pane on the right hand side of the main window.

In the example on the previous page, all devices apart from the first one are off-line, as shown by the red indicator on each unit in the Device View and the System Monitor view. When connected and on-line, the indicators will be green. A yellow flashing indicator means there is a problem – hover over the device in question to see a tool tip explaining what is wrong.

Before looking at the details of a device's controls and properties, here are a few general pointers about using the software:

- ✓ The last saved file can automatically be opened when the software is started by setting the option in the Tools ⇨ Options ⇨ General tab.

- ✓ Settings can be copied between units either using the buttons on the toolbar (which uses the currently selected amplifier) or by using the right-click context menu on the units "front panel" or in the Device View for more detailed options.

- ✓ The Global Mute has its own toolbar which can be hidden(!).

- ✓ The error log is stored to a file called "Logfile.txt", which is stored in the same directory as the program executable file.

Remember to save your system before closing **iCORE** to avoid having to rescan the system every time you open the software. All window positions, zones, and screen layouts (so positions of the Device View, Properties and System Monitor) are also saved.

Reorganising the Main Window

To move inner windows about, pick them up by their title bar:

For example, to move the properties window and re-dock it, pick up the properties window by its title bar and begin to drag it. This will make a number of docking option anchors appear – these look like this:
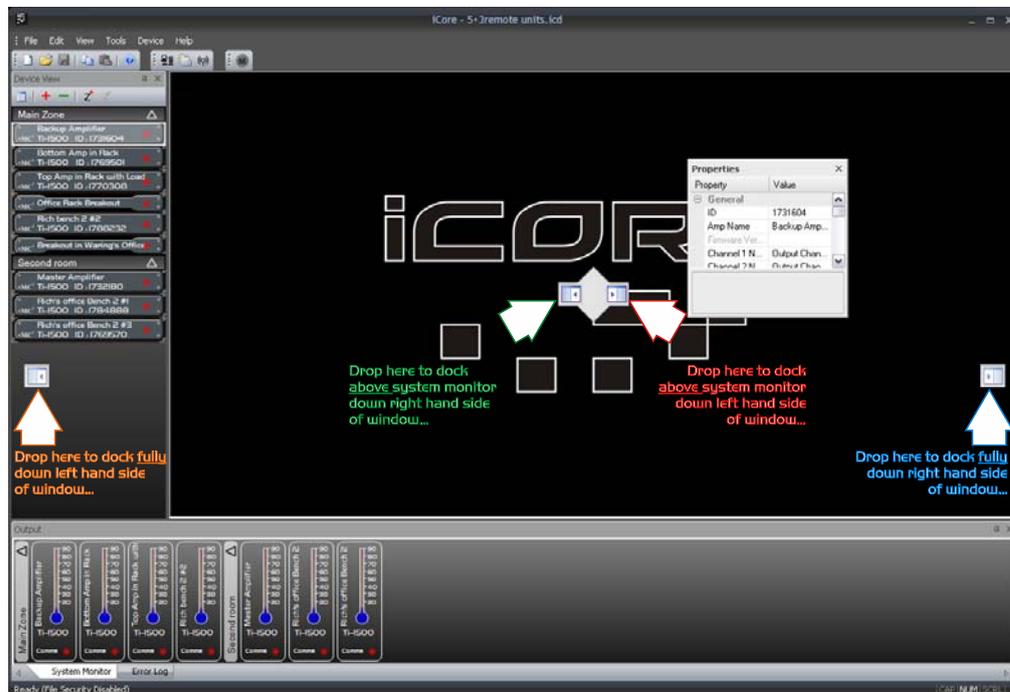
Drop the window on one of the anchors to dock it in the new position, as shown above. Similarly, the system monitor window can be docked either top or bottom

of the main window, and either fully across this window, or bracketed by the device view and/or properties window.

The device view and properties windows can be combined into a single tabbed window by picking either up and dragging it directly onto the other window where a new anchor will appear.
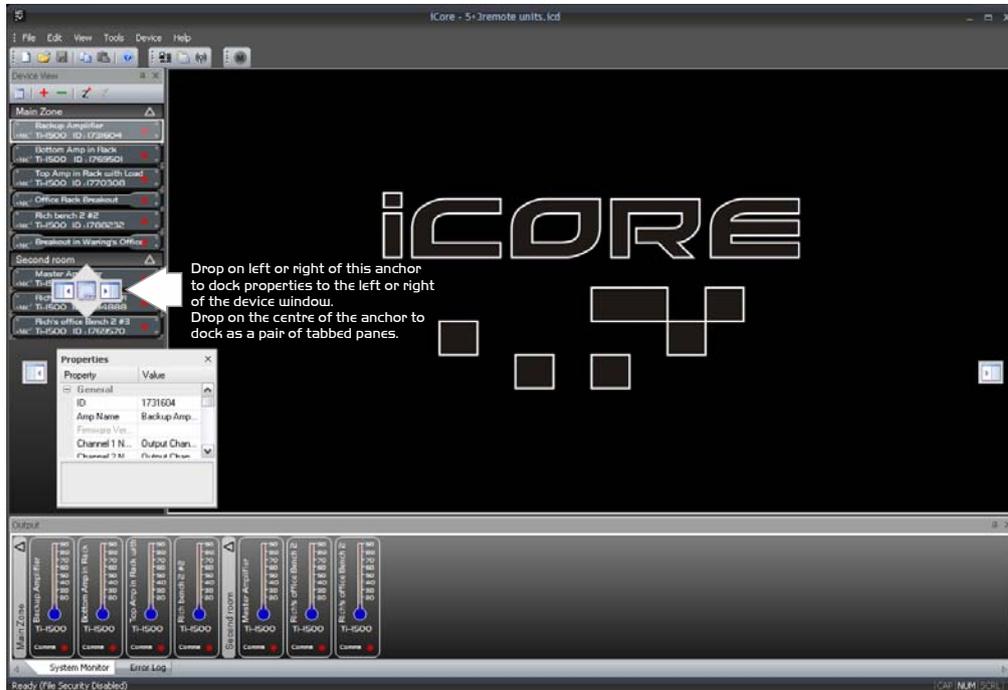
To separate out the windows again, just click on the tab of the window and drag and drop it as required to select a new position.

Windows can also be left floating by dragging them from their current positions and just dropping them on the main background.

Auto-hiding Windows

All inner windows can be set to "auto-hide", so they disappear into the edge of the main window when not required to maximise available screen area, but make them quickly available if necessary.
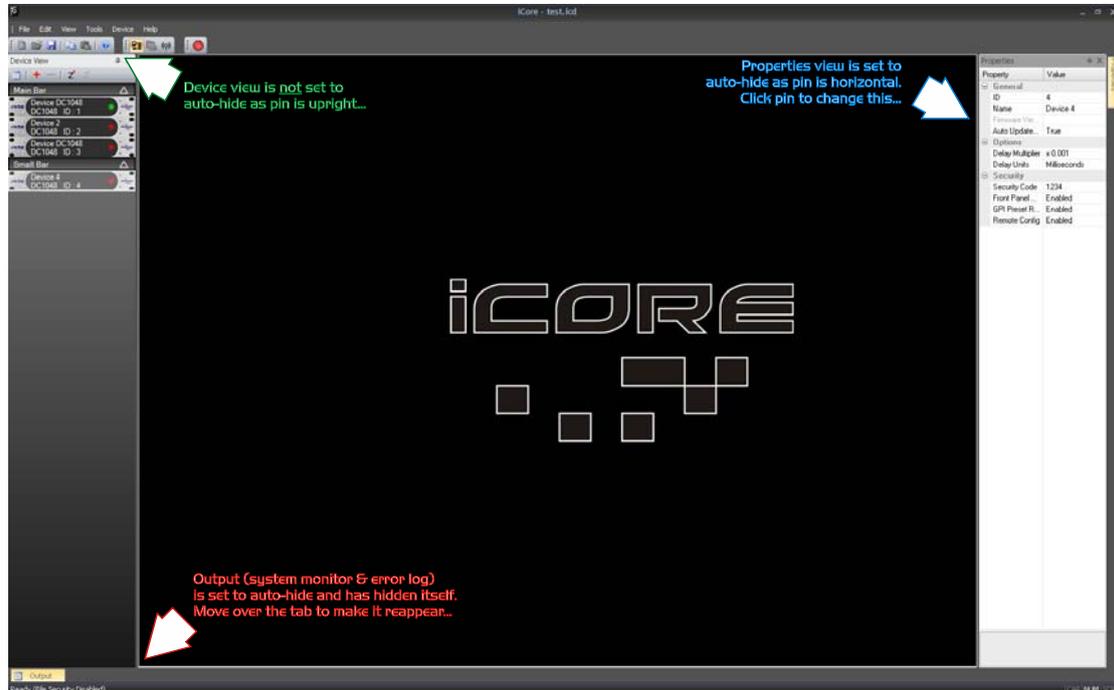
Remember, if any windows have been closed they can be reinstated through the menu View ⇨ Toolbars and Docking Windows.

Zoning Devices

The zones shown in the Device View and System Monitor windows allow groups of devices to be logically arranged to reflect their physical locations more accurately than just one large list of units.

Main zone ("Main Bar") contains 3 units

Another zone, "Small Bar" contains one unit
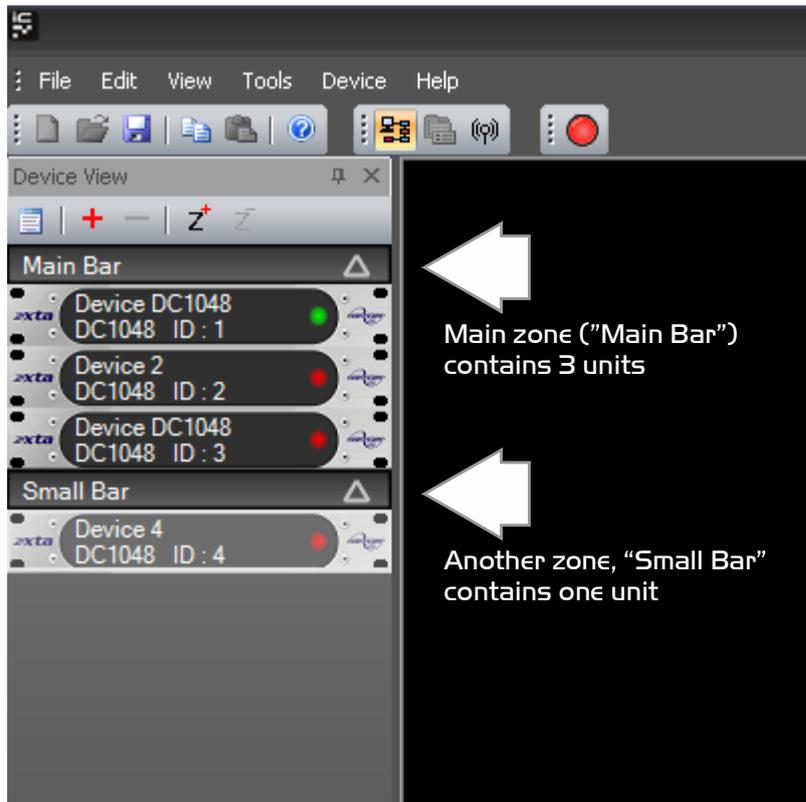
Things to know about zones:

✓ There's always a master (main) zone, which you can never get rid of.

✓ New zones can be added using the Z^+ button at the top of the rack view.

✓ Devices can be moved into new zones just by clicking on them and dragging them to the required zone. They can also be re-ordered within a zone in the same way.

✓ Zones can be renamed by double clicking on their names.

✓ Zone can be expanded and collapsed using the Δ in the zone header.

✓ Files will remember the zone layouts including expand/collapse status when you save them.
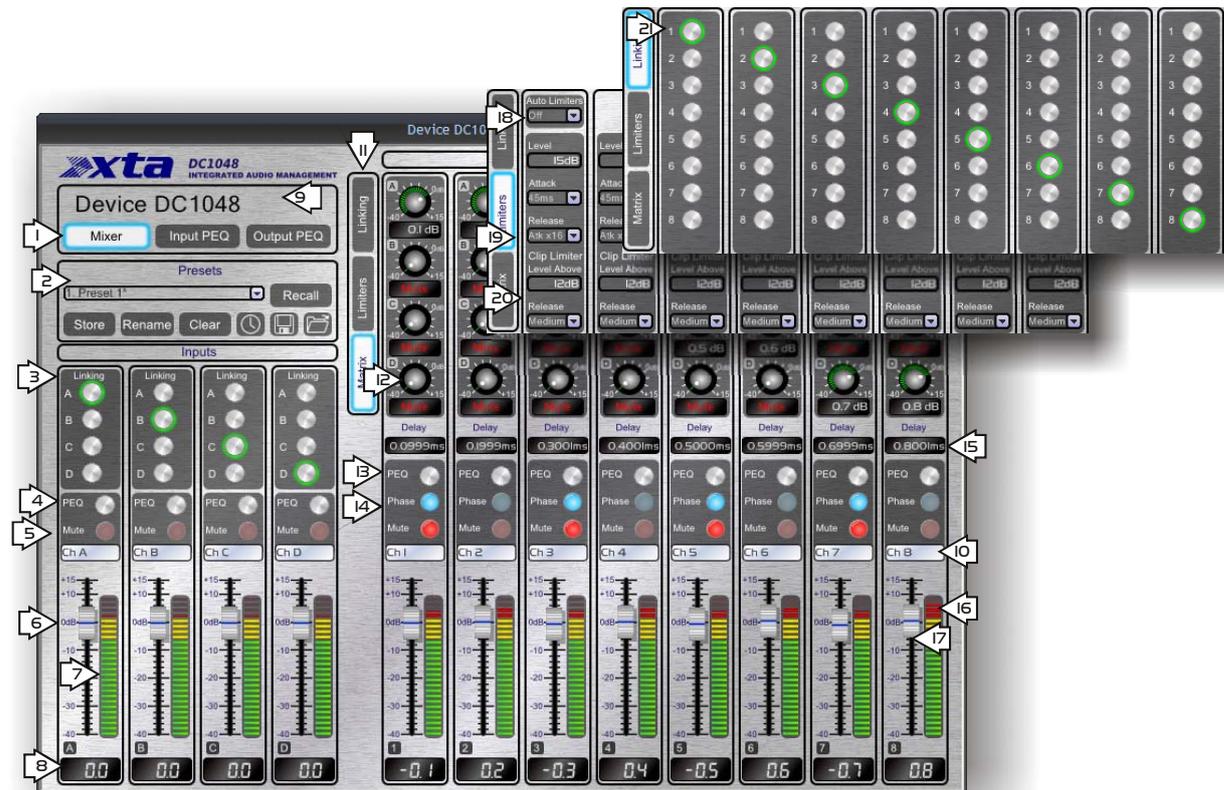
1: Unit view mode buttons: switch between matrix mixer (shown here), input parametric EQ (see page 31) adjustment, and output EQ adjustment including crossover filters (see page 30).

2: Presets management pane: store, recall, rename and erase complete snapshot presets, as well as setting up automatic (off-line) timed preset recalls. Individual snapshots may also be opened and saved as files on the PC. See page 32 for more information on timed presets and preset files.

3: Input linkage controls: link input channels so all adjustments track identically – note that changing linkage will immediately copy all parameters from the lowest channel to the others – change with caution!

4: PEQ shortcut buttons: jump directly to the input parametric EQ screen with the channel(s) selected – same as mode button (1), but also sets the correct channel.

5: Mute channels: not linked even if channels are. Remember, system mute is on main toolbar.

6: Input channel fader: this acts on the signal post-ADC and input metering. The gain may also be changed by clicking above or below the fader knob along the "track" to adjust the current value in 1dB steps.

7: Input level metering: real time metering shows post-ADC but pre-DSP level.

8: Input level readout: input gain values may be manually entered by double clicking on the readout.

9: Unit name: double click to edit the name, which can also be changed through the Properties View window.

10: Channel names: double click to edit names. These are stored as part of a preset.

11: Output view mode: switch between output linking set-up, matrix mixer, and limiters view.

12: Matrix mixer view: mix any combination of input channels to each output – either enter direct levels numerically by double clicking on the level readout, or click on the knob and move vertically to adjust mix level in 0.1dB steps. Note that values below –40dB will mute this matrix feed.

13: PEQ shortcut buttons: jump directly to the input parametric EQ screen with the channel(s) selected – same as Mode button, but also sets the correct channel.

14: Phase button: Flip the polarity of an output by pressing this (On – Blue indicator, and 180° out of phase).

15: Delay readout: up to 650mS of delay may be added to any output channel. Enter direct values numerically by double clicking on the readout, or single click on the readout and move vertically to adjust time in the current interval (mS, metres etc.). Step size and units can be changed through the Properties View window.

16: Output channel metering: real time metering shows level *relative to the limiter threshold* with the yellow section illuminating when the limiter threshold has been reached. Full scale shows 4dB into limiting. Time constants of metering are also linked to the attack and release times set for the limiter on each channel.

17: Output channel fader: this acts on the signal post-DSP and pre-limiter. The gain may also be changed by clicking above or below the fader knob along the "track" to adjust the current value in 1dB steps.

18: Limiters view: auto-limiters on/off – one setting for all 8 channels. When set to 'On' the attack and release times of the limiters are automatically chosen based on the high pass crossover filter for that channel. More information about setting accurate limiter thresholds is given in the section on page 49.

19: Limiters view: Program limiter threshold, attack and release: set the program limiters using these controls. More information about setting up limiters is given on page 49.

20: Limiters view: Clip limiter threshold and release: set up the clip limiters with these controls. More info on page 49.

21: Linkage view: Output linkage controls: link output channels so all adjustments track identically – note that changing linkage will immediately copy all parameters from the lowest channel to the others – change with caution!
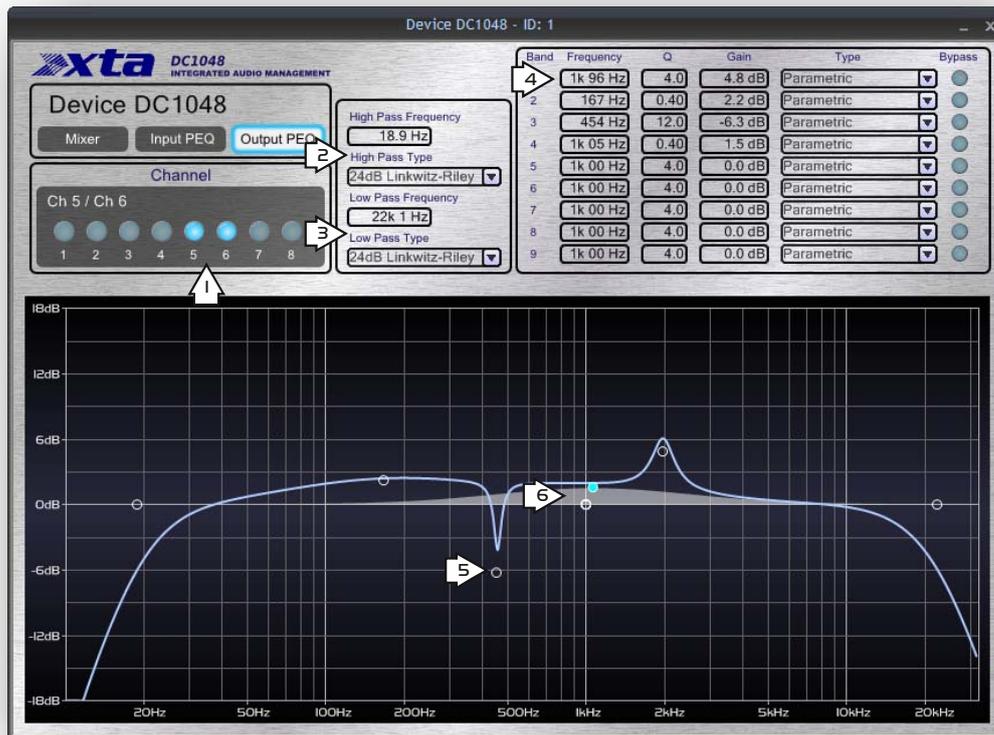
1: Output channel select: swap between the channel(s) to adjust. Linked channels will have their buttons illuminated together.

2: Crossover filters: high pass filter: enter frequency numerically by double clicking on the readout, or single click on the readout and move vertically to adjust. Response curve will show updates in real time. Note that the node for the filter will highlight on the curve, and this can also be dragged to adjust the frequency. Filter type is selected via the drop-down list.

3: Crossover filters: low pass filter: enter frequency numerically by double clicking on the readout, or single click on the readout and move vertically to adjust. Response curve will show updates in real time. Note that the node for the filter will highlight on the curve, and this can also be dragged to adjust the frequency. Filter type is selected via the drop-down list.

4: Parametric filters: frequency, 'Q' and filter gain can all be entered using methods explained above for the high/low pass filters. Additionally, each band may be individually bypassed, and the filter type chosen from the drop down list. More information on some of these individual filters and their usage is given in the appendix on page 51.

5: Response curve : filter node: adjusting a filter will illuminate its node on the curve and this allows it to be dragged in real time, updating the tabular information and adjusting the unit. For parametric filters, holding down the left mouse button whilst moving the scroll wheel will change the 'Q' of the filter.

6: Response curve: shadow EQ: the grey response shown in addition to the blue overall curve, will change depending on the filter currently being adjusted, and shows just its contribution to the overall response.
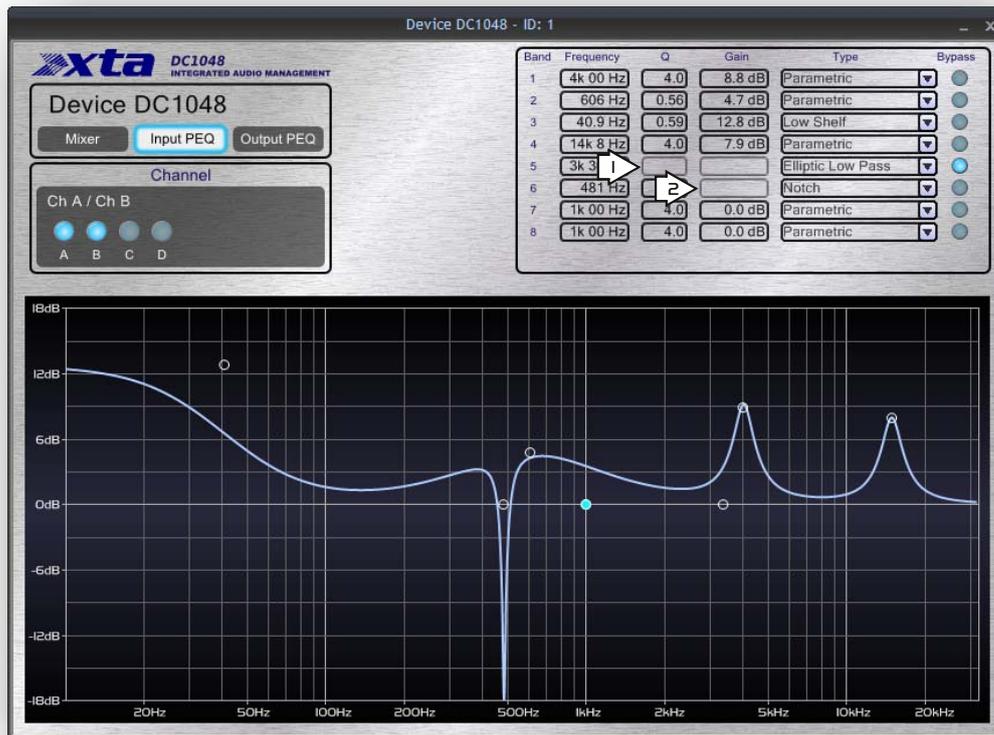
Whilst the input EQ and output EQ screens only differ in minor ways – no crossover filters on the input screen, and one less parametric band – this screenshot does highlight a couple more points worthy of note for both.

1: Filter number 5 has been set to an elliptical low pass response. This type of filter has no adjustment for 'Q' or gain (being a band pass filter) so these parameters are removed from the table.

2: Filter number 6 has been selected as a notch filter, and so has a fixed (very high negative) gain, but still has variable 'Q' (which may be increased greatly above the default value chosen for a much narrower response).

Timed Presets and Preset Files

In addition to storing presets within the unit itself, **iCORE** opens up the possibility of storing and recalling individual presets from a virtually unlimited library stored on the PC running the software.

Storage of presets within the unit is accomplished by selecting the required location from the drop-down list and then choosing Store. Recall is instantaneous with all settings changing on the unit and updating on the software control panels. Storing settings will pop up a window allowing the name to be changed before storing, and renaming allows just the name of a preset to be changed without saving new settings.

The icon buttons 1 and 2 are used to save and load individual presets from files stored on the computer, NOT in the unit.

Press button 1 to load a preset. This method effectively bypasses the unit's preset storage memory – loading a preset from a PC file will transmit the settings direct to the unit's working memory. It will be remembered when the PC is disconnected or off-line and will be reloaded if the unit is power cycled, but it is not stored in a user memory within the device itself. To store it in a user memory, just press the "Store" button after it's been loaded and choose a location as normal.

Saving settings into a PC file is accomplished using button 2 – this allows a library of presets to be set up on the PC and easily copied (or emailed) to other devices. Remember this doesn't store the settings in the unit directly – it stores the current settings shown in the software as a preset file on the PC.

These preset files are independent of the iCore configuration file accessed through the File > Save option (an ".icd" file). The ".icd" files store all details of all

connected units and their memories. The ".dcp" files created when storing settings to the PC as described above only hold individual preset settings for a single preset on a DC1048.
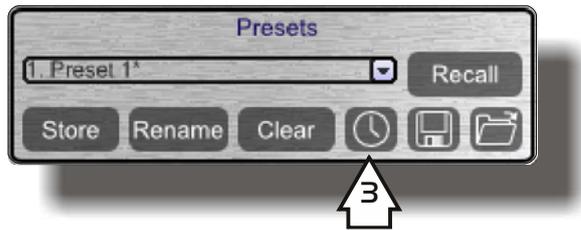
Button 3 (with the clock on it) is used to set up timed preset recalls. Pressing it will display a window as shown below:

Up to ten timed events can be enabled – these can be either "single shot" events where the date and time have to be specified, or repeated "weekly" events where the required days are specified and the time on these days.

Setting The Clock

There is no need to worry about setting the real time clock within the unit itself – this is automatically updated every time the unit goes on-line using the PC's clock settings – make sure this is set correctly or your unit won't recall things as you expect! If you don't want the unit to sync its clock every time, this can be disabled by changing the "Auto Update RTC" property to "False" in the Properties view.

Additional Device Properties

All other properties that are not directly related to audio and real time control are listed in the Properties window. These are:

General: *ID*: This is the unit's address on the network(Read only)
Device Name: Click to edit the name of the unit
Firmware version: Currently running unit firmware (Read only)
Auto Update RTC: Sync the unit's clock every time it's on-line

GPI Mode: Select how the unit responds to changes through the GPI port – the three modes of operation are explained on page 41
Transmit Preset: If enabled, any GPI triggered recalls will also be echoed onto the RS485 network to trigger other DC1048s.
Memory Offset: Add an offset to the GPI recall location to enable recalls above 1-4. This is also added to the TX'ed message if enabled (see previous parameter)

LCD Contrast: Adjust viewing angle of unit's display
On Delay: Set a countdown time to delay audio fading up when unit is turned on.
LED Timeout: Set how long LCD and buttons remain at full brightness after access

Options: *Delay Multiplier*: Set the step size used when adjusting any delay times on the unit

Delay Units: Choose how delay times are displayed – in either time or distance.

Security: *Security Code:* Last used code for local lock of front panel controls

System Lock: Current local lock state – may be changed remotely, but see page 38 for details of how this works.

Connection of Multiple Units on an RS485 Network

The USB Connection is the easiest and quickest way to connect to a single unit when uploading presets or updating firmware, and is the best connection for a "set and forget" system, where the cable can be unplugged and the system then left secure. If, however, a larger system of more than one unit is required, and real time monitoring and adjustment of these units is required on a regular basis, then the RS485 network connection on the rear panel is more useful. Additionally, other devices can share this RS485 network and can be monitored and controlled through iCORE.

Connection via front panel USB and break-in to the RS485 Network

Laptop or desktop PC
 running **iCORE**
software monitors and
controls all units.
**Baud rate must be set
to 115k!**

COMMS Menu
Mode: Master Connect to USB on front
ID Number: 1 - 32 Set address for remote access
RS Baud: 4800 - 15200K Baud rate must match on all units

USB from PC into front of
first unit…

…RS485 out of rear of first unit
into second…

COMMS Menu
Mode: Slave Connect to RS485 on rear panel
ID Number: 2 Select next address
RS Baud: 4800 - 15200K Baud rate must match on all units

…Parallel connections from
second unit into third unit…

COMMS Menu
Mode: Slave Connect to RS485 on rear panel
ID Number: 3 Select next address
RS Baud: 4800 - 15200K Baud rate must match on all units

…continue up to total of
32 units and TOTAL max
cable length of 1000m.

COMMS Menu
Mode: Slave Connect to RS485 on rear panel
ID Number: 4 Select next address
RS Baud: 4800 - 15200K Baud rate must match on all units

Connection directly to the RS485 Network

If a connection to the first unit cannot be easily achieved with a USB cable (due to location of this unit) then a longer RS485 connection is possible via the rear panel connection using a suitable RS485 converter. We recommend the KK Systems USB-485 adapter for simple conversion to RS485.

This device is powered via the USB connection and so has the ability to drive long cable runs reliably. This device is available from us, or directly from KK Systems at www.kk-systems.com.   The converter comes with a 9-pin D-type fitted as standard – this has to be adapted to an XLR connection.

To prevent voiding the warranty on the converter, we advise not cutting the 9-pin off, but rather make up an adapter – the pin out for this is below.

9-pin D type	XLR	Phoenix
Pin 4	1	1
Pins 3+7 (Brown + Orange)	2	2
Pins 8+2 (Black + Yellow)	3	3

Remember to set the first unit to SLAVE mode instead of MASTER so it accepts data on the rear Phoenix instead of the USB. Also, the baud rate setting in iCore now must match that of all connected units.
See page 17 for how to change this.

Connect to the first unit via its RS485 socket. To connect to further units, just use standard microphone cable (or similar), come out of the first unit on the Phoenix and simply parallel the three wires to the next device, and so on down the chain as shown in the previous diagram.

Laptop or desktop PC running ICORE software monitors and controls all units.

COMMS Menu
Mode: Slave Connect to RS485 on rear panel
ID Number: 1 - 32 Set address for remote access
RS Baud: 4800 - 15200K Baud rate must match that at PC

USB from PC through converter and into rear RS485 connection on first unit…

…RS485 out of rear of first unit into second…

COMMS Menu
Mode: Slave Connect to RS485 on rear panel
ID Number: 2 Select next address
RS Baud: 4800 - 15200K Baud rate must match that at PC

…Parallel connections from second unit into third unit…

COMMS Menu
Mode: Slave Connect to RS485 on rear panel
ID Number: 3 Select next address
RS Baud: 4800 - 15200K Baud rate must match that at PC

…continue up to total of 32 units and TOTAL max cable length of 1000m.

COMMS Menu
Mode: Slave Connect to RS485 on rear panel
ID Number: 4 Select next address
RS Baud: 4800 - 15200K Baud rate must match that at PC

We strongly recommend that you use screened cable for these connections and be sure to ground one end of the screen. As the RS485 drivers used are "quarter load" devices, the maximum number of nodes that can be connected together is 128, and the maximum theoretical cable length from the first node to the last node is 1000 metres. This distance will be affected by the cable quality and to some extent the operating environment.

Security and Locking

Overview

The DC1048 and **iCORE** both have security systems that allow for local and remote security to be implemented entirely independently. Via the front panel of the unit itself, control may be restricted or entirely prevented. Through **iCORE**, access to internal unit settings may be restricted though user levels with individual rights given to up to ten users, each with their own username and password.

Local Front Panel Locking

Pressing the **SYSTEM** button will show the lock options, namely

Sys. Lock: Full   ← All front panel functions disabled

            Menu   ← Only preset recall allowed

            Off   ← All access allowed

Use the ▲ and ▼ buttons to choose the required level of lock and press **OK**

The display will show:

System Menu:...

Enter Pin: 0000

with a cursor flashing over the left-most '0'. Use the ▲ and ▼ buttons to set the digit and press **OK** to move onto the next digit. After setting the last digit, pressing **OK** will display

[OK] - Lock Unit

with PIN: 0000

to lock the unit now, press **OK**, otherwise wait 5 seconds for the menu to drop out, or press another menu button to escape.

Once locked (depending on if it's a full or menu lock), pressing any menu key will display

Menus Locked!

Enter Pin: 0000

Simply enter the PIN again as for locking and press OK to unlock the unit.

Forgotten the PIN?

Well that's not very clever, is it? ;) You need to email us for the unlocking procedure – tech@xta.co.uk.

Security in iCORE

Before accessing the security features in ICORE please read this section carefully as once enabled, forgotten passwords and usernames cannot be erased and will require resetting all devices on the network individually!

To access security features in the software the system needs to be enabled. By default, all security features are turned off. Enable security by selecting File > Properties and ticking the box on the "General" tab:
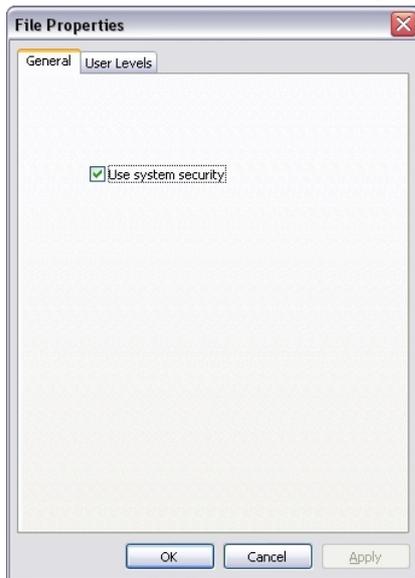
Next, choose the "User Levels" tab and add a user, as shown here:

The 'Admin' user is the "Top Level" user with access to everything. This user cannot be deleted. Default name and password is "Admin" and "Password" respectively. Clicking on the "Admin" user will show that the permissions are all ticked and this cannot be changed.

To create another user level with fewer permissions, press the "+" button to the right of the list, and choose the name, password and select the required permissions. Note that these permissions are system-wide and not related to an individual unit. They do NOT affect the local locking of the unit(s) connected.

Once another user (or several users) has been added, click OK and then choose Tools > Switch Users:

Select the username and type in the appropriate password to switch levels. The current user is displayed on the bottom left corner of the main screen.

Next time the system goes on-line, **all** security settings will be sent to every unit on the network (users/passwords/permissions). This means that even if another computer is plugged into the system, the security system will remain in place.

The rules governing the security system are:

- Security is GLOBAL across the network and not specific to a particular unit.

- Adding a device to the system once security is in place will cause it to become part of the secure system and it will receive all security info when the system goes on-line.

- Adding a device from a secure system to an open system (without security) will trigger a request for the password to be entered as used on the secure system. Once entered, security may then be disabled and this will be reflected on the previously secure unit so it won't request a password next time the system goes on-line. Failure to enter the correct password for a device will result in it being ignored when the system is on-line.

- Up to nine user levels can be added.

- Security information is stored in the **iCORE** file as well as the units, so usernames and passwords will be compared in case a different secure system is opened compared to the file open on the computer when going on-line.
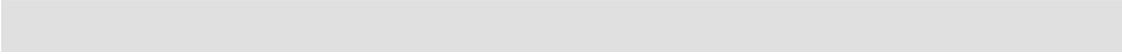
The GPI Port

Overview

The GPI port is designed for connection to either isolated or non-isolated systems to facilitate remote memory recalls without the need of a computer. There are three modes of operation, as defined in the **GPI Menu** > GPI via the front panel. These are explained in the next few pages, but first the difference between isolated and non-isolated connections.

Pin Number	Description
1 – 4	**Outputs** Connect to WP-1048 only
5 - 8	**Inputs** (0V – off; 2.5V – 10V max = on)
9	**Output** – +5V (current limited to 200mA)
10	**Output** – *Chassis* Ground (connect for non-isolated use)
11 - 12	**Output** – *Isolated* Ground (connect only for isolated use)

Isolated Connection

Pin 11 is internally connected to the common cathodes of the opto-isolators and so to trigger them, this must be joined to the negative side of any external supply. Chassis ground is NOT connected, nor is the available +5v supply on pin 9. Instead, an external power source provides a voltage, which is switched as necessary onto the anodes of the opto-isolators triggering memory recalls.
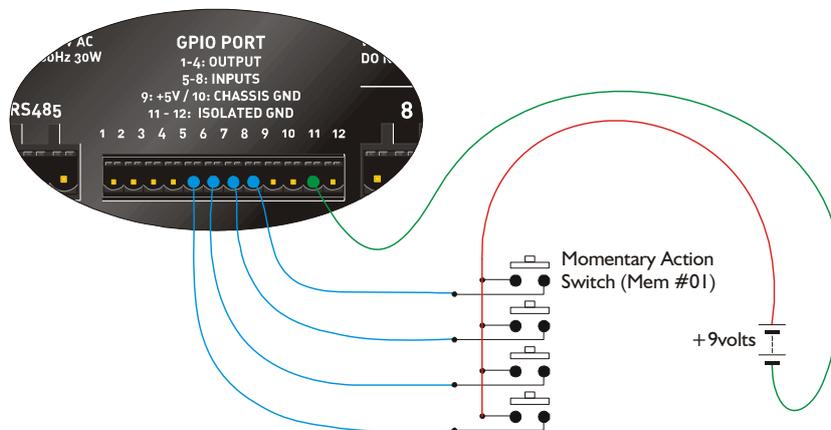
Isolated connection.
Connect external supply to
between common on switches, and
pin 11 ground only.

Non-Isolated Connection

If galvanic isolation is not required, then the GPI port can be used to provide its own supply for the opto-isolators. In this mode, the common cathodes connected on pin 11 must be connected to the chassis ground on pin 10. The +5V supply on pin 9 is then used to trigger memory recalls by switching it to pins 5-8 as required.

Non-isloated connection.
Connect pin 10 to pin 11 to
join grounds.
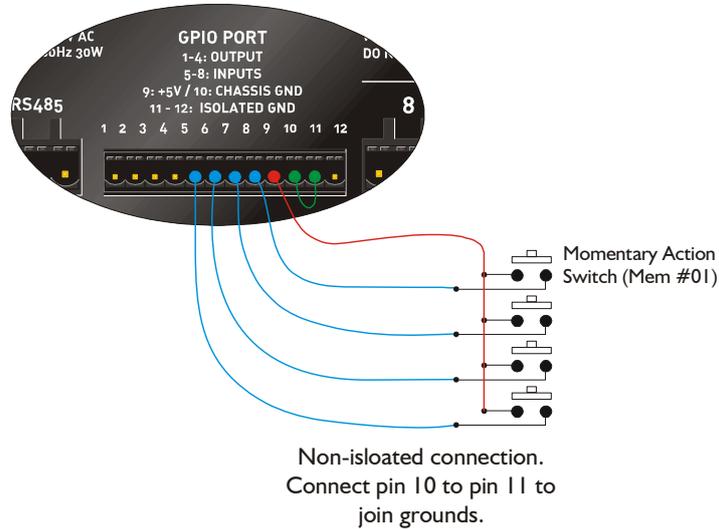
Simple Mode

The diagram above shows four switches connected individually to the four input lines on the GPI. Simple Mode allows for the recall of four contiguous memories triggered by pressing one of the four switches. These can be momentary as shown, or may be latching if some form of feedback is required locally. By default, the memories recalled will be numbers 01-04, but this can be changed by adding an offset through **GPI** > Mem Offset which will move the starting number, so an offset of 2 will recall locations 03 – 06 and so on.

Complex Mode

The difference between simple and complex mode is simply how the input lines are interpreted by the unit when triggered. Simple mode will only read a single line at a time (triggering multiple lines will result in the lowest numbered one being used). Complex mode reads the four lines as a binary number and so allows for recall of up to 16 memories, without recourse to the memory offset feature.

GPI INPUT LINES				MEMORY
8	7	6	5	RECALLED
0	0	0	1	#01
0	0	1	0	#02
0	0	1	1	#03
0	1	0	0	#04
● ● ●				
1	1	0	1	#14
1	1	1	0	#15
1	1	1	1	#16

Panel Mode

Panel mode is reserved for connection to a WP-1048 touch wall panel. Please refer to the installation instructions and operating manual for this product.

If the unit's GPIO terminals are not terminated with screened cables fast rising transients from extreme RF fields, or ESD strikes over 4000 volts may cause disturbance to the status LEDs on the unit. This will not affect audio performance and will be corrected on the next power up cycle.

Alarm Mode

Alarm mode is a special version of Simple Mode, where the port is read on power-up, as opposed to only triggering a preset recall when the port pins actually change. This means that if nothing is plugged into the GPI port and Alarm Mode is selected, the unit will recall memory 01 each time the unit is powered up.

This allows an isolated relay connection from a fire alarm system to recall a memory (with mutes on perhaps) to silence the system, but also restore it after the alarm condition has cleared. It also means that the system can indicate that the GPI cable has become unplugged as a different memory to "default" will recall, assuming default has been programmed as another memory (with mutes off). Note that the Memory Offset number is still valid in this mode.

Appendix I: Updating Device Firmware

Overview

The firmware that runs the DC1048 hardware and controls the remote comms may be updated using the loader engine built into iCORE. Before explaining how to update the firmware, please note that

ONLY ONE DEVICE MAY BE UPDATED AT A TIME – TURN OFF ALL OTHER CONNECTED UNITS DURING THE UPDATE PROCEDURE!

The other devices on the network don't need to be physically disconnected, just turned off (NOT STANDBY – **OFF**!) so that iCORE can determine which model it has to update and confirm the update has been a success.

Note that DC1048 units cannot be updated over the audio transport bridge (i.e. via a Ti-Breakout box) and must be directly connected to the local USB on the front panel and the unit set to Master mode in the COMMS menu.

Update Procedure Using iCORE

Before starting any updates…

SWITCH OFF ALL UNITS ON THE NETWORK (PROCESSORS, AMPS AND BREAKOUTS) APART FROM THE ONE TO BE UPDATED!

CLOSE ALL OTHER OPEN PROGRAMS ON YOUR COMPUTER!

Now, in iCORE, select Tools ⇨ Preset/Firmware Loader. You must be OFF-LINE for this choice to be available. Make sure you have changed the Comms mode on the unit to Master so it enables the USB connection.
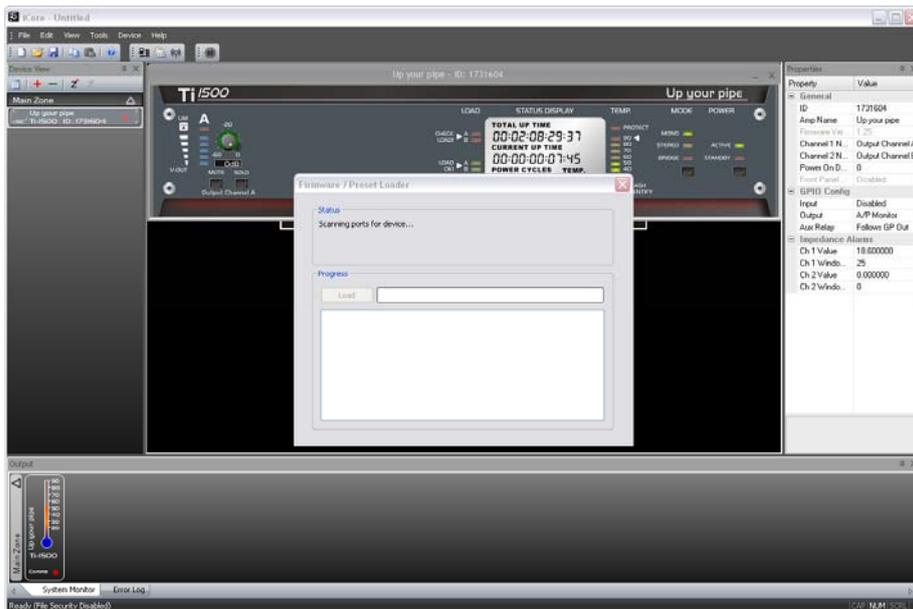
The loader will start scanning for all connected devices to determine what unit it has to update. After a few seconds the device will be found and identified (its Power LED will begin to flash). Check the model number, which will be shown in the status pane and if OK, press the "Load" button.

The unit will mute and the update will start.
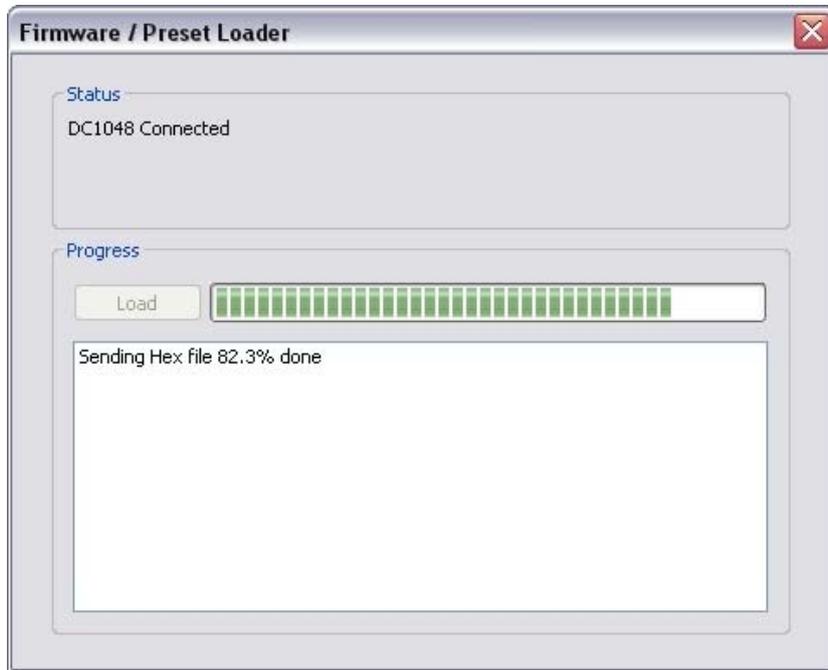
DO NOT START ANY OTHER PROGRAMS DURING THE UPDATE!
DO NOT DISCONNECT THE BREAKOUT DURING THIS PROCEDURE!

During the update the LCD will show a counter detailing the progress. The process takes less than 90 seconds and when complete, the unit will reboot automatically and a message will confirm that the update is complete.
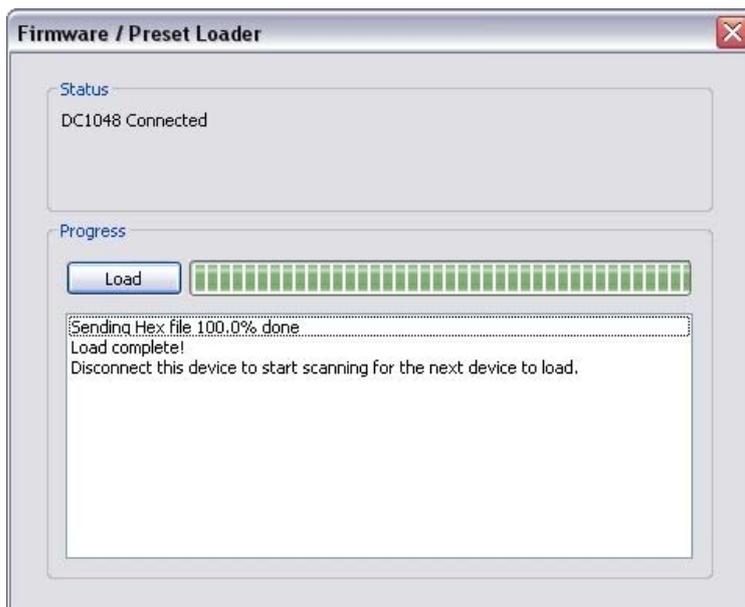
Don't forget to set the Comms mode back to Slave if the unit was part of a network.

Repeat this procedure for all units as required.

Appendix II: Limiter Types and Setting Thresholds

Program Limiter and "D-Max" Limiter

The DC1048 has two levels of dynamic protection on its outputs – a traditional program limiter, and a newly introduced "D-Max" limiter.

Program Limiter

High performance digital limiters are provided for each output with control over attack time, release time and threshold parameters - see page 49 for details. This level of control allows the user to balance the required subjective quality of the limiter against the driver protection requirements. It does also mean that an incorrectly set limiter may sound awful! In particular, as with all limiters, using too fast an attack or release time will result in excessive low frequency distortion. On the limiters screen in iCORE there is an option for automatic limiter time constants.   Use this option if you are unsure how to set the time constants manually. XTA recommend the use of the automatic setting.

In this mode the time constants will be automatically set from the High-Pass filter frequency according to the table below.

The time constants are set by the high pass filter frequency for that channel.

High Pass Filter	Auto Attack Time	Release Time
<10Hz – 31Hz	45mS	x16 (720mS)
31Hz – 63Hz	16mS	x16 (256mS)
63Hz – 125Hz	8mS	x16 (128mS)
125Hz – 250Hz	4mS	x16 (64mS)
250Hz – 500Hz	2mS	x16 (32mS)
500Hz - 1kHz	1mS	x16 (16mS)
1kHz – 2kHz	0.5mS	x16 (8mS)
2kHz – 32kHz	0.3mS	x16 (4mS)

"D-Max" Clip Limiter

The main limitation with traditional dynamics control is the inability of the processing to react truly instantaneously to the signal. One of the most significant advantages of digital signal processing over analogue is the ability to delay the audio signal precisely and without extensive complex hardware. The entire domain of digital signal processing is based around the combination of delaying, multiplying, and accumulating numbers (representing samples of audio) to implement all the filters and dynamics processing we have come to expect today.

In the case of dynamics processing, being able to delay a signal allows the processor module to delay the main signal in relation to the sidechain (the signal being monitored relative to the threshold), so that it can compensate for peaks prior to the arrival of the main signal.

Consider the situation of a monitor engineer listening to a band perform. Having no access to dynamics processors, he has had to resort to manually 'riding the faders' in an attempt to keep control of the levels. Should the level of one of the channels on his desk reach an unacceptably high level, he will turn it down appropriately.

Audio Input (Signal being monitored)

Gain Control Element

Output to Amp/Speaker System

Feedback Path from Monitor Engineer's Ears to Hand forming Sidechain Control Signal
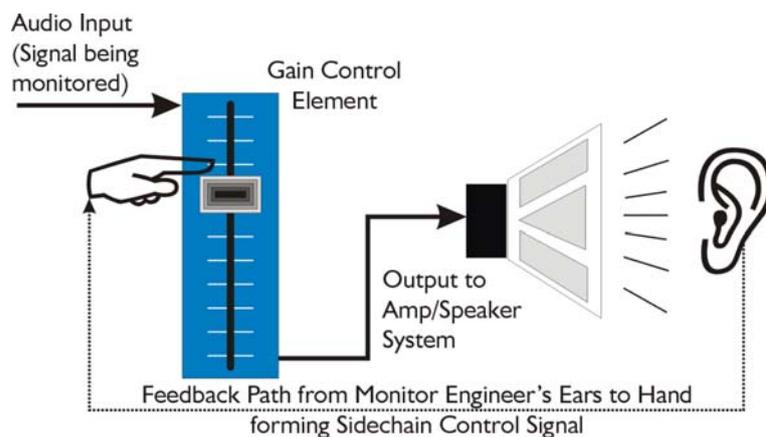
There is a hidden sidechain in operation even in this case. The main signal path is fed through the monitor desk and the gain controlled by adjusting the fader.

The sidechain is formed by the feedback path between the engineer's ears checking the level and his brain instructing his hand to turn the fader down if the volume goes over the threshold he has chosen.

In this case, the delay between the signal actually going over the threshold, the engineer registering the situation, and then turning the signal down will be in the order of several hundred milliseconds at best. This will only be true if he is not distracted – in reality, it may be several seconds before any gain reduction is imposed on the signal to bring it under control.
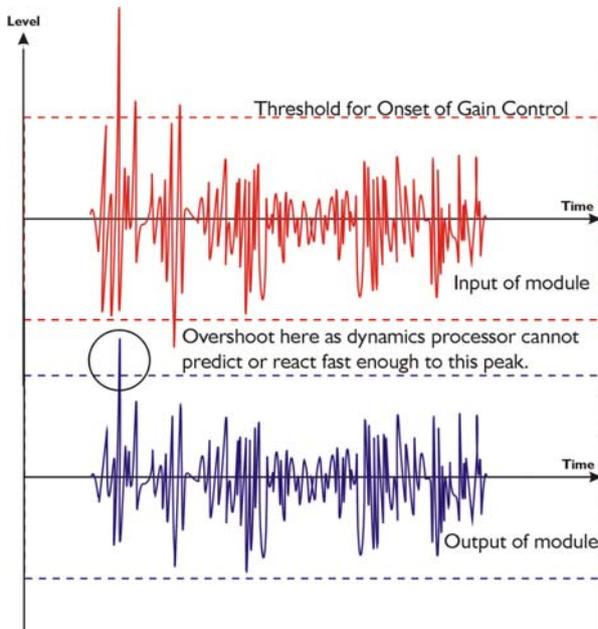
For an analogue dynamics processor, the situation is much better. Controlling the gain electronically, and not relying on a human sidechain feedback mechanism, it can react much more quickly.

The red waveform represents the input to the dynamics module, with the dotted line showing the threshold for gain control to occur. There are several peaks towards the start of this signal that are above the threshold, and so the dynamics processing should react to these as appropriate. (In this case reduce the gain).

The blue waveform shows the output of the dynamics module. The circled peak demonstrates that the processor has missed the first peak above the threshold (as it is very fast and short), but has 'caught up' shortly afterwards, keeping all other peaks under control. As it is unable to predict what is coming, this will always be a failing with analogue dynamics processing.

The "D-Max" clip limiter predelays the sidechain signal, resulting in a "zero overshoot" limiter, which is able to catch all peaks and provide a reliable absolute maximum setting for the output of any channel.
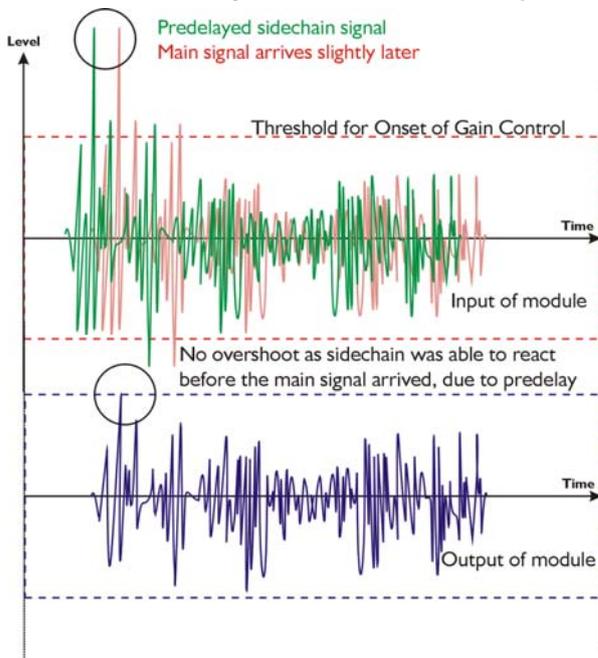
The predelayed sidechain is shown in green, with the main signal in red. As the main signal arrives slightly after the sidechain, the output from the unit does not suffer from the overshoot problem.

Remember that this delay is only in the order of tens of uS, and is a **predelay** – the sidechain is moved **back** in time in relation to the main signal. Inserting a delay into the **main** signal path of an analogue dynamics processor will achieve similar results, but with the penalty of delaying the main signal by the amount of look ahead delay introduced.

The "D-Max" limiter has only two parameters to adjust - the release time (either Fast, Medium, or Slow) and the threshold. Note that the threshold is set to be a minimum of 2dB above the threshold of the program limiter – setting the threshold to 10dB Above, means that no more than 10dB of overshoot above the threshold of the program limiter will ever be allowed. The release time may also be set to follow the High Pass filter of the output by selecting the "Auto" option on the limiters screen in **iCORE**.

Setting Accurate Limiter Thresholds

The limiters in the DC1048 are intended to be used for loudspeaker driver protection, as opposed to amplifier protection. All modern professional power amplifiers designed for live sound use have their own limiters, which are tailored to protecting the amplifier from clipping. The following section describes how to set up the units' limiters to provide exceptional protection against driver overheating, and cone over-excursion.

Most speaker systems are given a power rating in Watts RMS. This is the maximum continuous power that the system will handle and often appears very conservative. In reality, as music program is far from continuous in nature, the peak power of the system is much higher – up to ten times the continuous figure. Any limiter, which is to protect the driver from damage, must be able to fulfil the following tasks.

- ✓ Have an attack time, which is calculated to allow transients through but keep the RMS level below the speaker manufacturers specification;

- ✓ Have a release time, which is sufficiently long to avoid the limiter itself modulating the program;

- ✓ Be intelligent enough to adjust the envelope of the limiter according to the frequency content of the program material.

The program limiters are capable of performing all these tasks. The only parameter that the user must set manually is the threshold, and it is crucial that this is done correctly. Consider the table below.

dB	Ratio	Vrms	Pwr 8 Ω	Pwr 4 Ω	Pwr 2 Ω
45	177.83	137.74	2371.71	4743.42	9486.83
44	158.49	122.77	1883.91	3767.83	7535.66
43	141.25	109.41	1496.45	2992.89	5985.79
42	125.89	97.52	1188.67	2377.34	4754.68
41	112.20	86.91	944.19	1888.39	3776.78
40	100.00	77.46	750.00	1500.00	3000.00
39	89.13	69.04	595.75	1191.49	2382.98
38	79.43	61.53	473.22	946.44	1892.87
37	70.79	54.84	375.89	751.78	1503.56
36	63.10	48.87	298.58	597.16	1194.32
35	56.23	43.56	237.17	474.34	948.68
34	50.12	38.82	188.39	376.78	753.57
33	44.67	34.60	149.64	299.29	598.58
32	39.81	30.84	118.87	237.73	475.47
31	35.48	27.48	94.42	188.84	377.68
30	31.62	24.49	75.00	150.00	300.00

Using this table it is a straightforward procedure to work out the required setting of the limiter thresholds for the system.

✓First, check the RMS power rating of the speaker system and its impedance.

✓Look up this value in the table above, using the closest value below the rated power of the speaker system. Note the corresponding 'dB' value.

✓Check the gain of your amplifier, which needs to be in 'dB'.

✓Subtract this gain figure FROM that obtained from the table to find the required absolute setting for the limiter thresholds.

Note that, for safety, always set the limiter threshold 1 or 2 dB below the maximum allowable worked out using the above method.

ALWAYS REFER TO YOUR SPEAKER MANUFACTURER FOR LIMITER SETTINGS.
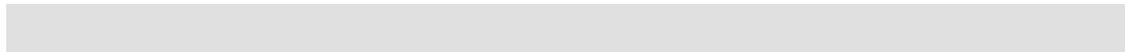
Appendix III: Parametric Filter Types and Their Uses

A wide selection of filter types has been made available under the PEQ sectiosn when editing input or output filters. Each filter type will be explained in turn in the following section.

Standard Parametric EQ

The standard parametric band has adjustable frequency, 'Q' (or Bandwidth) and Gain controls. These affect a range of frequencies symmetrically about the centre

frequency as shown in the graph.
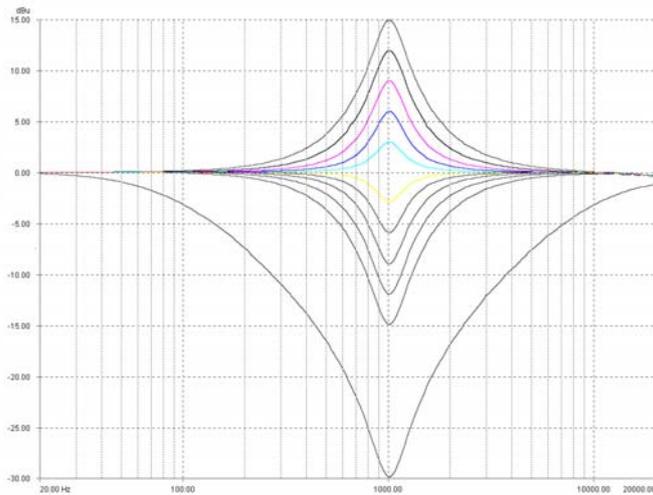
Various levels of cut/boost are shown to the left, along with various 'Q' settings (gain boosts only are shown below). Remember that 'Q' is 1/Bandwidth, so the higher the 'Q', the lower the Bandwidth, and the smaller the range of frequencies affected.
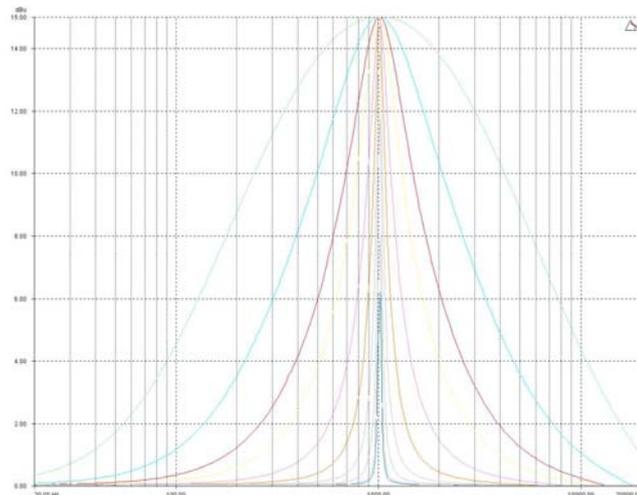
Shelving EQ (High Shelf shown)
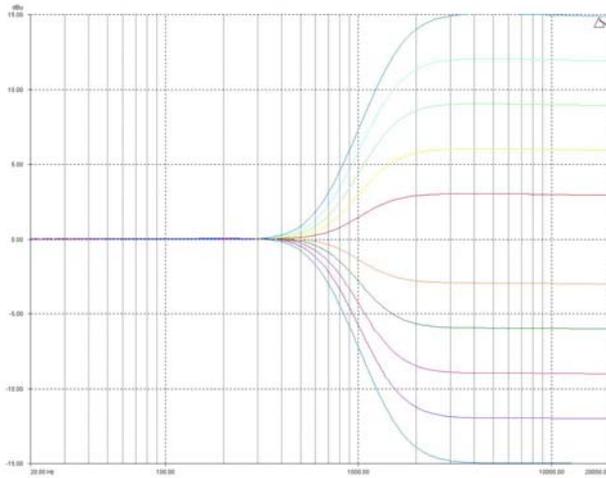
The shelving EQ has adjustable frequency, 'Q' (or Bandwidth) and Gain controls. These affect a range of frequencies from the turnover freqency as shown in the graph. For a high shelf, frequencies above the turnover frequency will be affected. For a low shelf, frequencies below the turnover frequency will be affected.

Various levels of cut and boost are shown to the left, along with various 'Q' settings (gain boosts only are show below).

Remember that 'Q' is 1/Bandwidth, so the higher the 'Q', the lower the Bandwidth, and the smaller the range of frequencies affected.

Note that 'Q' settings above 0.75 will result in slight overshoot in the filter response (as seen at the highest setting to the right). This is normal behaviour and does not indicate instability.
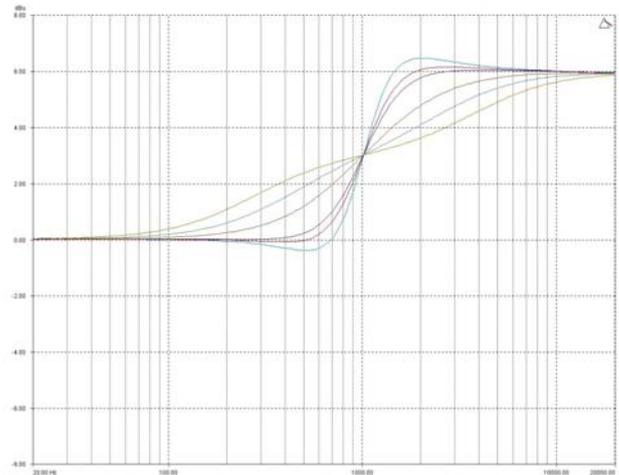
Creating a Flat-topped EQ Response
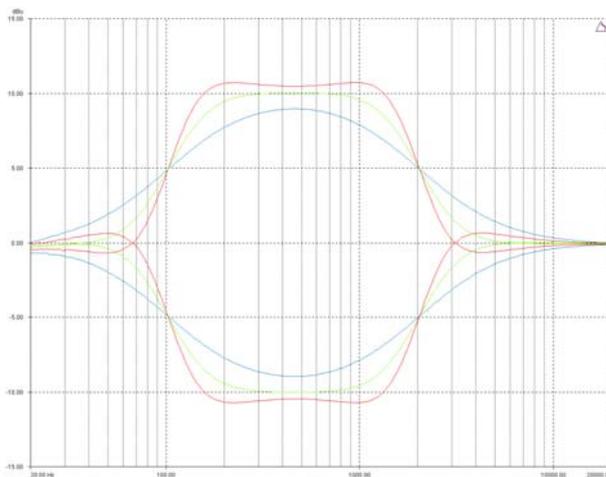
Use two EQ bands, BOTH configured as low shelves. For an overall BOOST, set the **Lower** frequency filter to **BOOST** the desired amount, and the **Upper** frequency filter to **CUT** by the same amount.

This example shows one filter at 100Hz and the other at 2kHz, with the 100Hz filter at −10dB, and the 2kHz filter at +10dB.

Varying the 'Q' affects the slope – values above 0.75 cause overshoot as shown. Assymetrical responses may be achieved by adjusting the 'Q' of each filter independantly.

Bandpass Filter
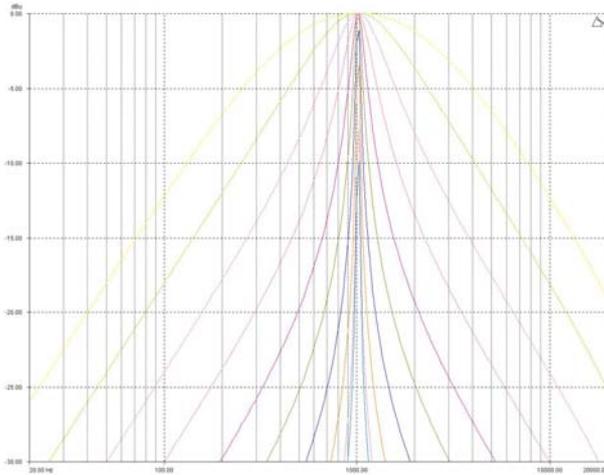
The bandpass filter has adjustable frequency and 'Q' (or Bandwidth) controls. These affect a range of frequencies symmetrically about the centre frequency as shown in the graph, gradually cutting the level, but providing no gain.

Remember that 'Q' is 1/Bandwidth, so the higher the 'Q', the lower the Bandwidth, and the smaller the range of frequencies affected.

Note that the response is fundamentally NOT a flat-topped response (so it is not constructed from a high pass and low pass). See previous page for details of how to construct a flat-topped filter response.

Notch Filter
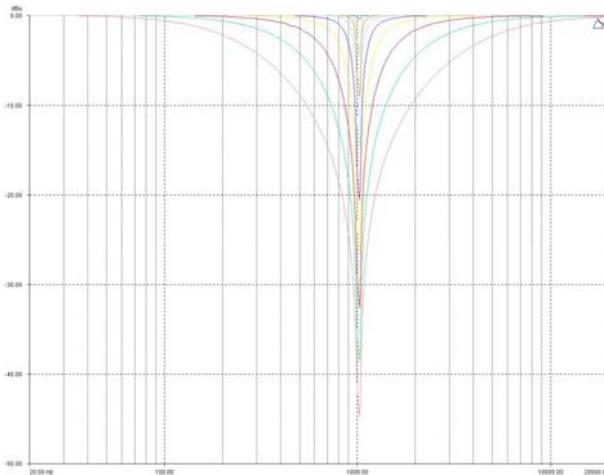
The notch filter has adjustable frequency and 'Q' (or Bandwidth) controls. These affect a range of frequencies symmetrically about the centre freqency as shown in the graph.

Remember that 'Q' is 1/Bandwidth, so the higher the 'Q', the lower the Bandwidth, and the smaller the range of frequencies affected. The notch filter depth varies with bandwidth – the wider the filter, the lower the depth will be.

All Pass Filter
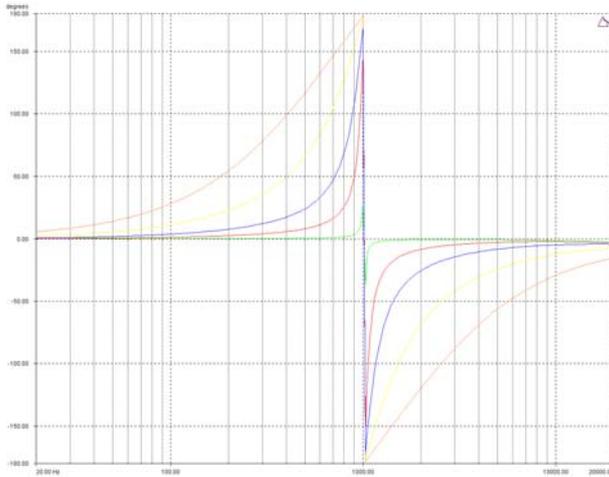
The allpass filter has adjustable frequency and 'Q' (or Bandwidth) controls. These affect the frequency at which the phase effectively flips 180°, and the 'speed' at which this transition occurs.

The graph shows an allpass filter centred at 1kHz, with various 'Q' settings – the higher the 'Q' the faster the transition.

Phase Filter
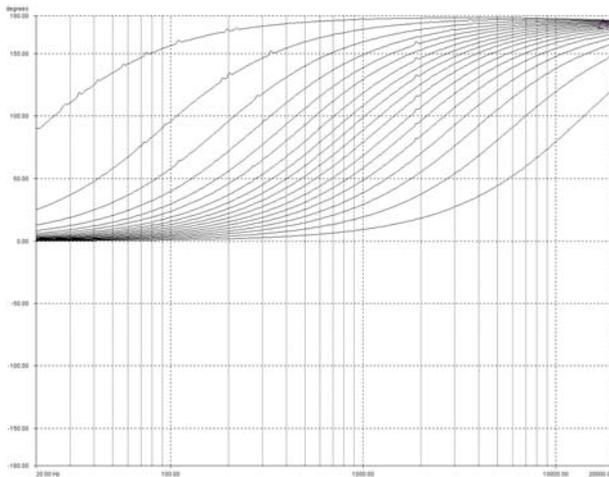
The phase filter has adjustable frequency, and phase shift controls. This introduces a phase shift that gradually changes from 180° above the centre frequency to the specified value at the centre frequency, and tending towards 0° below the centre frequency.

This graph shows the phase shift relative to the input (ignoring processing delays), in 10° steps – the filter will actually provide higher resolution than this, operating in 2° steps.The filter is centred at 1kHz in this example.

Low/High Pass Variable 'Q' Filter (Low Pass shown)
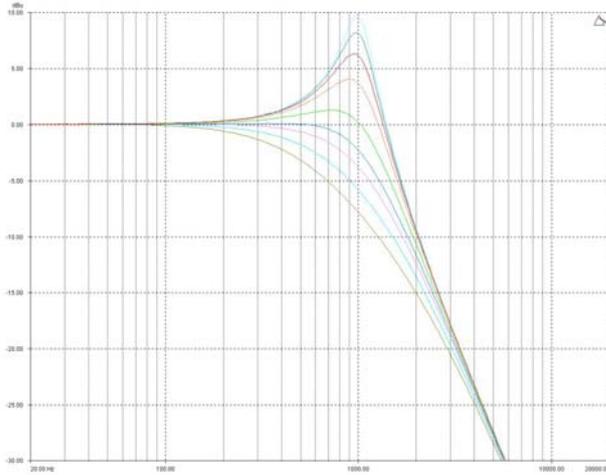
The low and high pass variable 'Q' filters have adjustable frequency and 'Q' (or Bandwidth) controls. The 'Q' control adjust the damping of the filter, so that low 'Q' settings show less overshoot at the turnover frequency, but also slower roll-off.

Remember that 'Q' is 1/Bandwidth, so the higher the 'Q', the lower the Bandwidth, and the smaller the range of frequencies affected. The filter is primarily 12dB/Octave, but in achieving this sort of roll-off with a high 'Q' value will result in quite a large overshoot in level at the turnover frequency. This type of filter is often also called a resonant filter.

Elliptical filters
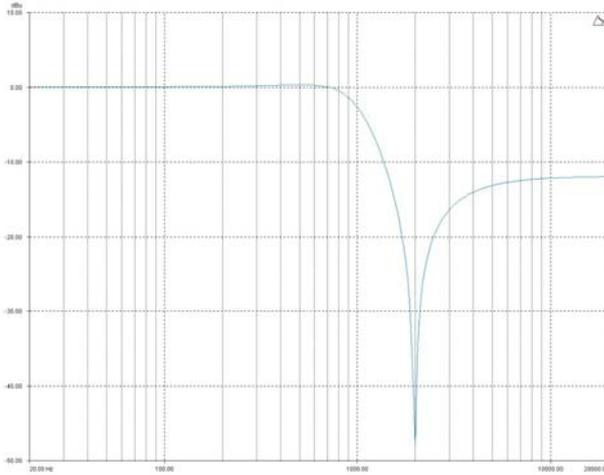
The elliptical filter has adjustable frequency only. This sets the 3dB point of the filter which features a steep roll-off of approximately 36dB/Octave down to one Octave above (or below in the case of a HPF) the turnover frequency.

However, the gain does increase again above this frequency to settle at 12dB down from 0dBr. This filter can be used in conjunction with the standard crossover filters to produce sharper roll-offs than would be otherwise achievable. The use of this filter is explained in the following example.

The graph shows three different low pass filter shapes.

Number 1 is a standard 24dB/Octave Linkwitz-Riley curve.

Number 2 is a 48dB/Octave Linkwitz-Riley.

As can be seen, number 2 is significantly steeper in roll-off than number 1, as would be expected.
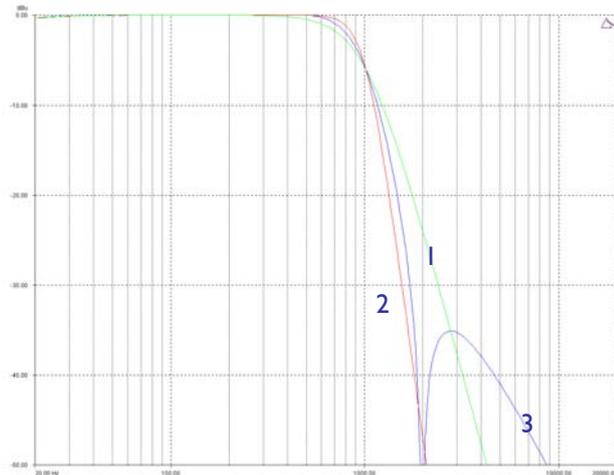
However, number 3 is a 12dB/Octave Butterworth filter with an Elliptical Low Pass filter following it. This produces a combined roll-off very close to that of the 48dB/Octave (with the side effect of the response rising again after the initial drop from the pass band).To produce a crossover filter of this shape it is simply a case of setting the low (or high) pass filter for that output to the desired crossover frequency, and selecting a 12dB Butterworth response:

Then select a parametric section on the same output, and modify its behaviour to select an HPF Elliptical filter. Set the turnover frequency of this filter to be the same as that of the crossover filter. Make sure you choose a high pass elliptical to work with a high pass crossover, and low pass elliptical to work with a low pass crossover.

Appendix IV: Maintenance

The unit will require little in the way of routine maintenance, apart from occasional routine checking of the fan outlets on the side panel.

Cleaning the casework should only be done with a cloth lightly dampened with water only. The use of chemical cleaners may damage the paint finish or dissolve printing!

Do not use abrasive cleaners, as the plastic insert will scratch - marks on this section can normally be polished out with a small amount of rubbing metal polish applied with a cloth, and then buffed to a shine again.

Appendix V: Specifications

Inputs: 4 electronically balanced
Impedance: > 10k ohms.
CMRR : >65dB 50Hz - 10kHz.

Outputs: 8 electronically balanced
Source Imp: < 60ohms
Min. Load: 600ohm
Max. Level: +20dBm into 600 ohm

Frequency Resp.: $\pm$½dB 20Hz-20kHz
-3dB @ 32kHz

Dyn. Range: >112dB 20Hz-20k unwtd

Distortion: < .02%@1kHz,+18dBm

Maximum Delay: 650 mS

Min Step Size: 0.3 μS

Input Gain: +6dB to -40dB in 0.1dB steps

Output Gain: +15dB to -40dB in 0.1dB steps and mute

Parametric Equalisation

8 per Input / 9 Sections per Output
Filter Gain: +15dB to -30dB in 0.1dB steps.
Freq. Range: 19.7Hz - 32kHz, 1/36 octave steps.
Filter Q / BW: 0.4 to 128 / 2.5 to 0.008 (Sections switched to shelving response)
Low frequency: 19.2Hz - 1kHz
High frequency: 1kHz - 32kHz
Shelf gains: ±15dB in 0.1dB steps.

High and Lowpass Filters

Filters: 1 of each per output.
Freq. Range HPF: 10Hz - 16kHz
1/36 octave steps.
Freq. Range LPF: 35Hz - 22kHz
1/36 octave steps.
Responses:
1st Order 6dB/Oct.
Bessel/Butterworth/Linkwitz-Riley 12-24dB/Oct.
Bessel/Butterworth 18dB/Oct.

Limiters
Program Limiter:
Threshold: +22dBu to -10dBu
Attack time: 0.3 to 90 milliseconds
Release time: 2/4/8/16/32 x Attack time

"D-Max" Limiter:
Attack Time: -60uS
Release Time: Slow/Medium/Fast

Display: 2 x 16 Character LCD

Input meter: 2 x 5 point, -24dB to digital clip.

Output meter: 8 x 6 point, -24dB to +4dB into limit.

Connectors

Inputs: 3 pin Phoenix

Outputs: 3 pin Phoenix.

Comms – USB (Front Panel)
RS485: 3 pin Phoenix

Power: 3 pin IEC

Power: 60 to 250V ±15% @ 50/60Hz.

Consumption: < 30 watts.

Weight: 3.3kg. Net (4.7kg. Shipping)

Size: 1.75"(1U) x 19" x 11.8"

(44 x 482 x 300mm) excluding connectors

Latency: 1.5mS (analogue in – analogue out @ 96kHz)

Due to continuing product improvement the above specifications are subject to change.

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