DP6i Audio Installation Controller

Operators Manual
Revision 1.00

XTA Electronics Ltd.
The Design House,
Vale Business Park,
Worcester Road,
Stourport-on-Severn,
Worcs.   DY13 9BZ.
England
Tel: 01299 879977 (Intl.   +44 1299 879977)
Fax: 01299 879969 (Intl.   +44 1299 879969)
Web: http://www.xta.co.uk

DP6i Quick Reference

THINGS YOU NEED TO KNOW

The parameters and their values are listed in the table below.

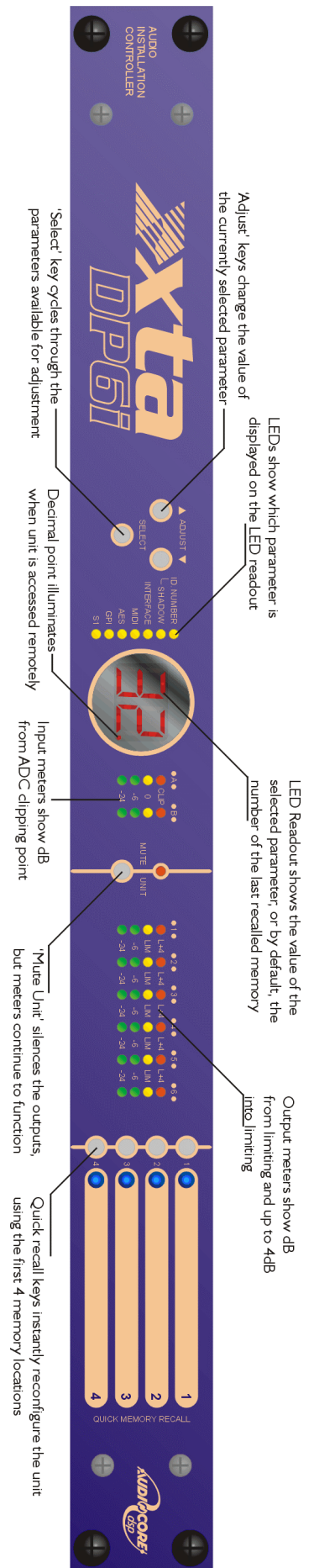| Parameter	Values	Notes
ID NUMBER	00 - 32	Shadow ID's only available when interface is set to 'slave' (INTERFACE 06 - 08)
INTERFACE	00	Master RS232 38400 baud
	01	Master RS485 38400 baud
	02	Master RS232 19200 baud
	03	Master RS485 19200 baud
	04	Master RS232 9600 baud
	05	Master RS485 9600 baud
	06	Slave RS485 38400 baud
	07	Slave RS485 19200 baud
	08	Slave RS485 9600 baud
	09	Master RS232 38400 baud & Wiser Wireless
MIDI	oF	MIDI Relay Off
	01 - 16	MIDI Relay ON channel specific – only available when Interface is set to 'Master' (00 – 05)
	AL	Midi Relay ON omni on
AES	AA	Analogue in – Analogue out
	Ad	Analogue in – Digital out
	dA	Digital in – Analogue out
	dd	Digital in – Digital out – if no AES interface is fitted or interface is set to 'Slave (06 – 08), display will be fixed at AA
GPI	oF	GPI OFF – if no GPI interface fitted, display will be fixed at Off
	on	GPI ON – works in 'simple' mode only

By default, the LED display shows the last recalled memory number as long as the memory hasn't been edited remotely – then it will display 00.

The memories cannot be recalled using the quick access keys unless the unit is in the default mode – i.e. no yellow parameter LEDs are illuminated (with the exception of the 'Shadow' LED).

Initially there will be no memories stored in the unit, so the quick memory recall buttons will not function.

The Mute Unit key will silence the entire unit, but the meters will continue to function. The remote software is unaware of this mute function – it is local control only.

Contents

CE An example of this equipment has been tested and found to comply with the following European and international Standards for Electromagnetic Compatibility and Electrical Safety:

Radiated Emissions (EU):   EN55013-1 (1996)
RF Immunity (EU):   EN55103-2 (1996) RF Immunity, ESD, Burst Transient, Surge, Dips &Dwells
Electrical Safety (EU):   EN60065 (1993)

Important Safety Information

Do not remove Covers.
No user serviceable parts inside, refer servicing to qualified service personnel.
This equipment must be earthed.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
DO NOT EXPOSE TO RAIN OR MOISTURE

ATTENTION
RISQUE DE CHOC ELECTRIQUE
NE PAS ENLEVER
NE PAS EXPOSER A LA PLUIE NI A L'HUMITE

It should not be necessary to remove any protective earth or signal cable shield connections.
Do not defeat the 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 wider blade and the third prong are provided for your safety. When the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
Only use this equipment with an appropriate mains cord.
In the USA the cord should comply with the requirements contained in the Standard for Cord Sets and Power Supply Cords, UL 817, be marked VW-1, and have an ampacity rating not less than the marked rating of the apparatus.

Thanks

Thank you for choosing the XTA **DP6i** 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 **DP6i**

After unpacking the unit, please check it 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.
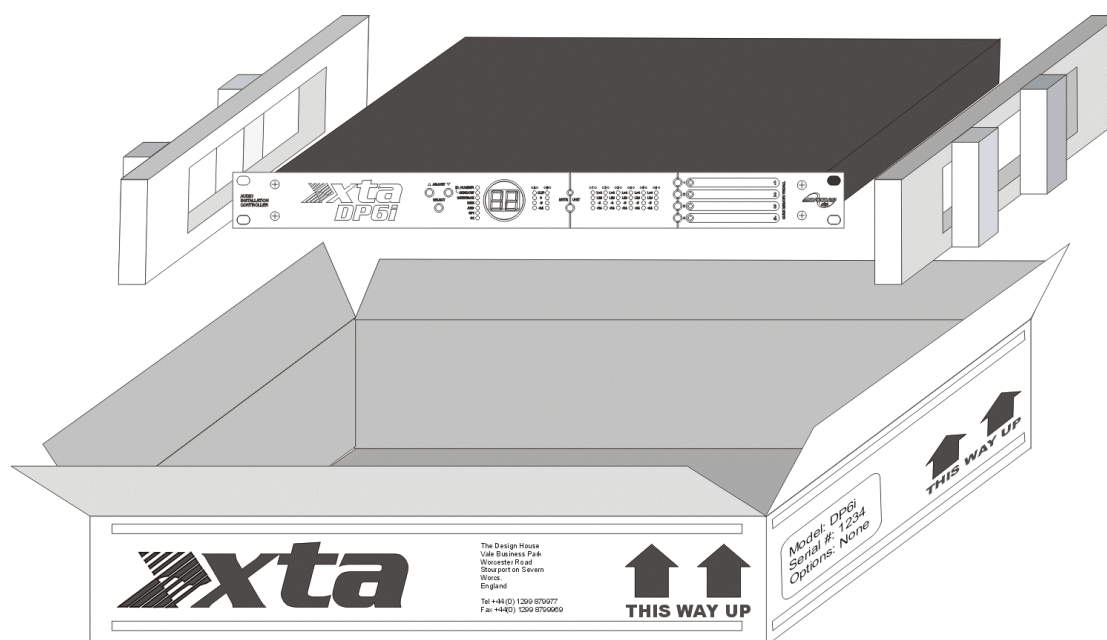
Introduction

The **DP6i** is a powerful DSP based audio processor, ideally suited for install applications, where it combines the functions of a multitude of conventional products in a compact 1U unit with extensive remote control capabilities. To achieve this, the **DP6i** has two inputs and six outputs which can be configured in five basic crossover modes – 3 x 2 way; 2 x 3 way; 4 way; 5 way; and 6 way.

Each input has a gain control, variable delay and eight bands of fully parametric equalisation. Each output has a gain control, variable delay, high and low pass filters, five bands of fully parametric equalisation, polarity switching and, additionally, a fully featured limiter.

Remote control[1] is catered for in the form of MIDI, RS232 and RS485 ports, and multiple user memories are provided for the storage and recall of settings.. Security lock-out is available for all controls.

The **DP6i** is also available with optional AES/EBU digital inputs and outputs. It may be controlled externally by XTA's proprietary ~~AUDIOCORE~~ Windows™ software, along with existing and future 'Audiocore' products.

Features

♦ Superb audio quality – carefully optimised double precision signal processing coupled with a 40-bit internal data path ensures a dynamic range in excess of 110dB. The high sampling rate means minimal filtering providing exceptional sonic purity.

♦ A flexible 2-input/6-output multi-mode format caters for any configuration, regardless of scale.

♦ A total of 46 parametric equalisation bands are available, each providing +15 to –30dB of gain at centre frequencies between 20Hz and 20kHz, with a wide range of 'Q's available between 0.4 to 128. All parameters feature fine resolution with 1/36 octave frequency steps, 0.1dB gain increments, and 100 'Q' settings. Any parametric section can also be set to operate as a high or low shelving filter.

♦ Each output features a high performance limiter, provided with complete control over attack, release and threshold parameters. To aid set-up, the output meters show headroom to the limiter threshold, and use time constants that track those of the limiter to display precise power usage.

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[1] Note that only the RS232 and RS485 interfaces offer full remote control of this product – the MIDI interface may only be used for memory recall (program change) purposes

♦ Each output features variable high and low pass filters, with a choice of 12, 18 or 24dB/Octave roll-off, and Butterworth, Bessel or Linkwitz-Riley responses. Independent control of each high and low pass filter allows asymmetric crossover bands to be created.

♦ Delay of up to 650mS may be independently set for each output, with an exceptionally fine minimum increment of 2.6μS.

♦ The comprehensive standard specification also includes 40 memories, and remote control via MIDI, RS232 or RS485 ports, with security lock-out.

♦ AES/EBU Digital input and output interfaces are available as an option.

♦ Input and output balancing transformers are also available as an option.

♦ A general purpose interface (GPI) is available as a option, allowing simple remote memory recall without the need to connect a PC.

Front Panel Familiarisation
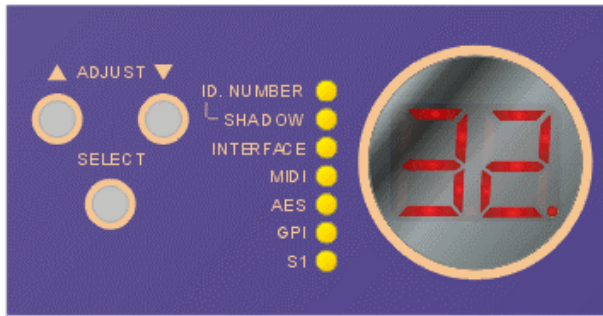
**Select Key:** Pressing this key will cycle through the options listed to the right of the key – each one will be highlighted in turn, with the LED display showing the value of the parameter.

Adjust Keys: Use these keys to alter the value of the parameter currently selected. Note that in certain circumstances, such as where an option is not fitted, (AES or GPI) the value may not be adjustable.

LED Display: This display shows, by default, the number of the last recalled memory. If this memory has been edited, the display will show 00 . If a parameter is being adjusted, the yellow LED beside its name will be illuminated, and the current value of it will be shown on the display.
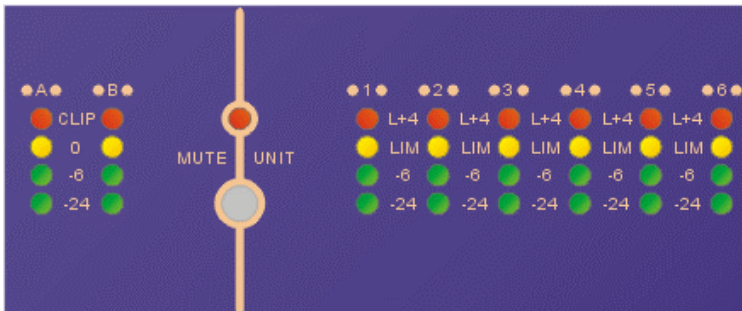
Input and Output Metering: Input meters show the headroom available below the clipping point of the analogue to digital converter. They are PRE-processing, so are not affected by the gain controls for the inputs or any applied equalisation. If the unit is clipping internally due to a DSP overflow (too much gain or excessive EQ), both CLIP LEDs on the inputs will illuminate, regardless of the actual input level, or which channel is overloading.

Mute Unit Key: Pressing this will instantly mute all the outputs. Note that the metering will continue to register. The state of this mute will be remembered on power down. Note that the remote PC controller has no knowledge of this key, as it is purely a LOCAL mute facility.

Output Meters: These show the headroom below limiting for the outputs. Adjusting the limiter threshold will cause the meter reading to change. The red LED illuminates when the level has reached 4dB over the limiter threshold. The ballastics of these meters are affected by the attack and release settings of the limiter.

Quick Memory Recall Keys: Pressing one of these keys will immediately recall the relevant memory location. See page 11 for more details of how this works.

Rear Panel Connections
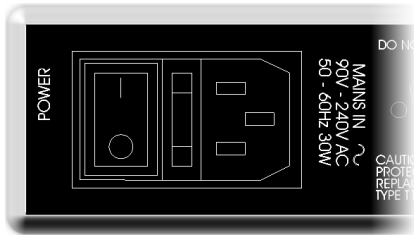
Power Switch: turns the units mains supply off and on.

Mains Fuse: located in a finger-proof holder adjacent to the mains inlet. A spare fuse is also located in this holder.

Mains Inlet: connected via a standard IEC socket.
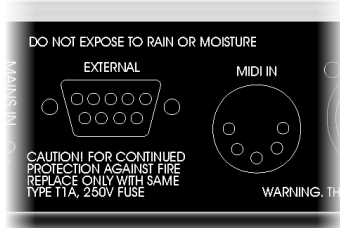
External: RS232 standard via a 9 pin D-type connector, for connection to a PC. Data is converted to RS485 standard and relayed to slave units via the RS485 sockets.

Midi IN: 5 pin DIN socket. See page 18 for more information.

RS485 In-Out: XLR sockets. Used for transmission of remote control data over long distance or multiple unit applications. See page 16 for more information.

Audio In-Out: 3 pin XLR sockets are provided for each channel. All are fully balanced, pin 2 hot, 3 cold, 1 screen.

Always replace the fuse with the correct type and rating as shown on the rear panel legend.

Operating the *DP6i*

Note about operation with ![AUDIOCORE dsp] *Windows™ software.*

The following operating information covers setup and control of the DP6i via the front panel controls only. Please consult the manual supplied with this software for information regarding full computer control.

Start-up procedure

Switching the unit on will cause all the LEDs on the panel to illuminate briefly including the display showing *8.8.*, following which the software version number will be displayed on the LED display, typically *1.0*. There will then be a fade up of the audio over a few seconds which is accompanied by a flashing *uu* on the display.

Preliminary Set-up

The procedure below should be followed when first installing a DP6i.

- ✓ Press the SELECT key so the ID NUMBER LED is illuminated and use the ADJUST keys to change the LED display to show *01*.
- ✓ Press the SELECT key once so the INTERFACE LED is illuminated and use the ADJUST keys to change the LED display to show *00*. This will select the RS232 interface and a baud rate of 38000 baud in Master mode.
- ✓ Press the SELECT key 4 more times to cycle past MIDI, AES and GPI, so that all the yellow LEDs are off.

Now, connect the unit to the computer and start Audiocore – please see page 13 for details of the interfaces and which one is best for your application.

Quick Memory Recall Keys

When the unit is first used, there will be nothing stored in the memories and the quick recall keys will not appear to do anything. Storing settings into either the first four input memory or x-over memory locations (or both) will allow these keys to gain instant access to these configurations.

The rules for what is recalled are simple: If you have stored something in input memory number 'N' and x-over memory number 'N', they will both be recalled when you select 'N'. If only an input memory is stored at number 'N' it will be recalled on its own, and similarly for the case of only a x-over memory.

Pressing the required quick access key will instantly recall the setting, illuminate the blue LED and display the number on the LED display. Note that this will change to *00* if the memory is edited remotely after it has been recalled.

Disabling the Memory Recall Keys

Under certain circumstances it might be preferable to disable the memory recall keys completely. This can be accomplished by the removal of an internal link on the front panel.

Memory Recall
Panel Keys
Enabled

Memory Recall
Panel Keys
Disabled

Mute Unit Key

Recall Keys

Output Meters
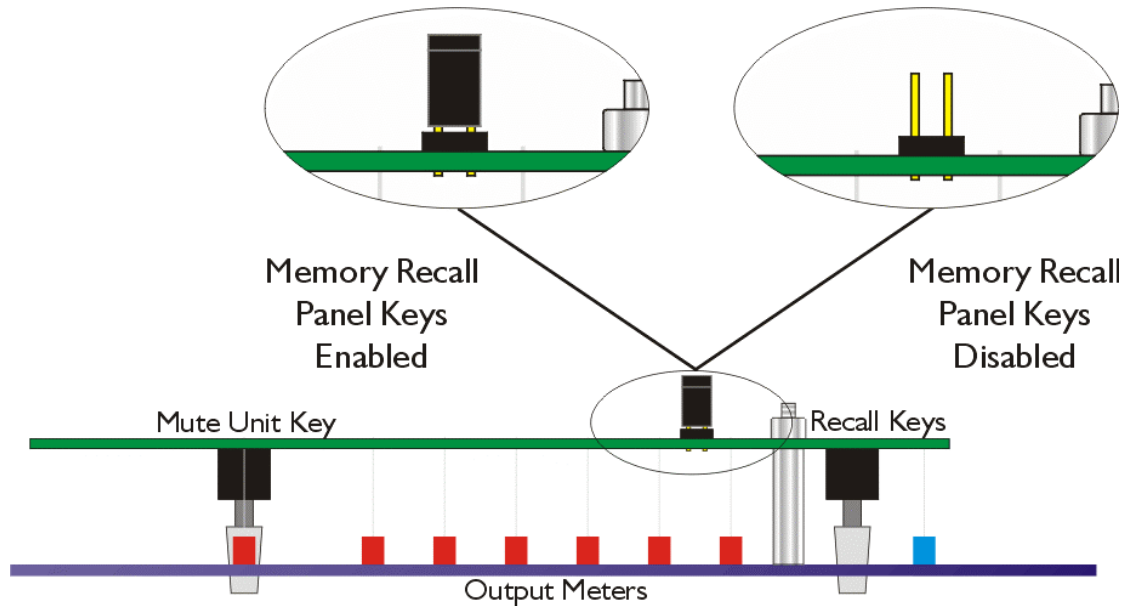
Mute Unit Key

Pressing the Mute Unit key will instantly silence all outputs, but all metering will continue to function.   Note that Audiocore is unaware of the setting of this key and once enabled, this cannot be overridden remotely – it takes precedence and is a local control only.

Interface Operation Guides

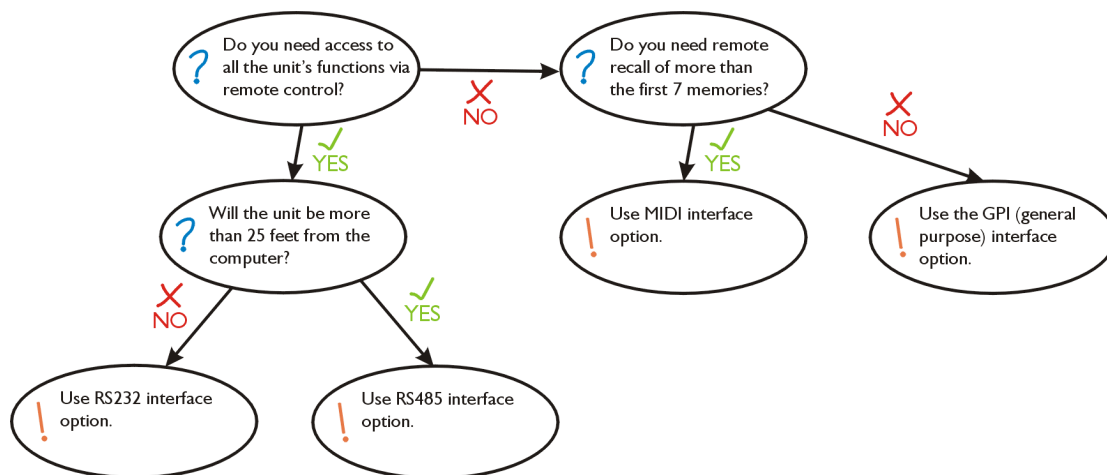As the **DP6i** has been designed primarily for installation purposes, the choice of which remote interface to use is very important. This section explains the different interface options and how to choose the best one for your application.

RS232 Interface

This interface is fitted as standard to all units and is accessed via the 9-pin D-type connector on the rear of the unit. Note that to connect to a computer's COM (serial) port correctly, a one-to-one cable must be used, and NOT a 'null modem' cable. A 'null modem' cable has the 'transmit' and 'receive' wires swapped over and will not work.

The RS232 connection is suitable for distances of about a maximum of 25feet between the PC and the unit. If you experience problems with the connections, consider

- selecting a slower baud rate (interface 02 or 04)
- selecting the 'Use Acknowledge Cmd' option in Audiocore (see the Remote Menu > RS232 Configuration window
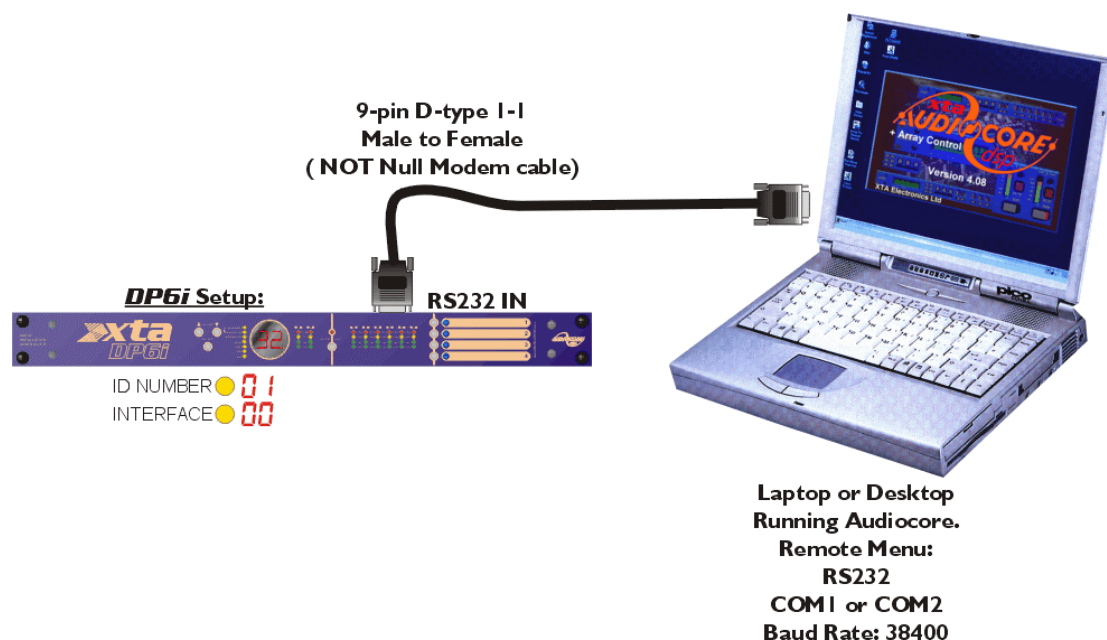- running the unit via the RS485 interface

Note than only one unit at a time may be connected to the computer via this interface. Additional units may be 'daisy-chained' via the RS485 connections from the back of the first one (it acting as a converter for them), but their RS232 ports are not used.

The RS232 interface may be used for full remote control and metering/monitoring of the unit.

RS232 Connection (Single Unit)

A typical interface set-up might involve running an RS232 link from laptop or a desktop computer to a **DP6i** set up as a master unit. The diagram below shows this method of connection, the required menu options are also given. Note that the RS232 cable must be a 1-1 connection type, NOT a null modem cable (which has connections crossed internally).

9-pin D-type 1-1
Male to Female
(NOT Null Modem cable)

DP6i Setup:

RS232 IN

ID NUMBER 01
INTERFACE 00

Laptop or Desktop
Running Audiocore.
Remote Menu:
RS232
COM1 or COM2
Baud Rate: 38400

Shadow ID Numbers

Shadow ID numbers allow extra units to share the same ID and follow the settings of the 'main' ID. This is useful for larger systems (for example anything above a 3-way stereo system) where it is only necessary to set up one side of the system, and allow the other unit to track it identically.

Using the shadow IDs in this way also reduces the apparent system complexity within Audiocore. **This is due to the fact that shadow ID's NEVER send back any settings to Audiocore and because of this will NOT appear in the list of connected units.**

They can be thought of as listening to and acting upon all information addressed to them, but not replying. Up to 31 shadow units may be connected and assigned the same ID as the 'main' unit, but remember that the maximum total units on any one RS485 network is 32.

Shadow ID numbers are accessible when the unit's interface is configured as a slave (interface types 06 – 08), and will appear after ID number 32, starting from 01 again, but with the 'SHADOW' LED illuminated.

RS232 Connection (Multiple Units)

If control over multiple units is required, typically the slaves will be set up to run from the RS485 ports on the master **DP6i**. Note the incremental 'ID NUMBER' option in the unit's setup.

9-pin D-type 1-1
Male to Female
(NOT Null Modem cable)

DP6i Setup:

RS232 IN

ID NUMBER 01
INTERFACE 00

RS485 OUT

XLR - XLR

DP6i Setup:

RS485 IN

ID NUMBER 02
INTERFACE 06

RS485 OUT

XLR - XLR

DP6i Setup:

RS485 IN

ID NUMBER 03
INTERFACE 06

RS485 OUT

Laptop or Desktop
Running Audiocore.
Remote Menu:
RS232
COM1 or COM2
Baud Rate: 38400

Additional DP6i's
may be set up as slaves
with incremental ID's

RS485 Interface

This interface is fitted as standard to all units and is accessed via the 3-pin XLR sockets on the rear of the unit. Cables to connect units together or to an RS232-485 converter will need to be wired one-to-one. We recommend the use of standard shielded microphone cables, or a balanced feed from a multicore.

RS485 is a fully balanced system, capable of sending data over distances of up to one kilometre. Note, however, that this is the *total* length of connection. The RS485 output of each unit is purely hardwired from the input and so no electrical regeneration of the signal is provided. What this means is that the distance from the *first* RS485 output to the *last* RS485 input must not exceed 1km in total.
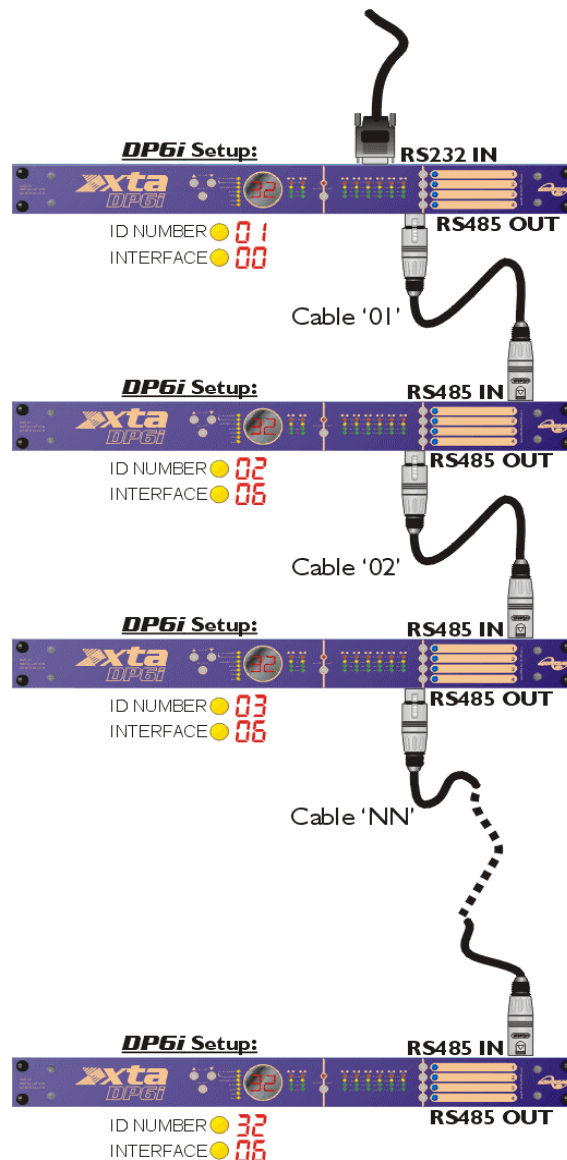
Cable' '01' + Cable '02' + …Cable 'NN' < 1000 metres

RS485 Connection

To use RS485 communication directly from a computer, a master **DP6i** must be configured to receive RS485. You must have a suitable RS485 port on your computer, or a converter connected to the serial port in use. This configuration is shown below, along with the required unit setup.
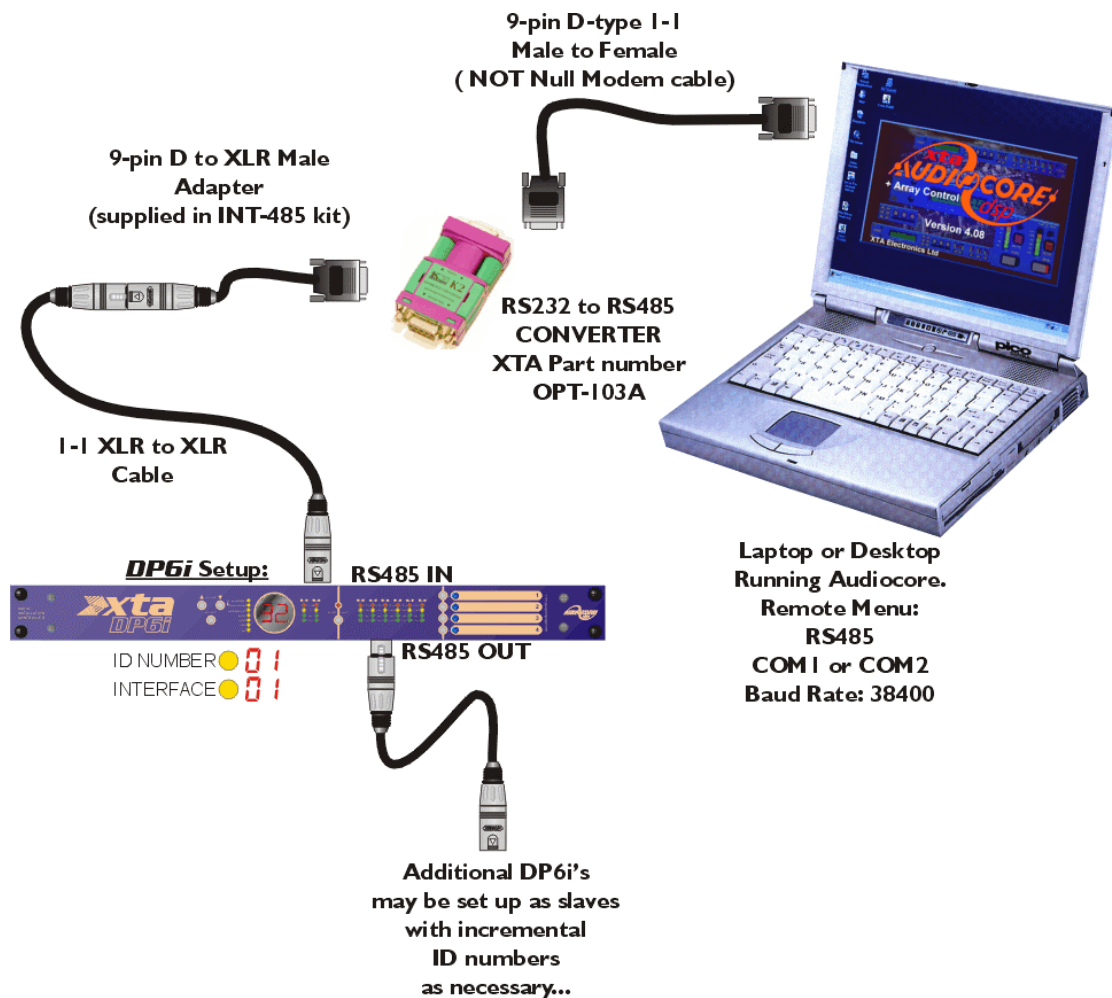
Both the converter and the required adapter cables are available from XTA.
The converter is part number OPT-103A. The adapter is available in a kit which includes an RJ-45 adapter; the XLR to 9-pin adapter, and the converter itself. This complete kit is part number INT-485.

If you need to make up one of the XLR to 9-pin adapters, the pin-out is:

XLR	D-type
1	1
2	3
3	8

Midi Interface

NOTE: This interface may only be used to trigger memory recalls.

This interface is fitted as standard to all units and is accessed via the 5-pin DIN socket on the rear of the unit. A standard MIDI cable (that is a 5pin DIN male to male wired one-to-one) will be needed to connect the unit to the MIDI interface, be it an external unit (probably in the case of a laptop) or an internal card (desktop PC).

The MIDI connection will not provide full control/monitoring facilities due to the fact that it is an input only. However, it does allow for scene changes in any sequencer or control package that supports MIDI program change messages. The memory map is given below.

Program Change 1 – 40:   Recall INPUT memories 1 - 40
Program Change 65 – 73:   Recall INPUT + X-OVER memories 1 - 9
Program Change 97 – 105:   Recall X-OVER memories 1 - 9

All other program changes sent to the unit will have no effect.

Midi Connection

To use MIDI communications, the **DP6i** must be configured to receive as a master via its MIDI port. You must have a MIDI card or interface connected to your computer or suitable device. The setup is shown below.
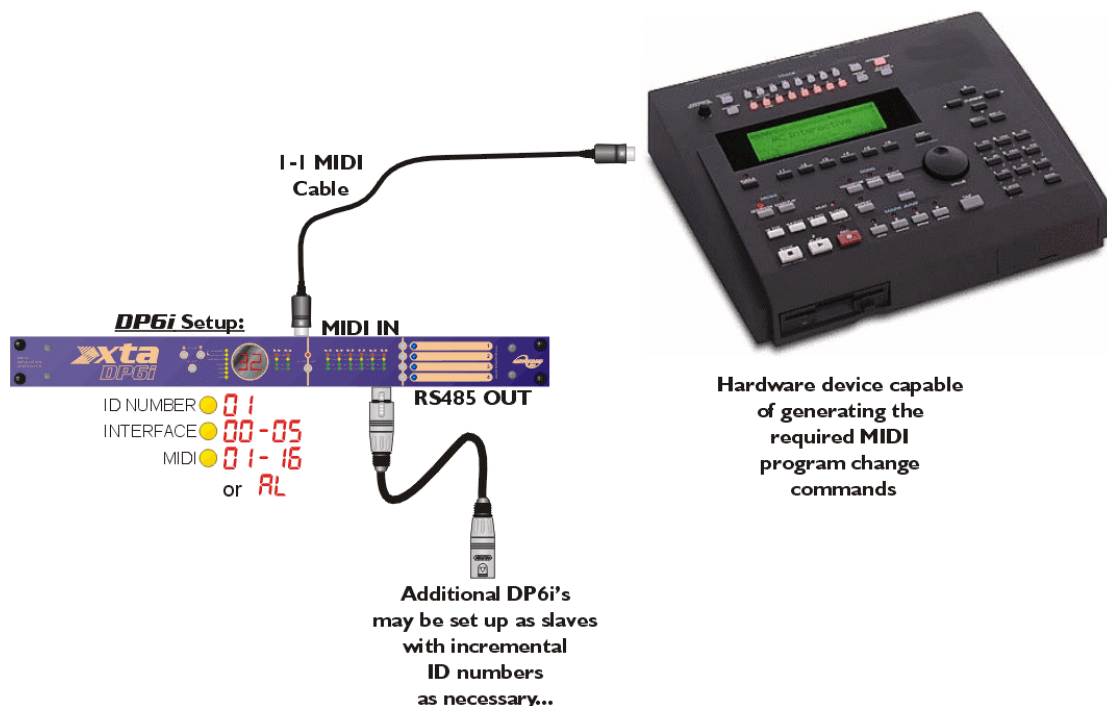
GPI Interface

In certain circumstances the connection of a computer to a **DP6i** is both impossible and undesirable, perhaps for reasons of unnecessary complexity and cost.

This is where the general-purpose interface option becomes useful. It permits the recalling of memories (input, crossover, or both) from a remote location, without the need for expensive interface controllers. Memories may be recalled using a simple wired interface.

The configuration and set-up of the interface is covered in Appendix 3 on page 36, as it is an option that is not fitted as standard.

Locking the Unit Remotely

Supplied with the **DP6i** is a remote locking program. This allows all the connected units to have their front panel controls locked out, including the Mute Unit key and the Quick Memory Recall keys.

Starting the program will display a window as shown below.
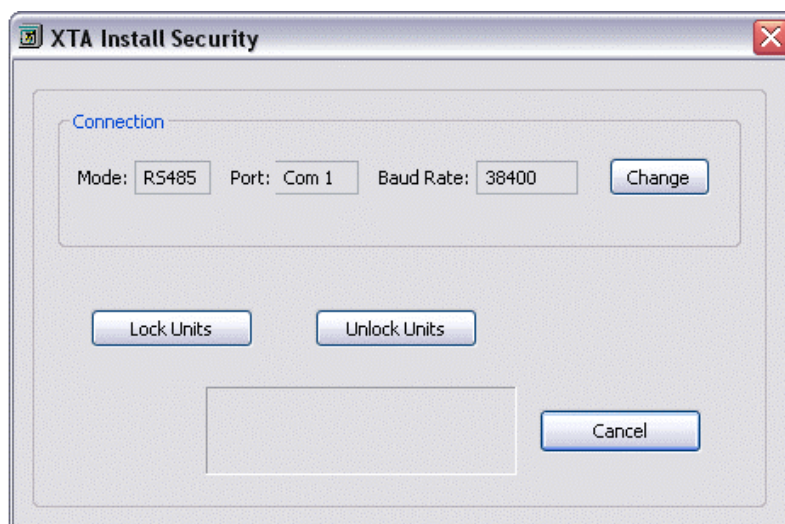
The connection should be the same as that used via Audiocore to control the unit – please see the preceding sections for information about this. Audiocore remote control is still possible when the unit is locked.

Pressing the 'Lock Units' button will ask for a password and confirmation of the same password again. Pressing the 'OK' button will send this password to ALL connected units and lock them. Confirmation of the lock is given by the units briefly showing **Lc** on their displays. Note that the password is stored in each unit, so if it is required to give a different password to each unit in a network, they will have to be connected individually to the computer.

Note that shadow units will be locked at the same time, but must be connected through a master for the program to work.

There is NO master unlock password – please contact XTA if you need to unlock your unit. There is a procedure for achieving this (without losing the settings stored in the unit), but you won't find details of it here!

Unlocking units is as simple as pressing the 'Unlock Units' button, entering the password, and pressing 'OK'. Confirmation of the unit(s) unlocking is confirmed by the display(s) briefly showing **Uc**.

DP6i Configurations

Introduction

To simplify the set-up of the **DP6i**, 5 crossover modes are selectable. These all have parametric equalisers, high and low pass filters, gain controls, delay and limiters. The following set of diagrams detail how each of the five modes is internally configured. Note that the 2 x 3 way and 3 x 2 way modes also offer the option of ganged parameter adjustment for stereo systems.
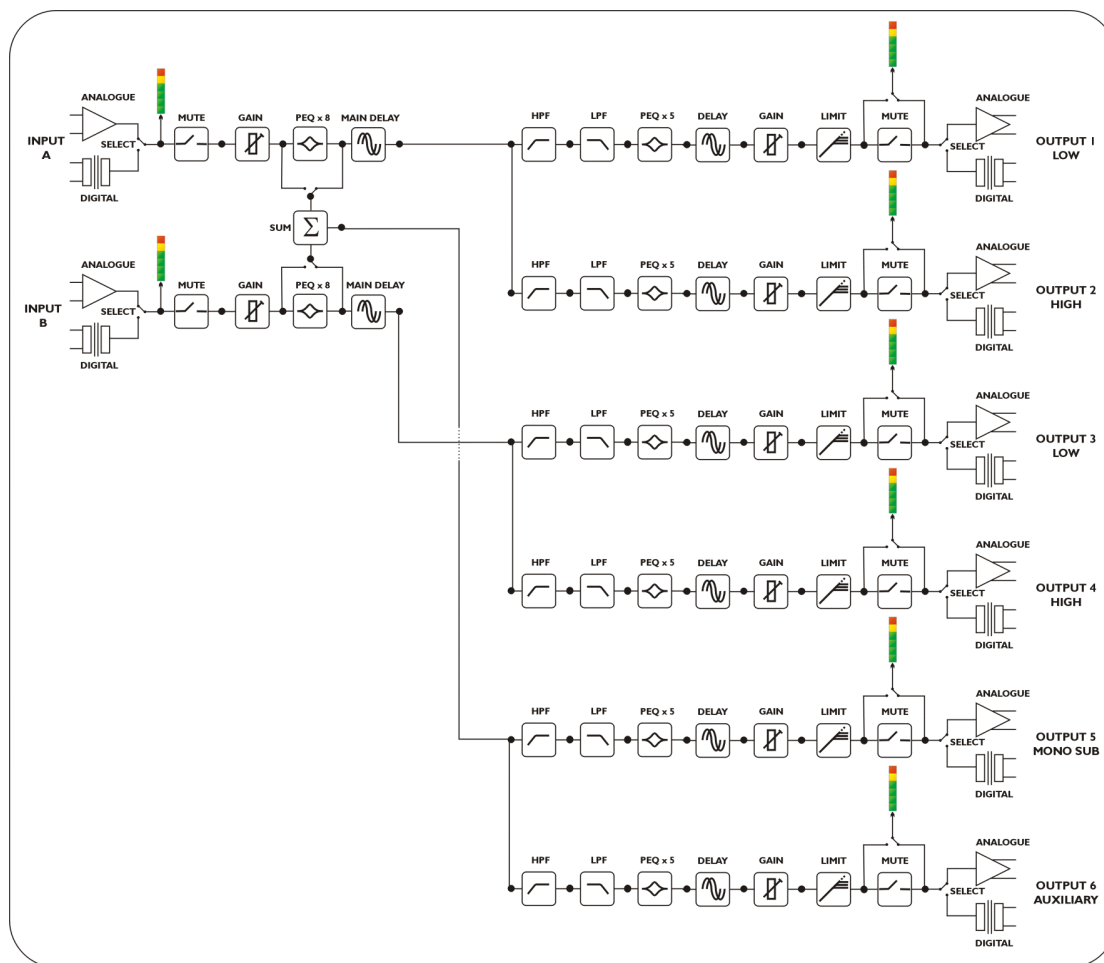
2 x 2 way with Mono Sum

This format feeds input A to outputs 1 and 2, designated low and high respectively. Input B feeds outputs 3 and 4, low and high respectively. Outputs 5 and 6 are both fed from the sum of inputs A and B. Output 6 is a full bandwidth output by default, with output 5 being bandwidth limited as a sub output. The choice of whether this summed signal is pre or post input EQ is made during the selection of this crossover configuration. Any changes made to the crossover points or EQ will not be affected by swapping from pre to post or vice versa.

2 x 3 way

This format feeds input A to outputs 1, 2, and 3 designated low, mid, and high respectively. Input B feeds outputs 4, 5, and 6, as low, mid, and high respectively. Note that this configuration, as with the 2 x 2 way, can have the outputs ganged for stereo operation. This gangs outputs 1 & 4, 2 & 5, and 3 & 6, so that they track identically. Any changes made to the crossover points or EQ will not be affected by swapping from pre to post or vice versa.
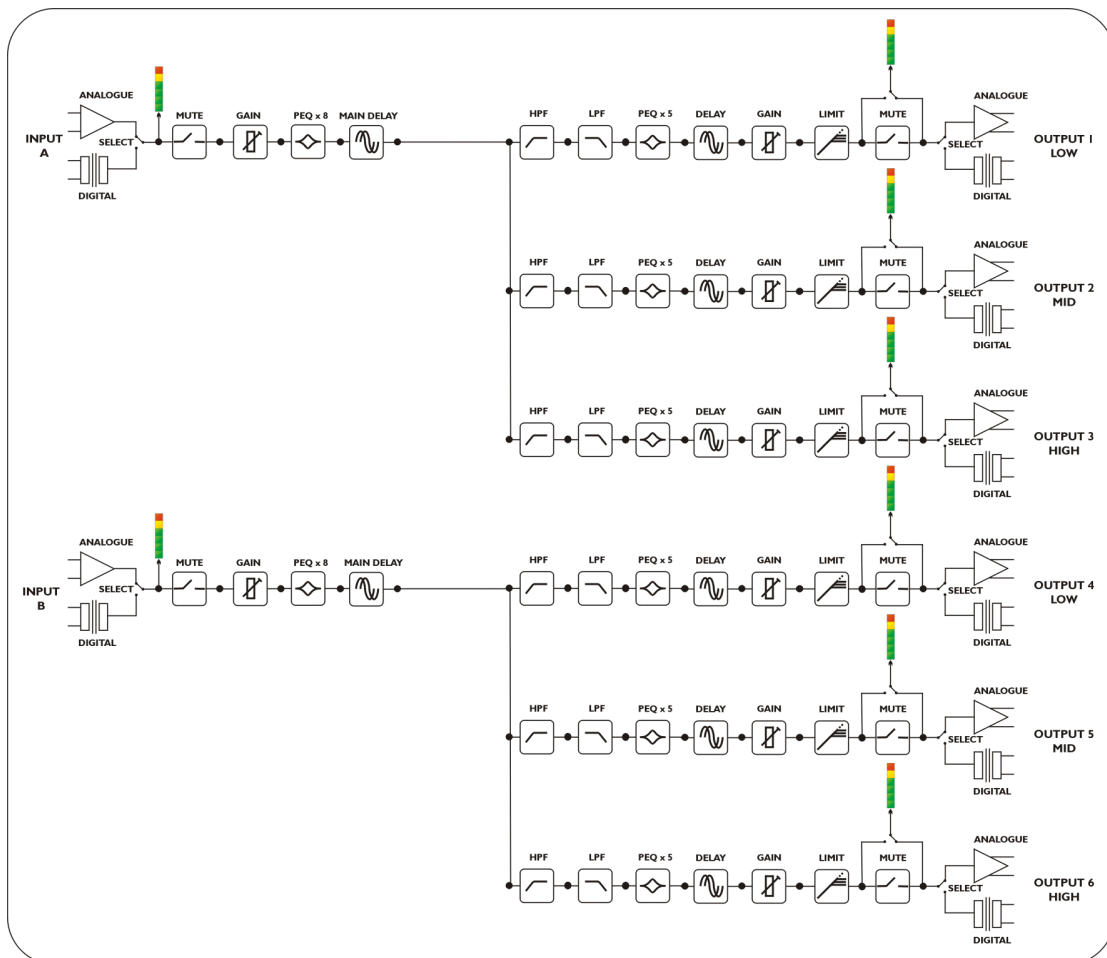
4 way + 2

This format feeds input A to outputs 1, 2, 3, and 4 designated low, lo-mid, hi-mid and high respectively. Outputs 5 and 6 are configured as auxiliaries, with their source being either input B, or the sum or inputs A and B. The choice of pre or post input EQ for the sum signal is only offered if outputs 5 and/or 6 are chosen to feed form the sum. This configuration also allows all the input EQ to be moved to input A, giving 16 bands of fully parametric EQ. If there does not appear to be any EQ on input B, this will be why.
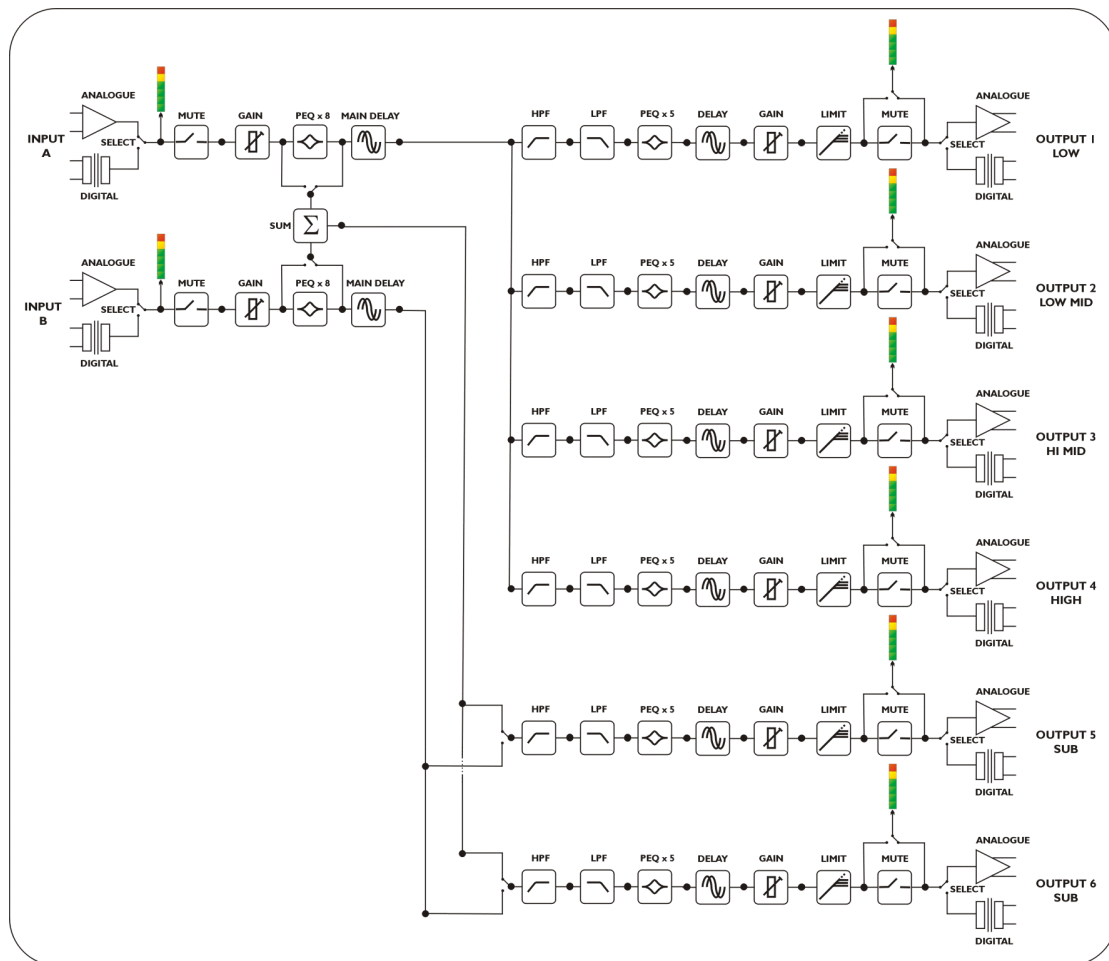
5 way + 1

This format feeds input A to outputs 1, 2, 3, 4, and 5 designated sub, low, lo-mid, hi-mid and high respectively. Output 6 is configured as an auxiliary, with the source being either input B, or the sum or inputs A and B. The choice of pre or post input EQ for the sum signal is only offered if output 6 is chosen to feed form the sum. This configuration also allows all the input EQ to be moved to input A, giving 16 bands of fully parametric EQ. If there does not appear to be any EQ on input B, this will be why.
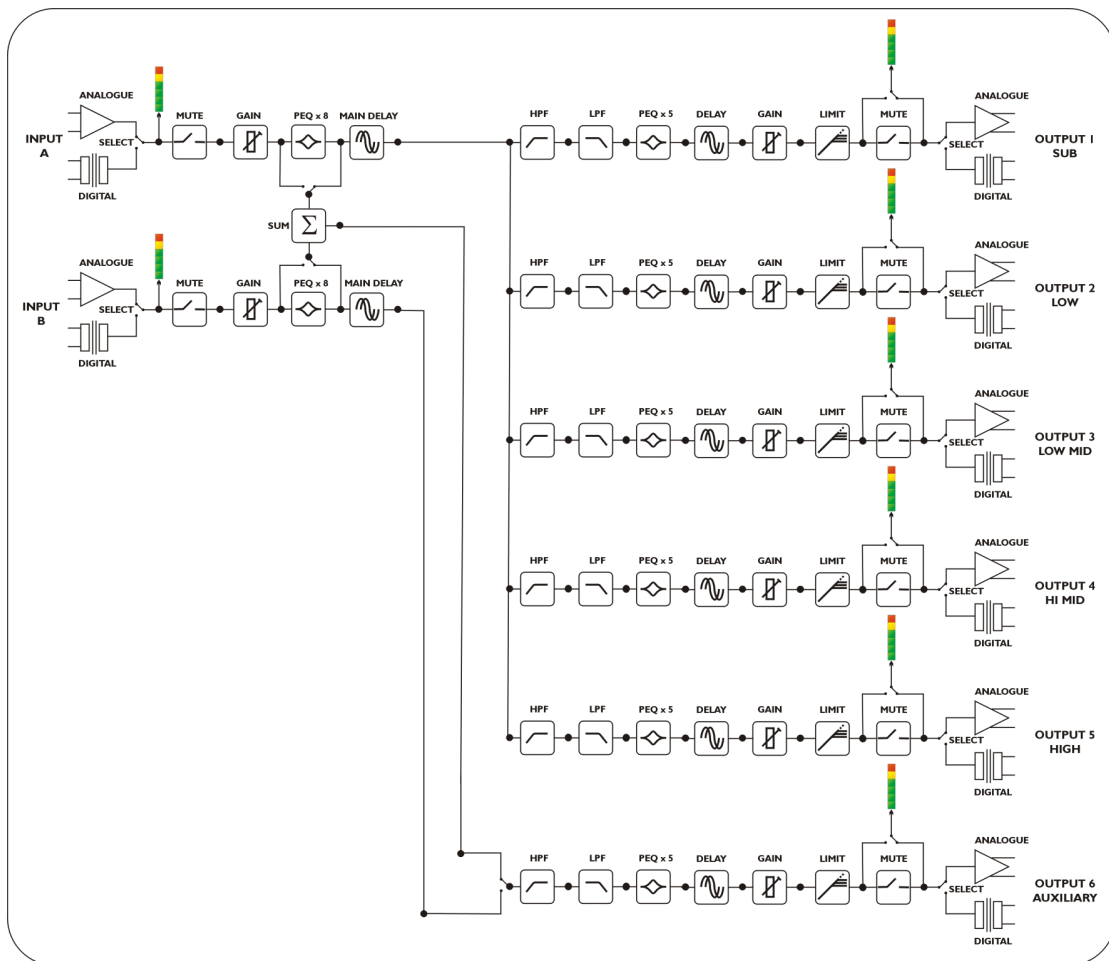
6 way

This format feeds input A to all outputs designated lo-sub, through high, 1 to 6 respectively. This configuration also allows all the input EQ to be moved to input A, giving 16 bands of fully parametric EQ. If there does not appear to be any EQ on input B, this will be why.

AES / EBU Operation Guide

Connection of AES/EBU signals is via the existing rear panel XLR connectors. With the AES/EBU option fitted, selection of the routing options is possible as follows.

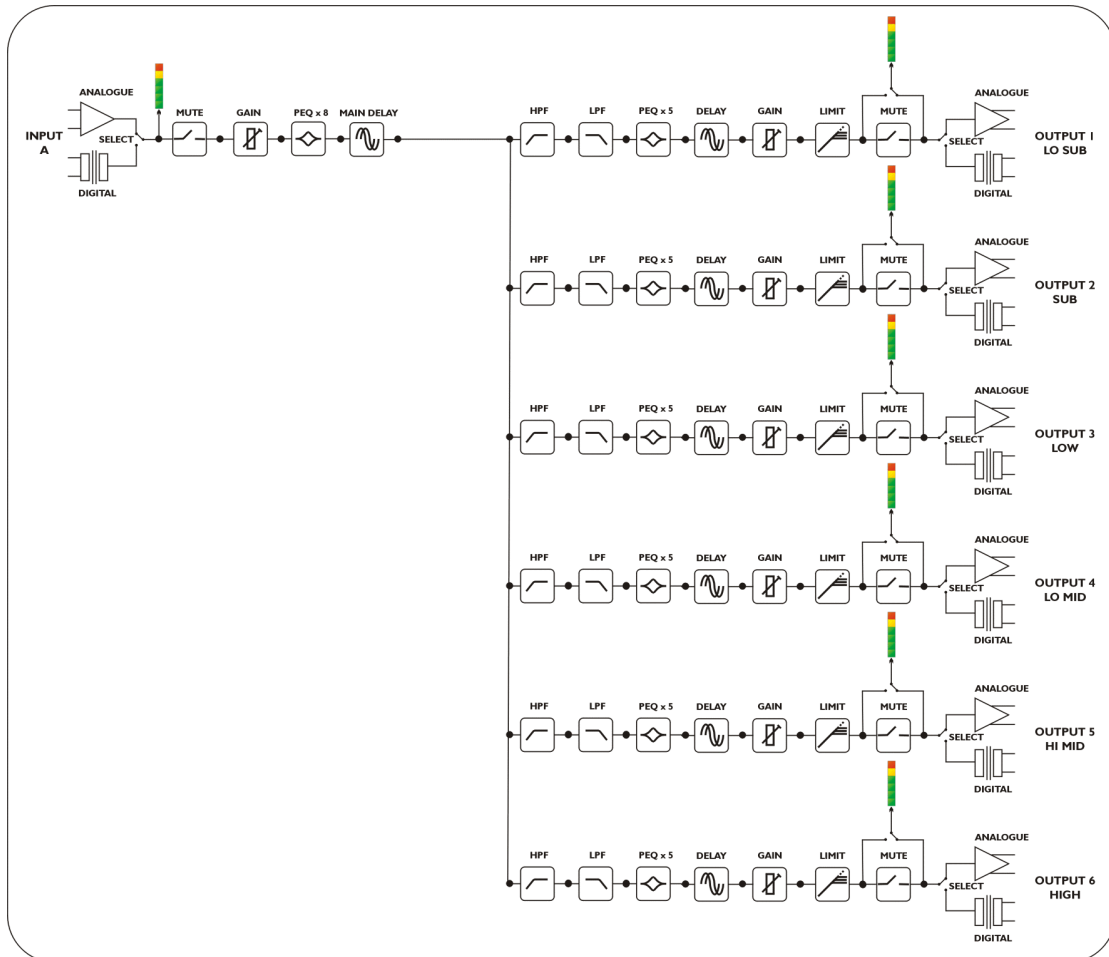Use the SELECT key to scroll down the parameters until the AES LED is illuminated. If the interface has been fitted correctly, it will not be possible to change the display on the screen to one of four options as below:

AA – Analogue in -> Analogue out
Ad – Analogue in -> Digital out
dA – Digital in -> Analogue out
dd – Digital in -> Digital out

AES / EBU Connections
The AES/EBU digital signal is a stereo data stream, and so only one input XLR and three output XLRs are used for the digital interface.

The connections are as follows:

Input A -   Analogue Input at all times
Input B -   Switchable between **digital (stereo) input** and analogue input

Output 1 -   Switchable between **digital out (for channels 1 & 2)** and analogue 1
Output 2 -   Switchable between **digital out (for channels 3 & 4)** and analogue 2
Output 3 -   Switchable between **digital out (for channels 5 & 6)** and analogue 3

Output 4 -   Analogue output 4 only
Output 5 -   Analogue output 5 only
Output 6 -   Analogue output 6 only

Note that the internal sampling rate of the DP6i is 48kHz. When the analogue in to digital out route is chosen, the output sample rate will therefore be 48kHz. This cannot be changed. When using a digital input, however, the DP6i will lock to any sample rate from 32kHz up to 48kHz, and this will be the outgoing sample rate as well.

Please be aware that as all filter coefficients and time delays are calculated based on the units professional sample rate of 48kHz, there will be an offset introduced if any other rate is used. For example, if the consumer sample rate of 44.1kHz is used, then all filter frequencies must be shifted down by a factor of 44.1/48 or 0.92. Hence a 1kHz filter will actually be centred at 920 Hz and so on.

Time related features such as delays and limiter attack and release times must be shifted up by a factor of 48/44.1 or1.09. Hence a set delay time of 100mS will actually be 109mS, and a limiter attack time of 4mS will become 4.36mS.

Operating Notes

Operating Level

With any audio signal processing equipment it is necessary to ensure adequate signal level is used through the device, to avoid sacrificing noise performance. It is suggested that the operating level chosen should give adequate level to just light the -12dB LED on the headroom meter with maximum program level being used. Since the meter is deliberately set to show clipping 3dB early, this still provides 9dB of headroom before clipping occurs. With equalisation in use it may be necessary to further reduce the input level, as gain within the unit may cause digital clipping, indicated by the top red LED's lighting independently of the rest of the meter.

It should be noted that the figure quoted for the maximum input level options is the clipping point for that option (not a safe operating level). Always ensure that this clipping point is no lower than that for the following equipment in the signal chain, and allow extra margin if equalisation sections are boosted.

Grounding

The Screen (shield) pins on all audio connectors are normally connected directly to the ground pin of the IEC mains inlet. The chassis is also directly connected to this pin. Never operate this unit without the mains safety ground connected. Signal ground (0V) is in turn connected to the chassis ground.

To avoid ground loops, cable shields should be connected to ground at one end only. The normal convention is that the shield is only connected at the output XLR. Provision is also made for separately isolating each input and output shield pin permanently within the DP6i by breaking the appropriate PCB track, where marked with a box and an arrow next to each XLR connector using a small drill bit or cutter. See the following diagram for details.
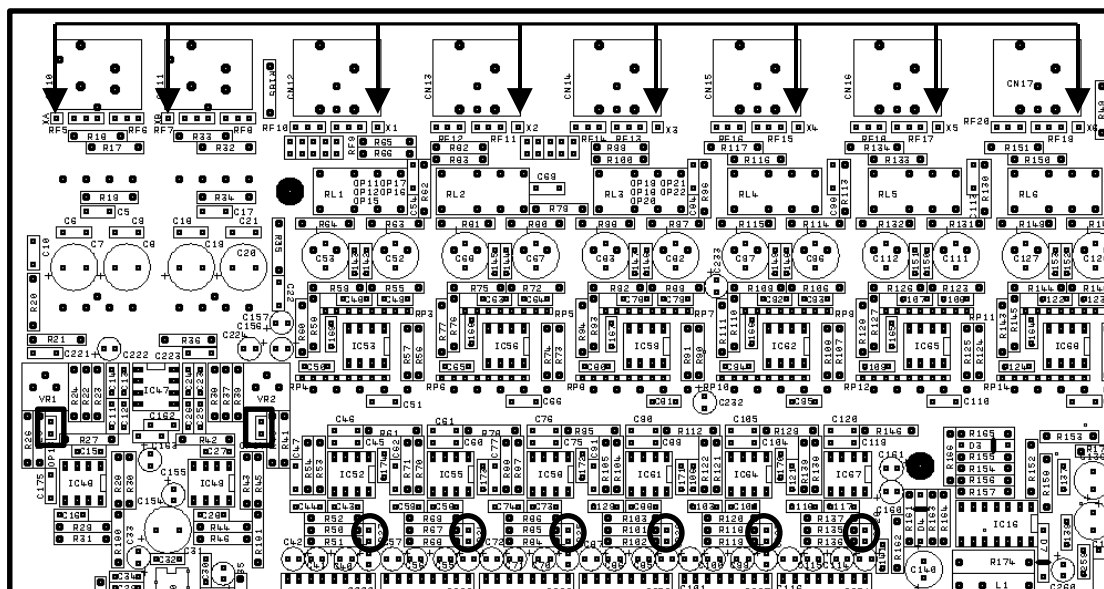
XLR pin 1 Isolation points (arrowed) and 10dB pads (circled)

Crossover Filter Slopes

Please consult the block diagrams on page 11 for details of the various configurations available. All crossover modes feature adjustable crossover frequencies with a choice of slopes, 5 bands of driver compensation E.Q. per output and delay time plus limiters for each output. A powerful 8 band parametric equaliser is also provided on each input for room equalisation. Phase reverse is provided for each output.

A choice of Bessel or Butterworth slopes at 12/18/24dB per octave and Linkwitz-Riley at 24dB per octave are provided. Since Low and High pass functions are separately adjusted, asymmetric slopes are easily achieved, if required. It should also be noted that the turnover frequency displayed in Audiocore is the -3dB point for all slopes except 24dB Linkwitz-Riley where the -6dB point is shown. If the -6dB point is to be used for the Bessel or Butterworth filter, take the required crossover frequency, multiply this by the appropriate factor from the following table and then select the closest available frequency.

Filter Type	High pass factors	Low pass factors
Bessel 12dB/Oct.	1.45	0.69
Butterworth 12dB/Oct.	1.31	0.76
Bessel 18dB/Oct.	1.37	0.73
Butterworth 18dB/Oct.	1.19	0.84
Bessel 24dB/Oct.	1.35	0.74
Butterworth 24dB/Oct.	1.15	0.87

Please note that unlike conventional analogue crossovers, crossover points and slopes are set with absolute accuracy since component tolerance problems do not occur.

Time Alignment

A further advantage of the **DP6i** over conventional products is the provision of an independently adjustable delay section for each output. This allows the true arrival time from multiple drivers to precisely aligned rather than relying on the compromise 'phase adjust' approach. Delay time is adjustable in **2.6**μS steps (1mm).

To convert from units of time (i.e. milliseconds) to units of distance use the following formula:

$$1 \text{ millisecond} = 343\text{mm } (1.126\text{ft}) \text{ @ } 20°\text{C } (68°\text{F})$$

To calculate time delay for a known distance, use:

$$\text{Time delay} = \frac{\text{Distance in meters}}{20.06 \times \sqrt{273 + °\text{C}}}$$

where °C is the temperature in °C.

To simplify this equation at 20°C.
Delay time in milliseconds =
(Distance in meters x 2.192) or (Distance in feet x 0.955)

Note: Centigrade = (Fahrenheit –32) x 0.5555.

Output Limiters

High performance digital limiters are provided for each output with control over attack time, release time and threshold level parameters. 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 Limiter control screen within Audiocore there is an option for automatic limiter time constants.

In this mode the time constants will be automatically set from the Highpass 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 – 22kHz	0.3mS	x16 (4mS)

Setting Accurate Limiter Thresholds

The limiters built into the **DP6i** 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 **DP6i**'s 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 **DP6i**'s limiters are capable of performing all these tasks. The only parameter which 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. Follow the steps described overleaf.

- ✓ 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 the dB value 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.

Specifications

Inputs: 2 electronically balanced◆
Impedance: > 10k ohms.
CMRR : >65dB 50Hz - 10kHz.

Outputs: 6 electronically balanced◆
Source Imp: < 60ohms
Min. Load: 600ohm
Max. Level: +20dBm into 600 ohm

Frequency Resp.:±½dB 20Hz-20kHz
Dyn Range:>110dB 20Hz-20k unwtd
Distortion:< .02%@1kHz,+18dBm
Maximum Delay: 650 mS
Min Step Size: 2.6 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 / 5 Sections per Output
Filter Gain: +15dB to -30dB in 0.1dB steps.
Freq. Range: 20Hz - 20kHz, 1/36 octave steps. (368 positions)
Filter Q / BW: 0.4 to 128 / 2.5 to 0.008 (Sections switched to shelving response)
Low frequency: 20Hz - 1kHz
High frequency: 1kHz - 20kHz
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:
Bessel/Butterworth 12-18-24dB/Oct.
Linkwitz-Riley 24dB/Oct.

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

Display: 2 x 7-segment LED

Input meter: 2 x 4 point, -24dB to digital clip.
Output meter: 6 x 4 point, -24dB to +4dB into limit.

Connectors
Inputs: 3 pin female XLR
Outputs: 3 pin male XLR.
MIDI In: 5 pin DIN
External: 9 pin DEE connector (RS232)
RS485:3 pin male XLR (out) 3 pin male XLR (in)
Power: 3 pin IEC

Power: 60 to 250V ±15% @ 50/60Hz.
Consumption: < 20 watts.
Weight: 3.5kg. Net (4.8kg. Shipping)
Size: 1.75"(1U) x 19" x 11.8" (44 x 482 x 300mm) excluding connectors.

Options   ◆ = Transformers available.
Optional Interfaces AES/EBU Digital Input/Output
        Due to continuing product improvement the above specifications are subject to change.

Warranty

This product is warranted against defects in components and workmanship only, for a period of one year from the date of shipment to the end user. During the warranty period, XTA will, at it's discretion, either repair or replace products which prove to be defective, provided that the product is returned, shipping prepaid, to an authorised XTA service facility.

Defects caused by unauthorised modifications, misuse, negligence, act of God or accident, or any use of this product that is not in accordance with the instructions provided by XTA, are not covered by this warranty.

This warranty is exclusive and no other warranty is expressed or implied. XTA is not liable for consequential damages.

Options and Accessories

Part Number	Part Description
ITX-100	*DP6i* Transformer balanced inputs (factory fitted only)
OTX-100	*DP6i* Transformer balanced outputs (factory fitted only)
AES-6i	AES/EBU Digital inputs/outputs (factory fitted only)
OPT-103A	RS232 to RS485 converter (from PC to *DP6i*)
OPT-103B	9 pin 'D' type to XLR male adaptor cable
OPT-103C	9 pin 'D' type to 9 pin 'D' type cable. (1m)
INT-485	Kit comprising OPT103A/B/C
OPT-GPI	GPI Interface Kit

Appendices

Appendix 1: Limiter threshold in dB to Vrms lookup table.

dB	Vrms		dB	Vrms
+22	9.75		+5	1.38
+21	8.69		+4	1.23
+20	7.75		+3	1.09
+19	6.90		+2	0.98
+18	6.15		+1	0.87
+17	5.48		0	0.77
+16	4.89		-1	0.69
+15	4.36		-2	0.62
+14	3.88		-3	0.55
+13	3.46		-4	0.49
+12	3.08		-5	0.44
+11	2.75		-6	0.39
+10	2.45		-7	0.35
+9	2.18		-8	0.31
+8	1.95		-9	0.27
+7	1.73		-10	0.24
+6	1.55			

Calculation:

$Vrms = 0.7746 \times 10 \char`\^ (dBu + 20)$

Appendix 2: Default X-over settings and names for all formats.

X-over	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6
2x2 way+Ms	Low	High	Low	High	Msub	Aux
	20Hz – 1k82H	k82Hz – 22kH	20Hz – 1k82H	k82Hz – 22kH	4.8Hz – 120H	10Hz – 22kHz
2 x 3 way	Low	Mid	High	Low	Mid	High
	2.1Hz – 120H	20Hz – 1k82H	k82Hz – 22kH	2.1Hz – 120H	20Hz – 1k82H	k82Hz – 22kH
4 way + 2	Low	LoMid	HiMid	High	Aux	Aux
	15Hz – 149Hz	49Hz – 1k31H	1k31Hz – 8kHz	8kHz – 22kHz	0.1Hz – 22kH	0.1Hz – 22kH
5 way + 1	Sub	Low	LoMid	HiMid	High	Aux
	15Hz – 80.3Hz	0.3Hz – 180H	80Hz – 1k31H	1k31Hz – 8kHz	8kHz – 22kHz	0.1Hz – 22kH
6 way	LoSub	Sub	Low	LoMid	HiMid	High
	15Hz – 80.3Hz	0.3Hz – 149H	149Hz – 1kHz	1kHz – 4kHz	4kHz – 10k1Hz	0k1Hz – 22kH

Note: All filters set to 24dB Linkwitz-Riley.

Appendix 3: Additional Information: General Purpose Interface

The GPI (General Purpose Interface) allows the recall of memories via an external switch box, alleviating the need for a computer system when only memory changes are needed.

This information is reproduces in the application note that accompanies the GPI kit itself. The following parts are contained in the GPI Kit.
- One GPI Interface card;
- One 15pin D-type to 9pin D-type adaptor;
- One male 15pin D-type with hood;
- Software upgrade disk;
- One application note.

Hardware Installation.

Ensure that the unit is switched off and that the power cord is removed from the mains supply!
Position the unit so that the front panel is facing you, remove the seven retaining screws from the top cover and place the screws and cover to one side. Now locate the RS232 card and remove the retaining bolts (5mm) from the rear of the unit and unclip the connector from the main circuit board. The card can now be removed and the GPI card put in its place. Be sure to tighten the retaining screws but be careful not to strip the thread.
The installation of the card is now complete - please replace the top cover.

What can I do with the GPI interface?

The GPIP interface allows the recall of the first 7 memories in your **DP6i** via a simple contact closure interface. The rules for what is recalled are simple: If you have stored something in input memory number 'N' and x-over memory number 'N', they will both be recalled when you select 'N'. If only an input memory is stored at number 'N' it will be recalled on its own, and similarly for the case of only a x-over memory. Trying to recall a location where no memory is stored will not do anything.

What do I need to plug in to recall a memory?

On the following page there are two example circuit diagrams of GPI switches. The first is a self powered version, that is it takes its power from the unit and is therefore not fully isolated from the unit. The second diagram is a powered version, this gives full isolation from the unit, it should be noted however that **no more than 10v** should be used to activate the opto isolators as damage could occur.

Note that either individual momentary action or latching switches may be used. Additionally, a rotary switch may be used, but realise that this will mean that the seven memories will only be accessible in a linear fashion. Individual switches allows "Random Access" of the memories in any order which might be more useful. The type of switch used to build a remote interface is not crucial, but XTA suggest the following as suitable.

Farnell Components Order Code 176-477 (Momentary Push-button Variety)
Farnell Components Order Code 176-478 (Latching Push-button Variety)
Farnell Components Order Code 176-487 (Mounting Bracket for Interlocking Set)
Farnell Components Order Code 176-516 (Interlocking Cam)
Farnell Components Order Code 176-491 (Round Caps)
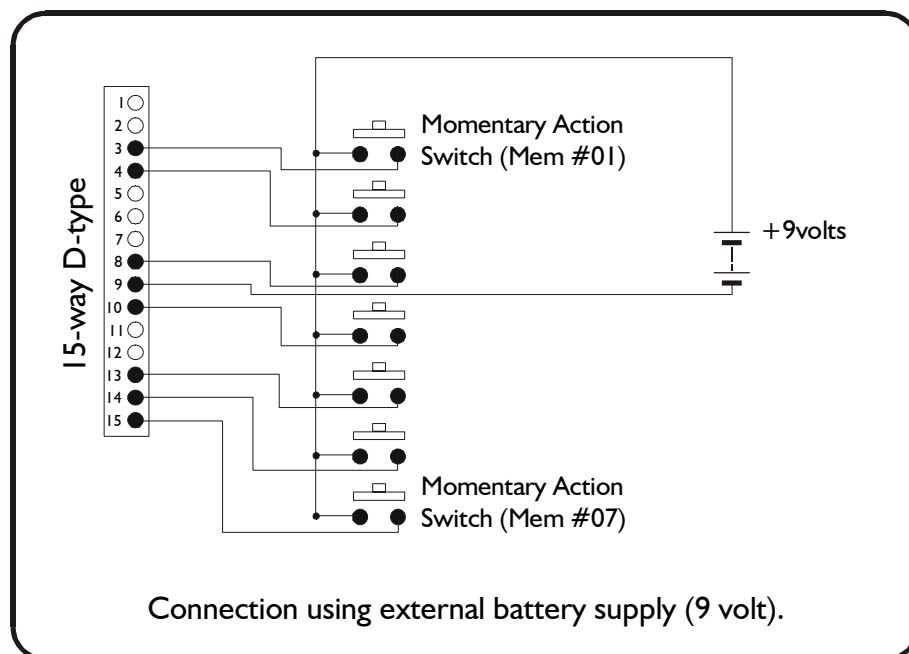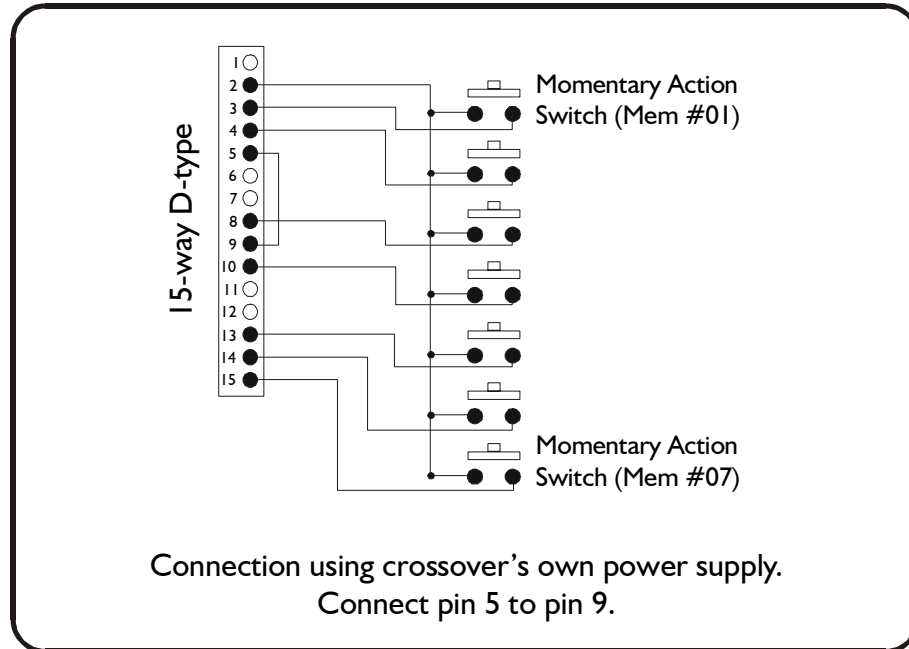Farnell Components Order Code 176-492 (Rectangular Caps)

For a rotary switch we suggest:
Farnell Components Order Code 422-381 (Rotary Non-Shorting)
Note that the rotary switch must be a 'break before make' variety, or unpredictable operation may occur.

Examples of two typical interfaces that may be used to operate the interface.

Connection using crossover's own power supply.
Connect pin 5 to pin 9.

Connection using external battery supply (9 volt).

How Do I Configure The Interface?

Use the SELECT key to scroll down the parameters until the GPI LED is illuminated. If the interface has been fitted correctly, it will not be possible to change the display on the screen from *oF* to *on*. It's as simple as that! Note that any recalls initiated using the GPI interface will relay a memory recall command out of the RS485 port, allowing all connected units to respond and change configuration at the same time.

How Do I Trigger a Memory Recall?

As can be seen from the schematic diagrams, operation just involves connecting a single pin of the socket to a positive supply, derived either from the unit (non-isolated – ground must also be connected from pin 5 to pin 9), or from an external supply. In the case of the external supply, its ground must be connected to pin 9 to complete the circuit. Only a momentary action switch is required, but latching ones may be used if a physical indication of the remote memory selected is required.
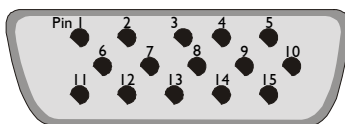
Pin Numbering of 15-pin connector
(as viewed from the rear of the unit)

Have I Lost My RS-232 Port?

No. The circuitry for the RS-232 port is included on the GPI card. An adapter is included in the GPI kit which plugs into the 15-pin connector, and converts it to the original 9-pin which may be used in exactly the same way as before. The port may be used for loading software upgrades, and remote control applications.