



bw broadcast

DSPmpX



FM Broadcast Clipper and Stereo Generator

Operational Manual
Version 2.10

www.bwbroadcast.com

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WARRANTY

BW Broadcast warrants the mechanical and electronic components of this product to be free of defects in material and workmanship for a period of one (1) year from the original date of purchase, in accordance with the warranty regulations described below. If the product shows any defects within the specified warranty period that are not due to normal wear and tear and/or improper handling by the user, BW Broadcast shall, at its sole discretion, either repair or replace the product.

If the warranty claim proves to be justified, the product will be returned to the user freight prepaid.

Warranty claims other than those indicated above are expressly excluded.

Return authorisation number

To obtain warranty service, the buyer (or his authorized dealer) must call BW Broadcast during normal business hours BEFORE returning the product. All inquiries must be accompanied by a description of the problem. BW Broadcast will then issue a return authorization number.

Subsequently, the product must be returned in its original shipping carton, together with the return authorization number to the address indicated by BW Broadcast. Shipments without freight prepaid will not be accepted.

Warranty regulations

Warranty services will be furnished only if the product is accompanied by a copy of the original retail dealer's invoice. Any product deemed eligible for repair or replacement by BW Broadcast under the terms of this warranty will be repaired or replaced within 30 days of receipt of the product at BW Broadcast.

If the product needs to be modified or adapted in order to comply with applicable technical or safety standards on a national or local level, in any country which is not the country for which the product was originally developed and manufactured, this modification/adaptation shall not be considered a defect in materials or workmanship. The warranty does not cover any such modification/adaptation, irrespective of whether it was carried out properly or not. Under the terms of this warranty, BW Broadcast shall not be held responsible for any cost resulting from such a modification/adaptation.

Free inspections and maintenance/repair work are expressly excluded from this warranty, in particular, if caused by improper handling of the product by the user. This also applies to defects caused by normal wear and tear, in particular, of faders, potentiometers, keys/buttons and similar parts.

Damages/defects caused by the following conditions are not covered by this warranty:

Misuse, neglect or failure to operate the unit in compliance with the instructions given in BW Broadcast user or service manuals.

Connection or operation of the unit in any way that does not comply with the technical or safety regulations applicable in the country where the product is used.

Damages/defects caused by force majeure or any other condition that is beyond the control of BW Broadcast.

Any repair or opening of the unit carried out by unauthorized personnel (user included) will void the warranty.

If an inspection of the product by BW Broadcast shows that the defect in question is not covered by the warranty, the inspection costs are payable by the customer.

Products which do not meet the terms of this warranty will be repaired exclusively at the buyer's expense. BW Broadcast will inform the buyer of any such circumstance. If the buyer fails to submit a written repair order within 6 weeks after notification, BW Broadcast will return the unit C.O.D. with a separate invoice for freight and packing. Such costs will also be invoiced separately when the buyer has sent in a written repair order.

Warranty transferability

This warranty is extended exclusively to the original buyer (customer of retail dealer) and is not transferable to anyone who may subsequently purchase this product. No other person (retail dealer, etc.) shall be entitled to give any warranty promise on behalf of BW Broadcast.

Claims for damages

Failure of BW Broadcast to provide proper warranty service shall not entitle the buyer to claim (consequential) damages. In no event shall the liability of BW Broadcast exceed the invoiced value of the product.

Other warranty rights and national law

This warranty does not exclude or limit the buyer's statutory rights provided by national law, in particular, any such rights against the seller that arise from a legally effective purchase contract. The warranty regulations mentioned herein are applicable unless they constitute an infringement of national warranty law.

SAFETY INSTRUCTIONS

CAUTION: To reduce the risk of electrical shock, do not remove the cover. No user serviceable parts inside. refer servicing to qualified personnel.



WARNING: To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture.



This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure—voltage that may be sufficient to constitute a risk of shock.



This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.

DETAILED SAFETY INSTRUCTIONS:

All the safety and operation instructions should be read before the appliance is operated.

Retain Instructions:

The safety and operating instructions should be retained for future reference.

Heed Warnings:

All warnings on the appliance and in the operating instructions should be adhered to.

Follow instructions:

All operation and user instructions should be followed.

Water and Moisture:

The appliance should not be used near water (e.g. near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool etc.).

The appliance should not be exposed to dripping or splashing and objects filled with liquids should not be placed on the appliance.

Ventilation:

The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa rug, or similar surface that may block the ventilation openings, or placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

Heat:

The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliance (including amplifiers) that produce heat.

Power Source:

The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

Grounding or Polarization:

Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.

Power-Cord Protection:

Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords and plugs, convenience receptacles and the point where they exit from the appliance.

Cleaning:

The appliance should be cleaned only as recommended by the manufacturer.

Non-use Periods:

The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

Object and Liquid Entry:

Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

Damage Requiring Service:

The appliance should be serviced by qualified service personnel when:

- The power supply cord or the plug has been damaged; or
- Objects have fallen, or liquid has been spilled into the appliance; or
- The appliance has been exposed to rain; or
- The appliance does not appear to operate normally or exhibits a marked change in performance; or
- The appliance has been dropped, or the enclosure damaged.

Servicing:

The user should not attempt to service the appliance beyond that is described in the Operating Instructions. All other servicing should be referred to qualified service personnel.

CE CONFORMANCE: This device complies with the requirements of the EEC Council Directives: 93/68/EEC (CE Marking); 73/23/EEC (Safety – low voltage directive); 2004/108/EC (electromagnetic compatibility). Conformity is declared to those standards: EN50081-1, EN50082-1.



WARNING: This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions in this manual it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device (pursuant to subpart J of Part 15 FCC Rules), designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, at which case, the user, at his own expense, will be required to take whatever measures may be required to correct the interference.



CANADA WARNING: This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the Radio Interference Regulations of the Canadian Department of Communications. Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux brouillages radioélectrique édicté par le ministère des Communications de Canada.

FORWARD

Thank you for your purchase of the DSPmpX digital audio broadcast processor.

Over the last decade the staff at BW have observed broadcast processors from afar with fascination and intrigue and shared a keen interest in digital audio processing. In January 2002 we decided on a whim that it was time to have a go at designing our own digital audio processor. We knew that if we were going to design an audio processor we had to do it the BW way and make the processor the most cost effective fully featured all-in-one broadcast processor on the planet. The one aim, to make an audio processor that offered all of the features found in the other more costly processors but at a fraction of the price. That processor was the DSPX!

Why DSPX? Like most products the concept is conceived nameless. The name DSPX came about for several reasons. Firstly, the BW team couldn't decide on a name we liked so the concept became DSP processor X. As the project developed it soon became clear that the processor was to be a processor for all seasons and so in true algebraic fashion X represents many things. DSPX was born.

As DSPX brand gained popularity, we decided to expand our range of products by offering stereo generator version only, for discrete STL use or re-broadcasting applications. The stereo generator in DSPmpX is built-on high performance digital stereo encoder that was proven on-air in DSPX, with even improved filtering and clipping protection.

Once again, thank you for your purchase; we hope you enjoy the DSPmpX!

BW Broadcast Team

INTRODUCTION TO THE DSPMPX

The BW DSPmpX is a new generation digital stereo generator for FM. Using the latest DSP technology the DSPmpX offers exceptional cleanliness and performance. It is not just a stereo generator with composite clipping, it's a whole back-end clipping and signal conditioning for FM processing.

The DSPmpX has been designed and built from scratch using a new approach to the design of a digital audio processor that incorporates the most up to date components. Cutting edge technologies allow the DSPmpX to produce similar results to other processors in the market but in a simpler more cost effective way. The advances we have made have allowed us to pass the savings on to our customers.

What's Under the Lid?

The DSPmpX is driven by a fast 8 bit micro-controller which controls an array of specialised analogue and digital circuits: These include 24-bit A/D and D/A converters, analogue level control circuitry, 6 x 24 bit DSP's, an ethernet port, a trigger port, an RS232 port, an LCD screen and memory devices to hold the software and firmware.

The Processing Architecture

After input selection and pre-emphasis the 24-bit digital audio signal is fed to high-quality oversampled distortion-cancelled clipper that is taken directly from our flagship processor DSPXtreme. The output of this clipper goes into overshoot compensated 15.5 kHz filter which feeds a stereo generator. The stereo generator incorporates a composite clipper as well.

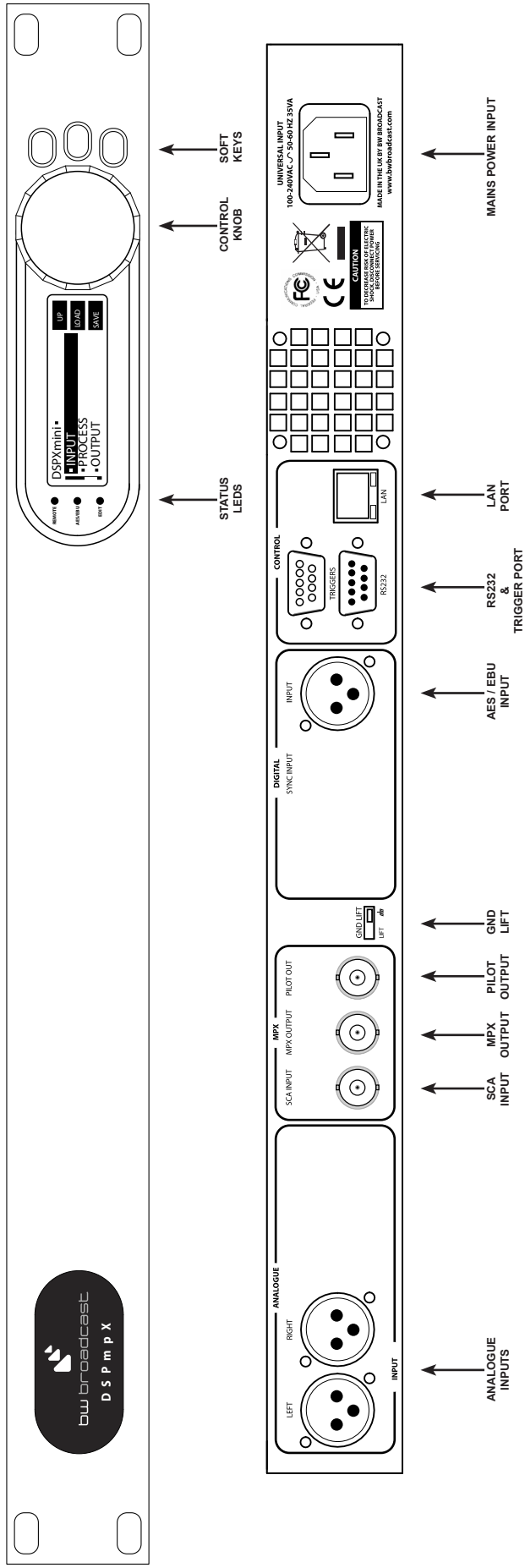
The easy to use front panel control system with LCD afford the user with ease of use and setup.

Comprehensive control of all processing parameter is available to the user both from the front panel control system and by remote (computer) control.

At a fraction of the size, weight and price of its rivals, the DSPmpX is a clear winner.

Dynamic, fresh & innovative...

... The DSPmpX



DSPmpX FRONT AND REAR PANELS

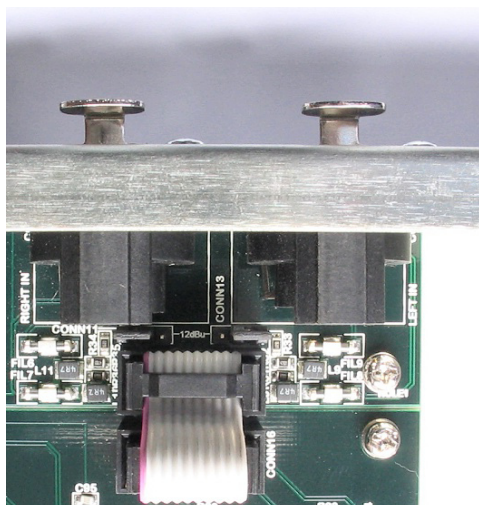
INPUT LEVEL JUMPER SETTINGS

This section applies only to units with the serial number below 500

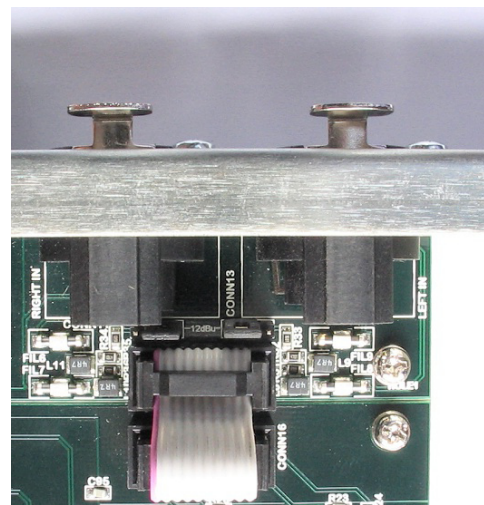
Your processor has several internal jumpers. To access them, you will have to lift the top cover after removing ten screws that hold it.

Setting input clip level

A pair of jumpers are located just behind analog input connectors and are used to set the input clip level between +24dBu and +12dBu. As shipped from the factory, jumpers are set for +24dBu operation which is suitable for standard, professional balanced levels. If the audio levels going to the processor are low and/or coming from unbalanced source, you might want to set the jumpers for +12dBu operation. You can check the levels going into the processor at any time by bringing up the metering screen (press the middle soft key on the front panel). If you are unsure, leave these jumpers at factory default.



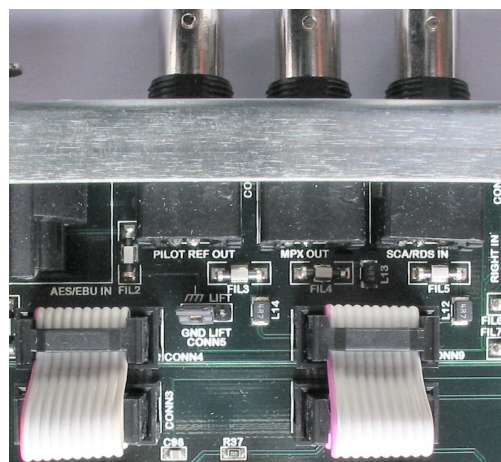
Jumpers set outwards for +24dBu clip level
(factory default)



Jumpers set inwards for +12dBu clip level

Ground lift

Ground lift jumper is located just behind Pilot Out connector. It removes circuit ground from chassis ground. If you are experiencing hum or buzz in your audio, you might want to move this jumper to the lifted position as indicated on the board.



Circuit ground tied to chassis ground
(factory default)

DSPMPX METERING

The DSPmpX metering is accesable at any time by pressing the middle soft key on the front panel. It shows instant input and output meters as well as MPX meter.

I/O metering

The input meters show the level of the input audio. The meters are 'hooked in' to the DSP code after the input source, pre-emphasis and level selection.

The output meters represent the output level in dB below full scale output.

The multiplex output metering represents the composite outputs peak level. This is a representation of the output in relation to the peak composite level of the processing and not the actual level set by the multiplex output level control.

The IO meters follows an approximation of the PPM level of the audio waveform.

STATUS LEDS

The DSPmpX front panel contains three status LEDS.

REMOTE: Indicates that the DSPmpX is currently talking to a remote computer. This will flash during an update of the firmware or remote control with the remote control application.

REMOTE ●

AES/EBU: Indicates the presence of a valid AES/EBU signal connected to the digital audio input of the DSPmpX.

AES/EBU ●

EDIT: Indicates that you are currently editing a parameter

EDIT ●

QUICK START

1. Install the DSPmpX into the rack.
2. Connect AC power to the unit, and turn on the power.
3. Connect the analogue and / or digital audio inputs.
4. Select the analogue or digital input as the source of the processing with the 'INPUT SELECTION' parameter which can be found in the 'INPUT' menu. Apply audio and observe the input meters (accessible by pressing the middle soft button labelled MTR). Adjust the 'LEVEL' and 'RIGHT TRIM' controls as necessary.
5. Select the pre-emphasis setting for your region (75 μ s for the USA and 50 μ s for Europe) if audio is not already pre-emphasized.
6. Navigate to the 'STEREO' menu and adjust the 'LEVEL' to match the transmitter (or link device) that follows the DSPmpX. Adjust for 100% modulation with audio.
7. You're on the air!

Further information on each parameter is contained in the 'menu structure' and 'setting up the processing' sections of this manual.

PRE-EMPHASIS

Even though your STL or transmitter may contain pre-emphasis we recommend disabling it, letting the DSPmpX handle the pre-emphasis for the transmission system. The DSPmpX uses overshoot compensated clipping after pre-emphasis to prevent overmodulation and sophisticated processing methods to produce tightly filtered and very clean multiplex output. Using de-emphasis and then pre-emphasis again in the transmitter will only degrade performance.

If however, you are using a broadcast multi-band dynamics processor prior to DSPmpX that includes pre-emphasis management, it might be better to disable the pre-emphasis in DSPmpX and let the dynamics processor handle the pre-emphasis. The best advice would be to try both options and see which produces a better sound.

The best solution is always to locate the DSPmpX at the transmission site. This way overshoots are minimised and quality is maintained.

USING DSPMPX AFTER CODED STLs

If DSPmpX is fed by a coded (compressed) STL system which is being fed by an FM audio processor, there are a couple of things to be aware of.

If you are using clipping in the FM audio processor, clipping products (harmonics) will alias in the encoder and will also cause encoder to "waste bits" trying to encode the (useless) harmonic content in the audio. On top of that, the encoder will typically overshoot with tightly peak controlled signal (by as much as 4 dB). All of this will increase coding artifacts as well as the distortion.

As the DSPmpX employs quality distortion-cancelling clipper, we would suggest that you try letting DSPmpX do all of the final clipping. Significantly reducing the clipper drive in the FM audio processor and then compensating for that in the DSPmpX, might result in a better audio quality on-air.

If the STL is perceptually coded, as suggested above keep the processing within your FM audio processor pre-emphasized, but set the output from your FM audio processor to flat (de-emphasized). Then restore pre-emphasis in the DSPmpX again. In traditional (analog) STL set-ups this is not desirable to do, but here you are using perceptual encoder that is designed to do masking on flat audio and will NOT sound good if you feed it with pre-emphasized audio. Also, take care not to drive the coded STL too hot - we would suggest leaving at least 5 dB of headroom for any overshoots that could be generated within the STL encoder/decoder. If you drive the encoder to 0 dBfs, the overshoots generated by and within the decoder will get clipped, which you might not notice it as the peak level will look tight, however they will increase the distortion.

THE DSPMPX AND ITS PROCESSING STRUCTURE

The DSPmpX broadcast audio processor is intended to be used for processing audio prior to broadcast on FM.

THE PROCESSING PATH

Input selection and conditioning

The DSPmpX offers the user input selection (analog or digital input), mode selection (stereo, mono L, mono R, mono sum or swap L/R) and pre-emphasis selection. Channel imbalance can be corrected with right trim control.

Main clipper

The DSPmpX main clipper is sophisticated, oversampled and overshoot-compensated clipper which produces tightly peak controlled output. An integrated steep 15 kHz filter effectively removes out-of-band frequencies and protects pilot.

Stereo encoder

The DSPmpX's DSP stereo encoder takes its inputs after the main clipper. The stereo encoder is highly oversampled and offers superb stereo performance. A composite clipping function is provided for those who wish to use it. An optional pilot protection notch filter keeps the pilot area clean of harmonics generated by composite clipping.

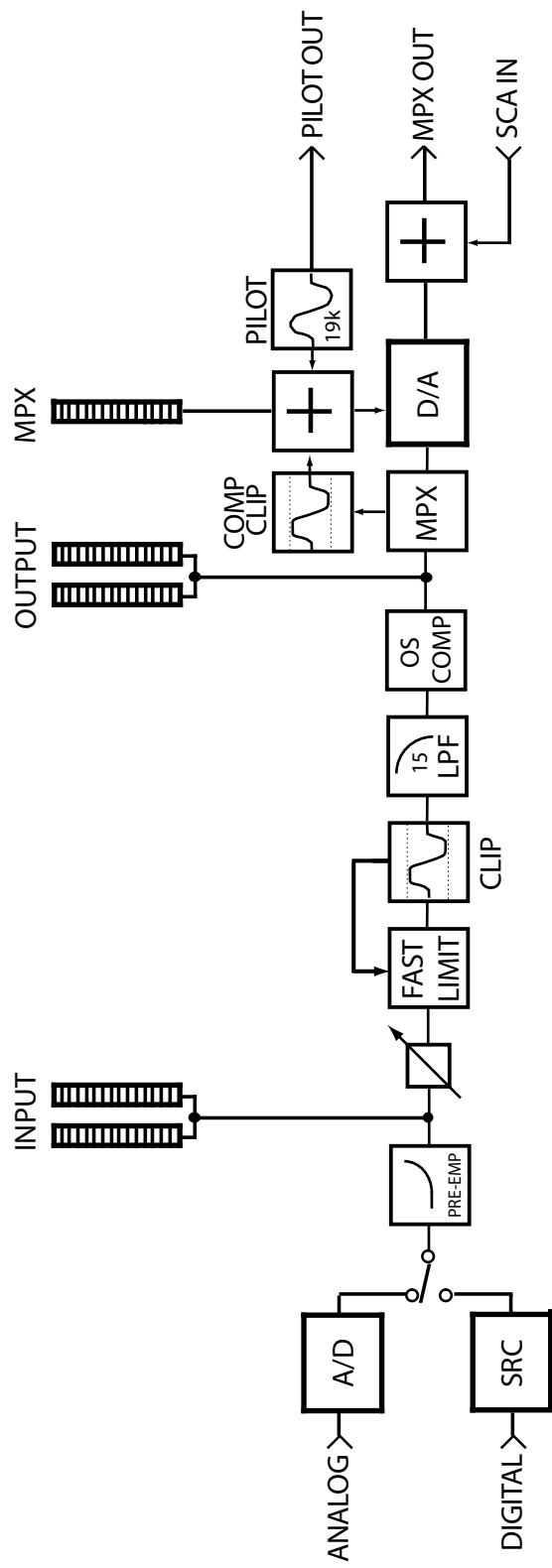
THE GAIN STRUCTURE

With the main clipper drive set to 0.0 dB, main clipper threshold will correspond to -6 dBfs. That means that any input audio peaks going above -6 dBfs (as observed on the input meters) will be clipped by the main clipper.

By changing the clipper drive, you can vary the amount of clipping for a given signal level, or effectively change the threshold of clipping. For example, if you set the clipper drive to +3.0 dB, input audio with peak level of -6 dBfs will be 3 dB clipped. Or in other words - the audio will now start to be clipped if it goes above -9 dBfs.

As the main clipper will take care of all peak level control and produce tight peak ceiling, you do not need to use composite clipping at all. The composite clipper is there at your disposal for "artistic" purposes and/or gaining additional loudness.

In a typical situation where the processor resides at the studio, audio is delivered over L/R discrete STL to the transmitter location where DSPmpX is located and connected to the transmitter, we suggest you set the output level of the STL so that the peaks are hitting -6 dBfs on the input meters. Then use Clip drive in the DSPmpX to set the desired amount of clipping (listen for distortion as well). It could be just a few dB to control the potential STL overshoots or more if you want more clipping.



DSPmpX PROCESSING BLOCK DIAGRAM

MENU SYSTEM OVERVIEW

This section presents an overview of the four main menus and their submenus and any parameters that are contained in them.

INPUT: Contains all the controls that affect input selection, level control and signal conditioning.

PROCESS: Contains all the controls that affect the processing.

OUTPUT: Contains all the controls that affect output selection, level control and signal conditioning.

SCHEDULE: Contains all the real time clock controls for switching presets (Dayparting).

SYSTEM: Contains all the system controls (non processing) such as remote control and security.

MENU STRUCTURE

MENU: INPUT

- INPUT SOURCE
- INPUT MODE
- INPUT LEVEL
- RIGHT TRIM
- INPUT FAIL SWITCH
- PRE-EMPHASIS

MENU: PROCESS

- DRIVE
- COMPOSITE CLIP

MENU: STEREO

- LEVEL
- PILOT LEVEL
- PILOT REFERENCE OUTPUT
- PILOT PROTECT

MENU: SYSTEM

- LCD CONTRAST
- TRIGGER PORT
- CODE LOCK
- REMOTE SOURCE
- MENU: LAN CONFIG
 - IP
 - DG (DEFAULT GATEWAY)
 - SM (SUBNET)
 - MA1 (MAC ADDRESS PART1)
 - MA2 (MAC ADDRESS PART2)
 - PORT

MENU: ABOUT

- VERSION
- CONCEPT
- HARDWARE
- CONTROL SYSTEM
- PROCESSING
- REMOTE APPLICATION

BOOTLOAD

The 'INPUT' menu contains options relating to the control and conditioning of the audio inputs.

'SOURCE' This parameter allows you to select between the analog and digital inputs as the source for the processing.

'INPUT MODE' This parameter allows you to select different mono options as well as the default stereo option. There is also the ability to swap the left/right channels.

'LEVEL' Allows you to set the analogue input level with reference to the DSPmpX's A/D converter clip ceiling. This would normally be set to +24dBu if you are driving the DSPmpX from professional audio equipment source. If the input level is low, you may decrease this parameter to bring the level up and reduce signal-to-noise ratio. Make sure that the input audio meters NEVER show clipping under any conditions.

'RIGHT TRIM' This parameter allows you to adjust the right channels gain in small increments to BALANCE out any small gain discrepancies between the left and right channels. The range is +/- 3dB.

'INPUT FAIL SWITCH' This parameter allows you to turn on and set the timer of the automatic switch to another input, if the primary input fails. If the silence is detected on the primary input (the one set with the SOURCE parameter) lasting longer than the preset time (10, 20, 30, 60 or 90 seconds) the processor will switch to secondary input (DIGITAL if SOURCE is set to ANALOG and vice versa). As soon as the audio is detected on the primary input again, the unit will switch back to it.

'PRE-EMPHASIS' This parameter allows you to activate pre-emphasis when the DSPmpX is being used to process for FM broadcast. The available options are 50uS, 75uS and OFF

The 'PROCESS' menu contains all of the controls relevant to the main and composite clippers.

'DRIVE' This control sets the drive to main audio clipper. The range is from -6dB to +6dB.

'COMPOSITE CLIP' Controls the drive into the composite clipper which effectively sets the amount of composite clipping. The range of composite clipping is -0.5dB to +2dB.

The 'STEREO' menu contains all of the controls relevant to the DSP stereo encoder that generates the multiplex signal.

'LEVEL' Controls the output level of the composite MPX output. Range is 0dBu to +12dBu.

'PILOT LEVEL' This parameter sets the level of the composite signals 19 Khz pilot tone. The adjustable range is 6% to 12% and an OFF setting for mono applications.

'PILOT REFERENCE OUTPUT' This controls the 19KHz pilot output reference signal which is available on the DSPmpX back panel. Options are enabled and disabled.

'PILOT PROTECT' This controls activates the pilot protection notch filter, which protects the pilot area from harmonics generated by (high) composite clipping.

The 'SYSTEM' menu contains all the system controls (non processing) such as remote control and security.

'LCD CONTRAST' Sets the contrast of the front panel LCD screen. The range is 0 to 25.

'TRIGGER PORT' This enables or disables the rear panel trigger (remote) port. The options are enabled and disabled. More information is available in the trigger port section of this manual.

'CODE LOCK' This enables or disables the security code lock. The options are enabled and disabled. More information is available in the code lock section of this manual.

'OUTPUT LOCK' This enables or disables the output code lock. The options are enabled and disabled. More information is available in the code lock section of this manual.

'REMOTE SOURCE' This selects the serial or the NET/LAN port as the remote control method. The default option is OFF.

The **'LAN CONFIG'** menu contains the controls relevant to the LAN/NET port.

'IP' Sets the IP address of the LAN port.

'DG' Sets the default gateway of the LAN port.

'SM' Sets the subnet mask of the LAN port.

'MA1' Sets the first half of the MAC address of the LAN port.

'MA2' Sets the second half of the MAC address of the LAN port.

'PORT' Sets the port number of the LAN port.

'ABOUT' DSPmpX version number and design credits.

'BOOTLOAD' This option is used to FLASH update the software and firmware inside the DSPmpX. Further

SETTING UP THE PROCESSING ON THE DSPMPX

This section has more detailed information on setting up the DSPmpX's processing.

Input selection and conditioning

DSPmpX accepts both analog and digital audio inputs. You can make a selection on which one to use in the INPUT menu. If you will be using analog input on unit with serial number below 500, you might need to change the internal jumper position (see page 9) if incoming audio is too low in level (you can check the audio input level on metering screen). If necessary, adjust balance with right trim control. Additionally you can swap channels (if left and right channels got swapped along the way to the processor) or use only one or a sum of channels as mono source. You can also activate an automatic fall-back to secondary input (i.e. DIGITAL) if there is silence detected on the primary input (i.e. ANALOG) lasting longer than the set period of time. The switch from the secondary input back to the primary input is instant, once an audio signal re-appears on the primary input.

Pre-emphasis

If incoming audio is not already pre-emphasized, set the pre-emphasis according to your country's broadcasting standard (75 μ s is used in USA, while Europe and most of the other countries use 50 μ s).

15 kHz filtering and main clipping

Before steep 15 kHz filter which removes out-of-band spectrum and protects pilot region, DSPmpX performs final clipping. Final clipping is necessary to keep the modulation (deviation) at or below the allowed limit. The DSPmpX's clipper is oversampled and overshoot compensated and ensures very tight peak control. Use caution when setting the drive to the clipper as overdriving it will produce distortion, particularly if audio has already been dynamically processed.

Stereo generator

DSPmpX digital stereo generator creates the multiplexed output with superb stereo separation, excellent pilot stability, low distortion and low crosstalk between main and sub-channel. MPX level is adjustable via front panel and has a wide range to produce proper modulation level with any exciter. Pilot injection level is adjustable as well, with the option to turn it off for mono operation. If you are already broadcasting mono audio, turning pilot off is a good idea as it will increase your signal to noise ratio by about 23 dB. There is also a switchable 19 kHz pilot reference output for RDS encoders.

Composite clipper

The composite clipper in the DSPmpX's stereo encoder is highly over-sampled and allows you to gain an extra dB or two of modulation loudness when using the multiplex output to drive your FM transmitter. The range of the composite clipper is -0.5 to 2 dB. As with any clipper, overdriving it will produce distortion so careful adjustment is advised.

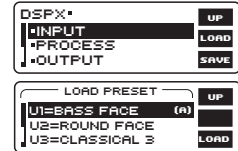
If you are using high composite clipping drive (lots of composite clipping), an optional pilot protection notch filter will protect the pilot area from being contaminated by clipping harmonics. Be aware that the filter will remove some of the harmonics which might result in slight increase of overshoots, depending on how much composite clipping you are using. Therefore you might need to re-adjust the output level to keep modulation peaks below 75 kHz (100% modulation) when the filter is activated.

MANAGING PRESETS (FRONT PANEL CONTROL)

The DSPmpX has an assortment of factory presets and provision for 8 user ones. While the factory presets may not suit your tastes you will generally find one that serves as a good starting point in creating your own custom preset. The preset facilities of the DSPmpX are accessed from the three intuitive soft keys.

Selecting a preset.

First press the 'LOAD' button and then select the preset you want with the control knob. Factory presets are prefixed with Fx where x is a number. User presets are prefixed with Ux where x is a number between 1 and 8. Once you have selected the preset you want to load you simply press the 'LOAD' button again. You can audition various presets by simply scrolling through the preset list and hitting 'LOAD' over each one you wish to listen to.

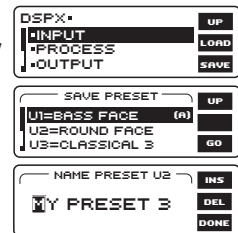


Comparing a preset

When making processing adjustments it is often desirable to compare against the preset you are adjusting. For example you may wish to modify a factory preset and save it as a user preset. You select a factory preset and load it, making it active. You like the factory preset but want to possibly reduce the drive into the main clipper to reduce distortion. You could modify both processing parameters and then press the 'LOAD' button. The middle button of the softkeys will change to B. Pressing this button will reload the saved preset allowing you to compare before and after your changes. The previously marked 'B' button will have now changed to a 'A' button which if pressed will return you to the adjusted preset. The other option you have if you don't press 'UP' is the 'LOAD' button, reloading the saved preset and discarding your changes. By using the button you can easily make processing adjustments quickly and hear instantly if the change is to your liking. It is very easy to forget where you are sonically so the comparison feature is very useful. You can also use the facility to make one processing parameter change at a time, adjusting it, discarding it or saving it to the preset. You can then repeat the comparison process until you are happy with all of your processing changes.

Saving a preset

To save the current active settings to a user preset you simply press the 'SAVE' button. You can then select the user preset with the control knob and press the 'GO' button. A new screen is presented to you allowing the name of the preset to be changed. 'INSERT' and 'DELETE' hot keys are provided to speed things up. Once you are happy with the name you press the 'DONE' soft key to save the preset to the DSPmpX's memory. For speed, saving the current settings to the same active preset is as simple as pushing the same button three times as 'SAVE' selects the presets, 'GO' confirms the preset to save and 'DONE' confirms the name entry stage.



Exporting a preset to a PC

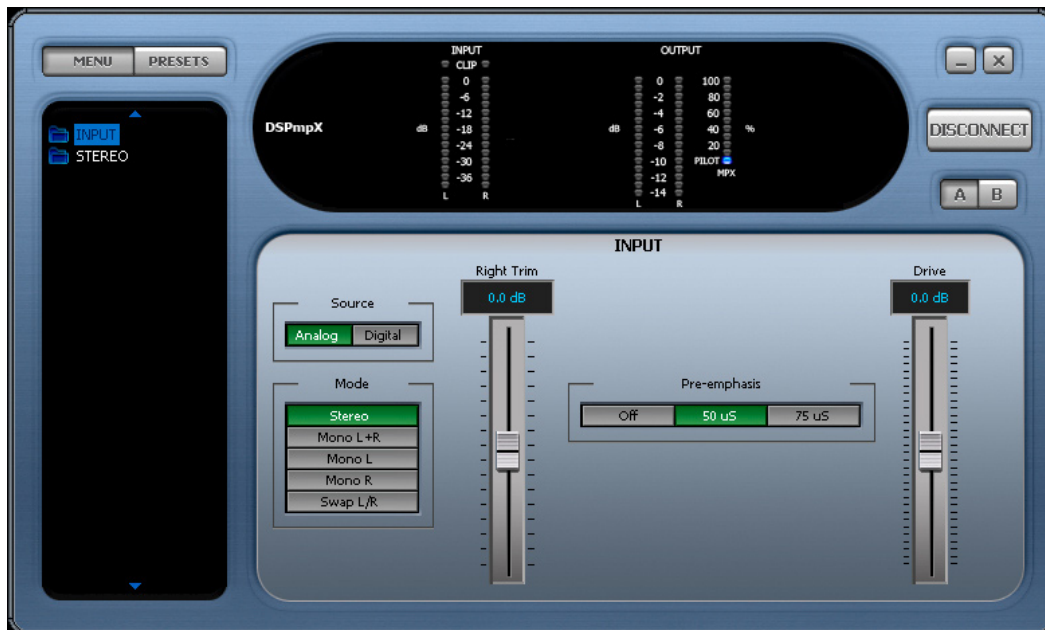
This is handled by the remote control application.

Importing a preset from a PC

This is handled by the remote control application.

REMOTE CONTROL OF THE DSPMPX

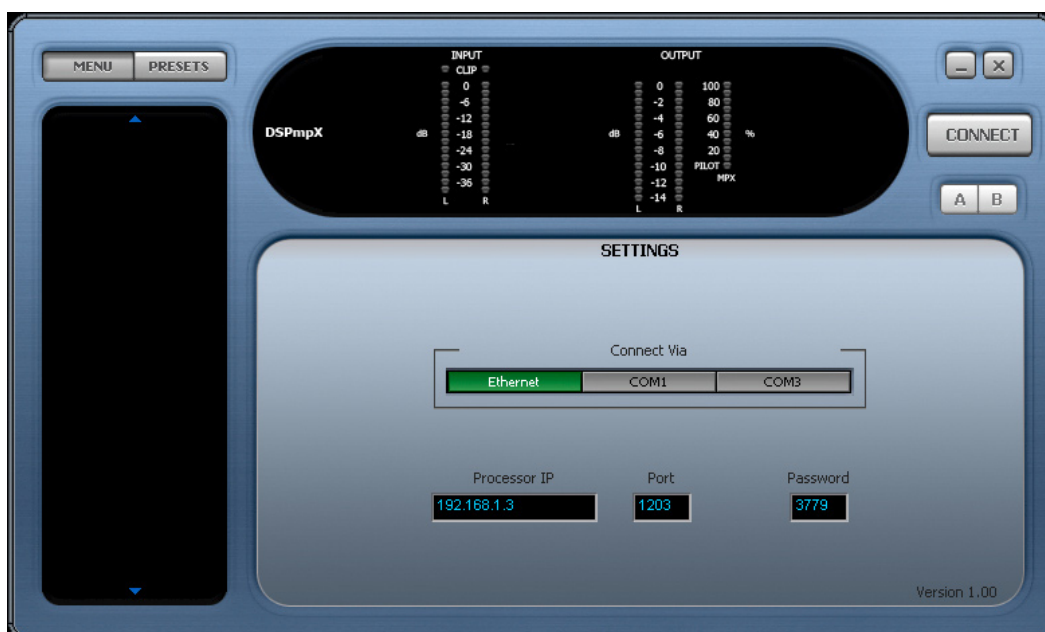
In addition to the front panel LCD control system the DSPmpX has a serial port and an ethernet/LAN port. These allow remote control of the DSPmpX through a remote application program running on a windows based PC. The remote control program is available for download from www.bwbroadcast.com



DSPmpX remote application

The DSPmpX can only talk to the serial system (RS232) or the ethernet/LAN system at any point in time so you will need to select which one of the two remote control methods you wish to use by selecting the appropriate option from the remote source parameter which is contained in the system menu accessible from the DSPmpX's front panel.

If connecting via an ethernet connection you will need to set the IP address or Hostname that the DSPmpX is connected at and also include the PORT number that the DSPmpX has been set to use. The default port that BW use is 1203. You can leave it as is unless you have a reason to change it. Your network administrator can help you with this.



DSPmpX remote application connection screen

CONTROL OF THE DSPmpX BY RS232

If you wish to use the RS232 to control the DSPmpX follow the steps below

1. Connect the supplied serial cable to the rear RS232 port
2. Navigate to the 'REMOTE SOURCE' parameter (also in system) and select the serial option
3. Run the DSPmpX remote application and you will be presented with a connection screen (see image). Select the COM port on your computer that you have plugged the serial cable into
4. A password needs to be entered, regardless of password settings on the DSPmpX itself. A password still needs to be entered even if the passwords on the DSPmpX have been disabled.
5. Click connect on the application and you should receive a 'please wait' box while the information is retrieved from the DSPmpX. Once connected you are then free to control the DSPmpX with the remote application. Further information on the remote application is contained on the following pages. If the DSPmpX remote application does not connect or disconnects after a few seconds then it could be that the password is incorrect. The default password for the DSPmpX is 3779. You are free to change these on the DSPmpX itself (see information on password control elsewhere in this manual)

NET/LAN PORT

The DSPmpX is equipped with a NET/LAN port for ease of remote control, setup and monitoring.

CONTROL OF THE DSPmpX BY THE NET/LAN PORT

If you wish to use the NET/LAN port to control the DSPmpX follow the steps below

1. Connect a cat 5 cable to the RJ45 port on the DSPmpX and plug this into your network hub/switch. A Xover cable can be used to connect directly to a PC if you don't have a switch or hub.
2. . Navigate to the 'REMOTE SOURCE' parameter contained in the system menu on the DSPmpX and select the Network option.
3. Run the DSPmpX remote application and you will be presented with a connection screen (see below) . Select the Ethernet option.
4. A password needs to be entered, regardless of password settings on the DSPmpX itself. A password still needs to be entered even if the passwords on the DSPmpX have been disabled.
5. Click connect on the application and you should receive a 'please wait' box while the information is retrieved from the DSPmpX. Once connected you are then free to control the DSPmpX with the remote application. Further information on the remote application is contained on the following pages. If the DSPmpX remote application does not connect or disconnects after a few seconds then it could be that the password is incorrect. The default password for the DSPmpX is 3779. You are free to change these on the DSPmpX itself (see information on password control elsewhere in this manual)

PASSWORD ACCESS

The DSPmpX contains two levels of password control, a high level password which blocks access to all areas of the DSPmpX and an 'Output' level password that allows access to all areas of the DSPmpX except the output menus that contain the output mode and level settings. The 'Output' level password could be given to programme controllers to adjust the processing knowing that the transmission will remain compliant as there is no way for the user to adjust the peak output level of the DSPmpX.

These passwords can only be set from the DSPmpX front panel and are located in the system menu.

The password box is located on the connection screen to the right of host and port input boxes.

The default (factory shipped) passwords for the two locks are '3779'. The remote application will always default to this when it is run, unless you change it. Some users may find the output lock set to '0000' Try this is 3779 does not let you access the output menus.

When the DSPmpX is connected the LED's will show activity and the main controls window should show processing controls, depending on what option is selected on the menu tree located to the left of the screen. The DSPmpX remote control application has three windows. The left hand contains the navigation/preset window. The top shows the LED metering while the bottom right contains the main controls window that is populated with the appropriate controls for the part of the processing that is selected in the menu tree.

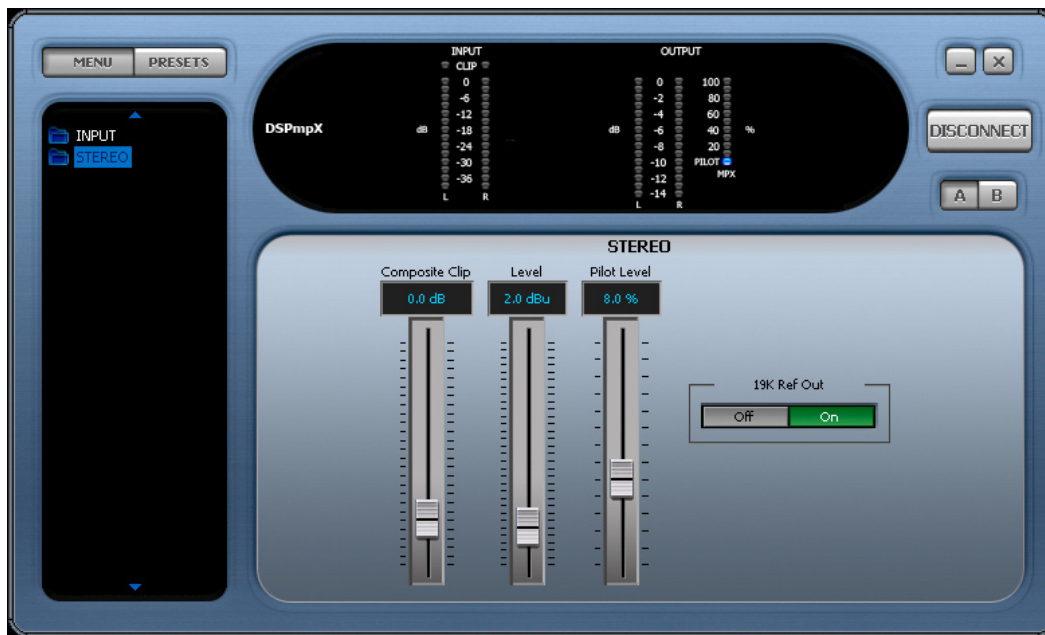
At the top left of the application you have the menu/preset toggle buttons. These change the contents of the left hand window from the DSPmpX menu tree to the preset list. The top right of the application contains the minimise and close icons, the connect / disconnect button and the A/B buttons which will be covered shortly.

NAVIGATING THE PROCESSING STRUCTURE AND MAKING PROCESSING ADJUSTMENTS

Navigating through the processing structures of the DSPmpX is very simple. When connected click the menu button (top left) if not already depressed. You should then see the menu tree in the left hand window (see above image).

You can now navigate through the menu tree and see the controls that are contained in that menu appear in the

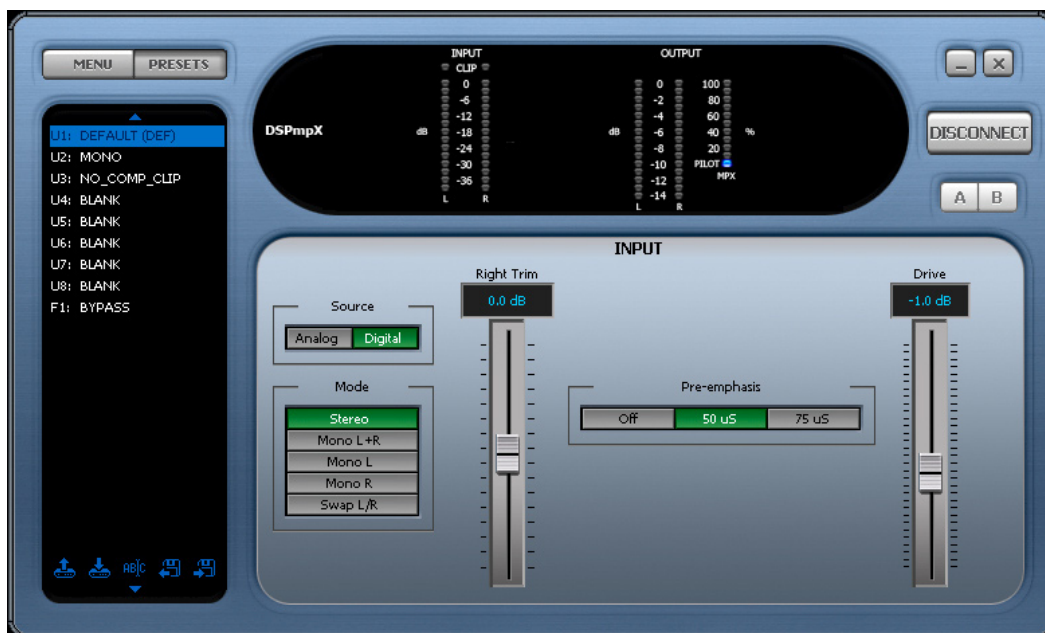
main controls windows. The example below shows the controls that are contained in the stereo menu. Changing the processing is as simple as adjusting the sliders and buttons.



DSPmpX remote application connected

WORKING WITH PRESETS

The DSPmpX remote application makes it easy to load, save and change presets. Click the preset button (top left) if not already depressed. You should then see the preset list in the left hand window (see image).



Preset window shown

Understanding the preset list

The preset list contains all of the presets contained in the DSPmpX. The user presets are prefixed U1 to U8.

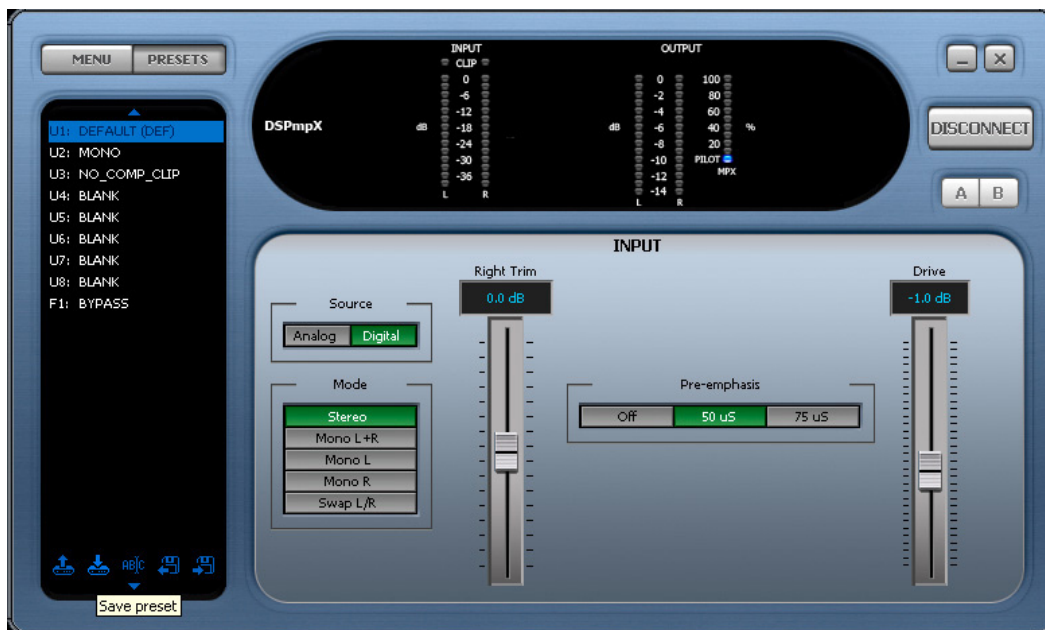
It is important that you understand the following terminology and how the various presets are displayed in the window if you want to use the preset window correctly and efficiently:

The currently 'on air' preset is always marked in green.

The preset marked in green will also have a label appended to the preset name. This can be (DEF) or (TR) and these stand for the default preset and triggered presets.

If you are not using external trigger port the default preset will always be the 'on air' preset and it will be marked in the preset list with a (DEF) which appends to the preset name. If the remote trigger interface has changed the preset the (DEF) marked preset may not be the one that is on the air. If a trigger occurs the (TR) will appear next to the name and the preset name will change to green to indicate that it is 'on air' and has overridden the (DEF) default preset. When the trigger finishes, control will always return to the default (DEF) preset. It is possible to have a (DEF)(TR) situation where a remote trigger forces 'on air' a user preset which also happened to be the default preset. Unlikely but possible.

Various preset operations are possible including changing the default preset, saving a preset to a user preset location, changing the name as well as PC file operations to backup or share presets with other DSPmpX users. To perform an operation you will need to select a preset by clicking on to the name in the list. This will highlight the preset with a blue bar. This does not change the preset or affect anything on the air. All this blue selection bar indicates if that this is the preset that we want to perform an operation on. We have two methods of performing the operation on the preset. The first method is to click one of the icons at the bottom of the window. These are from left to right, Load preset, Save preset, Rename preset, Load from PC, Save to PC. The other method is to right click over the preset where you will be presented with a drop down menu containing the same options.



Preset icons

Load preset

Load preset will change the default preset to the one selected. This usually means that this preset will become 'on air'. The exception to this is when the default preset is being overridden by a remote trigger. In this case the DSPmpX will 'on air' the selected preset when the trigger hands back control to the default preset.

Save preset

Save preset will save the current on-air preset to the highlighted user preset position. You can not write over a factory preset.

Rename preset

Rename preset allows the user preset name to be edited. You are restricted to 15 characters.

Saving presets to PC

This option will pop up the standard windows save dialog box. You can select a file name and location for the preset to be saved under. The preset that is saved is the currently highlighted (in blue) preset, not the one that is currently 'on-air'

Loading presets from a PC

This option will pop up the standard windows load dialog box. You can browse to and select a preset file to be loaded into the DSPmpX. The preset location that is loaded is the currently highlighted (in blue) preset, not the one that is currently 'on-air' You can only load into a user preset.

A/B COMPARISON FEATURE

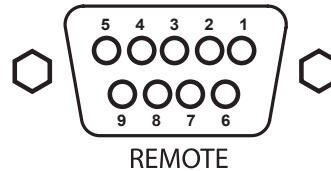
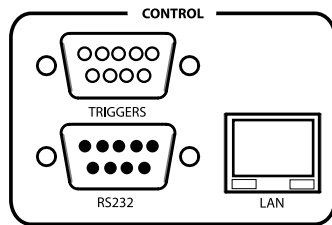
The Remote application has two buttons labelled A and B that are located just below the connection button. These buttons allow you to compare changes you have made to the processing against the saved preset. When you load a preset the buttons should be greyed out but as soon as you make any processing changes these buttons will become active. By selecting the B button you can temporarily revert back to the saved preset. During this time all the processing controls will grey out to indicate you are in a compare mode. To return to the settings that you have been adjusting click the A button and the processing controls will 'un-grey' If at any time you want to revert to the saved preset and lose your adjustment just reload the preset from the preset selection window.

The A/B feature makes it easy to build up your own presets by being able to easily compare before and after processing adjustments. We hope you find it useful.

REMOTE TRIGGER PORT

The system menu contains the remote trigger port option from where it can be enabled or disabled.

If enabled the remote trigger port on the processor allows you to select any of the first 8 user presets by pulling one of 8 pins on the trigger port socket low. The rear panel trigger port socket is a 9 pin male D-type whose connections are shown below.



REMOTE TRIGGER PORT PIN-OUT

PIN 1	USER PRESET 4
PIN 2	USER PRESET 3
PIN 3	USER PRESET 2
PIN 4	USER PRESET 1
PIN 5	EARTH RETURN
PIN 6	USER PRESET 8
PIN 7	USER PRESET 7
PIN 8	USER PRESET 6
PIN 9	USER PRESET 5

The trigger port socket contains an earth return connection pin for the 8 opto-isolated trigger pins. When the trigger pins are connected to the earth return pin they will change the currently active preset to the user preset triggered by that pin. If more than one pin is pulled low at the same time the pin with the lowest number will take priority. E.G. if all pins are pulled low trigger 1 will take priority. Once the trigger pin disconnects from the earth return connection the processor will return processing to the normally active preset.

Relays, contact closures, open collector and other hard wiring arrangements can be used to perform the appropriate connection between the trigger port pin and the earth return pin.

If you wish to trigger a factory preset you will need to copy that factory preset to a user preset first.

SECURITY CODE LOCKS

The system menu contains the security code lock options from where they can be enabled or disabled.

The DSPmpX has two code locks, the main full lock and the output lock. When enabled the full code lock prevents editing of the DSPmpX parameters. When enabled the output lock restricts access to the output menu section of the DSPmpX. This is useful when you want to stop someone from being able to adjust peak output levels which could cause your broadcast to be non-compliant with your regulatory bodies transmission specs. For example you may not want a programme director to be able to adjust the multiplex level into a transmitter but you do want them to be able to adjust the processing.

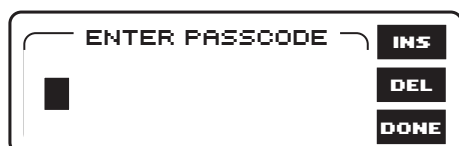
The security code locks if enabled will engage after 4 minutes of no activity on the front panel control system. This time has been chosen as a compromise between having the system lock you out when adjusting processing parameters and a short enough period of time to lock the unit after you walk away from the DSPmpX.

The DSPmpX is factory shipped with the factory default lock codes of 3779. Some users may find that the output lock is set to a default of '0000' so try this if you cant access the output menus with 3779.

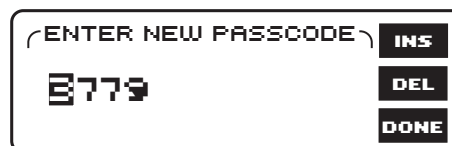
Enabling the security code lock feature: Navigate to the system menu and set the code lock option to enabled. Confirm the current password. The lock will engage after four minutes of no front panel control system activity.

Disabling the security code lock feature: Navigate to the system menu and set the code lock option to 'disabled'. Confirm the current password.

Changing the lock codes: Once locked the DSPmpX will not allow processing adjustments (or access to the output menu). The lock code can be entered with the use of the rotary encoder and the GO soft key can be pressed to confirm entry and proceed. If unsuccessful you will be required to try again. If successful the DSPmpX will allow you to re-confirm the code or change it. This is where you may want to change the factory default code if you have not already done so. The soft keys will allow you to confirm the change or accept the previous code and the DSPmpX should then be unlocked.



Entering the pass code



Confirming or changing the pass code

Forgotten DSPmpX lock code:

Contact DSPmpX support and request the procedure to reset the DSPmpX lock code back to factory default. In resetting the DSPmpX code lock you will also wipe clean your user presets. We recommend that you export (back-up) your user presets to be on the safe side.

The easiest thing is not to forget the unlock code or to leave it at factory default. The factory default code is easy to remember, just punch in the first four letters of your favourite audio processor on a telephone keypad.

SPECIFICATIONS

Specifications apply for measurements from analog left/right input to stereo composite output and to FM analog left/right output. Measurements apply to FM mode of operation.

Frequency Response (Bypass Mode): Follows standard 50 μ s or 75 μ s pre-emphasis curve \pm 0.10 dB, 2.0 Hz–15 kHz. Analog left/right output and digital output can be user configured for flat or pre-emphasised output.

Noise: Output noise floor will depend upon on the processor settings but is governed by the dynamic range of the A/D Converter. The dynamic range of the digital signal processing is 144 dB.

Processing Sample Rate: 48kHz - 768kHz depending on processing stage.

Processing Resolution: Internal processing has 24 bit (fixed point) or higher resolution.

Analog Audio Input

Configuration: Stereo

Impedance: >10k, load impedance, electronically balanced

Nominal Input Level: Software adjustable from 0 dBu to +24 dBu peak

Maximum Input Level: +24 dBu

Connectors: XLR female Pin 1 chassis ground, pins 2 (+) and 3 (-) electronically balanced, floating and symmetrical.

A/D Conversion: 48 kHz 24 bit 128x oversampled delta sigma converter with linear-phase anti-aliasing filter.

Filtering: RFI filtered.

Analog Audio Output *

Configuration: Stereo. Flat or pre-emphasised (at 50 μ s or 75 μ s), software-selectable.

Source Impedance: 10 Ohm, electronically balanced and floating.

Load Impedance: 600 Ohm or greater, balanced or unbalanced.

Output Level (100% peak modulation): Adjustable from –12 dBu to +24 dBu peak, into 600 Ohms or greater load, software-adjustable.

Signal-to-Noise: \geq 90 dB unweighted (Bypass mode, de-emphasised, 20 Hz–15 kHz bandwidth, referenced to 100% modulation).

L / R Crosstalk: \leq –70 dB, 20 Hz–15 kHz.

Distortion: \leq 0.01% THD (Bypass preset, de-emphasised) 20 Hz–15 kHz bandwidth.

Connectors: XLR male. Pin 1 chassis ground, pins 2 (+) and 3 (-) electronically balanced, floating and symmetrical.

D/A Conversion: 48 kHz 24 bit 128x oversampled

Filtering: RFI filtered.

Digital Audio Input

Configuration: AES/EBU Stereo, 24 bit resolution, software selection of stereo, mono from left, mono from right or mono from sum.

Sampling Rate: 32, 44.1, 48, 88.2, or 96 kHz, automatically selected.

Connector: XLR female. Pin 1 chassis ground, pins 2 and 3 transformer balanced and floating, 110 ohm impedance.

Filtering: RFI filtered.

Digital Audio Output *

Configuration: Stereo per AES/EBU standard. Output configured in software as flat or pre-emphasised to the chosen processing pre-emphasis (50 μ s or 75 μ s).

Sample Rate: Internal free running at 32, 44.1 or 48 KHz selected in software. Can also be synced to the AES/EBU digital input at 32, 44.1, 48, 88.1 or 96 kHz, as configured in software.

Connector: XLR-type. Pin 1 chassis ground, pins 2 and 3 transformer balanced and floating, 110 ohm impedance.

Output Level (100% peak modulation): –12.0 to 0.0 dBFS software controlled.

Filtering: RFI filtered.

MPX output

Source Impedance: 10 Ohm Single-ended, floating over chassis ground.
Load Impedance: 600 Ohm or greater.
Maximum Output Level: +12.0 dBu (peak) software-controlled output level control
Minimum Output Level: 0dBu (peak) Software-controlled output level control
Pilot Level: Adjustable from 6.0% to 12.0% and OFF, software controlled.
Pilot Stability: 19 kHz, ± 1 Hz (10 degrees to 40 degrees C).
D/A Conversion: 24-bit
Signal-to-Noise Ratio: ≤ -85 dB (Bypass mode, de-emphasised, 20 Hz – 15 kHz bandwidth).
Distortion: $\leq 0.02\%$ THD (Bypass mode, de-emphasised, 20 Hz – 15 kHz bandwidth).
Stereo Separation: Typ. > 70 dB 30 Hz - 15 kHz.
Crosstalk-Linear: ≤ -80 dB, main channel to sub-channel or sub-channel to main channel.
Crosstalk-Non-Linear: ≤ -80 dB, main channel to sub-channel or sub-channel to main channel.
38 kHz Suppression: ≥ 70 dB.
76 kHz & Sideband Suppression: ≥ 80 dB.
Connectors: BNC, floating over chassis ground
Filtering: RFI filtered.

Subcarrier (SCA) Inputs

Configuration: Subcarrier input sums into composite baseband output.
Impedance: $> 10K$
SCA input level Sensitivity: Sums into MPX output at 10% injection.
Connector: BNC, unbalanced and floating over chassis ground.

Pilot Output

19 kHz Pilot Reference: BNC, 5V sine unbalanced and floating over chassis ground. Software selectable

Remote Control

USB Port: B type connector (front panel) *
Serial Port: DB9 (rear panel) 19200 kbps
Ethernet Port: 10 Mbit/sec on RJ45 female connector.
Remote Control (trigger port): DB9 opto-isolated and floating. Eight pull low inputs

Other

Voltage: 100–240 VAC, 50–60 Hz, 35 VA.
Connector: IEC. Detachable 3-wire power cord supplied.
Grounding: Circuit ground is independent of chassis ground, and can be isolated or connected with a rear panel switch.
Dimensions (W x H x D): 44mm x 482mm x 200mm

* not applicable to DSPmpx and DSPXmini



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