FDS-366T OMNIDRIVE™
User Manual
Connect here first...

ZM10019 issue 4 CB/PW/DN/DP/JWK

Software version 2.00

IMPORTANT SAFETY INFORMATION

DO NOT REMOVE COVERS.
NO USER SERVICABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

THIS EQUIPMENT MUST BE EARTHED.
IT SHOULD NOT BE NECESSARY TO REMOVE ANY PROTECTIVE EARTH OR SIGNAL CABLE SHIELD CONNECTIONS TO PREVENT GROUND LOOPS. ANY SUCH DISCONNECTIONS ARE OUTSIDE THE RECOMMENDED PRACTISE OF BSS AUDIO AND WILL RENDER ANY EMC OR SAFETY CERTIFICATION VOID.

REGULATORY INFORMATION

This equipment has been tested and found to comply with the following European and International Standards for Electromagnetic Compatibility and Electrical Safety:

Emmissions (EU):	EN55013+A12+A13	(1990)
Generic Immunity (EU):	EN50082-1	(1992)
Mains Harmonics (EU)	EN61000-3-2	(1995)
Voltage Fluctuations (EU)	EN61000-3-3	(1995)
Electrical Safety (EU):	EN60065+A11	(1993)
Electrical Safety (USA):	UL813/ETL	(1996)

For continued compliance with international EMC legislation ensure that all input and output cables are wired with the cable screen connected to Pin 1 of the XLR connectors.

The input XLR Pin 1 is connected to the chassis via a low value capacitor, providing high immunity from ground loops whilst ensuring good EMC performance.

The **FDS-366T Omnidrive** was designed and developed by BSS Audio, Hertfordshire, UK.

In keeping with our policy of continued improvement, BSS Audio reserves the right to alter specifications without prior notice.

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1.0 Primary Checks

As part of BSS' system of quality control, this product is carefully inspected before packing to ensure flawless appearance.

After unpacking the unit, please inspect for any physical damage and retain the shipping carton and ALL relevant packing materials for use should the unit need returning.

In the event that damage has occurred, please notify your dealer ***immediately***, so that a written claim to cover the damages can be initiated.

Please fill in the warranty details on the form opposite for future reference.

2.0 Installation

Fig 3.1 Unit dimensions.

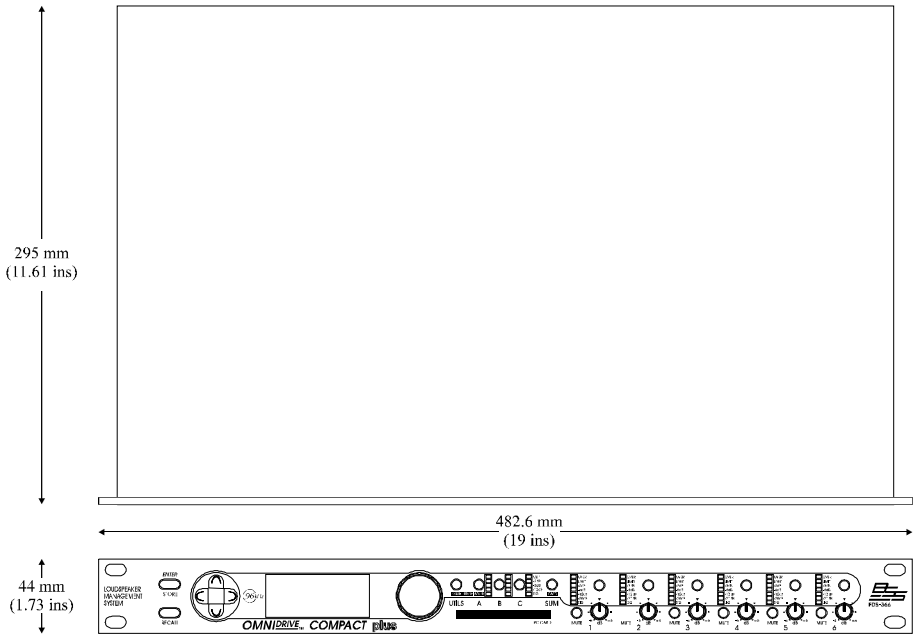
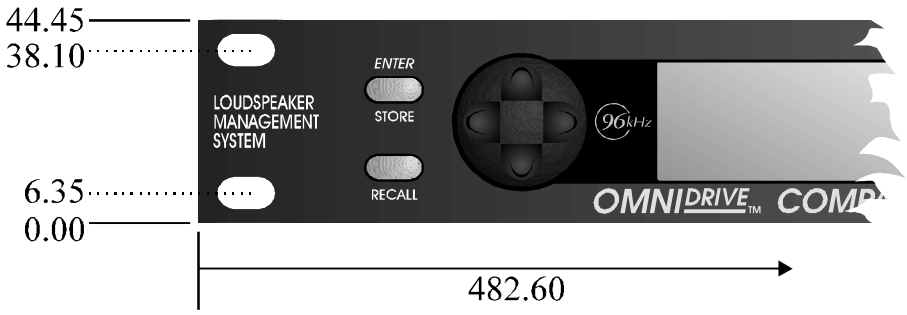


Fig 3.2 Rack dimensions.



Note all dimension in mm

3.0 Warranty Information

When sold to an end user by BSS Audio or a BSS Audio Authorised Reseller, this unit is warranted by the seller to the purchaser against defects in workmanship and the materials used in its manufacture for a period of one year from the date of sale.

Faults arising from misuse, unauthorised modifications or accidents are not covered under this warranty. No other warranty is expressed or implied.

If the unit is faulty it should be sent to the seller of the equipment, in its original packaging with shipping prepaid. The unit will be returned to you when the repair has been completed. If the unit was purchased in the European Union, you may, as an alternative, return the unit to any other BSS distributor in the European Union.

You should include a statement listing the faults found. The unit's serial number must be quoted in all correspondence relating to a claim.

IMPORTANT

We recommend that you record your purchase information here for future reference.

Unit Serial Number: _____

Dealer Name: _____

Dealer Address: _____

_____

_____

_____

Post/Zip Code: _____

Dealer Phone Number: _____

Dealer Contact Name: _____

_____

Invoice/Receipt Number: _____

Date of Purchase: _____

Comments or questions regarding the **FDS-366T** or other BSS products? Contact us at this address:

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Phone (+44) (0)1707 660667. Fax (+44) (0)1707 660742.

Web site, **www.bss.co.uk**

About the FDS-366T Omnidrive Compact Plus

4.0 Introduction

Introducing the BSS Audio **FDS-366T Omndrive Compact Plus**, an incredibly powerful loudspeaker management system in only 1U of rackspace! Based on BSS Audio's many years of experience building analogue processing devices for the live sound and installed markets, the FDS-366T Omnidrive is an 'all in one' solution for system crossover assignment, EQ, delay and dynamics control.

Processing power

Using custom designed digital signal processing (DSP) technologies BSS Audio are able to deliver far more capabilities in one box than was realisable from a whole rack of analogue equipment only a few years ago. Also as all the processing on the audio signal is kept in the digital domain added noise and phase anomalies usually expected with analogue equivalents are virtually eliminated. The signals are processed at 24bit, 96kHz resolution to achieve a dynamic range greater than 112dB to ensure the best possible audio quality for your system.

Security

Moreover, the comprehensive security features included in the FDS-366T enable the unit to be set up with varying degrees of access to its functionality applied and protected by passwords. Indeed the whole unit can be locked totally to prevent tampering, in installed applications for example.

Routing

An arrangement of 3 inputs and 6 outputs and an additional internal sum of inputs A&B, A+B+C, pre or post input EQ can be matrixed in various combinations to provide a complete loudspeaker management system with integral crossovers, delays, dynamic EQ, and protection limiters.

Applications

The flexibility of the FDS-366T enables it to be employed for many system uses, such as complete 3 way stereo setups or a 2 way LCR combination. Equally FDS-366T Omnidrives can be stacked to run larger 5 and 6 way systems and more.

In stage monitor systems the FDS-366T can function as a triple bi-amp crossover with delay, limiters and EQ. On-stage 'hotspots' caused by monitors with identical signals can be eliminated by applying small delays between wedges.

Furthermore, the FDS-366T can function as a distribution unit to multizone systems where crossovers may be passive or local to the loudspeaker. In this case, the provision of delays and EQ can radically enhance such a system while reducing both processing costs and required rack space.

Upgradeable operating system

The system operating software is held in flash EPROM, which means that upgrading to new software is easy - either via PC card or from a PC via the MIDI or RS-232 ports.

Memorising Setups

60 internal program locations are available to the user for storing system setups, which may be generic system programs or complete venue settings. These memories may be stored onto a PC card for backup or archiving.

5.0 Features

- ✓ Individual keys to select input and output channels for editing.
- ✓ Crossover slopes of 6,12, 18, 24 or 48dB per octave.
  Filter types:Butterworth, Bessel, Linkwitz-Riley and WHISEWORKS-NTM*.
- ✓ Comprehensive output limiters on each band (mid-filter).
- ✓ Equalisers and 'dynamic' equalisers on each input and output.
- ✓ High resolution input and output delays up to 2.6 seconds in approximately 11 microsecond steps.
- ✓ Input LED metering, showing signals from -12dB to clip level, and SIG.
- ✓ Output LED metering, showing signals from -20dB to +6dB over limit threshold, and SIG.
- ✓ Front panel output level trims and mutes.
- ✓ Polarity reverse on each output.
- ✓ Phase adjustment for each crossover point, and phase compensation defeat.
- ✓ PC card port for storage and recall of program settings
- ✓ Electronically balanced inputs and outputs with transformer output option.
- ✓ MIDI, RS-232, RS-485 and program change ports on rear panel.
- ✓ 96kHz sample rate and 24bit encoding/decoding for audio excellence.
- ✓ AES/EBU digital input for direct digital feeds into Omnidrive.
- ✓ Alignment Assistant for setting up cabinet driver alignments.
- ✓ Comprehensive system security with control lock out, programmable 'Owner' and 'OEM' locks, and 'Safe' mode available for complete system lock out.
- ✓ Temperature based delay correction.

If you are familiar with the FDS-355 Omnidrive then look at the extra benefits that the FDS-366T brings, an extra output channel, dynamic equalisation, Thiele crossover shape and 96kHz audio quality to start with!

* The words "WHISEWORKS", "Neville Thiele Method" and NTM logotype are trademarks of Precision Audio Pty. Ltd (registration pending). Manufactured under license from Precision Audio Pty. Ltd. International Patents Pending.

Features

Some of the features are explained in greater detail here.

- **96kHz Sample rate**

  The FDS-366T operates the A-D and D-A converters and the Digital Signal Processing (DSP) at a sample rate of 96kHz. The use of a higher Nyquist frequency enables the audio bandwidth to extend all the way up to 40kHz. With this extra frequency response we have also been able to incorporate more accurate filter sets for a more natural, open sound.

  There is also benefit from the improved filter response shapes when the nyquist frequency (the maximum frequency of which the DSP can correctly process the signal), moves up from 24kHz to 48kHz. Low-pass filters and bell filters then retain their magnitude and phase response shapes more accurately.

- **AES/EBU digital input**

  The FDS-366T is equipped as standard with a stereo AES/EBU digital audio input which will accept sample rates of 44.1, 48, 88.2 and 96kHz. 44.1 and 48kHz modes are sample-rate converted and the waveform interpolated to 88.2 and 96kHz respectively within the FDS-366T so that all of the filtering is done at the higher rate to get more of the benefits of the increased sample rate. Using the AES input the realisable dynamic range is increased to greater than 117dB.

- **Phase matching**

  This feature maintains the inter-band phase relationship true to the crossover type selected (Bessel, Butterworth, L-R etc), regardless of any interference from far-end crossover filtering.

  In 2-way crossovers, this is not an issue since each band has just one high-pass or low-pass filter. Three or more bands however, cause at least one band to have both low-pass and high-pass filters which react with one another, so disturbing the correct phase relationship at the crossover point. This can result in poor combining of adjacent crossover bands, resulting in an irregular frequency response and non-uniform polar characteristics.

  The *Phase Matching* technique used in the FDS-366T eliminates this problem by compensating for these phase anomalies. The phase compensation can be bypassed if not required.

Features

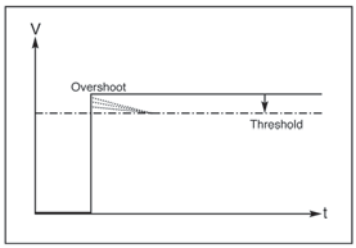
- **Alignment Assistant**

The *Alignment Assistant* is an advanced loudspeaker measurement function built-in to the FDS-366T for directly measuring the delay and phase relationships between drivers (using a measurement microphone), and automatically adjusting the settings to accommodate these.

The Alignment Assistant has the ability to 'see' past the crossover filters, and is thus able to compensate for the drivers and enclosures themselves, leaving the crossovers to do exactly what they were intended to do - presenting a precisely aligned acoustic wavefront.

The Alignment Assistant can measure and compensate for:

- Physical alignment of drivers within an enclosure.
- Driver or enclosure phase anomalies near the crossover point.
- Relative distance correction of arrayed boxes.



- **Advanced Limiters**

Driver protection limiters have always been a balance between protection, transparency and the preservation of maximum power. The all-new limiter algorithm in the FDS-366T not only allows the user the freedom to change the way the compromises are balanced, but introduces several new features which enable the requirements to be met with less sacrifice.

- Feed-forward design for better stability.
- Adaptive attack, so that attack time is reduced the further over threshold the signal strays. This helps to preserve transparency for light overshoots, but acts more aggressively if the signal strays too far.
- Adaptive release, so that short-term overshoots do not reduce the average power output, whilst keeping distortion low on sustained over-threshold signals.
- Adjustable attack speed (fast/med/slow/dual) - but still related to the high-pass crossover frequency.
- Adjustable release speed (fast/med/slow) - but still related to the high-pass crossover frequency.
- Brickwall overshoot limiter. This is actually a soft-clipper which constrains signals which overshoot during the attack phase. The user has adjustable 'overshoot' from 1 to 12dB (and *off*).
- Dual time-constant mode for giving simultaneous protection against short-term mechanical damage or clipping, and longer term thermal damage.

Features

- **Safe mode**

The FDS-366T has a hidden function called 'Safe'. 'Safe' mode is intended to be used as a complete lock-out for installations or as the ultimate protection for hire systems etc.

When SAFE mode is switched on, *all* controls are disabled, the screen blanks and the backlight is dimmed. The input and output meters will still display the existence of signal being processed through the unit but no one can change any values within the unit.

! Any adjustments made to the gain controls whilst in 'Safe' mode will not be heard until 'Safe' is turned off.

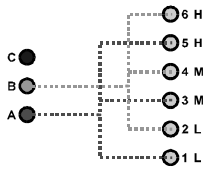
! As the 'Safe' mode is intended for ultimate security, the details of its use cannot be published here. Please consult your dealer for further information on Safe mode.

6.0 Typical Applications

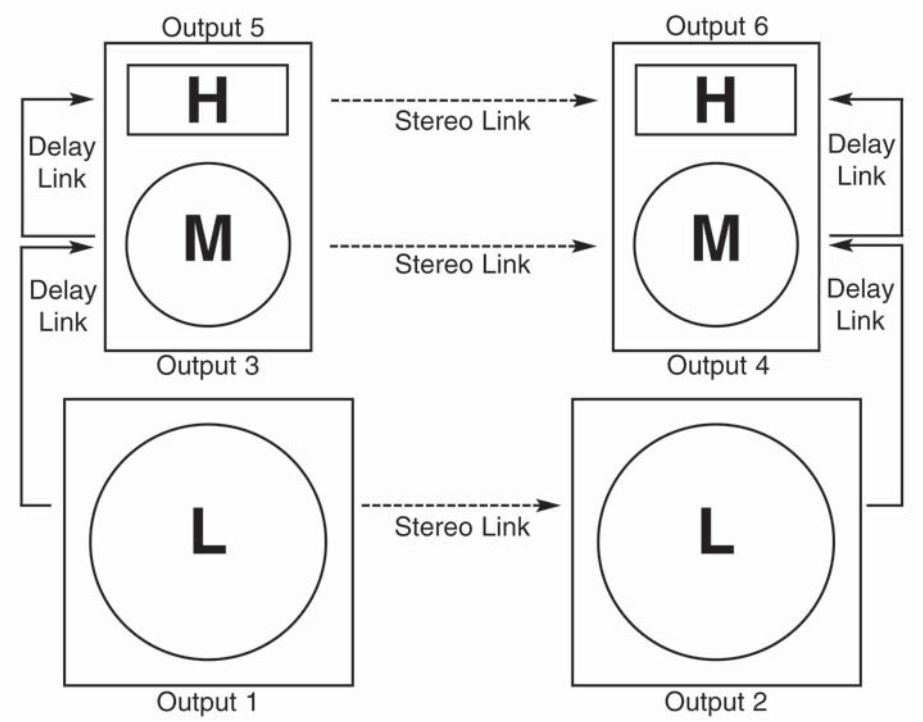
The FDS-366T has three inputs: **A**, **B**, **C**. An internal mono **sum** of inputs is also available for routing to any of the outputs. Many combination of routing inputs to outputs is available, and the FDS-366T can be configured as a stereo or mono device. The basic configurations are selected in the **Utilities** and the following examples are based upon these as possible likely setups.

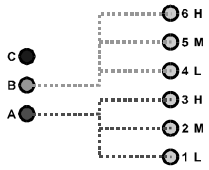
Stereo 3-Way with mono sub-bass.

Systems can be run in one of two stereo 3-way modes.



LLMMHH allows compatability with the 355, now having two low outputs.





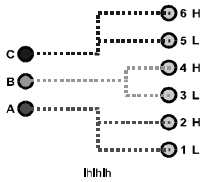
LMHLMH set up is an alternative, allowing users to choose the setup they are most familiar with.

Stereo Link "On" mode allows the same parameters on the left and right channels to be adjusted simultaneously, and any edits made whilst unlinked preserve the left/right difference as an offset.

Note: The stereo pairs change appropriately for **LLMMHH** and **LMHLMH** modes.

Typical Applications

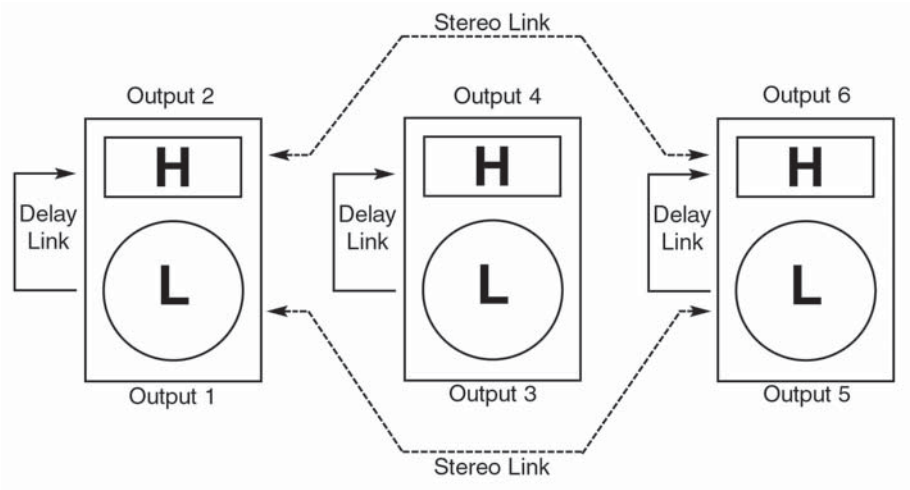
Triple Bi-amp (Stage monitors)



The FDS-366T can provide 3 channels of bi-amp crossover for monitor racks with EQ, delays, and limiters. With so much EQ available in the FDS-366T, it is easy to assign 12 bands of EQ to the input, as well as EQ to the output bands, saving the need for external EQ.

In **LHLHLH** mode by default, input **A** feeds outputs **1** and **2**, input **B** feeds outputs **3** and **4**, and input **C** feeds outputs **5** and **6**.

In this mode, it is possible to remove 'hot spots' on stage. Where the same mix is sent to a number of performers, interaction between wedges can create lobes of high intensity sound causing confusion. Using a fine delay to shift wedge feeds can move these 'hot-spots' to less sensitive areas on stage.



LCR cinema systems (3x2-way)

A similar configuration to the triple 2-way setup above.

6-Way zoning distribution

The FDS-366T can be also be used as a zone distribution system, without using any of its crossover facilities. Using this mode, a common input signal can be routed to up to 6 separate outputs, each with delays, EQ and limiters.

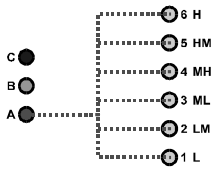
Typical uses for this mode would include feeding a number of under-balcony loudspeakers with integral passive crossovers, using the delays of the FDS-366T for time correction, and EQ for tuning response.

For this application set the configuration to **Mono** and each output should be full range (unless you particularly want to band restrict the outputs). Use the 'Xover Freq' screens in the output channel to set each band edge to be 'OUT'.

Typical Applications

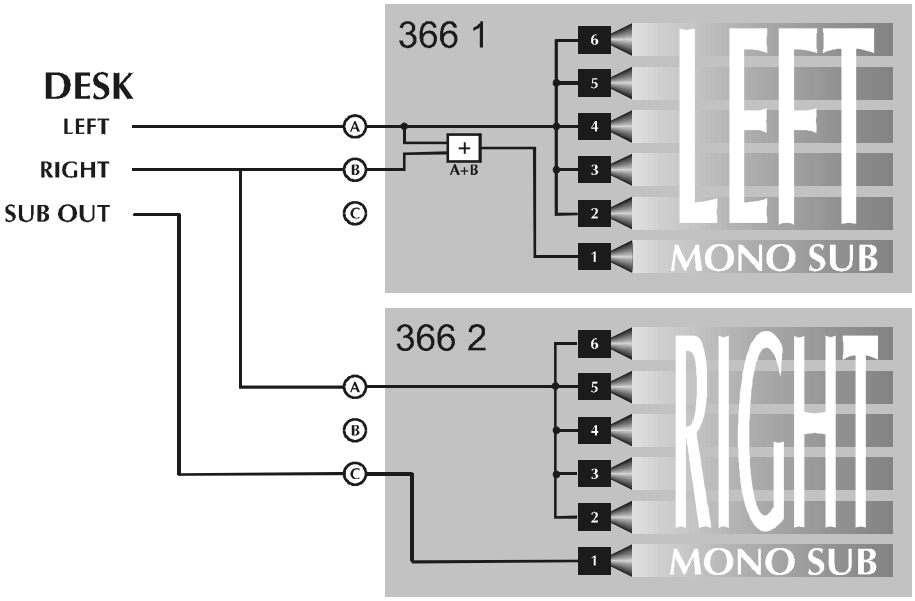
Mono 6-way

In the mono mode, the FDS-366T can provide a full 6-way system. It can also function as a 5-way system fed from input A, with an independent sub-bass output fed from the sum of inputs A & B or input C.



Stereo 6-way (example)

Two FDS-366Ts working in this mode can form a stereo 6-way system. For example purposes only, in the diagram below the first FDS-366T is running a 5 way system with the mono sub bass derived from the sum of inputs A and B. The second FDS-366T has its mono sub bass output fed from a dedicated output on the desk running into input C.



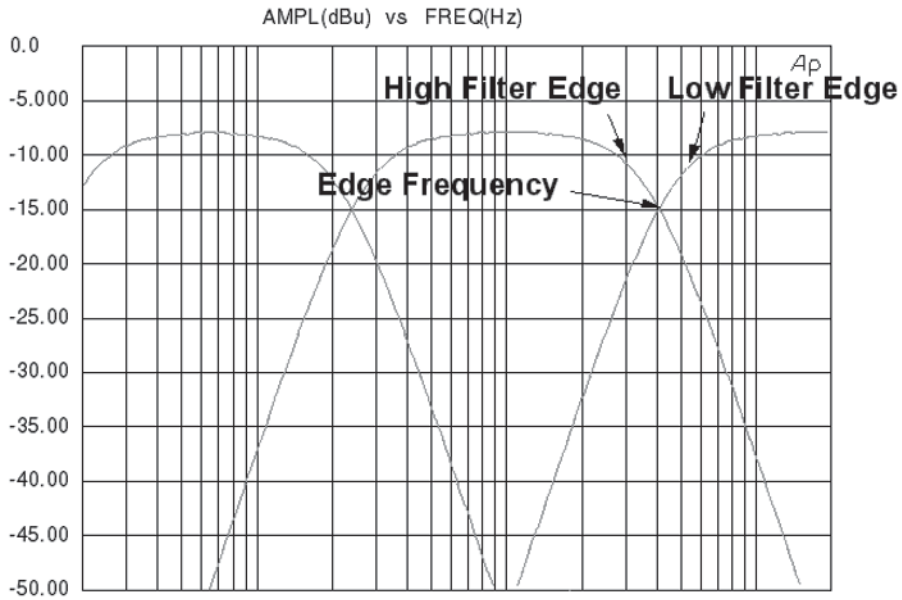
7.0 Crossover Shapes and Frequencies

It is not possible to provide one loudspeaker driver to cover all audible frequencies. Even if the frequency response could be achieved, the large size of the driver required to shift enough air at low frequencies would offer an impossibly directional beam at high frequencies because at small wavelengths, the differing path lengths from the extremities of the diaphragm to the listener would cause cancellations off-axis. Therefore, it is necessary to use more than one driver and to split the bands with an electrical filter or *crossover*. This filtering can be done by passive, active or digital means, external to or within the loudspeaker cabinet.

Ideally, the filtering is done so that when acoustically combined, the drivers produce a constant output across the required range of frequencies. Additionally, the signal phase behavior with frequency should offer smooth transitions across all the drivers to achieve a constant group delay. Another important consideration is that the crossover should control the beaming properties, also known as the polar response, so that listeners off-axis do not hear anomalies in the sound range. Many crossover filter designs do not achieve these goals.

Finally, the signal should be quickly attenuated outside the optimum band of operation for each driver to avoid driver anomalies such as resonance and over-excursion distortion at low frequencies. In these instances some crossover shapes have limitations.

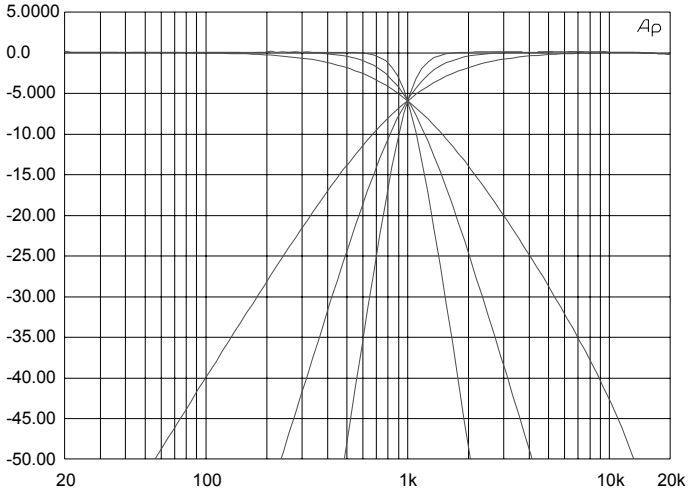
The FDS-366T allows full control over each high and low pass filter of a crossover segment in *shape, slope* and *frequency*. Graphically these parameters are labelled as below.



Filter Edge Identification

Crossover Shapes and Frequencies

The graphs on this page show the filter slope curves with associated crossover points in order to aid the sound technician in the choice of filter shape to use for the desired result between speaker drivers of differing specifications and characteristics.



Linkwitz-Riley 12, 24 & 48dB/Octave Slopes.
For many years Linkwitz-Riley crossovers have been the 'industry standard' as they offered the best compromise between the parameters discussed earlier. They retain good polar response, sum to a flat amplitude response and retain correct polarity across the 24dB/octave and 48dB/octave slopes. The 12dB/octave variant generally needs a polarity inversion to achieve the required results. They have been the usual choice for most applications.

Butterworth 6, 12, 18, 24 & 48dB/Octave Slopes.
The even order Butterworth crossovers (12, 24, 48dB/octave) exhibit a symmetrical polar response due to identical phase responses in the Hi and Lo bands. There is an issue with a 3dB peak in the amplitude response at the crossover frequency but this can be corrected with equalisation. In contrast, the odd order Butterworths (6 & 18dB/octave) sum to a flat amplitude response but suffer asymmetry in their polar response that changes as the signal moves through the crossover point. This 'tilt' can produce colouration and is dependant on the listening position. These also require polarity inversion for correct response.

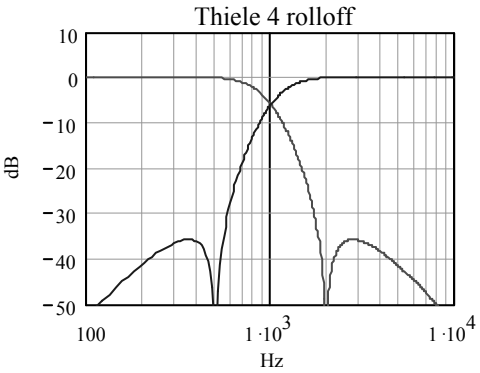
Bessel 12 & 24dB/Octave Slopes.
Standard Bessel filters when used for crossover duties do not provide immediately acceptable results due to deficiencies in their amplitude response. Due to this only 4th and 2nd order (Bes 24 & 12) alignments were considered to be acceptable for inclusion. The 12dB/octave version will require a polarity inversion of one band for proper summation.

Crossover Shapes and Frequencies

WHISEWORKS-NTM Crossover

The WHISEWORKS-Neville Thiele Method (NTM) crossover filter is a new type of electrical/acoustical filter offering significant performance advantages over all previous crossover filter types in audio applications. The filter was developed by Neville Thiele (pronounced “Teel”).

This filter uses a unique notched response to achieve a very steep roll-off rate outside the passband. There are two choices of NTM crossover included in the FDS-366T; a 4th order (NTM 36) and an 8th order (NTM52). The 4th order shape offers exceptional group delay flatness with a roll-off of at least 36dB/ octave. The 8th order version offers the steepest roll-off rate of all.



WHISEWORKS-NTM Crossover Filter advantages:

1. It sums to give constant output against frequency.
2. It has a well defined phase response.
3. It keeps the phase difference between adjacent drivers at zero degrees throughout the crossover region to prevent beam shifting.
4. It has the highest known rate of attenuation in the stop band of all conventional analogue or analogue-equivalent filters of similar order.

The faster roll-off rates realised by the NTM filter shape enable lower distortion that is particularly valuable in applications where space is at a premium as smaller drivers may be used. Driver and cabinet design constraints are also eased since designers can work ‘closer to the edge’ where resonance, breakup, or other anomalies may normally occur with more gentle slopes.

The new Neville Thiele Method crossover shapes now represent the optimal combination of characteristics for most applications and listening tests seem to bear this out! We feel that this shape could topple the Linkwitz-Riley as the new ’industry standard’, particularly as the nearest Linkwitz-Riley equivalent (L-R 48) has attained a reputation for a "hard sound", this doesn’t appear to be the case using the NTM shapes.

Crossover Shapes and Frequencies

Crossover comparison chart

Below is a chart comparing the different crossover filter types that are provided in the FDS-366T Omnidrive. This table should help to ascertain the particular choice of filter dependant on application. Shapes marked with an asterisk * will require polarity inversion.

Shape	Order	Amplitude response flatness	Group delay flatness	Polar response	Roll-off rate
BUT 6	1st	●●●●●●	●●●●●●	●	●
BUT 12*	2nd	●	●●●●●	●●●●●●	●●
BES 12*	2nd	●●●●●	●●●●●●	●●●	●
L-R 12*	2nd	●●●●●●	●●●●●●	●●●●●●	●●
BUT 18*	3rd	●●●●●●	●●●●●●	●●	●●●
BUT 24	4th	●	●●●●	●●●●●●	●●●●
BHS 24	4th	●●	●●●●●●	●●●●●	●●●
L-R 24	4th	●●●●●●	●●●●	●●●●●●	●●●●
BUT 48	8th	●	●	●●●●●●	●●●●●
L-R 48	8th	●●●●●●	●●	●●●●●●	●●●●●
NTM 36	4th	●●●●●●	●●●●	●●●●●●	●●●●●
NTM 52	8th	●●●●●●	●●	●●●●●●	●●●●●●

Key:
● = **Worst**
● ● ● ● ● ● = **Best**
BUT = Butterworth
BES = Bessel
L-R = Linkwitz-Riley
NTM = Neville Thiele Method

Amplitude response flatness: also known as 'frequency response', a measure of the flatness of the amplitude with differing frequencies. Choosing a crossover alignment that sums to a flat amplitude response is usually desirable because such a system will require less equalisation.

Group delay flatness: a measure of how different frequencies are delayed throughout the crossover region. Although it is unlikely that all frequencies can be delayed equally, a smooth group delay response that lacks peakiness is desirable.

Polar response: a qualification of the lobing effect due to the distance between any pair of drivers involved in the crossover. The main lobe needs to be on-axis so that listeners on-axis do not hear dips in the amplitude response through the crossover region.

Roll-off rate: A measure of how quickly the slope of the filter drops off to a much lower amplitude. A steeper slope is generally required to maximise the potential of driver frequency response and to narrow the frequency range that is affected by the crossover operation.

Crossover Shapes and Frequencies

Phase Compensation

Phase compensation to active crossovers was introduced in the classic FDS-355 Omnidrive Compact Loudspeaker Management System. The FDS-366T Omnidrive includes this feature, freeing the user of worry about phase alignment between bands.

More info about Phase Compensation:
A properly designed 2 way crossover always exhibits the inter-band phase relationships that are characteristic of the chosen crossover shape. For example, the Linkwitz-Riley filter shape, with its low-pass filter for the low band, and high-pass filter for the high band, will maintain zero phase difference between these bands at all frequencies, which means that the acoustic outputs from the drivers will sum to a flat response, free of any shifting in polar response.

In 3 way (or more) systems, things can start to go wrong. The mid band in a 3 way system for example, has not one filter, but two (high-pass, and low-pass). The low-pass filter, set at the mid-high crossover frequency will produce some phase disturbance at the low-mid crossover frequency, causing the low-mid crossover filter pair to be misaligned. The same is true of the high-pass filter, which may affect the mid-high crossover filter pair. This misalignment causes incorrect acoustic summing, which results in a non-flat response, and a polar response which shifts with frequency, causing further response problems in some listening positions. Although these effects may be subtle when the crossover frequencies are well separated, 4 and 5 way systems particularly can produce significant errors.

The phase compensation scheme employed in Omnidrive analyses these phase anomalies whenever adjustments are made, and automatically introduces phase adjustment into certain bands so that the phase difference between adjacent bands is always close to zero degrees. Intentional phase differences can be introduced using the **Delay** and **Phase** parameters.

Omnidrive will not attempt to apply phase compensation if the high and low frequencies or shapes of the adjacent bands do not match, on the assumption that the user does not expect to produce a standard crossover alignment.

By default the FDS-366T applies phase compensation to crossover setups where there are 3 bands, or more, in use on a channel and where the crossover filter shapes are *identical*. In general the application of this feature is desirable to maintain the correct phase relationships between bands but, in certain circumstances phase compensation may need to be defeated to avoid phase inconsistencies between separated speaker installations, such as side or under fills and certain monitoring applications. The facility to do this is called 'Phase Comp' and is found in the **Utilities**.

8.0 Dynamic Equalisation

DEQ

What is DEQ?

The BSS DPR-901 Analogue Dynamic Equaliser was a revolutionary way of dealing with equalisation, and was made possible by the *subtractive progressive knee* technique developed for the industry-standard DPR-402 Analogue Compressor. The very same techniques are used in the FDS-366T to give you dynamic control of equalisation, or indeed for conventional full-range compression on every input and every output.

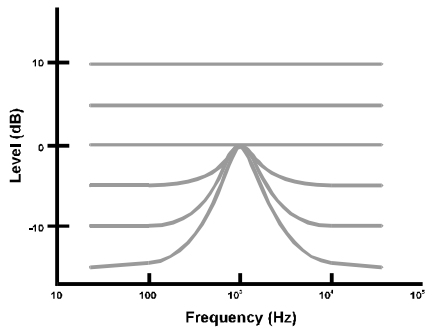
The compressor used in the FDS-366T Dynamic Equaliser uses the audibly transparent 'subtractive VCA' (Voltage Controlled Amplifier) technology used in all other BSS compressors, and results in substantially better performance than other methods. There is clearly no VCA in use in the FDS-366T, as it is a digital device, but the DSP (Digital Signal Processing) models the effect using algorithms developed by our crack team of audio systems experts.

The subtractive 'VCA' also allows the realisation of a completely different type of compression that BSS have named *parametric compression*. This enables selective compression to be applied to only certain frequencies in a signal, as displayed by a conventional looking parametric filter control window. When the selected frequencies are encountered, the Dynamic Equaliser starts to compress *only those* signals at a rate determined by the ratio and threshold controls.

The Dynamic Equaliser operates in two very different ways depending on whether the parametric equaliser is set to boost or cut:

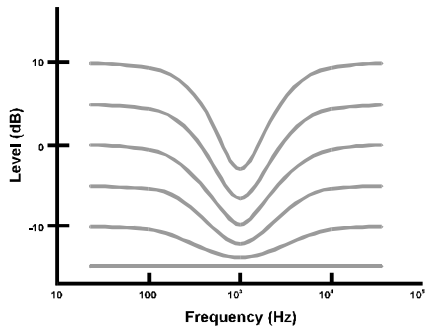
In **boost** mode, the parametric equaliser is allowed to impose its response on the signal when *below* threshold, but the effect of the equaliser is 'flattened out' as the signal starts to *exceed* threshold.

Dynamic EQ boost at -15dB threshold



In **cut** mode however, the equaliser only has effect *above* threshold, and is flattened out as the signal reduces *below* threshold.

Dynamic EQ cut at -15dB threshold



Dynamic Equalisation

DEQ

Notes and Uses

Frequency selective compressing

Conventional compressors affect the whole audible band of frequencies equally. Some compressors can be configured to only start compression when they encounter given frequencies, however, once they start compressing they compress the whole audio band. This is quite distinct from the type of compression available in the FDS-366T DEQ.

The DEQ can be set up so that when it encounters a given *band* of frequencies it compresses *only that band*, this is a very different technique from simple equalisation and is vastly more powerful for both corrective applications and creative manipulation.

To use Dynamic EQ as a wide band compressor, use high pass (i.e low shelving) with a low frequency or vice versa.

Use with Stereo sources

To avoid 'image shift' when stereo sources are compressed the input DEQs have their sidechains linked when the **Stereo Link** parameter is set to "On" .

Control of horn distortion

Above a certain critical sound level output, horn loaded speakers often start to produce distortion. This is due to the irregular movement of air in the horn throat and is usually a problem over a restricted range of frequencies. The band of frequencies affected is dependent on the dimensions of the horn.

The DEQ can be used to reduce the energy in the frequency band that aggravates the horn, resulting in both a much-improved sound and the possibility of higher sound levels.

To do this:

1. With some program material playing, set the EQ shape of the DEQ to Bell with some boost.
2. Manipulate the sound system level, DEQ frequency and width parameters to find the frequency band that is causing problems.
3. Make this band as narrow as possible using the width parameter, ensuring that the DEQ is initially set to "Off".
4. Set the EQ to *cut* and increase the system sound level until there is unacceptable distortion.
5. Adjust the threshold ("Thr") parameter until the distortion is diminished.
6. Try different ratio and filter settings to achieve the best response.

Dynamic Equalisation

DEQ

Dynamic bass and treble enhancement

The bass and treble content of the program can be made to appear louder without increasing the overall sound level if the middle frequencies of the program are reduced when the sound level approaches the limit. This can be especially useful to squeeze the last few dB of perceived headroom out of a PA.

The parametric equaliser associated with the Dynamic Equaliser is much like the other EQs in the FDS-366T (and may in fact be used as a conventional equaliser if DEQ is set to "Off".

As the sidechain of the compressor is fed from the equaliser, this endows the DEQ with the unique ability to select a portion of the audio band and compress *only* that band.

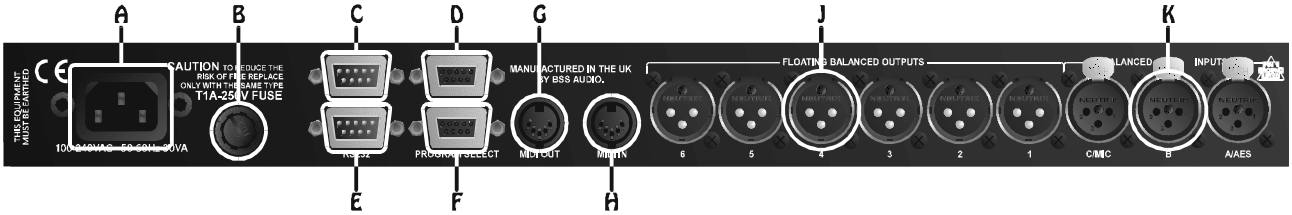
To do this:

1. Set the EQ parameters to boost at the appropriate frequencies, using either BELL filter shape, or probably more aptly, LO-SHELF for the LF end or HI-SHELF for the HF end.
2. Set the threshold ("Thr") parameter so that the boost/cut bargraph starts to go upward at the desired level.
3. Adjust the ratio control for the correct amount of compression.

For more information on setting Dynamic Equalisation please refer to the DEQ descriptions in the Input and Output sections of this manual.

The Rear Panel and Connections

9.0 Rear panel



A Mains power input

The power inlet for the FDS-366T. Note that there is no On/Off switch for the unit. Accepted voltage range: 90-240V AC 50/60Hz, autosensing.

B Fuse

In the event of failure due to mains overload only replace with T1A fuse as stated on the unit.

C,D RS-485 connectors

Serial connection to a PC on a multi-drop network.

E RS-232 connector

Serial connection to either a PC or to connect to another FDS-366T.

Provides an easy way to upload new software.

F Program select connector

Use to select programs 1-8 with external switches or buttons or can also be connected to Soundweb's control port logic outputs.

G MIDI OUT connector

H MIDI IN connector

For connection to other FDS-366T units in order to perform simultaneous program changes, backup or control functions.

J Band outputs (6)

The FDS-366T audio outputs are electronically balanced and floating.

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

K Channel inputs (3)

The FDS-366T audio inputs are electronically balanced. Transformer balancing is available as a retrofit option.

Pin 1	Open circuit
Pin 2	Signal Hot (+)
Pin 3	Signal Cold (-)

10.0 Connections - Mains Power

Mains Power

IMPORTANT: The wires in the mains lead are colour coded in accordance with the following code.

Green and Yellow = Earth
Blue = Neutral
Brown = Live

If the colours of the wires in the mains lead do not correspond with the identifying markings on the terminals in your plug refer to the following:

① The wire that is coloured *Green & Yellow* or *Green* must be connected to the terminal which is marked with the letter 'E' or by the Earth symbol ⏚ or which is coloured *Green & Yellow* or *Green*.

② The wire that is coloured *Blue* must be connected to the terminal labelled 'N' or coloured *Black* or *Blue*.

③ The wire that is coloured *Brown* must be connected to the terminal labelled 'L' or coloured *Red* or *Brown*.

WARNING! THIS APPLIANCE MUST BE EARTHED.

The Green and Yellow wire of the mains cord must always be connected to an installation safety earth or ground. The earth is essential for personal safety as well as the correct operation of the system, and is internally connected to all exposed metal surfaces. Any rack framework into which this unit may be mounted is assumed to be connected to the same grounding circuit.

⚡ Units supplied to the North American market will have a moulded 3 pin connector that is provided to satisfy required local standards.

Voltage setting

The FDS-366T uses a switch mode power supply which offers high efficiency and low heat generation. This power supply accepts universal AC power input voltages in the range 100V AC to 240V AC (nominal), and requires no setting adjustment for AC power voltages in this range. Minimum AC input voltage is 90 Volts, and the maximum is 264 volts.

Outside these ranges the unit will not work satisfactorily, if at all. Voltages in excess of the maximum will probably cause damage. Voltages below the minimum will cause complete system shutdown. The flash memory in the unit should preserve all data in the event of a power failure.

Connections - Mains Power

AC Power fusing

The incoming mains power is protected within the FDS-366T by a fuse in the holder mounted on the rear panel.

In the event that a mains fault occurs and blows this fuse always replace with an identical **20mm x 5mm 'T' fuse, rated at 1A** for continued protection from equipment damage and fire.

Spare fuses of the correct rating are supplied with the unit.

It is most important for continued safety that this specification is strictly adhered to.

Location of mains fuse on rear panel.

Connections - Audio

Audio

The FDS-366T has three balanced Inputs and six balanced Outputs that can accommodate both balanced and unbalanced signals.

Note: Because the FDS-366T outputs can be programmed for any passband, caution must be taken when connecting the outputs to the amplifiers. The connection of low frequency signals to high frequency drivers could cause serious damage - this is not covered by warranty.

Please check your wiring before using the Omnidrive. During the initial set up of the system turn the output volumes up slowly and listen for hums, buzzes and crackling all of which could be down to faulty wiring and could damage your speakers and/or amplifiers.

Balanced wiring

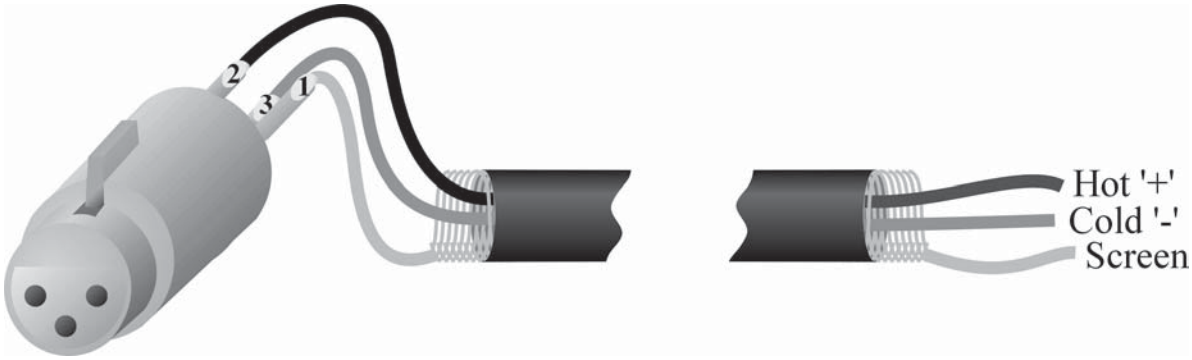
High quality twin conductor shielded audio cables should always be used for all inputs and outputs. The two Inputs are balanced female XLRs. Input cable shields need to be derived from the signal source end as pin 1 for the Inputs is isolated via a low value capacitor to provide high immunity from earth loops, whilst ensuring good EMC performance.

Signal source

Omnidrive Input

The Outputs are balanced male XLRs, with pin 1 connected to ground.

Either pin 2 or pin 3 can be used as 'hot' provided that both the Inputs and Outputs are wired to the same standard.



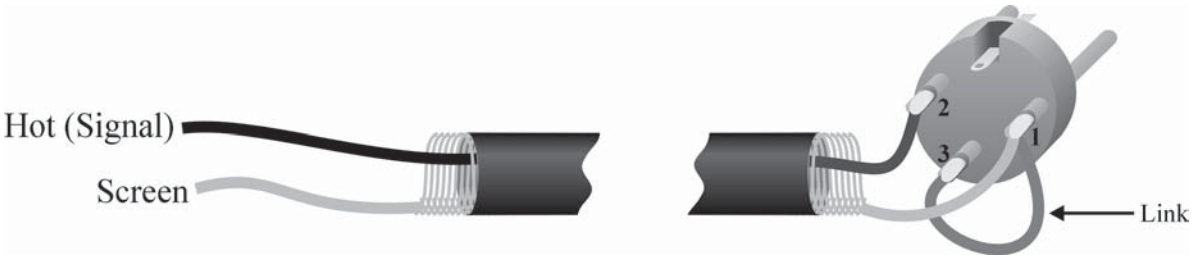
Omnidrive Output

Signal Destination

Connections - Audio

Unbalanced wiring

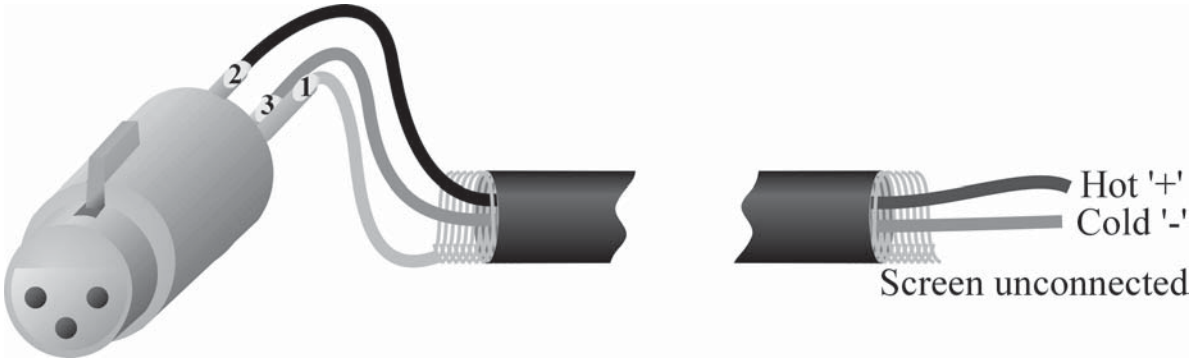
A fully balanced system will yield the best possible results with none of the problems often associated with interconnected audio equipment. However, if the equipment driving the FDS-366T has only unbalanced outputs then the *input* plug to the FDS-366T should be wired so that the shield connection on pin 1 is shorted to either pin 2 or pin 3, depending on the wiring convention of the unbalanced equipment at the sending end.



Signal Source

Omnidrive Input

If the equipment connected to the FDS-366T *Outputs* only has unbalanced inputs, it is still recommended to use balanced (i.e. 2-connector shielded) cable. The interconnecting cable should have the shield earthed to pin 1 at the FDS-366T output, the output 'cold' should be connected to the unbalanced input (0V) ground, and the output 'hot' should be connected to the unbalanced live input. There should be no connection between the cable screen and the 0 V/chassis ground connection of the unbalanced equipment. Strict adherence to these wiring conventions will help to eliminate potential ground loop hums by removing signal currents from the cable shield.



Omnidrive Output

Signal Destination

Note: All diagrams show pin 2 as the 'Hot' connection and pin 3 as the 'cold', in some applications this standard may need to be reversed.

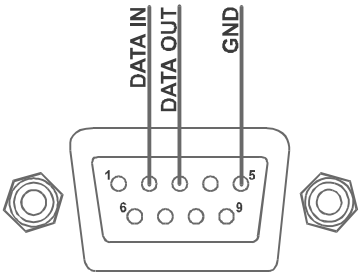
Connections - Serial Controller Connections

MIDI

Standard 5 pin DIN **MIDI In** and **Out** jacks are located on the back panel. These allow remote program recall, parallel control and MIDI systems exclusive dump capability. Standard 5 pin din MIDI cables should be used.

RS232 Serial

An RS-232 connector allows updating of the flash memory via a PC (as system firmware updates become available - check our website, www.bss.co.uk for updates) and also for other software packages such as Smaart or Soundbench to control the FDS-366T.



The cable from the first unit to the PC should be a *null modem* cable. If you wish to make a suitable cable then connect two female 9 way d-type connectors together as follows:

pin 2 - to - pin 3

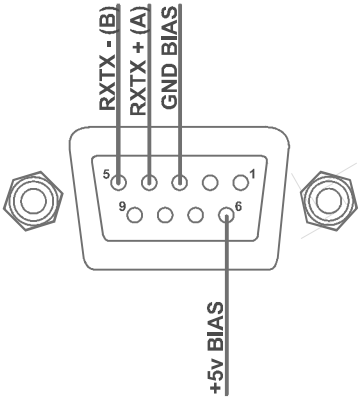
pin 3 - to - pin 2

pin 5 - to - pin 5

RS485 Serial

RS-485 connectors enable Omnidrives connected at some distance apart to communicate for program changes or control purposes. If you need to position Omnidrive units more than 50 feet away from the PC use the RS485 connectors built in to the FDS-366T.

The two RS485 connectors on the FDS-366T are wired in parallel to make connecting units easy. Cables to jump between units should be made up using two male 9 way D-type connectors wired as follows:



pin 4 - to - pin 4

pin 5 - to - pin 5

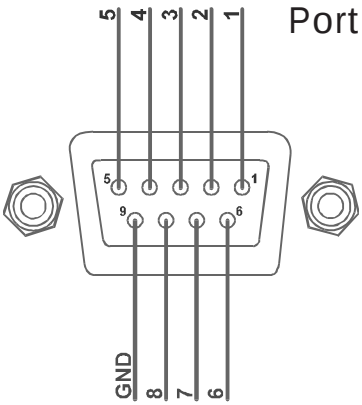
pin 3 - Cable screen

pin 3- to - pin 3 (Optional, only if ground drops encountered.)

Further information relating to the usage of these connectors can be found in chapter 21.0 Seial Communications.

Connections - Program Select Port

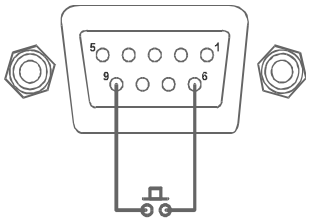
Program Select Port



Port wiring diagram

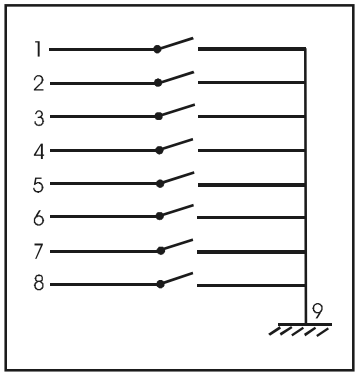
The program select port can be used for external selection of the first 8 programs stored in the unit. Short the appropriate pin on the program Select port to pin 9 to recall the program. This port uses 'negative edge swtiching' which means that a voltage drop activates the program change. Momentary switches are best used to trigger the program changes.

For example, to recall program 6, short pin 6 to pin 9.

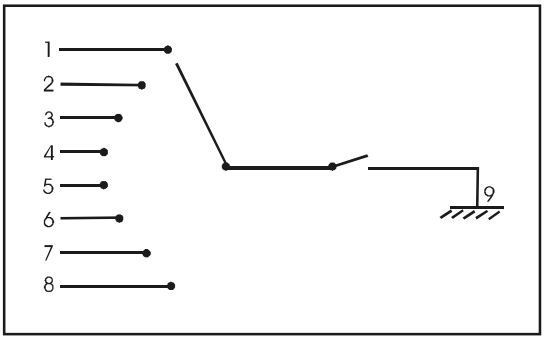


Program 6

Up to 8 switches can be wired in this way, here are some examples of possible configurations.



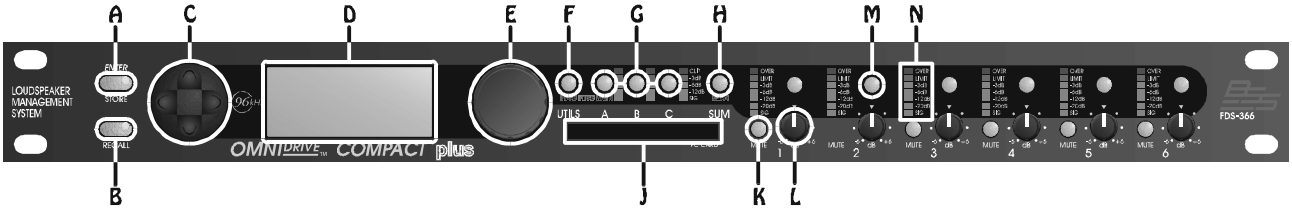
Using 8 momentary switches as above or, using a rotary selector with a momentary switch to trigger the program change, see below.



A BSS Soundweb 'control port' could be used to trigger these program changes by assigning LEDs to the control port 'logic outs' and using 'parameter presets' to switch programs. Note that the action of the LEDs would need to be inverted to achieve the correct result.

Using the FDS-366T Omnidrive Compact Plus

11.0 Front Panel



A STORE /*ENTER* key

Program data can be stored to either internal memory, or a PC card, and is done by using the store facility. This key also doubles as an ***ENTER*** key for confirmation of some programming actions.

B RECALL key

Program data can be recalled to the unit from either internal memory or a PC card using the recall facility.

C Navipad

4-way control key for selecting parameters displayed by the LCD screen. **^** and **v** will change the parameter to adjust in the current channel. **<** and **>** are either used to adjust the value of the current parameter or, in some cases, to move left and right. e.g: in EQ screens.

D Main Display

The main LCD screen displays current parameters being edited with numerical and graphical representations. When the user is not editing, the screen can display the overall system response, or a custom logo.

E Rotary encoder

The rotary encoder is used in conjunction with the navipad keys to input or select information, and also to move between screens. Pushing and holding the wheel will return you to the default screen after a few seconds.

F UTILS button

Quick access to the **Utilities** menu parameter screens.

G Input Channel Select Buttons

Quick access to the Input channel parameter screens.

Front Panel

H SUM button

Quick access to the Input Sum parameter screens.

J PC card slot

The card slot is used for storing/recalling program data via a standard type 2 PC card. Note that the card only inserts up to about a third of its length.

K Mute button

Pressing a mute button will toggle the associated band output on and off. The mute button is illuminated red when the output is MUTED. Mute status is saved when a program is stored.

L Gain trim

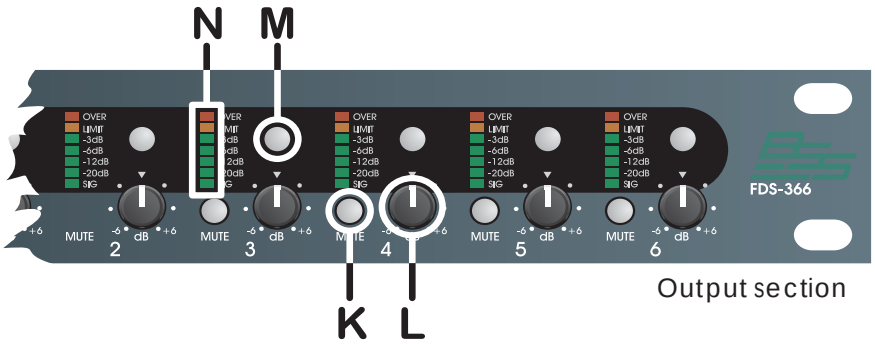
Each output band can be trimmed for output level across a range of -6dB to +6dB. The settings of the gain trims can be saved with a program if required.

M Output Channel Select Buttons

Used to access the edit screen for the relevant channel. Illuminates when the output is being edited.

N Output meter

Calibrated to limiter threshold settings.



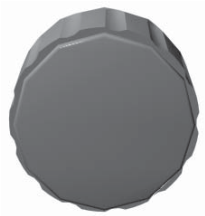
Output section

12.0 Navigation

The Navipad

The Navipad

To the left of the display screen there is a four way rocker selector switch. This enables navigation through the various screens and to both select a **parameter** to adjust (^/v) and to fine adjust the **value** of the currently selected parameter (< and >). Where the parameter is non-numeric these keys scroll through a list of options.



The Rotary Encoder

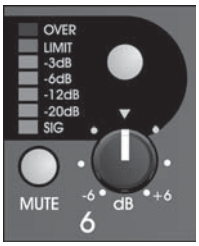
The Rotary Encoder

To the right of the display screen there is a continuous rotary encoder that, when turned, changes the **values** in the value area of the screen. If this control is pressed continuously it will also step through the Inputs, Outputs and Utility modes (the latter only if Utilities was already selected). If held down and turned it will also enable fast switching through the avaliable modes.

Quick access to the main functions of the FDS-366T is available via a selection of front panel buttons.

Utilities and Input Section

In the middle of the unit, next to the rotary encoder, are the buttons that select edit access to the Utilities (**UTILS**) and the four inputs; **A**, **B**, **C** and the **SUM** .

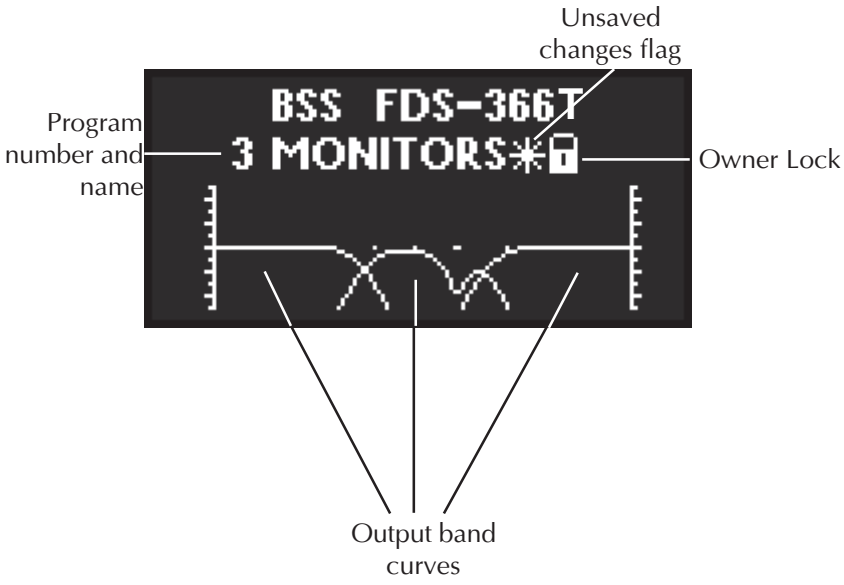


Output Section

The right hand end of the unit is dedicated to the output channels. There are six outputs that each have an edit selection button, gain trim, meter and mute switch.

In general navigate around the programming functions of the FDS-366T Omnidrive by pressing the required mode button (**UTILS** for Utilities functions, **Input** or **Output** select buttons as shown above). Then use the two main controllers to select and edit the various screens. In this way a great deal of operational flexibility is achieved.

13.0 Default Screen



On powering up, the FDS-366T performs internal checks and sets up the audio path before releasing the output mute relays. This takes a few seconds. During this time the operating software version will briefly be displayed. When the FDS-366T is fully powered up the 'default' screen is shown, this gives a representation of the current state of the unit.

If Lock Out mode in the Utilities is "On", the default screen will be replaced by the standard BSS logo or one of the users choice, see the section on loading custom logos for more information on personalising your Omnidrive.

The main area of the display contains the output band curves. Each band curve represents the frequency response of the high and pass crossover rolloffs, in addition to any equalisation filters that have been used (and are not hidden).

14.0 Quick Start Guide

This section describes how to get started using the FDS-366T Omnidrive. If you are unsure about how to use this product please take the time to study this manual before attempting to deploy the unit in earnest. The FDS-366T is a very capable device and as such, knowledge of both audio sound systems and the way that the Omnidrive integrates with them is required, especially to achieve the best results. If you are familiar with the concepts of setting up a system then following this Quick Start guide should enable you to access the facilities of the Omnidrive quickly and easily.

Further information is available in the relevant sections of the manual for clarification of the functionality described below, plus there are many other higher level features that can be employed and these are described elsewhere.

Connecting up

Audio connections

The audio connections should be made *before* powering the unit. All inputs and outputs are electronically balanced, with Pin 2 'hot' signal (+ve), please ensure that your system wiring conforms to the correct specification.

Outputs from your source equipment, e.g. mixer, should be connected to the FDS-366T inputs using inputs A&B for stereo analogue sources or input A for AES digital connection.

The output channels from the FDS-366T should be used to feed amplification systems connected to the relative speakers for the particular bands that are to be setup in the Omnidrive.

Do not put any audio through the unit at this time.

AC power connection

The FDS-366T has a universal voltage AC power input. Connect the FDS-366T to AC power with the lead supplied. The unit will switch on automatically (there is no separate on/off switch). The display should show the default screen, with the current program (if selected), and overall system response curves.

Quick Start Guide

Getting going with a preconfigured program

- **Program recall**

If the FDS-366T has already been configured with a suitable program, you only need to use the recall mode to set the parameters to that program.

! Be aware that different programs may contain inappropriate routings and EQ/Limiter settings for your particular system so care should be exercised when selecting the correct program.

Press **RECALL**. Turn the rotary encoder to select the required program by number and name, and press **RECALL** again.

Programs marked with diamonds are 'OEM' programs and have usually been designed to match specific sound systems. Programs marked with a padlock symbol are 'Owner' programs. Either of these two types of locked programs may only allow edting access of some of the units functions.

Some units will be locked to a specific program only, in this case most controls will be disabled and the unit will be ready for use.

- **Recalling a program from a PC Card**

To load programs from a PC card:

1 Push the card into the slot on the front panel of the FDS-366T.

2 Press **RECALL**.

3 Press **'v'** on the navipad control to highlight "Int", and turn the encoder to select "6Prg" (or "6All" for a full PC Card recall).

4 Press the **'^'** key to return to file selection, and turn the rotary encoder to select the required program.

5 Push RECALL again to recall the program as the current setting.

5Prg and 5All are for the recall of FDS-355 programs which can be read by the FDS-366T ***(refer to the PC Card chapter for more info)***.

Getting some output:

Having selected the appropriate program for the application of the Omnidrive now it is time to apply some audio source material to the unit's inputs. By default all the output mutes should be lit red, i.e. channels muted, so to hear the signal unmute the outputs one by one checking that the sound output is correct for the speaker system required. Adjust the trim levels as necessary to acquire the correct volume balance.

A brief explanation of how to edit the Omnidrive's parameters follows on the next page.

Quick Start Guide

Setting up a system

The overall configuration of the FDS-366T is the first parameter that needs to be set. Decide whether the unit needs to run as a stereo 3 way, mono up to 6 way or as a 3 channel 2 way device.

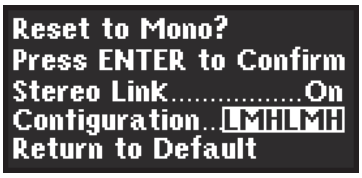
- **Configuration**

The FDS-366T has 4 modes as starting points from which the unit can be configured:

"Mono" - Mono 6-way
"LLMMHH" - Stereo 3-way (similar to FDS-355 routing)
"LMHLMH" - Stereo 3-way
"LHLHLH" - 3-channel 2-way

Access the **Utilities** menu from the default screen by pressing the **^** navipad key, or press the **Utils** button. Scroll around the Utilities menu, if required, to access the "Configuration" screen.

Turn the rotary encoder to select the option you wish to use.

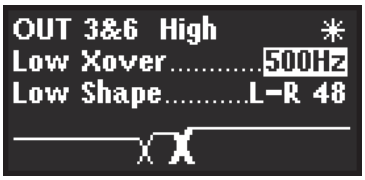


NOTE: When the configuration is changed, the unit will prompt for confirmation of the action. If the '*ENTER*' key is pressed, then the mode will change, and *default values* for that configuration will be restored. It is advisable to do a 'Store' before changing configuration if you have edited a program previously.

Note also that all audio output mutes are 'on' by default however, as these mutes are the last function to be applied during the change it is possible that some audio may be heard. It is still therefore recommended that volumes be turned down when switching Configurations to avoid possible damage to speaker systems.

Once the Configuration is chosen, the crossover points, individual band delays, EQ, DEQ and limiter parameters can be set up.

- **Setting the crossover points**



1 Select the band to be edited by pressing the output assign key on the required channel.

2 Press the navipad **^/v** keys until the first crossover ('Low' slope) screen appears.

3 Select the filter shape from the available types with the rotary encoder. Choose between Butterworth (Butt), Bessel (Bess), Linkwitz-Riley (L-R) and NTM and between the various slope rates available.

4 Press the navipad ^ key to access the frequency/Xover point and choose its frequency using the rotary encoder wheel.

5 The high slope and frequency screen is then accessed by pushing the ^ key.

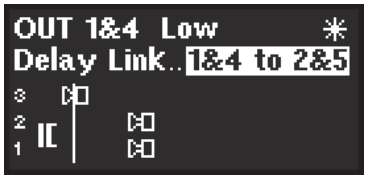
- **Assigning Band delays**

Quick Start Guide

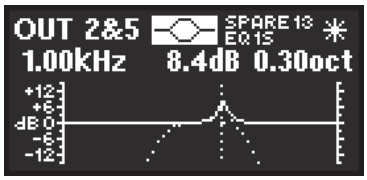
Use the navipad **^/v** keys to select the delay screen. The delay is adjusted using the rotary encoder.

Default settings for display and adjustment of delay is in meters (m), but can be changed to milliseconds (ms), feet/inches (ft) or frames per second (fps) using the "Delay Units" parameter in the **Utilities**.

Bands can also be *linked* so multiple outputs can be delayed as one using the "Delay Link" facility.



- **Adding EQ**



Use the navipad **^/v** keys to move to the EQ screen. The EQ *shape* can be edited first. The shape of the EQ can be selected from one of the following by turning the rotary encoder:

High Shelf with 12dB slope (Hi12)

High Shelf with 6dB slope (Hi6)

Bell

Low Shelf with 6dB slope (Lo6)

Low Shelf with 12dB slope (Lo12)

Navigate around the other EQ parameters using the navipad to adjust:

- Filter Frequency (kHz)
- Cut/Boost (dB)
- Filter Bandwidth (Oct) (bell EQ only)

Once an EQ has been set, press **^** again to assign a new EQ (if required).

- **Setting the limiters**

There are several parameters associated with the limiters of the FDS-366T, which allow you to:

- Switch the limiter (On/Off)
- Adjust the limiter threshold (Thr)
- Adjust the attack & release times (Atk & Rel)
- Adjust the brickwall limiter overshoot (Over)

The output meters are calibrated to the *threshold*, so the threshold value will determine the reference of '0' on the meter at all times, even if the limiters are off. The threshold is indicated in dBu, but can be changed to mV via the Limiter Units screen in the **Utilities**.

- **Storing your settings**

Quick Start Guide

When you have set up the Omnidrive it is essential to store your settings so that they can be recalled should the power be removed from the unit.

Press the **STORE** button to enter the store mode.

Select an unused program location from the list, the Omnidrive will move the cursor to the naming area of the screen. Input an appropriate name for your settings using the rotary encoder to change the characters and the navipad </> keys to move along the naming area.

Having given your program a name press **STORE** again. The Omnidrive will ask if you want to store the program with a lock to prevent accidental further storing over this memory location. Select either "Locked" or "Unlocked" and press **STORE** a final time to commit your settings to memory.

A locked program is denoted by the key symbol displayed next to the name of the program.

This Quick Start Guide is only designed to get you up and running with the FDS-366T Omnidrive's more obvious features. There are many more facilities that can be implemented, including dynamic EQ, phase adjustment, polarity reversal and gain, please refer to the 'Outputs' section of this manual for further information. Also remember that EQ, gain and delay can be applied to the input channels, see the 'Inputs' section for more information.

15.0 Quick Reference - How to ...

Use delays for driver alignment

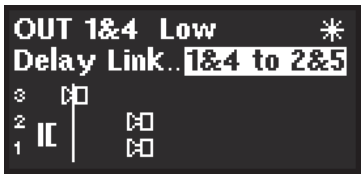
The best way to do this is to have a good idea of the physical positions of the voice coils of the drivers in the cabinet. If you do not know this, an estimate can be made, but it may take a while longer.

For example consider a 3-way box; with a 12″ direct radiator, a 2″ horn with a compression driver, and a 1″ bullet.

The voice-coil furthest away from the front of the cabinet will be the 2″ horn, so the other two drivers will need delaying to compensate for the time it takes the audio energy to reach the outer flare of the horn. This distance could be 300mm. Subtract from this the distance of the voice coil of the low driver (lets say 120mm) and set that delay to the result (180mm). Do the same for the 1″ bullet, which will usually have a shorter distance from voice coil to front, and hence need a longer delay.

Alternatively use the Alignment Assistant to aid this process with measurements, see the Alignment Assistant section in the Utilities chapter of this manual for more information.

Keep relative delays while delaying a group



This is achieved by using the 'Delay Link' mode. Any bands can be linked so that a delay applied acts to all the linked bands. This means that relative shifts between cabinets can be made without upsetting driver alignments.

Select the output band to be linked, then use the navipad **^** key to cycle through the screens until the **Delay Link** screen is shown. Turning the rotary encoder will show all possible choices, which are determined by the bands sourced from the same input. The graphic display will also show the bands being linked.

Name a band

The FDS-366T has a preset list of names you can select from which may suit your system layout. For example, *Output 1* can be renamed to *Subs*.

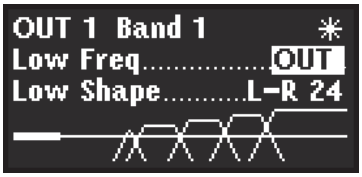
To do this:

- Select Output **1** by pressing the appropriate output select button or by pushing the rotary encoder to select Output **1**.
- Use the navipad **v** key to select the **Name** screen (if not already shown).
- Turn the rotary encoder to select a relevant name for the output. The name is automatically retained at the top of the display when a new screen is selected.

Quick Reference - How to ...

Make a band full range

The 'Xover Adjust' must be changed from "**Both**" to "**Edge**" in the **Utilities**. Pressing **UTILS** while in a crossover edit screen will select 'Xover Adjust'.

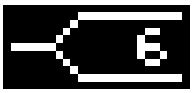


1 Select the band to be edited by pushing the output assign buttons.
2 Use the navipad **^/v** keys to cycle to the Xover frequency for the lower band edge ("Low Freq").
3 Turn the rotary encoder anti-clockwise until the display reads "OUT", the graphic display should show the lower edge as a horizontal line, with no roll-off.
4 Pressing the navipad **^** key twice will access the upper edge Xover frequency screen ("High Freq").
5 Turn the rotary encoder clockwise until the display reads "OUT", and the band is shown as completely flat, i.e. displayed as a continuous horizontal line across the display.

Add EQ for Constant Directivity horns

Constant Directivity horns often require additional equalisation in order to extend their frequency response. In most cases, this is a fairly simple EQ, requiring only a gentle slope (6dB per octave) high-pass shelving filter.

To add CD EQ:



1 Select the band to be equalised by pressing the output assign button or by pushing the rotary encoder to select the channel
2 Press the navipad **^/v** keys until you reach a free EQ.
3 Select the 'shape' icon at the top of the screen and select a 6dB, Hi Pass filter by turning the rotary encoder until the graphic shown left is displayed.
4 Push the navipad **<** key to access the EQ frequency.
5 Adjust the frequency by turning the rotary encoder to about 2kHz (check with your manufacturer for detailed information about frequency and boost requirements for a system).
6 Push the navipad **>** key to access the EQ cut/boost, and turn the rotary encoder to give a boost of about 6dB.
7 The frequency and boost values may need slight adjustment to give the best results.

Load custom logos

Custom logos can be loaded into the FDS-366T using the 366Load.exe loader program (available from our web site, www.bss.co.uk).

- These logos must be in .GIF 87a (non-interlaced) format.
- The size of the FDS-366T screen is 128x56 pixels, and 2 colours.
- Logos should be drawn with a white tool on a black background.

Programming functions in depth

16.0 Program Functions

The FDS-366T has 60 internal program memories which should be plenty of storage space for most applications. However it is always good practice to back up your programming work and this can be achieved in several ways. Programs can be saved to a PC card (refer to the next chapter for more information on the use of PC cards) or 'dumped' via MIDI into either another FDS-366T or a computer/midi data storage medium for later recall.

Storing and Recalling a program can be done at any time using the **STORE** and **RECALL** keys on the left hand side of the LCD, unless *Backup and Swap* has been turned on (see more about this facility in the 'Utilities' section).

NOTE: If the unit is prompting for confirmation of an action at any time, the STORE/*ENTER* key is often used to confirm the action, pressing it at these times will not access the STORE facility.

Recalling a Program

Press the **RECALL** key to access the Recall screen.

The rotary encoder selects the program number to recall (when highlighted), or selects the internal memory or PC card to recall (when highlighted).

The **^/v** keys are used to toggle between Program number and recall type.

The FDS-366T is able to recall both FDS-355 and FDS-366T file types, although FDS-355 programs are converted to suit the new layout and range of the FDS-366T parameters.

Int

Recall programs from the units internal memories.

Prg

Recalls *the currently selected program* from a PC card in the slot at the front of the unit (with a FDS-355 file format).

All

Recalls *all* program data from a PC card in the slot at the front of the unit (with FDS-355 file formats).

Prg

Recalls *the currently selected program* from a PC card in the slot at the front of the unit (with a FDS-366T file format).

All

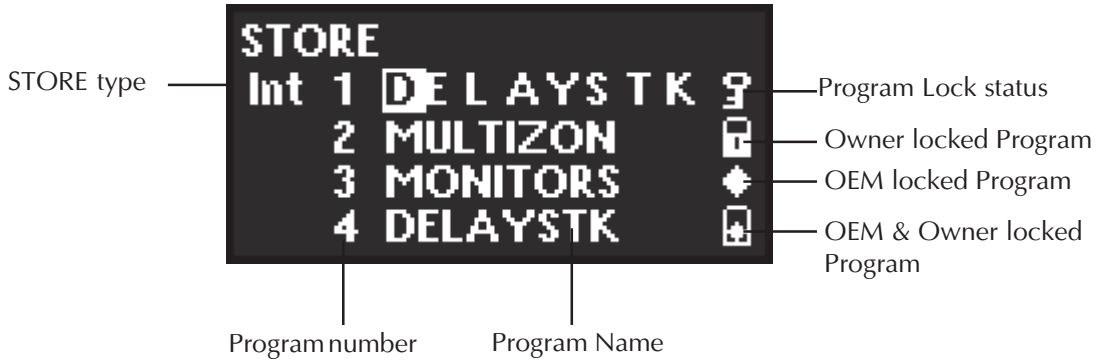
Recalls *all* program data from a PC card in the slot at the front of the unit (with FDS-366T file formats).

When the program you wish to recall has been selected, push the RECALL key again to recall the program. The unit will display a message showing that data is being recalled, and will then display the default screen once the recall is complete.

To exit from the recall screen without recalling a program, press any of the select buttons other than the navipad.

Program Functions

Storing a Program



Familiarise yourself with the method for storing programs as this must be done to memorise any editing that you may have done to your system set up.

- Pressing the **STORE** key will access the Store screen.
- Use the **^/v** keys (or push the rotary encoder) to move along the program name, and also between the program name and the store type at the top left of the screen.
- While the program number is highlighted, turning the rotary encoder will cycle through programs 1-60.
- While each of the letters in the program name are highlighted, turning the rotary encoder will cycle through all available characters. Note that the letters in the program name being edited (at the top of the screen) are more spaced out than other program names on the screen...

Program lock

This facility is available for each stored program. The last space in the program name is reserved for program lock. If a program name displays a key symbol at the right hand side, a new program, or edited version of the current program, cannot be stored in this location.

If you try to store a program in place of a locked program, the unit will display "Program Locked!", but will then highlight the key icon, giving you the option to turn off the lock if you wish to overwrite the existing program. The lock can be turned off in order to delete or overwrite a program by turning the rotary encoder anticlockwise or by pressing the navipad **'v'** key.

Locking a program in this way is purely to protect the user against accidentally overwriting a stored file. The lock status can easily be changed by anyone unless the program is either 'OEM' or 'Owner' locked. These types of locked programs cannot be saved over unless a particular method is used to first disable the locks. More information about 'OEM' and 'Owner' locks can be found in the Utilities section.

Program Functions

Store Type

There are 3 ways in which data can be stored, and these are indicated by the store type message at the top of the display. To highlight the Store type message, use the navipad 'v' key while a program number is highlighted. Once highlighted, turn the rotary encoder to select the type of store you wish to use.

INT

This stores the program in the internal memory of the unit.

Prg

This stores the *currently selected* program to a PC card (if inserted) in the slot at the front of the unit (in a 366T file format).

All

This stores *all* program data to a PC card (if inserted) in the slot at the front of the unit (in a 366T file format).

The Program Lock can be applied to a program stored using any of these 3 methods.

NOTE: The edit flag ('*') appears when there are unsaved changes to a program, compared to the initial status of the last recalled/stored program (Internal memory only). When a program is stored to internal memory, the edit flag will disappear.

If a program is stored to a PC card, then the flag will NOT disappear, since there are differences between the last recalled/stored program (Internal), and the current program.

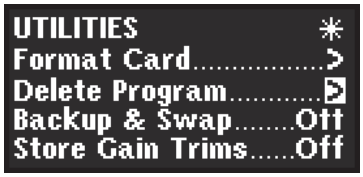
Store Lock

Once the program name has been entered, the store type selected, and the Program lock status cleared, pressing the STORE key again will prompt the message "Store Locked?", asking whether the program should be stored with a Program lock. Use the rotary encoder to turn the Lock on or off ("Locked?" or "Unlocked?"). Once the Lock status is set, push the STORE key a final time to commit the program to memory (or PC storage). The display will now default back to the screen displayed before the STORE facility was accessed.

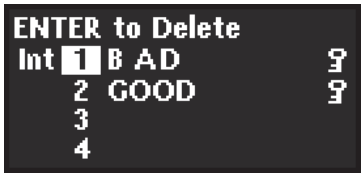
To exit from the store screen without storing a program, press the 'RECALL' button.

Program Functions

Delete Program



To delete a program press the **UTILS** button and scroll through the options until the screen on the left is displayed.
To enter the Delete Program mode, press either > or turn the encoder clockwise, this will change the screen to:



Choose the program to be deleted using the < and > keys or rotary control.
Press ***ENTER*** to delete the program.

Pressing the **^/v** keys at any time will exit the Delete Program mode.

Note:
Program locked (key symbol) and Owner locked (padlock symbol) programs can both be deleted using Delete Program. OEM locked (diamond symbol) programs can also be deleted using Delete Program unless the Delete Program option was locked in the Utilities during the OEM lock process. In this case the OEM program cannot be deleted if it is the currently active program but, can still be deleted if another program is selected.

To totally secure the unit with OEM programs both the Delete Program and Configuration parameters must be locked on *every* program. If this is not done then a user could create a new unlocked program by changing the Configuration and this would then give access to Delete Program again.

17.0 PC Card Usage

Card types

The program memories of the FDS-366T Omnidrive can be saved to PC cards for further storage, safety backup and portability between systems. Note that the PC card only inserts up to about a third of its length into the front panel slot. Do not try to force the card further in as this could cause damage to the unit. Also it is recommended not to leave unused cards in the slot as they could become damaged if the unit is knocked from the front.

Compatible Cards

The PC Card socket on the front of the unit is designed to use PCMCIA type 2 memory cards of between 256kbyte and 2Mbyte storage capacity. The Smart Card interface requires 68pin compatible SRAM memory cards. Attribute memory is not required and is not used. 256K, 512K, 1MB, 2MB cards can be used, however probably the most appropriate card size for the FDS-366T is the 256K card which can hold approximately 14 complete setup (CAL or PAL) files.

Storage life

Battery life varies with manufacturer and memory size and should be checked with the card supplier.

Rechargeable cards are also available. These cards should periodically be left in the card slot of an FDS-366T for a few hours to recharge. Expected battery life for rechargeable cards when not plugged into a unit is about one year, but should always be checked with the card supplier.

PC Card format

The PC Card filing system on the FDS-366T uses a ‘pseudo-floppy’ format. This filing system conforms to the PC CARD standard although it does not format Card Information Structure (CIS) information.

Formatting a Card on the FDS-366T writes a standard PC DOS format to the card beginning at byte 0 as the first byte on a disc. The format writes a DOS boot sector with basic format data but does not write boot software.

This is followed by a single File Allocation Table (FAT) starting at byte 200H. The root directory is written with one entry, a sub-directory called BSSDATA. All data files used by the unit are stored in the BSSDATA sub-directory as there are limits to the number of files that can be stored in the root directory.

The file types that are recognised by the FDS-366T have different file extensions as follows.

"6Prg"	FDS-366T Program data	*.PPG
"6All"	FDS-366T All data	*.PAL
"5Prg"	FDS-355 Program data	*.CPG
"5All"	FDS-355 All data	*.CAL

The file sizes are variable, and change with the number of EQs used, and number of programs.

PC Card Usage

Computer compatibility

BSS has tested and developed the card filing system using an IBM compatible PC card reader and a range of palm-top computers, but cannot guarantee that the cards can be read by any particular piece of computer equipment.

To transfer files to and from an external computer note the following:

- Format the card on the computer.
- Write a sub-directory called BSSDATA into the root directory immediately after formatting the card. All files used by the FDS-366T, FDS-388 and FPC-900 remote are stored in the BSSDATA sub directory.

FDS-355 compatibility

The FDS-366T Omnidrive is capable of reading the programs from the older FDS-355 five channel Omnidrive with a few differences, shown below.

In **RECALL** mode the FDS-355 programs are listed as "5Prg" or "5All". "5Prg" is used to load individual FDS-355 programs and "5All" loads a set of FDS-355 programs overwriting all the data in the FDS-366T in the process.

When FDS-355 programs are loaded into the FDS-366T, the five FDS-355 channels become the top five channels on the 366, i.e. outputs **2-6**. This is intended to allow most stereo FDS-355 programs with a mono sub bass to convert to a stereo sub bass pair. After the conversions are done, channel 2 (which was previously channel 1 on the FDS-355) is copied into the new channel 1 on the FDS-366T, i.e. channels 1 & 2 become identical.

Gain, limiter threshold and eq cut/boost dB values are all converted to the new finer steps/incremental values on the FDS-366T. For example the eq cut/boost values are changed from 0.5dB steps to 0.2dB steps so there may be 0.1dB changes in the values after conversion, e.g. 2.5dB becomes 2.4dB while 2.0dB would stay the same.

If the limiter was "Off" in the FDS-355 program, it stays off. If it was "On" then the **Attack** and **Release** parameters in the FDS-366T are set to "Med" (medium). If the Limiter Attack on the FDS-355 was set to "Fast" then the **Over** (overshoot) value is set to 6dB, otherwise it will be set to 12dB. Dynamic EQs are set to defaults, i.e. with no cut/boost applied.

18.0 Utilities

Introduction

```
UTILITIES
End of utilities
Format Card.................>
Delete Program.............>
Backup & Swap........Off
Store Gain Trims.......On
Midi Dump.....................>
Midi Channel................16
Midi Mode............TX Off
Serial Port............RS485
Input A/AES...Analogue
OEM Lock.................Off
Owner Lock........Active
Lock Out.................Off
Contrast.....................\
Brightness................High
Temperature...........20°C
Delay Corrn..............Off
Delay Units.................m
Limit Units................dBu
Alignment Assistant...>
Phase Comp................On
Xover Adjust..........Both
Sum Type...A+B Post Eq
Stereo Link.................On
Configuration...LMHLMH
V Default Screen
```

The **Utilities** contain settings for the FDS-366T that are of a more general operational nature, rather than particularly related to the individual function of the input and output channels.

Pressing the **UTILS** button or pushing the navipad **'^'** key while viewing the 'default' screen will display the Utilities menu. The **'^'** and **'v'** keys are then used to move along the Utilities path, which starts at the bottom of the list and works upwards, and the rotary encoder is used to change the selected parameter. If confirmation of an action is required, the **STORE/*ENTER*** key should be pressed.

Utilities with "**>**" next to their names have further screens associated with them. Press **'>'** on the navipad to access the extra parameters.

Note: The '96kHz' indicator light under the **Utils** button is purely to display the units sample rate for the AtoD and DtoA conversion of the audio.

The Utilities can be regarded in several functional groups:

- Overall configuration of the input/output routing
  1. Configuration
  2. Stereo Link
  3. Sum Type
- Operational alignments & adjustments
  4. Xover (Crossover) Adjust
  5. Phase Comp(ensation)
  6. Alignment Assistant
  7. Delay Corrn (Correction)
  8. Temperature
- Display units
  9. Limit Units
  10. Delay Units
- Screen adjustment
  11. Brightness
  12. Contrast
- Security locks
  13. Lock Out
  14. Owner Lock
  15. OEM Lock
- Connector modes
  16. Input A/AES
  17. Serial Port
- MIDI functions
  18. MIDI Mode
  19. MIDI Channel
  20. MIDI Dump (also a program function)
- Program functions
  21. Store Gain Trims
  22. Backup & Swap
  23. Delete Program
  24. Format Card

Utilities - Configuration & Routing

1. Configuration

"Mono", "LMHLMH", "LLMMHH" or "LHLHLH"

Configuration defines the general operating mode for the FDS-366T; either Mono, Dual/Stereo 2-Way or Stereo 3-way. The rotary encoder is used to select the desired configuration.

- "**Mono**" mode assigns all outputs from input A.
- Stereo "**LMHLMH**" mode routes input A to outputs 1, 2 & 3 and input B to outputs 4, 5 & 6.
- Stereo "**LLMMHH**" mode routes input A to outputs 1, 3 & 5 and input B to outputs 2, 4 & 6. (Similar to the FDS-355)
- Three way "**LHLHLH**" will route inputs A, B & C to 1&2, 3&4, and 5&6 respectively to drive three 2-way speakers. e.g left, centre, right or 3 bi-amped monitors.

2. Stereo Link

"On" or "Off"

This mode selects whether parameters will be adjusted together, or independently on each stereo pair of channels.

Turning the rotary encoder clockwise selects Stereo Link "On", and anticlockwise selects "Off".

If a MONO configuration is chosen then this parameter is set to "Off" and is unchangeable.

3. Sum Type

"A+B Post EQ", "A+B+C Post", "A+B Pre EQ" or "A+B+C Pre"

Determines what signals are mixed together for the Sum channel. The mono sum is often used for sub-bass drive and can be derived from either inputs A&B or A, B & C (useful for LCR systems particularly).

The sum options are:

- **A+B Post EQ**
  Input A plus Input B (with 6dB of attenuation), with input equalisation.
- **A+B+C Post EQ**
  Input A plus Input B plus input C (with 9.5dB of attenuation), with input equalisation.
- **A+B Pre EQ**
  Input A plus Input B (with 6dB of attenuation), without input equalisation.
- **A+B+C Pre EQ**
  Input A plus Input B plus input C (with 9.5dB of attenuation), without input equalisation.

When selecting the signal source in the Output channels, it is this sum which becomes one of the source options.

Utilities - Crossover Adjustment/Phase Comp

4. Xover Adjust

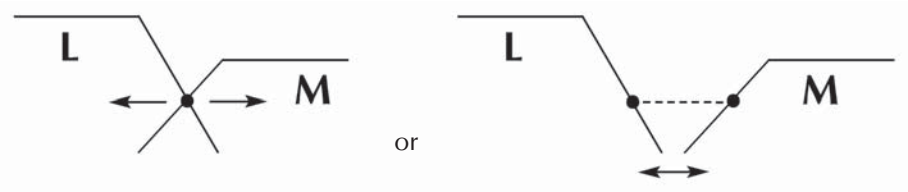
"Both" or "Edge"

The Xover Adjust determines how crossover points are adjusted relative to the corresponding edge of the adjacent band. The following options may be selected:

BOTH

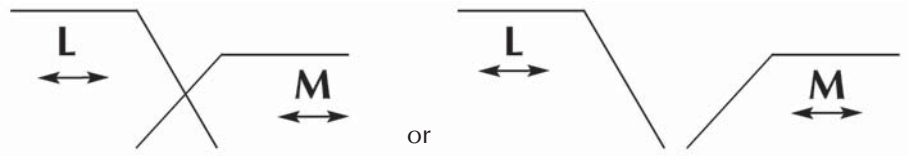
When set to BOTH, both the upper band edge of the lower band and the lower band edge of the upper band are adjusted as a pair. This means that only one filter adjustment is required to set a crossover point, and the graphic display shows both edges moving together.

NOTE: You can select either band in order to adjust the crossover - the lower band or upper band - and either adjustment will move both band edges together, updating the data for the other band.



EDGE

When set to Edge mode, each band edge is adjustable independently. This allows the possibility to create band overlaps at the crossover point.



5. Phase Comp

"On" or "Defeat"

By default the FDS-366T is set up to analyse and apply phase compensation to networks using identical crossover shapes across three bands or more. This is generally desirable but, there are certain circumstances when it may be necessary to defeat this feature, such as when using split systems, some monitor applications and side or under fills.

Further information regarding the implementation of phase compensation can be found in the 'Crossover Shapes and Frequencies' section of this manual.

Utilities - Alignment Assistant

6. Alignment Assistant

The Alignment Assistant is an advanced loudspeaker measurement function built-in to the FDS-366T for directly measuring the delay and phase relationships between drivers (using a measurement microphone), and automatically adjusting the settings to accommodate these. The Alignment Assistant has the ability to 'see' past the crossover filters, and is thus able to compensate for the drivers and enclosures themselves, leaving the crossover to do exactly what it was intended to do, and present a precisely aligned acoustic wavefront. The Alignment Assistant can measure and compensate for:

- Physical alignment of drivers within an enclosure
- Driver or enclosure phase anomalies near the crossover point
- Relative distance correction of arrayed boxes

Note that Alignment Assistant will not alter the phase response of the selected crossover alignment. This will be preserved by the Phase Compensation feature, dependent on the Phase Compensation Defeat setting in the Utilities.

Method

Alignment Assistant uses a special stimulus signal that is sent to the outputs of the FDS-366T during measurement. Each band output is stimulated in turn (via the normal crossover filtering and equalisation). A measurement microphone plugged into the C input of the FDS-366T picks up the stimulus reproduced by the driver under test, and records the result for analysis. The special nature of the stimulus signal allows not only the delay (distance) from driver to microphone to be established, but also the impulse response of the driver/ enclosure, from which phase details can be calculated.

Once all the bands have been measured, the delay and phase results are stored and used to determine the band delays to be applied to make the wavefront from the system coherent between drivers and between cabinets. Various options allow the measurement to be biased towards driver alignment within a cabinet, cabinet alignment, polarity correction, or a combination of these.

Microphone placement and connection

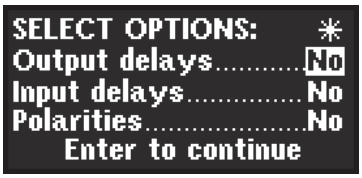
The microphone must be placed far enough away from the loudspeakers so that the vertical placement of drivers does not give rise to differential delays which the listener will not normally be subjected to. It must be close enough that a reasonable level of acoustic energy of the stimulus is achieved and thereby ensuring that there is good signal-to-noise ratio. A good placement would be a forward listener position.

If an array of two or more cabinets are to be aligned, then the microphone should be placed centrally between the cabinets. If the drivers within a cabinet are to be aligned then better signal-to-noise conditions will exist closer to the cabinet. The microphone should then be optimally placed on the central axis of the cabinet at a distance of perhaps 3 metres (10 feet) or so. Care should be taken to place the microphone away from acoustically reflective surfaces such as walls, pillars etc.

The microphone must be plugged into Input C. When the automated measurement process is running, it is important that the microphone is not moved. A microphone stand is highly recommended. Although the system is quite tolerant of noise, It makes sense to keep the environment as quiet as possible.

Utilities - Alignment Assistant

Procedure



The alignment assistant takes you step-by-step through the various stages of the process starting with the "SELECT OPTIONS" screen.

Determine which parameters are to be measured and adjusted.

- **Output Delays** are used for correcting for discrepancies in distance or phase between adjacent drivers in a cabinet or stack.
- **Input Delays** are used for aligning cabinets with one another.
- **Polarities** will correct driver polarities.

Use the Navipad ^ and v to move to the menu item you wish to adjust, then use < and > to change the selection between "Yes" and "No".

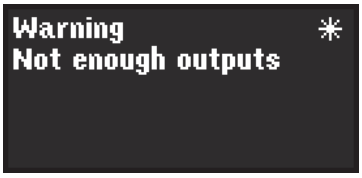
Once you are happy with the selections, press the ***ENTER*** button to continue the assistant.

Selecting bands to measure

You do not have to measure all bands at once; you can decide to exclude some bands from a measurement session.

Use the front panel mute buttons to determine which bands are to be included in the measurement session. Muted bands will not be measured and will not have their parameters altered. Initially no bands will be selected. At least one band must be unmuted for the Alignment Assistant to work.

Once you are happy with the selections, press the ***ENTER*** button to start the measurement process.

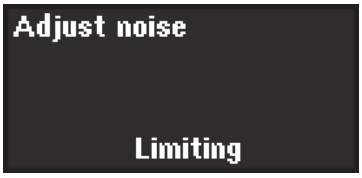


! If all the outputs are muted then the Omnidrive will warn that there are not enough outputs to start the process.

The measurement system is tolerant of a reasonably wide range of stimulus levels received at the microphone and is fairly tolerant of extraneous noise also. However, optimal measurement accuracy will be obtained with reasonably high levels of stimulus. The unit allows this level to be set subjectively.

The stimulus, which sounds similar to pink noise, will start at a low level. Use the rotary encoder to adjust the level of the stimulus to a reasonably high sound pressure level which is still comfortable to listen to (or wear ear defenders!).

As the signal level is increased, you will see the input C bargraph meter beginning to indicate that the microphone is receiving the signal. The unit will expect to see a certain minimum signal level before allowing you to continue.



You should avoid setting the level so high as to cause any outputs to limit or clip.

Utilities - Alignment Assistant

Adjusting the stimulus level

As you increase the stimulus level, the microphone amplifier in the FDS-366T will automatically adjust it's gain to try to obtain a good level. You may therefore not see the input C bargraph value changing once it gets close to full-scale.

If the input level is reasonable and the outputs are not limiting or clipping then start the automated measurement phase by pressing the ***ENTER*** button.

Warning: As the automated part of the measurement process continues, similar SPL(Sound Pressure Levels) stimulus signal levels to those set above will be output intermittently. Care must be taken to ensure that nobody will be subjected to potentially hearing-impairing SPLs.

After measuring each band, the impulse response of the band will be shown graphically on the screen. This may be useful for checking that the Alignment Assistant has captured a sensible measurement rather than noise, etc.

Press ***ENTER*** to continue with the next band.

If this warning is encountered this is because the delay parameters on the output channels that the Alignment Assistant is trying to measure are either 'OEM' or 'Owner' locked. To prevent this, escape from the Alignment Assistant by pressing the **RECALL** button, go to the appropriate lock in the Utilities and deactivate the locks that have been set on the delay parameters on the output channels. Now restart the Alignment Assistant procedure which should now work without this warning appearing.

The not enough level warning may also be encountered at this stage as each band may need tuning separately.

Notes

1. **Which parameters get overwritten?**

Some parameters get overwritten by running Alignment Assistant. If you have valuable settings in place it is recommended that you save the current setup to a new program location before activating Alignment Assistant.

Depending on what options you activate when starting Alignment Assistant the following parameters get overwritten:

- ***Output Delays***
- ***Input Delays***
- ***Polarities***

Any bands that are omitted from alignment will have their settings preserved.

2. **Linking**

Stereo linking and delay linking have no effect on Alignment Assistant. Every band that is selected for alignment will have its parameters individually measured and set.

3. **Polarity in 2nd & 3rd order systems**

Alignment Assistant will not try to evaluate the correct polarity for crossover alignments which require polarity inversion, such as 2nd order and some 3rd order alignments. If the polarity option is enabled, the polarity of the measured bands will be corrected on an individual basis. If you wish to make corrections for crossover alignments which require other polarity settings then these should be applied manually.

4. **Effects of band EQ & dynamic EQ**

Alignment assistant will accurately take into account the effects of crossover settings, but will not account for any equalisation you have put in place on the output bands.

It is assumed that any output equalisation has been applied deliberately and that you require the phase effects that the equalisation will produce. If not, then more accurate results will be obtained if *input* equalisation is used instead of output equalisation.

The same applies for Dynamic Equalisation, although more so, since the phase relationship will change dynamically depending on signal level, causing Alignment Assistant to produce results which are only correct at the level of the stimulus.

5. **Accuracy**
It is difficult to predict accuracy but, under the correct conditions the Alignment Assistant will be more than adequate for aligning drivers to within a few degrees.

Very low frequency bands are often aligned less accurately in terms of time, because of the poor stimulus bandwidth, but will be more than adequate in terms of phase angle. Note also that very low frequency bands can easily be phase shifted by DC block filtering, both within the FDS-366T and in external equipment, causing additional time shifts to be correctly *aligned out*.

6. **C input - care needed with feedback**
When using input C in your system care should be taken when Alignment Assistant finishes, since the routing of input C will revert back to feeding outputs. Although the gain will be very much lower (because the microphone amplifier is defeated), this could under some circumstances cause feedback to the microphone.

7. **Exiting the Alignment Assistant**
If at any time during the process you wish to escape back to normal operation, press the RECALL button.

8. **Maximum distance/delay**
Alignment Assistant has an upper limit on the maximum delay time that may be measured of approximately 75ms (23 metres or 75 feet). If the distance between the driver and the microphone causes a delay any greater than this, erroneous readings will result.

9. **Microphone type**
The choice of measurement microphone is not critical, although a high quality capacitor microphone with a flat frequency/phase response will give more accurate results.

If the microphone is phantom powered, it must be capable of operating at a phantom voltage of at least 15V.

We recommend the BSS FPC900-MIC for this application.

Utilities - Adjustments, Units and Screen

7. **Delay Corrn (Correction)** "Off", "Manual" or "MIDI"

Corrects the implementation of delay in the unit to compensate for ambient temperature. This facility works in tandem with the **Temperature** utility.

With Delay Corrn (correction) set to 'Off', the default temperature is set to 20°C.

Setting Delay Corrn to "Manual" allows a user defined value to be entered, from -20°C to 50°C, in 1°C increments.

If Delay Corrn is set to "MIDI", then the temperature value can be taken from a temperature probe connected to a FDS-388. If the 366 is used with a single 388, then the 366 MIDI input should be attached to the MIDI output of the 388. The 388 should be set to "MIDI:XMIT MET".

8. **Temperature** -20°C to +50°C

Sets the ambient temperature manually if Delay Corrn is set to 'Manual'.

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9. **Limit units** "dBu" or "mV"

The limit units screen allows the units of limiter threshold to be changed between **dBu** and **mV**, depending on your amplifier specification.

10. **Delay units** "ms", "ft", "m", 24fps", "25fps" or "30fps"

This selects the units used for displaying and adjusting delays.

- **ms** represents milliseconds
- **ft** represents feet (and inches - for short delays)
- **m** represents metres.
- **24**, **25** and **30fps** represent delays using 24, 25 and 30 frames per second respectively - for syncing to video and film.

Note that for longer delays, the resolution of the rotary encoder is reduced to match the number of decimal places displayed. Short delays will adjust in approximately 11us increments, whilst longer delays will adjust in 100us increments.

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11. **Brightness** "High" or " Low"

Change the brightness of the LCD display's backlight. Select between High or Low for different ambient light conditions.

12. **Contrast** Change the contrast of the LCD display. A "/" character will rotate to show that the value is being changed. Adjust until the screen display is the most easily readable.

Utilities - Security Lock Outs

Any changes made to an audio system have the potential to be damaging, even if only accidentally made. For this reason several different security systems are built in to the FDS-366T to protect the system.

The security levels offered by the FDS-366T enable the various functional aspects of the Omnidrive to be secured away from accidental or malicious adjustment. Some locks are quite easy to defeat, while others deliver in depth protection for preconfigured set ups at parameter level and are accessed by passwords.

13. Lock out

"On" or "Off"

Lock Out mode prevents access to editing functions on the input and output channels. Since this utility is not password-protected, Lock Out can still be accessed and turned off. This mode is intended only as a precaution against accidental adjustments, and not as a tamper-proof security lock.

When **Lock Out** is set to "On", no variables can be changed except for the display **Brightnesss** and **Contrast** and, of course, the **Lock Out** itself. The screen will display either the unit's BSS logo or any custom logo that has been loaded, (see the Quick Reference section for more details on how to load your own custom logo). Navigation around the various screens to look at the parameter values is possible but only the front panel gain trims and mutes are adjustable.

! Locking the unit in this way is only to protect the Omnidrive against other users changing the system setup accidentally or against unauthorised people intentionally changing the system. This status can be changed by anyone who knows how to operate the FDS-366T.

14. Owner lock

"Off" or "Active"

The **Owner Lock** mode gives the programmer the ability to hide selected parameters from other users' view and prevent those parameters from being tampered with.

A password is entered by the programmer to protect the integrity of the locked parameters, and this password is necessary to subsequently gain access to the 'Owner' locked parameters and to the parameter locking mechanisms.

The end user may then use the locked 'Owner' program as a basis for operating a system, and only make further modifications to the setup to an extent completely controlled by the program designer.

Owner locked programs are denoted by the padlock symbol, shown left, next to either a program name or next to any parameters that have been Owner locked.

It is advisable to edit a program to the desired level before starting the locking process as further changes to parameter values cannot be made during the locking process.

Note that 'OEM' locked parameters cannot be unlocked or viewed with the Owner Lock.

Utilities - Security Lock Outs - Owner lock

Setting up 'Owner' Locks

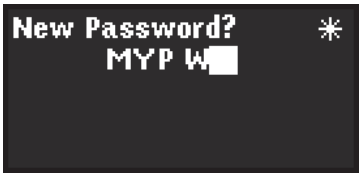
1. To activate the **Owner Lock** go to the **Utilities**, select "Owner Lock" and turn the rotary encoder clockwise.
2. Enter the default password, which is "OMNI" for **Owner Lock,** by turning the rotary encoder to change the displayed character, and then either pressing the navipad > key or pushing the rotary encoder to move along the password. The use of a default password is to prevent accidental or malicious setting of lock flags.
3. Press ***ENTER*** to enter the default password.

4. The "Lock Setup" screen is briefly displayed indicating to press the ***ENTER*** key when you have finished setting up the locks.

5. After this screen the "Lock all?" screen is displayed. This facility allows the locking of all parameters (that are saved as part of a program) immediately and is a good starting point if you want to unlock only particular parameters. Equally, if you wish to selectively lock only certain parameters leave "Lock all?" off. Press any button other than ***ENTER*** to move into the programming screens.

6. The screens from here on can be moved around in the usual manner, but turning the rotary encoder will now toggle Owner Lock on/off for the current parameter (shown by a padlock icon in place of the current value) instead of changing any values. Be sure to have set any program parameter values to those desired before entering the lock setup mode. The word "Own" in the top left of the screen denotes that this is Owner Lock mode and prompts you to press ***ENTER*** when finished setting the locks.

7. At the 'end' of the used EQs screen, there is an option to '"Lock Unused EQs". This option prevents any user without the correct password from entering any further EQs onto that channel.



8. Once the required parameters have been locked out, the ***ENTER*** key should be pressed again - prompting for the *user* password to be entered. At this point it is possible to change the existing default password to one of your choice - particularly recommended if the unit is to be hired out as the *default* password is the same on all FDS-366Ts. Note that the password is alphabetical only.
9. Press the ***ENTER*** key a final time to exit **Owner Lock** setup mode, confirming the lock selections.

Utilities - Security Lock Outs - Owner lock

Storing Owner Programs

To store a program as an 'Owner' program, the unit must be in Owner Lock setup mode when the program is stored, otherwise the stored program will not be identified as an Owner program in the program list. So as soon as the last set of locks have been applied and STORE/***ENTER*** has been pressed to confirm the selection press STORE again and save the program.

Adding further locks

Further locked parameters can be set up by first turning **Owner Lock** from "Active" to "Off" in the **Utilities**. To do this follow the procedure as above for entering the password and type in the *user* password, this time upon pressing ***ENTER*** you will be returned to the **Utilities** and the **Owner Lock** will now be "Off". Switch the **Owner Lock** back into set up mode by restarting the process as before, now using the *default* password. This time your previously locked parameters will still have the locked icons next to them and you can either change these settings or add new locks to further parameters.

In the RECALL and STORE screens the padlock symbol will be displayed next to any program that has had Owner locks applied to it. If the program is also locked the key symbol will not be shown unless you attempt to store over the program. In this case the "Program Locked!" warning will be shown and the cursor will move to the padlock icon. Turning this off with the navipad **'v'** key will reveal the key symbol, turn this off too in oder to store an edit over the existing program.

! The Owner locks can only be changed by someone who knows the Owner Lock password. BE WARNED THAT IT IS IMPOSSIBLE TO UNLOCK A PROGRAM WHERE THE PASSWORD HAS BEEN FORGOTTEN.

Utilities - Security Lock Outs - OEM lock

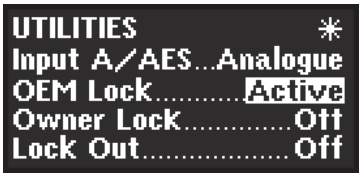
15. OEM Lock

"**Off or "Active**"

The **OEM Lock** mode gives the user the ability to hide selected parameters from other users' view and prevent those parameters from being tampered with. OEM Lock is the highest level of programmable security available to the FDS-366T.

A password is entered by the engineer to protect the integrity of the locked parameters, and this password is necessary to subsequently gain access to the OEM locked parameters and to the parameter locking mechanisms.

The end user may then use the locked 'OEM 'program as a basis for operating a system, and make further modifications to the setup, to an extent completely controlled by the designer.



Setting up 'OEM' Locks:

1. To activate the **OEM Lock** go to the **Utilities**, select "OEM Lock" and turn the rotary encoder clockwise.

2. Enter the default password, which is "BSS" for **OEM Lock,** by turning the rotary encoder to change the displayed character, and then either pressing the navipad > key or pushing the rotary encoder to move along the password. The use of a default password is to prevent accidental or malicious setting of lock flags.
3. Press STORE/***ENTER*** to enter the default password.

4. The "Lock Setup" screen is briefly displayed indicating to press the STORE/***ENTER*** key when you have finished setting up the locks.

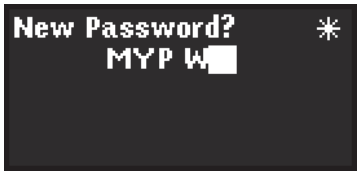
5. After this screen the "Lock all?" screen is displayed. This facility allows the locking of all parameters (that are saved as part of a program) immediately and is a good starting point if you want to unlock only particular parameters. Equally, if you wish to selectively lock only certain parameters leave "Lock all?" off.

6. The screens from here on can be moved around in the usual manner, but turning the rotary encoder will now toggle OEM Lock on/off for the current parameter (shown by a diamond icon in place of the current value). The word "OEM" in the top left of the screen denotes that this is OEM Lock mode and the bottom line prompts you to press STORE/***ENTER*** when you have finished setting the locks.

7. At the 'end' of the used EQs screen, there is an option to '"Lock Unused EQs". This option prevents any user without the correct password from entering any further EQs onto that channel.

8. Once the required parameters have been locked out, the STORE/

Utilities - Security Lock Outs - OEM Lock



ENTER key should be pressed again - prompting for the *user* password to be entered. At this point it is possible to change the existing *default* password to one of your choice - particularly recommended if the unit is to be hired out as the default password is the same on all FDS-366Ts. Note that the password is alphabetical only.

9. Press the STORE/***ENTER*** key a final time to exit **OEM Lock** setup mode, confirming the lock selections.

Storing OEM Programs

To store a program as an 'OEM' program, the unit must be in OEM Lock setup mode when the program is stored, otherwise the stored program will not be identified as an OEM program in the program list. So as soon as the last set of locks have been applied and STORE/***ENTER*** has been pressed to confirm the selection press STORE again and save the program.

When OEM programs are stored, they are automatically program-locked, and identified in the program list by a diamond. The OEM program lock status *cannot* be undone by the program lock utility, but an OEM program may be overwritten by another OEM program with the same OEM password.

For example, recalled OEM program 1 cannot immediately overwrite program 1, even if the same OEM password is used, and the message "Program Locked!" will appear. The OEM Lock must first be turned off, and then turned back on again (using the same password). Now if the program is stored over program 1, the STORE facility will allow the program to be overwritten.

! The Owner lock mode can only be changed by someone who knows the Owner Lock password. BE WARNED THAT IT IS IMPOSSIBLE TO UNLOCK A PROGRAM WHERE THE PASSWORD HAS BEEN FORGOTTEN.

Adding further locks

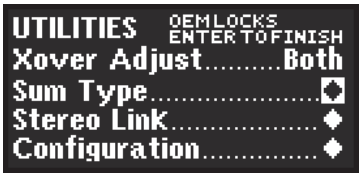
Further locked parameters can be set up by first turning **OEM Lock** from "Active" to "Off" in the **Utilities**. To do this follow the procedure as above for entering the password and enter the *user* password, this time upon pressing ***ENTER*** you will be returned to the **Utilities** and the **OEM Lock** will now be "Off". Switch the **OEM Lock** back into set up mode by restarting the process as before, now using the *default* password. This time your previously locked parameters will still have the locked icons next to them and you can either change these settings or add new locks to further parameters.

Utilities - Security Lock Outs - Notes

OEM & Owner Locks

If a program has both OEM and Owner Locks applied to it a combination symbol, i.e. diamond and padlock, will denote the common parameters. Any such programs will be displayed with this symbol in the STORE, RECALL and default screens.

Configuration parameter note



When the Configuration parameter is locked by either OEM or Owner locks it is displayed with the appropriate lock symbol during the lock setup mode. However, after the locks are confirmed the Configuration parameter will not be visible in the Utilities menu if an OEM or Owner locked program with this parameter locked is selected.

Lockable Utilities

Not all of the Utilities are lockable using OEM or Owner locks, some parameters are seen as applicable only to the unit's operation and are not stored as part of a program. Utilities that *are* lockable include:

- Configuration
- Stereo Link
- Sum Type
- Delay Correction
- Temperature
- Input A/AES
- MIDI Dump
- Backup & Swap
- Delete Program

Utilities - Input modes and MIDI

16. Input A/AES

"Analogue" or "AES"

Select whether the input A socket is to accept either conventional **Analogue** input or **AES** (AES/EBU) digital input. In the latter case it will be used as the source of channels A & B for routing in the unit.

17. Serial Port

"RS232" or "RS485"

Selects whether serial communications is using **RS485** or **RS232** to transceive program and/or control data. See the 'Serial Communications' section for more details.

18. MIDI Mode

"Off", "Program", Master", "Thru", "PC Port" or "Multidrop"

The selection of this mode sets what data the FDS-366T can *transmit* on it's **MIDI OUT** socket, and depends on the use of the FDS-366T in a system of similar devices. The possible selections are:

TX Off Prevents MIDI messages being transmitted, MIDI data sent from other Omnidrives, e.g. program changes, MIDI dumps and control information, is still received and acted upon accordingly.

Program Enables the unit to transmit only MIDI program changes, useful if there are several Omnidrives connected together and you do not want control information to affect the other units.

Master Transmits all control changes to other devices on the same MIDI channel, this enables parallell operation of two, or more, FDS-366Ts. This can be useful in situations where simultaneous control of multiple Omnidrives is needed, i.e. systemwide gain changes over multiple Omndrives during setup.

Thru Passes MIDI data received on the MIDI **IN** socket directly to the FDS-366T's MIDI **OUT** socket. MIDI data received by the unit is still acted upon but in this mode data is thrued onto other units connected to the MIDI OUT. This is important in order to send program changes (for example) to several Omnidrives simultaneously. This mode should also be selected when using the BSS MIDI network with the FPC-900r and Soundbench systems.

PC Port Allows the unit to be connected directly to a PC via the RS-232 port. In this mode programs like Soundbench and Smaart Live can communicate with the Omnidrive and edit the program parameters.

Multidrop Use this setting when the Omnidrive is to be part of a multidrop network of devices. See the 'Serial Communications' section for more info.

Utilities - MIDI

19. MIDI Channel 1-16

Select the MIDI channel that the unit is assigned to (standard MIDI channels 1 through 16 are available). In order to communicate effectively with other Omnidrives connected on the same MIDI network all units that require synchronisation for program changes and control must be on the same MIDI channel.

Alternatively, an easy way to prevent an Omnidrive connected via MIDI from accepting unnecessary program changes or control data is, to change its MIDI channel setting to a channel other than the one that the controlling Omnidrive is set to.

20. MIDI Dump

This mode allows you to send (dump) the current program settings to another FDS-366T, or a MIDI storage device, e.g. a computer or MIDI data filer, for backup. If you are using the MIDI Dump facility to transfer data to another FDS-366T, ensure that both devices are set to the same MIDI channel, and connect the MIDI OUT of the sending device to the MIDI IN of the receiving device. The MIDI Dump functionality is unaffected by the MIDI MODE setting.

To perform this operation:

- From the MIDI DUMP option in the Utilities, turn the rotary encoder clockwise, or press the > navipad key to access the MIDI DUMP mode
- Press ***ENTER*** to confirm the operation. A percentage complete figure will show how much data has been transferred. When the dump is complete, the screen returns to the Utilities menu.

NOTE: *All* parameter edits in *all* stored programs will be overwritten in any connected FDS-366T set to the same MIDI channel. Use MIDI Dump with care! This can also apply to other models, e.g. Minidrives, in this case units connected and set to the same channel may operate erroneously.

Utilities - Program Functions

21. Backup & Swap

"On" or "Off"

Defaults to **'Off'**.

Often known as Edit/Compare in other systems.

This function allows the user to make adjustments to a setup, and then compare the changes to the original setup.

With this facility turned **'On'**, the **STORE** and **RECALL** buttons are reprogrammed to perform 'backup' and 'swap' respectively.

Pressing the **STORE** (Backup) button will copy the current setup to the internal clipboard. Changes can then be made to the setup, and then the **RECALL** (Swap) button can be pressed to toggle between the two setups to compare them audibly.

Note: 'Backup & Swap' only works when parameters of a program have been edited**.**

This function has no effect in the following circumstances:

- Immediately after boot-up, as the backup is empty.
- Immediately after a setup has been stored; since pressing the **RECALL** (Swap) button toggles between two identical setups.

! With this option turned **'On'**, a Store or Recall can ONLY be performed from the default screen, or Utilities menu.

22. Store Gain Trims

"On" or "Off"

Stores the front panel gain trim values with the program. The front panel value is added to the band gain value for each output.

When recalling a program, the unit will warn to set ALL front panel trim values to zero.

23. Delete Program

This facility allows any stored program to be removed from the unit. Use the rotary encoder to select the desired program, and press ***ENTER*** to confirm deletion. See chapter 16.0 Program Functions for more information.

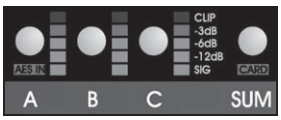
24. Format Card

For this mode to be enabled, a PC card must be present in the slot at the front of the unit. To begin the format, turn the rotary encoder clockwise, and the unit will prompt for ***ENTER*** to be pressed to confirm the action. When the card is formatted, the screen will return to the Utilities.

! ANY DATA ALREADY ON A CARD WILL BE LOST DURING A FORMAT AND IS IRRETRIEVABLE. BE SURE YOU ARE FORMATTING THE CORRECT MEDIA!

See chapter 17.0 PC Card Usage for more information.

19.0 Input Channels



There are three inputs available for routing to the outputs, plus an internal mono sum of inputs. The input channels are:

A, **B**, **C** and **Sum**.

Any input can be routed to any output, particularly in the 'Mono' configuration mode however, in the stereo configuration modes inputs A&B are usually the stereo pair and input C can be used as a separate feed for mono sources, e.g. a sub bass feed or in LCR applications (as the centre channel).

Note also that when input A has been selected to use AES digital sources (Utilities>Input A/AES) that the internal routing adjusts to accept the stereo AES feed and route in across inputs A and B, as for an analogue signal.

Sum notes:

The composition of the sum input may be specified in the **Utilities**, as either:

- "A+B Pre Eq"
- "A+B Post Eq"
- "A+B+C Pre" (Eq)
- "A+B+C Post" (Eq)

The facilities described in this section are common to all inputs, except **Sum** which only has Delay adjustment.

The edit screens associated with the inputs are in the order as follows:

For inputs **A**, **B**, **C**

1. Gain
2. Delay
3. EQ Bypass
4. DEQ (Dynamics parameters)
5. DEQ (EQ settings)
6. EQ 1

   Further EQs can then be assigned if required/available.

For the input **SUM**

1. Delay

Input Channels - Screen Explanations

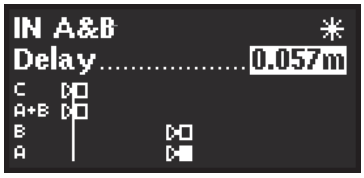
1. Gain

-15.0dB to +15.0dB in 0.1dB steps

To adjust the relative gain of the input channel, turn the rotary encoder to achieve the desired gain.

2. Delay

Adjustable in ms, m, ft and fps



The delay on each input channel can be adjusted individually, in approximately 11 microsecond steps. Turning the rotary encoder will set the amount of delay applied to the selected input.

This delay is typically used to set the delay for delay towers etc. or, to stagger the delays between the left and right channels to 'move' sound lobes in an installation.

Delays can be viewed and adjusted in metres('**m**') (default), feet/inches ('**ft**'), frames per second ('**fps**') or milliseconds ('**ms**') by choosing the appropriate setting in the 'Delay Units' **Utilities** option.

Note: The maximum delay value is restricted by any amount of delay applied to an output which the current input feeds. There is a maximum total delay time of 2625ms that can be assigned between both input and output channels.

3. EQ Bypass

"Bypass" or "On"

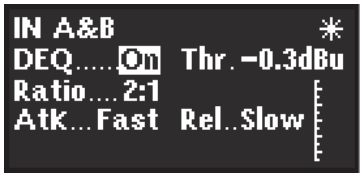
This screen enables all the Eqs currently in use to be switched out of the signal path when "Bypass" is selected. This is useful to check eq adjustments against the original uneqed source.

Input Channels - DEQ Dynamics Screen

The first EQ in each output can be programmed to work dynamically. The first DEQ screen sets up the parameters of the EQ's compressor; the EQ screen that follows sets the EQ parameters.

DEQ

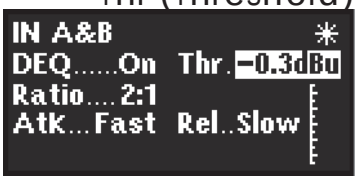
"On" or "Off"



Determines whether the Dynamic equaliser on this output channel is enabled for dynamic operation. When set to OFF, the equaliser will operate as a conventional equaliser. When set to ON, the boost/cut value of the equaliser is dynamically varied according to the amplitude of the signal. If the DEQ parameter is selected as "Off" then the other parameters on this DEQ screen are not selectable - switch DEQ to "On" to adjust them.

Thr (Threshold)

(-30dBu to +20dBu in 0.1dB steps)



Sets the signal level that is required to trigger compressor operation.

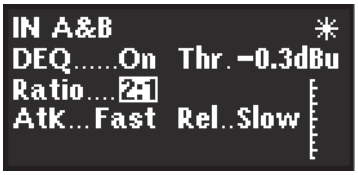
If a signal is *below* threshold in 'boost' mode, or *above* threshold in 'cut' mode, the Dynamic Equaliser will not compress it. Adjusting the threshold control downwards brings a signal closer to, or takes it above, the threshold level respectively.

Once the input signal is *above* the threshold level in 'boost' mode, or *below* threshold in 'cut' mode, gain reduction or compression will occur. The amount of effective boost/cut is indicated on the bargraph meter to the left of the DEQ parameters screen or on the curve itself in the DEQ Equaliser window. What actually happens to the sound when compressing is to a large extent governed by the **Ratio** parameter setting.

In use the threshold and ratio controls are generally adjusted as a pair whilst listening to the result. The attack and release parameters also change the characteristics.

Ratio

(2:1, 5:1, 10:1, 20:1, INF)



Determines the aggressiveness of the dynamic equaliser. Higher settings control the boost-cut very tightly, just like a limiter. Lower settings produce a more relaxed result.

In applications where gentle compression is required, it is advantageous to change from the linear to compression region in a very gradual manner, rather than the more conventional abrupt manner. The FDS-366T Dynamic Equaliser has been configured so that for *low* settings of the ratio control and *low* levels of compression, the transfer is *soft*. For *high* ratio settings and *high* levels of compression the transfer becomes *harder*.

This 'progressive knee' gives inaudible compression for low levels of ratio and gain reduction, whilst allowing harder compression for limiting and extreme control when required. It is also an important characteristic of the FDS-366T Dynamic Equaliser (and all other BSS Audio compressors) and is why a 'soft knee' or other similarly labeled control is not required. Progressive knee is also

Input Channels - DEQ Dynamics Screen

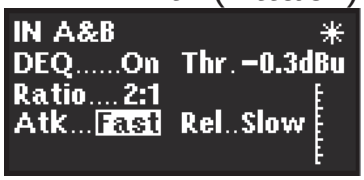
one of the main reasons for the transparency and musicality of the DEQ at low compression ratios.

Envelope shaping

The Dynamic Equaliser has automated time constants which track both the nature of the programme, and the settings of the crossover filters and the Equaliser associated with DEQ. The user may however influence this automation using the Attack and Release parameters, which effectively scale the automatic parameters.

Automatic time constants use a combined program related attack time setting and a two-part program related release time setting. The two part program dependent release provides a fast release to restore non-compressing gain as soon as the event has passed and a much longer one following release to avoid rapid gain change effects.

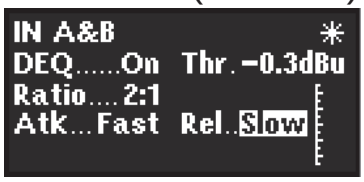
Atk (Attack)



"Fast", "Med", "Slow"

Sets the attack time of the dynamic equaliser so that the response time to increasing input signal levels can be adjusted.

Rel (Release)



"Fast", "Med", "Slow"

Specifies the release time of the dynamic equaliser so that the response time to decreasing input signal levels may be adjusted.

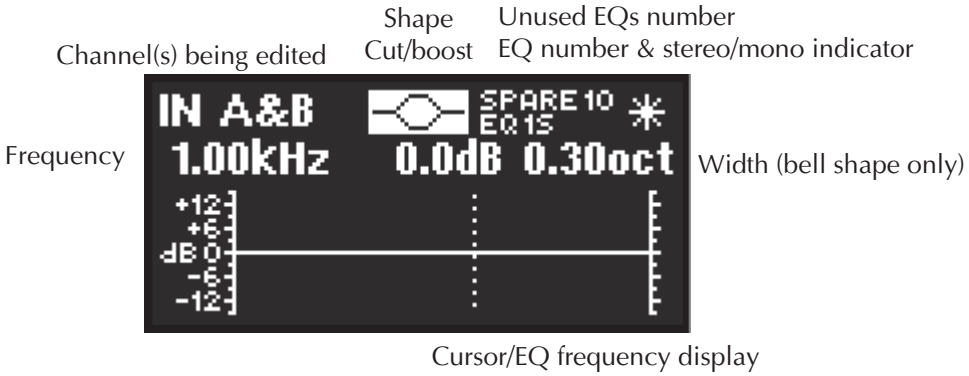
The dynamics bargraph shows the operation of the compressor, either compressing or expanding the signal dependant on the settings of the DEQ equaliser cut or boost settings. The bar in this display will not appear unless some degree of cut or boost has been applied.

Inputs - EQ

EQ adjustment screens

The next screen following the DEQ dynamics settings is the EQ adjustment screen associated with the DEQ, this is represented by the DEQ logo in the top right of the display. This EQ should be set up to accomplish the dynamic EQ characteristics as required and is permanently wired into the channel, although its effect can be switched out with the EQ Bypass facility. However, should all the spare EQ filters be in use elsewhere, it is possible to use this EQ without its dynamic element by switching DEQ 'Off' in its associated dynamics screen.

Using the navipad ^ key will step through into the first 'standard' EQ, i.e. without dynamic capabilities. Operationally these screens are identical to their DEQ equivalent except for the indication of spare EQ filters in the top right of the display. This is important as there are a set number of DSP filters available in the FDS-366T that can be used for EQ duties, see 25.0 Filter Allocations for more information.



If the FDS-366T's configuration is MONO, all EQ's will be mono, shown by the letter 'M' after the EQ number, e.g. "EQ2M". If configured for a stereo mode, i.e. LHLHLH, LMHLMH or LLMMHH, EQ's will be marked as stereo (when Stereo Link is "On") with an 'S' next to the EQ number, e.g. "EQ2S".

A contour line shows the effect of the crossover filters on this band, this is a combined response and will show both the DEQ EQ curve and any further EQs that are assigned in the same channel.

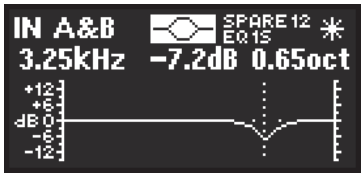
NOTE: The A+B sum signal is mixed *after* the EQ sections on A and B, so the A+B signal is affected by A *and* B EQ.

Adding extra EQs

To add extra EQs, an amount of cut/boost must be applied to the current EQ, another EQ (assuming there are spare EQs) will then be inserted automatically. Pressing the navipad ^ key will acccess the next EQ. If you press the ^ key and the screen does not change, then you have reached the last EQ currently in use.

Inputs - EQ

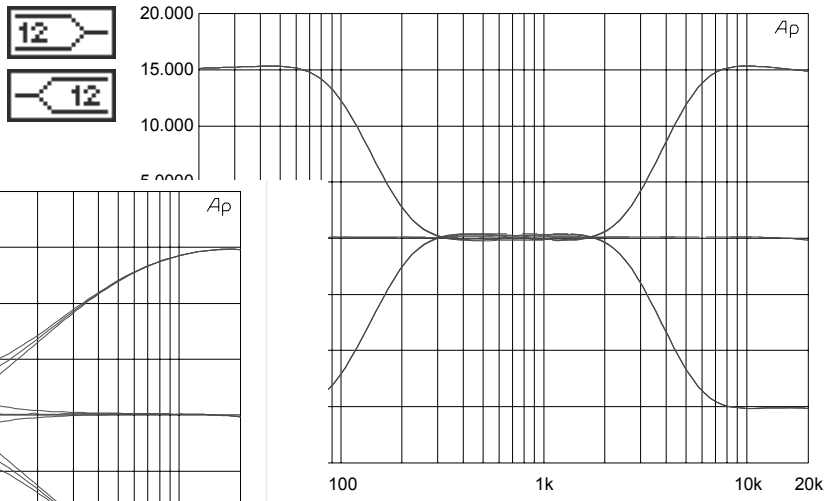
EQ shape



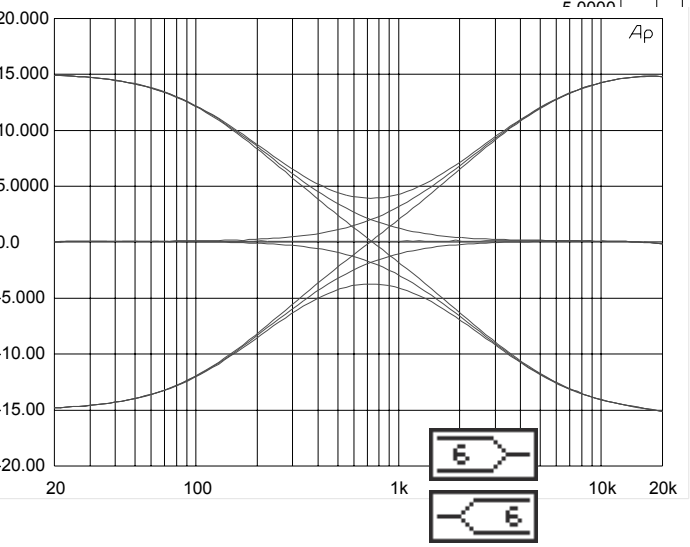
The shape of the EQ can be selected from one of the following by turning the rotary encoder:

- Hi shelving with 12dB slope (Hi12)
- Hi shelving with 6dB slope (Hi6)
- BELL
- Low shelving with 6dB slope (Lo6)
- Low shelving with 12dB slope (Lo12).

The EQ shape icon at the top of the screen will change, to show the type of EQ selected.



12dB/Octave Shelving EQ graph

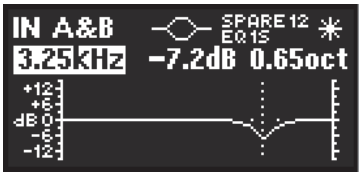


6dB/Octave Shelving EQ graph

Inputs - EQ

Frequency

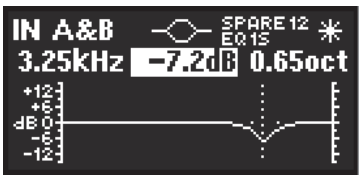
"15Hz" to "16kHz"



Turning the rotary encoder adjusts the EQ 'centre' frequency if a bell shape EQ is chosen and the -3dB points for the shelving EQs. The filter position is shown graphically by the cursor.

Cut/Boost

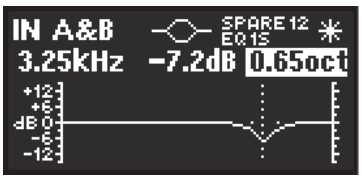
"-15dB" to "+15dB" in 0.2dB steps



Turn the rotary encoder clockwise to add boost (+ gain) or anti-clockwise for cut (- gain) at the centre frequency chosen above.

Width

"0.05" to "3.00" Octaves in 0.05 increments



Only displayed if the 'bell' shape is selected. Turning the rotary encoder clockwise widens the EQ (lower Q) up to a maximum of three octaves. Turning the rotary encoder anticlockwise makes the EQ narrower (higher Q) to a minimum of 0.05 octaves.

20.0 Output Channels

There are six output channels available for routing audio to the external system. The output channels are labelled 1-6 on the front of the unit. To select any one of the 6 output bands, either press the rotary encoder until the output is shown on the screen, or press the relevant assign key in the outputs area on the front panel. The assign button illuminates to show the output is selected.

The outputs can be sourced from any of the input channels and in various combinations dependant on the configuration set in the Utilities and source settings made for each output channel.

The edit screens associated with the outputs are in the order as follows:

1. Name
2. Source
3. Low crossover - shape and frequency
4. High crossover - shape and frequency
5. Phase & Polarity
6. Gain
7. Limiter
8. Delay Link
9. Delay
10. EQ Bypass
11. DEQ (Dynamics parameters)
12. DEQ (EQ settings)
13. EQ 1

    Further EQs can then be assigned if required/available.

The facilities described in this section are common to all outputs.

Output Channels - Name & Source

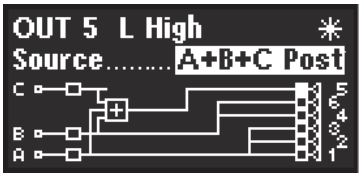
1. Name

'**Name**' is the first screen in the Output menu. Here you can identify each output with a name suitable to its function, selecting from a list of preset names in the FDS-366T.

Bands 1-6	Bullet
L Low	Flat
L Mid	Unused
L High	Bar
R Low	BStage
R Mid	Delay
R High	Centre
C Low	Mono
C Mid	Aux
C High	10"
Subs	12"
Low	15"
Lo Mid	18"
Mid	21"
Hi Mid	24"
High	1.5" Horn
Mid+Hi	Delay1-6
2" Horn	
1" Horn	

Turn the rotary encoder to select the desired name. If the name selected begins with "L " or "R ", then the L or R will *not* be displayed when stereo linking is on.

2. Source



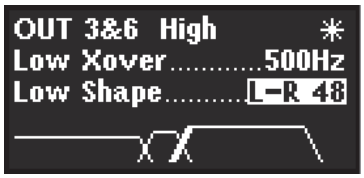
This screen gives a graphical representation of the input to output assignment matrix. The channel selected has its speaker icon highlighted, and a connecting line shows to which input it is currently assigned. The input source name is also shown above the diagram.

The diagram shows straight through connections from inputs to outputs, omitting any output stage processing (EQ, Xover etc) for clarity. The small boxes at the left of the diagram represent the input EQ, and the lines which connect to the sum (box with +) will move depending on whether 'pre' or 'post' EQ has been selected.

Note: The speaker icons are not drawn in a fixed order. The diagram will be drawn in the clearest way, to avoid lines crossing on the screen. Therefore care must be taken when interpreting input to output assignments, as the numbers next to the speaker icons (representing the outputs) will change positions.

Outputs - Crossover Settings

3. Low Shape



This screen is used to select the filter shape/slope type for the lower band edge (high-pass) of the current output band. The band edge will be highlighted on the graphic on the screen. The higher the dB/Octave number the steeper the slope of the filter's rolloff, see the graphs on the preceding page for a more accurate representation of this concept. Generally shallower, i.e. lower number slopes, should be used in applications where dips in the frequency response are encountered in the crossover area or where two drivers have a more integrated response around the croosover area.

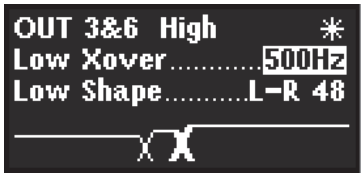
The available filter types are as follows, in this order:

- "But 6" Butterworth 6dB/Octave
- "But 12" Butterworth 12dB/Octave
- "Bes 12" Bessel 12dB/Octave
- "L-R 12" Linkwitz-Riley 12dB/Octave
- "But 18" Butterworth 18dB/Octave
- "But 24" Butterworth 24dB/Octave
- "Bes 24" Bessel 24dB/Octave
- "L-R 24" Linkwitz-Riley 24dB/Octave
- "But 48" Butterworth 48dB/Octave
- "L-R 48" Linkwitz-Riley 48dB/Octave
- "NTM 36" Neville Thiele Method 36dB/Octave
- "NTM 52" Neville Thiele Method 52dB/Octave

Turning the rotary encoder will scroll through the above list.

More information is available in chapter 7.0 Crossover shapes & Frequencies.

Low Freq/Xover



The lower edge (high-pass) of the crossover band can be set over a wide frequency range from **'OUT'** (no roll off) through 15Hz to 16kHz.

Turning the rotary encoder anticlockwise will lower the frequency, with '**OUT**' as the final step.

Turning it clockwise will increase the frequency, to **'OFF'**, which mutes the output.

4. High shape

Selects the Edge filter type and slope as for the higher (low-pass) band edge.

See the available filter types in the Low Shape description above.

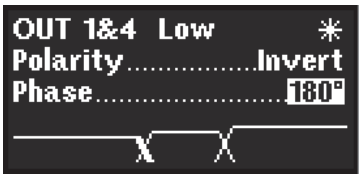
High Freq/Xover

This function works in a similar way to the 'Low Freq', except that **OUT** is the last step at the **clockwise** position.

NOTE: Turning the rotary encoder clockwise will decrease the frequency, to the final clockwise position '**OUT**', which does **NOT** mute the output.

Outputs - Polarity, Phase & Gain

5. Phase



0-180° (degrees) in 5° steps

The phase relationship of the two band edges at the crossover point can be adjusted in 5 degree steps using this function.

The phase angle reference frequency is set by the high edge frequency so that this band controls the phase between the current band, and the band above it. Adjustments should therefore start with the highest band, and work downwards. Note that the topmost band(s) do not have an adjustable phase parameter.

Adding any phase adjustment will utilise an EQ filter. The phase is adjusted by turning the rotary encoder.

Polarity

'Normal' or 'Invert'

The polarity invert function. Default is non-inverted. Turning the rotary encoder clockwise will invert the polarity of the output. Turning anticlockwise will return the polarity to non-inverted.

6. Band gain

-15dB to +15dB

To adjust the relative gain of the band output, turn the rotary encoder to achieve the desired level. This is independent of the output TRIM control on the front panel, and is additional to any level added by TRIM. Band Gain is stored as part of a program memory, whereas the settings of the trim controls on the front panel may be stored only when the 'Store Gain Trims' option is switched on in the Utilities.

Outputs - Limiter

7. Limiter

"On" or "Off"

When the limiters are turned '**Off**', the red 'OVER' indicator on the front panel meters will illuminate as a warning.

NOTE: BSS Audio cannot accept any liability for any damage caused by disabling the protective limiters in the FDS-366T. This function is used totally at the discretion of the user.

To enable the limiter switch the Limiter parameter to "On".

Over (Overshoot)

"0dB" to "12dB" in 1dB steps and "Off"

Specifies the brickwall limit as the absolute maximum signal level which will be allowed to pass above the limiter threshold level. Lower settings will provide the most protection, but can cause short-term distortion to be added on transients. Higher settings reduce the severity of this distortion at the expense of protection. The brickwall limiter can be switched "Off" if not required, although for most purposes it is recommended that it is employed to prevent possible damaging of speaker drivers by large transients, such as power surge breakthroughs.

Thr (Threshold)

"-10dBu" to "+20dBu" in 0.1dBu steps

The band limiter threshold can be adjusted by turning the rotary encoder to set the desired value to match the sensitivity of the amplifier in use. The default units are **dBu**, but can be changed to **mV** in the "Limiter Units" found in the **Utilities**.

! BSS Audio recommends setting the limiter thresholds below the amplifier clipping sensitivity by about 2dB. This prevents any transient overshoot driving the amplifier into clip and so damaging your loudspeakers. Even when limiters are disabled, the threshold setting determines the output meter sensitivity.

Atk (Attack)

"Slow", "Med", "Fast" and "Dual"

Sets the time taken to *reduce* the gain after the output signal level has risen above the threshold level.

The "Dual" mode makes use of two sets of time constants simultaneously. The fast time constants prevent clipping, while the long time constants are intended to keep thermal affects under control.

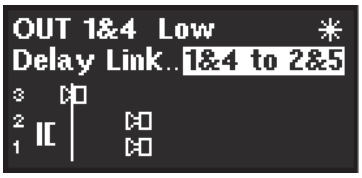
Rel (Release)

"Slow", "Med" and "Fast"

Determines the time taken to *recover* normal gain after the output signal level has fallen below the threshold level.

Outputs - Delay

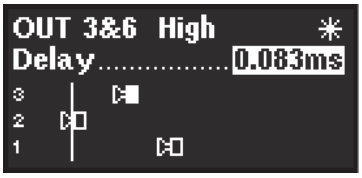
Delay link



The Delay Link option allows control of several band delays with a single adjustment. This means that once all the drivers in a single cabinet have been aligned, the whole cabinet can be delayed relative to the input signal, or another cabinet, by linking these band delays as one. Any offsets applied before linking will be retained after linking.

In the Delay Link screen, turn the rotary encoder until the desired linking configuration is shown. The linking options are dependant on the overall configuration of the unit and will change between pairs of outputs and single outputs when the Stereo Link is used. The linking is shown by two line symbols, the left vertical line indicates which outputs are able to be linked and, the square bracket symbol immediately next to it is displayed when the link is engaged.

Delay



The band delays are most often used to electronically align the driver voice coils with the other drivers in the system, so the sound sources are coherent in the physical plane.

The delay may be represented in either milliseconds (ms), meters (m), feet (ft) or frames per second (fps). The display units are changed in the Utilities and pressing the **Utils** button from the 'Delay' screen will access the 'Delay Units' screen immediately.

When represented in milliseconds each increment is about 11 microseconds, (the reading will change in 10 or 11us steps) which translates in physical terms to a distance of 3.4mm, giving high accuracy in terms of alignment. If delay units are set to fps, then the value can be adjusted in half frame increments. If delay units are changed from say meters to fps in the Utilities the FDS-366T will automatically convert the value of the delay. This also allows fine tuning once a value has been set in frames.

Turn the rotary encoder to move the icons from the left, the vertical line being the zero position (no delay) to right (maximum delay). The actual delay value is shown above the diagram, and the icons in the display represent the offsets between each output. Press the output channel buttons to switch between different sets of linked outputs; the currently selected output is shown by its driver icon being part solid instead of just outline.

Note that the maximum assignable delay is limited by any delay also assigned to input channels.

Outputs - EQ/DEQ

EQ Bypass

"On" or "Bypass"

An EQ bypass facility is now available. To switch out the effect of both the EQs and Dynamic EQ select "Bypass" in this screen.

DEQ Dynamics Screen

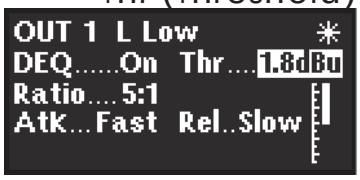
The first EQ in each output can be programmed to work dynamically. The first DEQ screen sets up the parameters of the EQs' compressor; the EQ screen that follows sets the EQ parameters.

DEQ

"On" or "Off"

Determines whether the Dynamic equaliser on this output channel is enabled for dynamic operation. When set to OFF, the following DEQ equaliser will operate as a conventional equaliser. When set to ON, the boost/cut value of the equaliser is dynamically varied according to the amplitude of the signal. If the DEQ parameter is selected as "Off" then the other parameters on this DEQ screen are not selectable - switch DEQ to "On" to adjust them. Useful for previewing the effect of the dynamics independantly.

Thr (Threshold)



(-30dBu to +20dBu in 0.1dB steps)

Sets the signal level that is required to trigger compressor operation.

If a signal is *below* threshold in 'boost' mode, or *above* threshold in 'cut' mode, the Dynamic Equaliser will not compress it. Adjusting the threshold control downwards brings a signal closer to, or takes it above, the threshold level respectively.

Once the input signal is *above* the threshold level in 'boost' mode, or *below* threshold in 'cut' mode, gain reduction or compression will occur. The amount of effective boost/cut is indicated on the bargraph meter to the left of the DEQ parameters screen or on the curve itself in the DEQ Equaliser window. What actually happens to the sound when compressing is to a large extent governed by the **Ratio** parameter setting.

In use the threshold and ratio controls are generally adjusted as a pair whilst listening to the result. The attack and release parameters also change the characteristics.

Ratio

(2:1, 5:1, 10:1, 20:1, INF)

Determines the aggressiveness of the dynamic equaliser. Higher settings control the boost-cut very tightly, just like a limiter. Lower settings produce a more relaxed result. In applications where gentle compression is required, it is advantageous to change from the linear to compression region in a very gradual manner, rather than the more conventional abrupt manner. The FDS-366T Dynamic Equaliser has been configured so that for *low* settings of the

Outputs - DEQ Dynamics Screen

ratio control and *low* levels of compression, the transfer is *soft*. For *high* ratio settings and *high* levels of compression the transfer becomes *harder*.

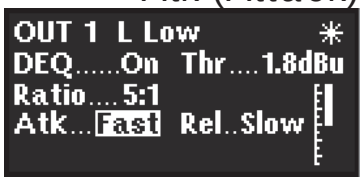
This 'progressive knee' gives inaudible compression for low levels of ratio and gain reduction, whilst allowing harder compression for limiting and extreme control when required. It is also an important characteristic of the FDS-366T Dynamic Equaliser (and all other BSS Audio compressors) and is why a 'soft knee' or other similarly labeled control is not required. Progressive knee is also one of the main reasons for the transparency and musicality of the DEQ at low compression ratios.

Envelope shaping

The Dynamic Equaliser has automated time constants which track both the nature of the programme, and the settings of the crossover filters and the Equaliser associated with DEQ. The user may however influence this automation using the Attack and Release parameters, which effectively scale the automatic parameters.

Automatic time constants use a combined program related attack time setting and a two-part program related release time setting. The two part program dependent release provides a fast release to restore non-compressing gain as soon as the event has passed and, a much longer one following release to avoid rapid gain change effects.

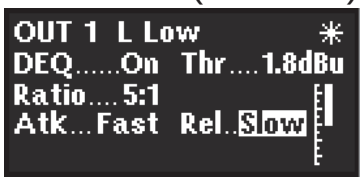
Atk (Attack)



"Fast", "Med", "Slow"

Sets the attack time of the dynamic equaliser so that the response time to increasing input signal levels can be adjusted.

Rel (Release)



"Fast", "Med", "Slow"

Specifies the release time of the dynamic equaliser so that the response time to decreasing input signal levels may be adjusted.

Dynamics Indicator

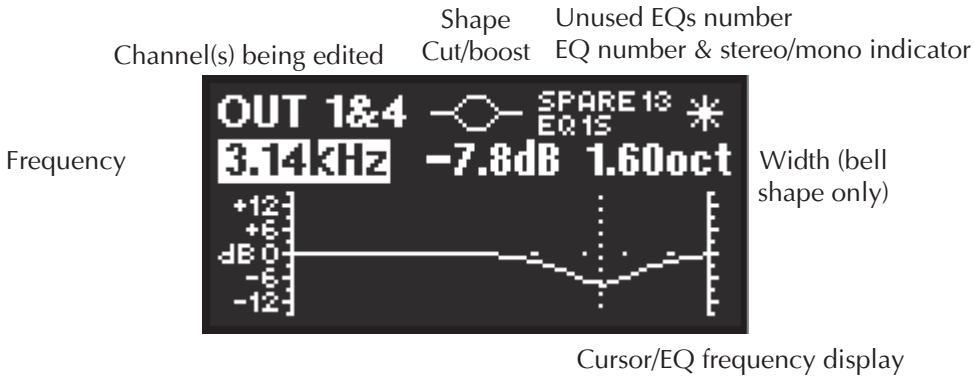
The dynamics bargraph shows the operation of the compressor, either compressing or expanding the signal dependant on the settings of the DEQ equaliser cut or boost settings. The bar in this display will not appear unless some degree of cut or boost has been applied.

Outputs - EQ

EQ adjustment screens

The next screen following the DEQ dynamics settings is the EQ adjustment screen associated with the DEQ, this is represented by the DEQ logo in the top right of the display. This EQ should be set up to accomplish the dynamic EQ characteristics as required and is permanently wired into the channel, although its effect can be switched out with the EQ Bypass facility. However, should all the spare EQ filters be in use elsewhere, it is possible to use this EQ without its dynamic element by switching DEQ 'Off' in its associated dynamics screen.

Using the navipad ^ key will step through into the first 'standard' EQ, i.e. without dynamic capabilities. Operationally these screens are identical to their DEQ equivalent except for the indication of spare EQ filters in the top right of the display. This is important as there are a set number of DSP filters available in the FDS-366T that can be used for EQ duties, see 25.0 Filter Allocations for more information.



If the FDS-366T's configuration is MONO, all EQ's will be mono, shown by the letter 'M' after the EQ number, e.g. "EQ2M".

If configured for a stereo mode, i.e. LHLHLH, LMHLMH or LLMMHH, EQ's will be marked as stereo (when Stereo Link is "On") with an 'S' next to the EQ number, e.g. "EQ2S".

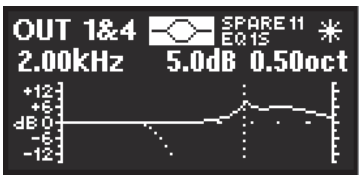
A contour line shows the effect of the crossover filters on this band, this is a combined response and will show both the DEQ EQ curve and any further EQs that are assigned in the same channel.

Adding extra EQs

To add extra EQs, an amount of cut/boost must be applied to the current EQ, another EQ (assuming there are spare EQs) will then be inserted automatically. Pressing the navipad ^ key will acccess the next EQ. If you press the ^ key and the screen does not change, then you have reached the last EQ currently in use.

Outputs - EQ

EQ shape



The shape of the EQ can be selected from one of the following by turning the rotary encoder:

Hi shelving with 12dB slope (Hi12)

Hi shelving with 6dB slope (Hi6)

BELL

Low shelving with 6dB slope (Lo6)

Low shelving with 12dB slope (Lo12).

The EQ shape icon at the top of the screen will change, to show the type of EQ selected.

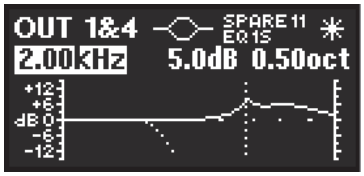
12dB/Octave Shelving EQ graph

6dB/Octave Shelving EQ graph

Outputs - EQ

Frequency

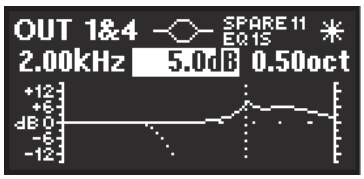
"15Hz" to "16kHz"



Turning the rotary encoder adjusts the EQ 'centre' frequency if a bell shape EQ is chosen and the -3dB points for the shelving EQs. The filter position is shown graphically by the cursor.

Cut/Boost

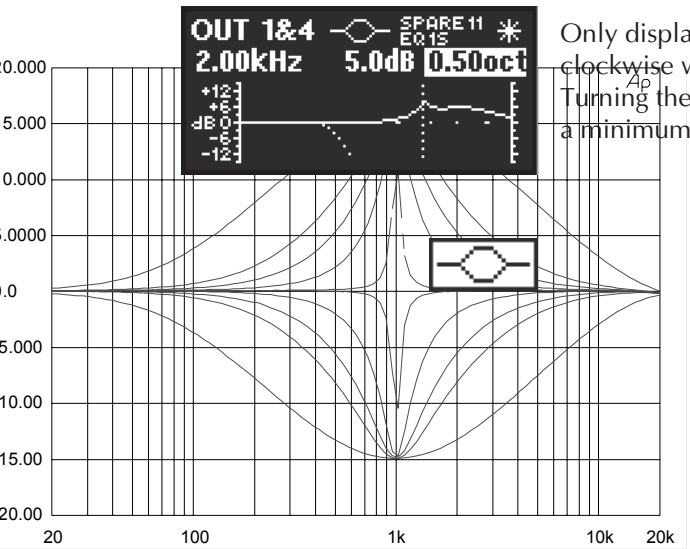
"-15dB" to "+15dB" in 0.2dB steps



Turn the rotary encoder clockwise to add boost (+ gain) or anti-clockwise for cut (- gain) at the centre frequency chosen above.

Width

"0.05" to "3.00" Octaves in 0.05 increments



Only displayed if the 'bell' shape is selected. Turning the rotary encoder clockwise widens the EQ (lower Q) up to a maximum of three octaves. Turning the rotary encoder anticlockwise makes the EQ narrower (higher Q) to a minimum of 0.05 octaves.

Limits of EQ Width

Reference Section

21.0 Serial Communications

The FDS-366T is equipped with MIDI, RS232 and RS485 ports that allow it many capabilities in communicating with further FDS-366T units, other BSS products and computer based editing and control packages such as SIA's Smaart.

This serial communications section describes how these ports can be used to transfer program changes, program data and control information between equipment in either single or multiple protocol combinations.

BSS Omnidrive products are generally able to switch programs in tandem and, FDS-366T Omnidrives can communicate program data via the MIDI Dump facility. A 'master' FDS-366T can control client FDS-366Ts so that any control movements and changes on the master unit can be parallelled on the other devices giving a high level of operational flexibility.

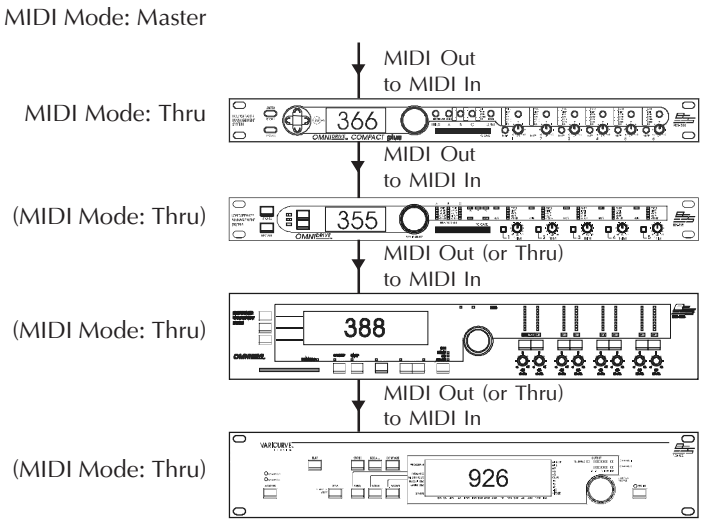
MIDI

MIDI can be used to form a network of FDS-366T and other MIDI compatible BSS units and/or control them from a PC. The MIDI Mode setting in the Utilities affects the way that the FDS-366T works with the various communications options.

To set up a basic network of MIDI compatible BSS devices one unit must always be the 'master' and this will be the first unit in the chain. Further Omnidrives, Minidrives and Varicurves can then be connected as in the diagram shown below. The 'client' devices should then all be set to MIDI Mode "Thru" (or use the MIDI hardware Thru sockets where fitted - note that the FDS-366T has no hardware Thru socket).

All units that are to receive data should be set to the same MIDI channel in the Utilities, i.e. most commonly to receive program changes.

Example MIDI network of BSS units



There is no need to connect the last unit's MIDI Out back to the first's MIDI In, i.e. master Omnidrive, and this could in fact cause problems if attempting to use the MIDI Dump facility. The user should also be aware that performing a MIDI dump across different models may cause unexpected errors. Units that are not the same model as the master unit creating the dump should be switched to different MIDI channels to avoid receiving unwanted data.

Synchronous Control

When a MIDI Dump is undertaken between two, or more, FDS-366T units they become synchronised, i.e. the contents of each device's memory is identical. It is at this point, and this point only, that parallel parameter control of multiple units is achievable. In this situation, changes made to parameters on the master Omnidrive will be mirrored on all other connected FDS-366T units that are set to the same MIDI channel and have just received the MIDI Dump. Changing of any of the Utilities parameters that affect the communications, i.e. MIDI Mode or Channel, will immediately end this capability.

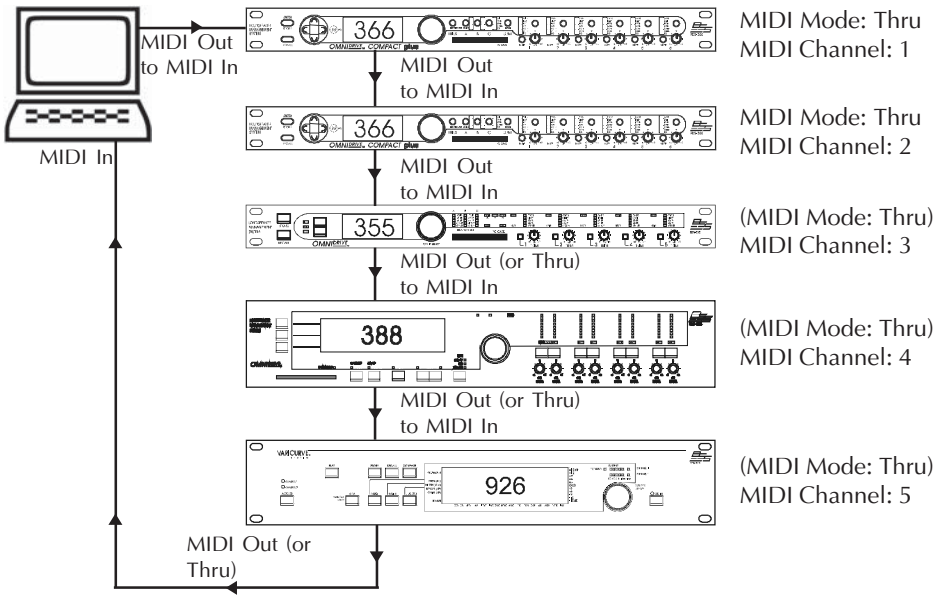
MIDI with PC Control

If a PC is used to control the network, i.e. using software such as BSS Audio's Soundbench, then the PC becomes the 'master' and also requires a MIDI 'loop' in order to communicate. The link to the PC can be MIDI only when a MIDI compatible sound card or interface is available in the computer.

The MIDI loop

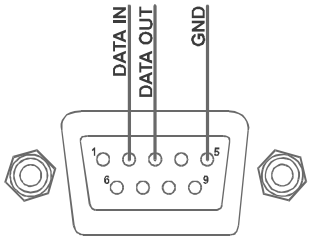
Connect the MIDI Out from the last unit in the chain back to the MIDI In on the PC in order for the PC to be able to actuate parameter level control on the Omnidrives. Each device must be set to an independant MIDI channel for Soundbench to communicate to them.

Example MIDI network of BSS units with PC control



RS232

For situations where a MIDI interface is not available or it is difficult to fit a MIDI port, e.g. on a portable, then the FDS-366T's built in RS232 port can be used to connect directly to any PC with a standard 9 pin D type serial port.



The cable from the first unit to the PC should be a *null modem* cable. If you wish to make a suitable cable then connect two female 9 way D-type connectors together as follows:

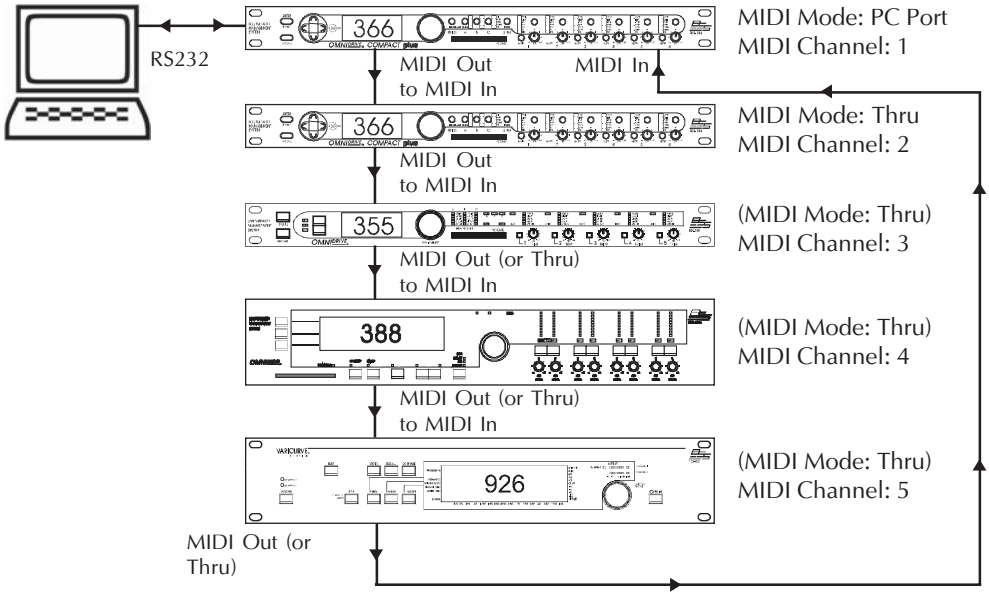
pin 2 - to - pin 3

pin 3 - to - pin 2

pin 5 - to - pin 5

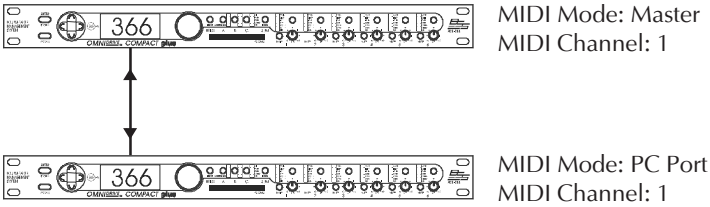
When using RS232, set the first Omnidrive's MIDI Mode parameter to "PC Port" and all the other units in the loop to MIDI Mode "Thru". Also, to enable the RS232 port the Serial Port parameter must be set to "RS232".

Example MIDI network of BSS units with PC control using RS232



It is possible to connect just two FDS-366T Omnidrives together using RS232. In this case either FDS-366T can become the master; the other unit being set to "PC Port" mode. A null modem cable is again used and as stated before, both units must be set to the same MIDI channel.

Do not expect RS232 to work reliably over more than 50 feet, if the distance is greater than this then you should use the FDS-366T's RS485 interfaces, as discussed in the next section.



Serial Communications RS485

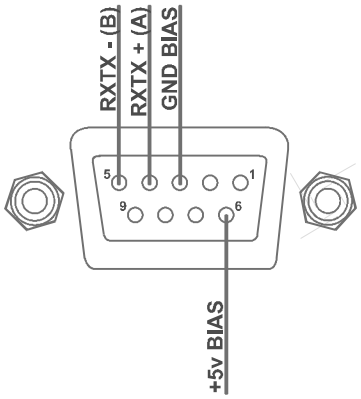
RS485 & Multidrop

Unlike RS232, that can only work with two devices and with cable lengths of about 50 feet, or MIDI that has a similar cabling length restriction, RS485 can be used to set up 'multidrop' networks of units that are capable of communicating successfully over long distances - up to around 4000feet. If you need to position Omnidrive units more than 50 feet apart (or away from the controlling PC) then the RS485 serial ports should be used instead of either MIDI or RS232.

Connections

RS485 allows up to a maximum of 32 devices to communicate at 'half-duplex' on a single pair of wires (plus ground), known as '2 wire' mode.

Note: The RS485 standard also supports '4 wire full-duplex' links. These installations are only applicable to extend an RS232 link with two RS485 converters, e.g. for use with the older FDS-355 Omnidrive or Minidrive products, there is no need or facility to use 4 wire links with the FDS-366T.



There are two RS485 connectors built in to the FDS-366T and these are wired in parallel to make connecting units easy. Cables to jump between units should be made up using two male 9 way D-type connectors wired as follows:

pin 4 - to - pin 4

pin 5 - to - pin 5

pin 3 - Cable screen

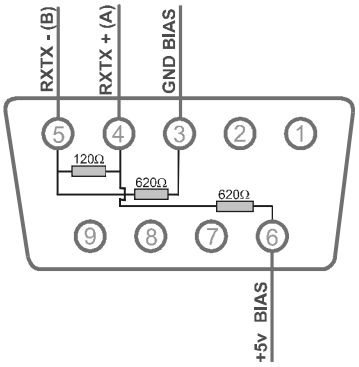
pin 3 - to - pin 3 (Optional - only if ground drops encountered)

Although RS485 is a balanced system, it can only cope with a few volts of difference between unit grounds. Pin 3 is intended to be connected for cable screen but is also connected to the unit ground via an internal 100 ohm resistor and can be used to join the adjacent two units' grounds together. Be aware that this may cause ground loop problems in the audio and may be masking errors in your system earthing.

To enable RS485 communication the Serial Port parameter in the Utilities must be set to "RS485". Note that RS232 and RS485 cannot be used simultaneously.

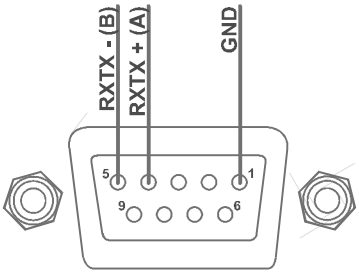
Termination and Biasing

Connecting two or more devices together using RS485 creates a 2 wire 'multidrop' network. In its most basic form this could be two FDS-366Ts situated in different rooms or a FDS-366T connected to a PC using an RS232/485 converter, further units can then be added to this network. However, the network requires termination at its extremities and this is usually achieved by wiring a 100-120Ω resistor across the data lines (pins 4 and 5). This is probably best fitted inside the RS485 9 way D type connector on both the first and last units in the chain. If a PC with RS232/485 converter is involved you may find that there is either a solder link or dip switch setting available to actuate termination (see the section on converters for more information).



For the network to operate correctly there needs to be a minimum of 200mV between the two data lines (pins 4 and 5). This can be ensured by connecting one set of 'biasing' resistors across pins 3 and 5 and, 4 and 6 using 620Ω resistors, usually near or at the beginning of the network. See the diagram on the left for a recommended configuration.

Serial Communications RS485



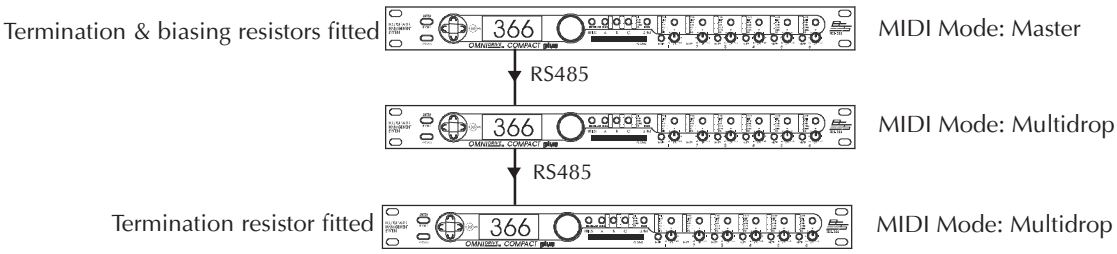
Note for older FDS-366 Omnidrives

Older FDS-366 units are wired slightly differently with pin 1 being the unit ground. As the +5v bias is not connected in these units it is not possible to set up biasing for them. Biasing may still be applied by a newer unit in the network.

Configuration

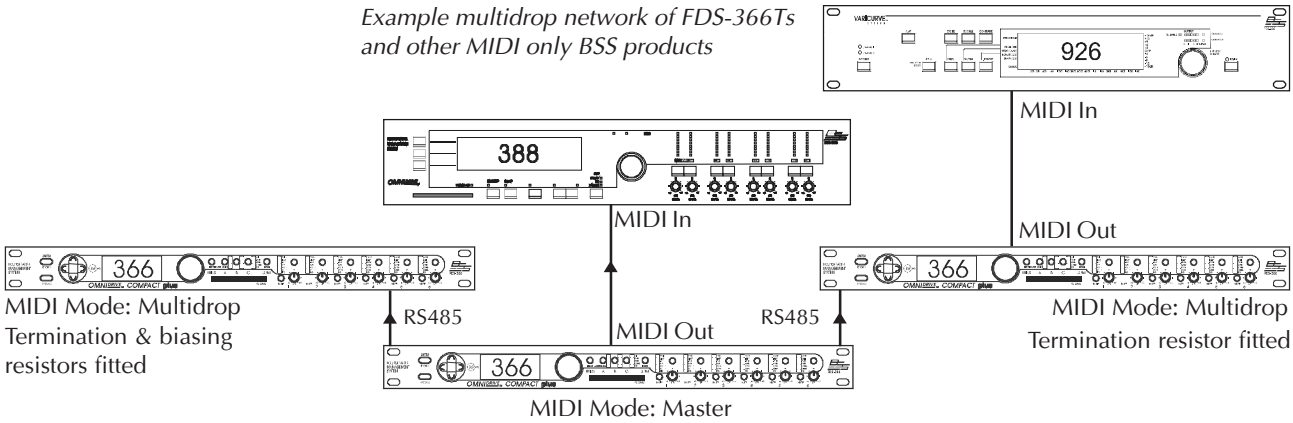
Program changes, full memory dumps and synchronous control are all possible in a multidrop network of FDS-366Ts using RS485. As before for the MIDI networks, one unit must be set as the 'Master', the other units are set to 'Multidrop' mode however, in this network *any* of the units can be used as the master, giving more flexibility for programming. Once again particular units can be addressed by using the MIDI channels (up to 16 possible assignments) to enable/disable communication between the master unit and clients. This method can be used for example to perform a MIDI Dump between several units without affecting others.

Example multidrop network of FDS-366Ts



Some of the older MIDI only BSS products can be connected (within Midi's distance capability) but, only by connecting single units to those on the RS485 multidrop network, as shown below. These units will be capable of accepting program changes but must be switched to a different MIDI channel if a MIDI dump is sent from the master FDS-366T.

Example multidrop network of FDS-366Ts and other MIDI only BSS products



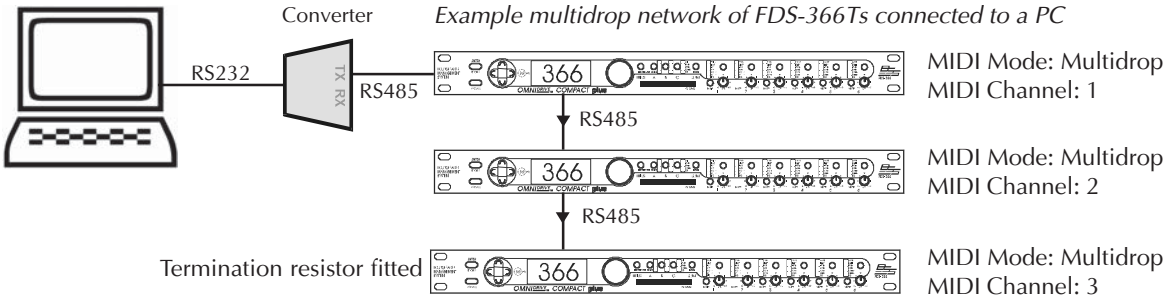
Serial Communications RS485

RS232 to RS485 Converters

At the time of writing the FDS-366T Omnidrive is the only BSS unit to have built in RS485 support however, a multidrop system can be used with RS232 equipped devices, such as the FDS-355, Minidrive models or a PC, using RS232 to RS485 converters.

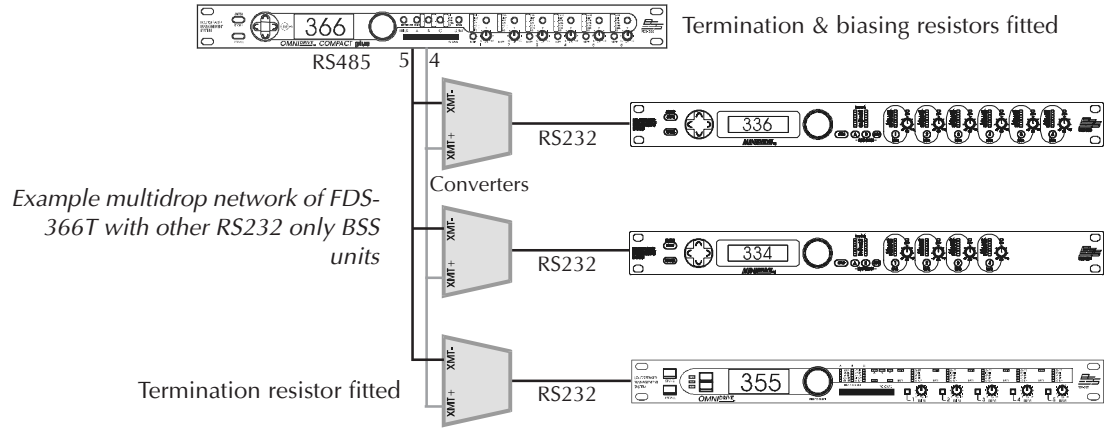
Most RS232/RS485 converters can be run in either 2 or 4 wire mode. For use with an RS485 multidrop system across FDS-366T's they only need to be set up in 2 wire mode. 4 wire mode should only need to be used to *extend* an RS232 cable over 50feet.

To connect a multidrop network of FDS-366Ts to a PC, for use with software such as BSS Audio's Soundbench for example, it is very likely that an RS485 interface will need to be fitted to the computer, either as an internal card or as an external converter connected to the PC's RS232 serial port.



MIDI channels should be set independantly. Termination and bias should be applied, either by adjusting settings (if available) on the converter or as discussed earlier, please consult your RS485 converter documentation.

FDS-366T Multidrop networks can also be arranged using units fitted with RS232 only using converters as shown below. One converter per unit is required set up in 2 wire (XMT- to XMT- and XMT+ to XMT+) mode. Biasing should be fitted as discussed earlier and termination should be applied on just the end nodes of the network. If different models are being used together care must be taken with MIDI dumps to ensure that the data is only received by compatible units. Use the MIDI channels to select only devices of the same type.



Serial Communications

Recommended converter - Patton Electronics Model 2089

The 2089f is manufactured by Patton Electronics - US +1 (301) 975-1000 and is a self-powered unit, i.e. no external transformer is needed and, can be used in 2 or 4 wire mode. It also has switchable 120Ω termination built in and does not require any soldering for connections. This converter has been tested with all the permutations discussed in this manual, although other converters from different manufacturers should work equally well.

Use 2 wire multi-point (hence 'multidrop') mode for driving an FDS-366T RS485 system. The switch settings shown below should be used to connect either a PC to a network of FDS-366Ts or other RS232 compatible BSS products, such as the FDS-355 or Minidrives. Switch S1-1 sets the termination resistance and should be set ot "ON" when used with either a PC or, if the converter is connected to the last unit in a network. All other units using converters in a network should have the termination switched "OFF".

The converter should be connected to a 9 pin D type connector, to plug into the FDS-366T RS485 port, with the XMT+ connected to pin 4 and XMT- to pin 5.

SWITCH	SETTING	FUNCTION
S1-1	ON	Rcv Impedance = 120Ω
S1-2	ON	2-wire mode
S1-3	ON	2-wire mode
S1-4	OFF	Echo Off
S2-1	ON	RTS On
S2-2	ON	RTS/CTS Delay = 8ms
S2-3	OFF	XMT "off" Impedance=Intermediate
S2-4	OFF	XMT "off" Impedance=Intermediate

22.0 Troubleshooting

Problem: Unit does not power up.

Solution: Check power cable is inserted properly at back of unit.
Check the fuse in the plug (if existing) on the power cable and/or try another power cable.
Check mains supply is powered and operating at a voltage within the required range.
Check the fuse at the rear of the unit has not blown.

Problem: No output.

Solution: Ensure mutes are not active.
Check that gains are not turned down on the input or output channels.
Check that crossover settings are correct for the frequency band on the output.

Problem: All 3 Input LEDs on a channel light up at once.

Solution: The unit is clipping internally. Reduce EQ or gain.

Problem: A new program will not save over an existing program.

Solution: Check that the existing program is not locked. If it is, clear the key icon by turning the rotary encoder. If the program is OEM locked, the overwriting program must have the same OEM password, and be an OEM original program.

Problem: The LCD graphics are not clear enough.

Solution: Use the brightness and contrast options in the Utilities to change the LCD display.

23.0 FDS-366T Omnidrive MIDI Implementation

V1.0 1 June 1999

A.1 FDS-366T MIDI Implementation

O=Yes X=No

FUNCTION		TRANSMITTED	RECOGNISED	REMARKS
BASIC CHANNEL	Default Changed	1-16 1-16	1-16 1-16	Memorised
MODE		X	X	
NOTE NUMBER		X	X	
VELOCITY		X	X	
AFTER TOUCH		X	X	
PITCH BENDER		X	X	
CONTROL CHANGE		X	X	
PROGRAM CHANGE	True Number	0-59 1-60	0-59 1-60	
SYSTEM EXCLUSIVE				
	Dump Request	X	O	
	Dump Follows	O	X	
	Program follows	O	O	
	Program Request	O	O	
	RTA Request	O	O	
	Message	O	O	
SYSTEM COMMON		X	X	
SYSTEM REAL TIME		X	X	
AUX MESSAGES		X	X	

NOTES:

1: Any parameter out of range will be ignored.

24.0 Default Configuration Settings

MONO		OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6
NAME		Band 1	Band 2	Band 3	Band 4	Band 5	Band 6
SOURCE		A	A	A	A	A	A
LO XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	OUT	50.8Hz	159Hz	500Hz	1.62kHz	5.09kHz
HI XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	50.8Hz	159Hz	500Hz	1.62kHz	5.09kHz	OUT
LINKING		None	None	None	None	None	None

LHLHLH		OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6
NAME		LLow	LHigh	LLow	Lhigh	CLow	CHigh
SOURCE		A & B	A & B	A & B	A & B	C	C
LO XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	OUT	1.62kHz	OUT	1.62kHz	OUT	1.62kHz
HI XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	1.62kHz	OUT	1.62kHz	OUT	1.62kHz	OUT
LINKING		1 & 3	2 & 4	3 & 1	4 & 2	None	None

LLMMHH		OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6
NAME		LLow	LLow	LMid	LMid	Lhigh	LHigh
SOURCE		A & B	A & B	A & B	A & B	A & B	A & B
LO XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	OUT	OUT	196Hz	196Hz	1.62kHz	1.62kHz
HI XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	196Hz	196Hz	1.62kHz	1.62kHz	OUT	OUT
LINKING		1 & 2	1 & 2	3 &4	3 & 4	5 & 6	5 & 6

LMHLMH		OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6
NAME		LLow	LMid	LHigh	LLow	LMid	LHigh
SOURCE		A & B	A & B	A & B	A & B	A & B	A & B
LO XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	OUT	OUT	196Hz	196Hz	1.62kHz	1.62kHz
HI XOVER	SHAPE	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24	L-R 24
	FREQ	OUT	196Hz	1.62kHz	OUT	196Hz	1.62kHz
LINKING		1 & 4	2 & 5	3 & 6	4 & 1	5 & 2	6 & 3

Default Configuration Settings (common)

PHASE	**(Degrees)**	0	0	0	0	0	0
POLARITY		Normal	Normal	Normal	Normal	Normal	Normal
GAIN		0dB	0dB	0dB	0dB	0dB	0dB
LIMITER	**ON/OFF**	On	On	On	On	On	On
	OVER	6dB	6dB	6dB	6dB	6dB	6dB
	THR	4dBu	4dBu	4dBu	4dBu	4dBu	4dBu
	ATK	Med	Med	Med	Med	Med	Med
	REL	Med	Med	Med	Med	Med	Med
DELAY	**LINK**	OFF	OFF	OFF	OFF	OFF	OFF
	LENGTH	0m	0m	0m	0m	0m	0m
EQ (Bypass)	**ON/BYPASS**	On	On	On	On	On	On
DEQ	**ON/OFF**	Off	Off	Off	Off	Off	Off
	THR	0.0dBu	0.0dBu	0.0dBu	0.0dBu	0.0dBu	0.0dBu
	RATIO	2:1	2:1	2:1	2:1	2:1	2:1
	ATK	Med	Med	Med	Med	Med	Med
	REL	Med	Med	Med	Med	Med	Med
	FREQ	1.00kHz	1.00kHz	1.00kHz	1.00kHz	1.00kHz	1.00kHz
	GAIN	0.0dB	0.0dB	0.0dB	0.0dB	0.0dB	0.0dB
	WIDTH	0.30oct	0.30oct	0.30oct	0.30oct	0.30oct	0.30oct
	SHAPE	Bell	Bell	Bell	Bell	Bell	Bell
EQ	**FREQ**	1.00kHz	1.00kHz	1.00kHz	1.00kHz	1.00kHz	1.00kHz
	GAIN	0.0dB	0.0dB	0.0dB	0.0dB	0.0dB	0.0dB
	WIDTH	0.30oct	0.30oct	0.30oct	0.30oct	0.30oct	0.30oct
	SHAPE	Bell	Bell	Bell	Bell	Bell	Bell

25.0 Filter Allocations

The crossover filters and EQs share DSP resources between two Motorola 56300 DSP chips. There are certain assignment constraints, the table below summarizes how the resources are allocated.

DSP Assignment table:

DSP Number	Total Filters	Output 1&2 Crossovers	Output 3-6 Crossovers	Input EQ	Output 1&2 EQ	Outputs 3-6 EQ*
DSP 1	25	All	None	All	All	Second
DSP 2	37	None	All	None	None	First

* The EQ for outputs 3-6 may come from either DSP 1 or DSP 2, but DSP 2 filters are used first, until all DSP 2 resources are allocated.

Summing this up in words:

- There are 25 filters in DSP 1, and 37 in DSP 2.
- All of the crossover filters for Outputs 1 & 2 come from DSP 1.
- All of the crossover filters for Outputs 3-6 come from DSP 2.
- All of the Input EQ comes from DSP 1.
- All of the Output EQ for Outputs 1 & 2 comes from DSP 1.
- Output EQ for Outputs 3-6 may come from either DSP.
- 12dB/Octave and 24dB/Octave crossovers use 2 filters per edge.
- 48dB/Octave crossovers use 4 filters per edge.
- Stereo EQs use 2 filters each.
- 5 of the DSP1 filters and 4 of the DSP2 filters are always allocated to the DEQ.

For example, a stereo 3 way 12dB/octave crossover would use DSP resources as follows:

- 4 filters are used in DSP 1 for Output 1 & 2 crossovers high edge crossovers. (2 per 12dB/Octave Slope).
- 12 filters used in DSP 2 for Output 3-6 crossovers (1 per 12dB/Octave Slope).
- There is a total of (25-4)= 21 filters left in DSP 1 for either Input EQ or Outputs 1 & 2 EQ.
- There is a total of (37-12)= 25 filters left in DSP 2 for any Output EQ.

26.0 Specifications and Block Diagram

Performance (filters out)

Frequency response	10Hz - 20kHz, +/-0.25dB
	10Hz - 40kHz, +/-2dB
Dynamic range	>112dB, unweighted 22Hz to 22kHz
Channel Separation	>80dB, 30Hz to 20kHz
Distortion (THD)	<0.005%, 20Hz - 20kHz @+10dBu output

Metering

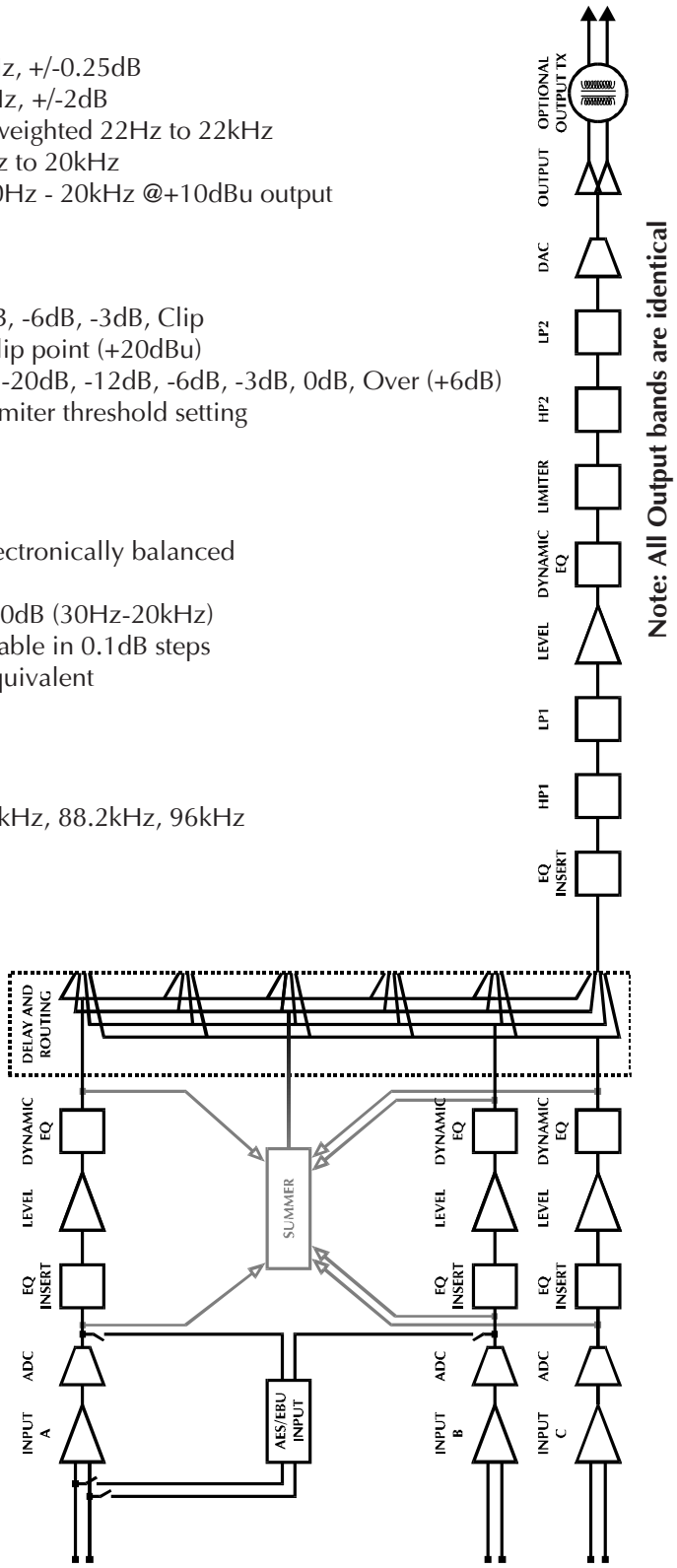
Input headroom metering	-20dB, -12dB, -6dB, -3dB, Clip
	Relative to clip point (+20dBu)
Output metering	SIG (-40dB), -20dB, -12dB, -6dB, -3dB, 0dB, Over (+6dB)
	Relative to limiter threshold setting

Input Section

Input Impedance	10kOhm, electronically balanced
Maximum Input Level	+20dBu
CMRR	Better than 50dB (30Hz-20kHz)
Input gain	+/-15dB variable in 0.1dB steps
Input Connector	XLR-3F or equivalent

AES/EBU Interface

Input sample rate	44.1kHz, 48kHz, 88.2kHz, 96kHz



Specifications

Output Section

Output Impedance	<50 Ohms, electronically balanced & floating
Maximum Output Level	+20dBu into 600 Ohms or greater
Output Gain	+/-21dB, variable in 0.1dB steps
Output Connector	XLR-3M or equivalent
	Transformer Balancing optional

Crossover Filters

Slopes	6, 12, 18, 24, 36, 48 or 52dB per octave
	(Filter type dependant)
Type	Bessel, Butterworth, Linkwitz-Riley or Neville Thiele Method

Delays

Available on Inputs A, B, and C, and Outputs 1, 2, 3, 4, 5, 6

Delay Step	10.4 microseconds
Maximum Delay Time	2.6 seconds

EQ

Maximum number of EQ filters > 50 (depending on crossover slopes)

EQ Type	Parametric, Bell or shelving on any filter
EQ Gain	+/-15dB, variable in 0.2dB steps
Q (bandwidth)	0.05 to 3 octaves, variable in 0.05 steps
EQ freq	15Hz to 20kHz
Dynamic slope	2:1 to 20:1 (dynamic EQs only)

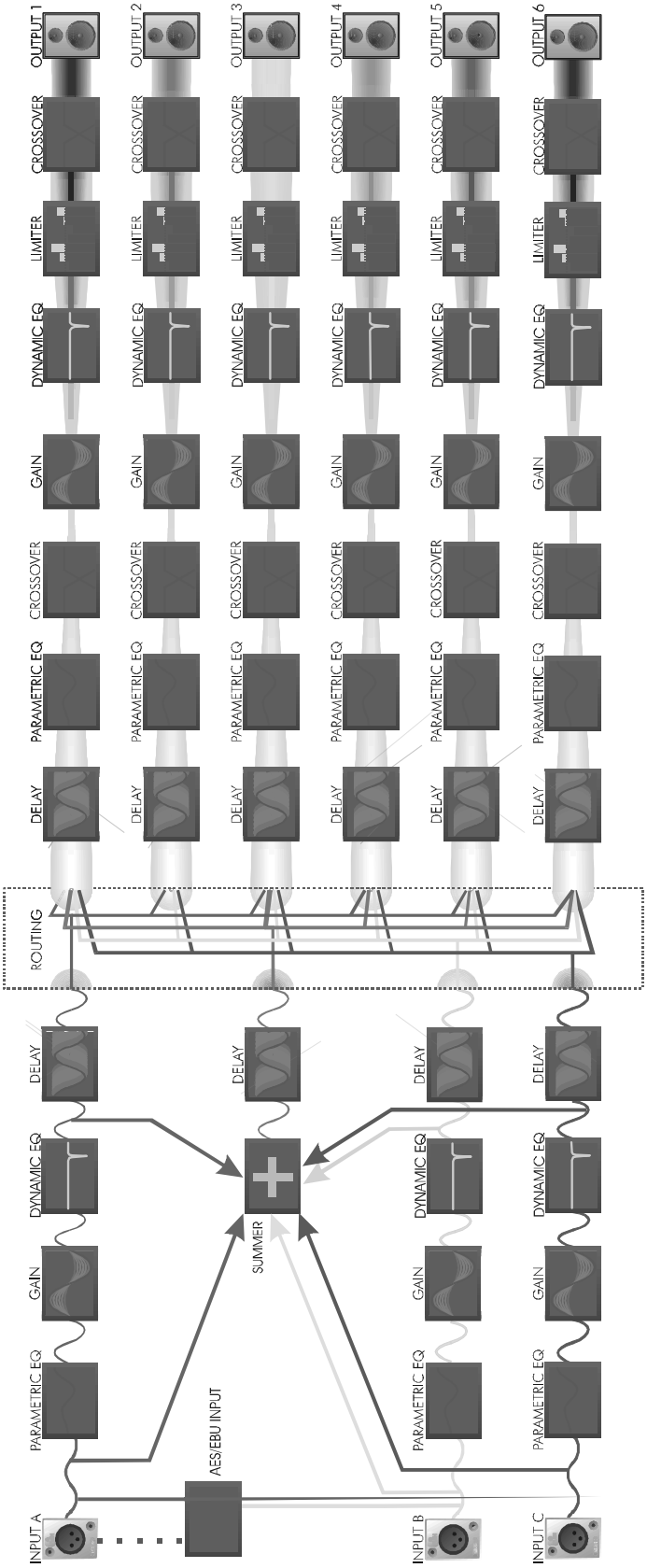
General

Dimensions	19" x 1.75" x 11.5"
	(483mm x 45mm x 292mm)
Weight	8.4lbs (3.8kgs), unpacked
AC Power	90V-264V AC, 50/60Hz, 30VA

Options

Output Transformers
Soundbench V3 PC-based remote control software (included)

27.0 Block Diagram



28.0 User Notes

User Notes

User Notes

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