

DD 1000

User Manual

Klark Teknik Building
Walter Nash Road
Kidderminster
Worcestershire
DY11 7HJ

Tel: +44 (0) 1562 741515

Fax: +44 (0) 1562 745371

Email: info@uk.telex.com

Website: www.ddaconsole.com

DD 1000 User Manual
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In line with the company's policy of continual improvement, specifications and function maybe subject to change without notice. This Operator Manual was correct at the time of writing. E&OE.

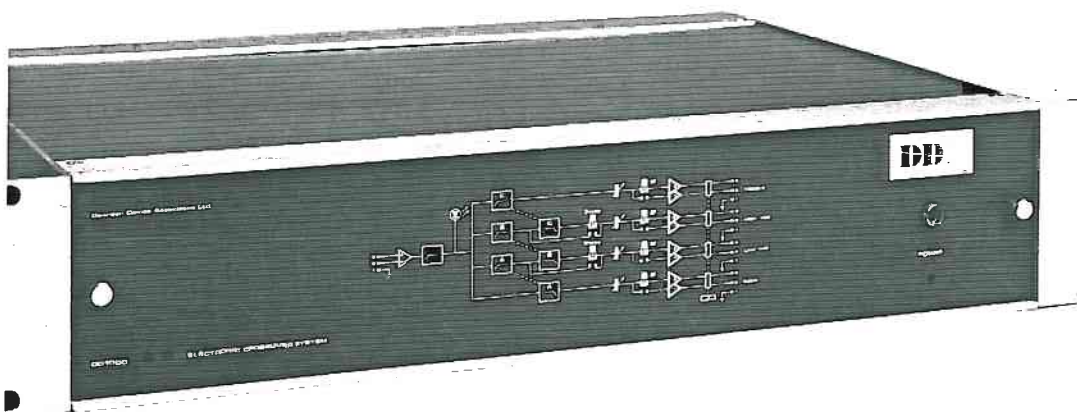
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Section 1.....Introduction & Warranty

1.1 Introduction

The DD1000 is a stereo, 4 way electronic crossover unit, in which all the important filter parameters can be programmed by the use of various plug-in system programming modules.



Crossover frequency, slope, and roll-off characteristics can be tailored to suit the requirements of each system, and additionally, the output levels of each band can be precisely adjusted by front panel controls, which are mounted behind a tamper proof fascia.

Output polarity can also be reversed, in each band, to enable the system to be set up for optimum phase characteristics.

All inputs and outputs are electronically balanced, thereby eliminating unnecessary transformers from the signal chain, preserving phase integrity and ensuring low distortion at all output levels below clipping.

An important feature is the delayed turn-on, instant turn-off characteristic, which completely isolates the outputs in the event of a power failure, and delays the connection of all outputs for 3-4 seconds after power is applied, thereby ensuring that surges and power thumps produced by any equipment feeding the crossover unit cannot damage the speaker systems.

1.2 Warranty

This warranty applies to units purchased in the UK, and should form the basis of the warranty offered by the overseas Distributor of DDA products.

"DDA" means Dearden Davies Associates Limited

"End User" means the person who first puts the equipment into regular operation.

"Dealer" means the person other than DDA (if any) from whom the End User purchased the equipment provided such person is authorised for this purpose by DDA or its accredited Distributor.

"Equipment" means the equipment supplied with this manual.

If within the period of twelve months from the date of delivery of the Equipment to the End User it shall prove defective by reason only of faulty materials and/or workmanship (but not faulty design) to such an extent that the effectiveness and/or usability thereof is materially affected, the Equipment or the defective component shall be returned to the Dealer or to DDA and subject to the following conditions the Dealer or DDA will repair or at its option replace the defective components. Any component replaced will become the property of DDA.

Any Equipment or component returned will be at the risk of the End User whilst in transit (both to and from the Dealer or DDA) and postage must be prepaid.

This warranty shall only be valid if: -

- i) The Equipment has been properly installed in accordance with the instructions contained in this manual; and*
- ii) The End User has notified DDA or the Dealer in writing within 14 days of the defect appearing; and*
- iii) No persons other than authorised representatives of DDA or the Dealer have effected any replacement of parts, maintenance, adjustments or repairs to the Equipment; and*
- iv) The End User has used the Equipment only for such purposes as DDA recommends with only such operating supplies as meet DDA's specifications and otherwise in all respects in accordance with DDA's recommendations.*

- v) *Defects arising as a result of the following are not covered by this warranty : faulty or negligent handling, chemical or electrochemical or electrical influences, accidental damage, Acts of God, neglect, deficiency in electrical power, air – conditioning or humidity control.*
- vi) *Benefit of this warranty may not be assigned by the End User.*
- vii) *End Users who are consumers should note that their rights under this warranty are in addition to and do not affect any other rights to which they may be entitled against the seller of the Equipment.*

Section 2.....Specifications

Input Impedance Electronically Balanced	10k Ohms
Input Level (nominal) (maximum)	+4dBv +20dBv
Output Impedance Electronically Balanced	<75 ohms
Output Level (nominal) (maximum balanced) (maximum unbalanced)	+4dBv +26dBv +20dBv
Noise (at any output)	< -90dBv
Crosstalk	< -70dBv
Distortion (at any output, +4dBv)	<0.02%
Interface	Audio - XLR type AC Mains - IEC
Case	2U Rack Mount, Aluminium
Dimensions	Width 483 mm (19") Height 89 mm (3.5") Depth 311 mm (12.25")
Weight	3.8 Kg (8.5 lbs)
Power Requirements	100 - 120 Volts, 50/60 Hz 200 - 240 Volts, 50/60 Hz

Section 3.....Installation

3.1 Unpacking

Your DDA Crossover was carefully packed in a container designed to protect it from rough handling during transit. However, if damage is evident, do not destroy the packing material. Notify the carrier immediately. Claims for damage in transit must be made by the consignee.

3.2 Environmental Conditions

The unit itself produces very little heat. However, If installed in a rack containing other heat producing equipment, such as power amplifiers etc, adequate ventilation must be provided, to ensure prolonged component life. Avoid installation in close proximity to large power transformers, which could induce hum into the circuitry.

3.3 Power

The unit can be operated from either 100 – 120v or 200 – 240v mains supplies (50 or 60Hz).

Verify both the actual mains voltage and the setting of the mains voltage selector switch on the rear panel, before applying power to the unit.

Check also that the fuse rating is correct for the mains voltage. The fuse should be a 20mm Anti-surge type, of 500mA rating for 200 – 240v operation, and of 1A for 100 – 120v operation.

Do not operate the unit with fuses of incorrect rating – this will invalidate the warranty.

Connect a suitable plug to the mains power cable. The colour coding of the cable will depend on the country in which the unit was purchased.

Europe	Brown – Live
	Blue – Neutral
	Green/Yellow – Earth
USA	Black – Live
	White – Neutral
	Green – Earth

Do not operate the system with the earth wire disconnected. It is required for safety and a potential hazzard situation could occur in the event of a malfunction.

3.4 Audio Connections

All audio connections are made by means of XLR type connectors, inputs being on female connectors, and outputs on males. Both inputs and outputs are electronically balanced to minimize earth loop problems.

- Pin 1 - Screen
- Pin 2 - Signal +ve (hot)
- Pin 3 - Signal -ve (cold)

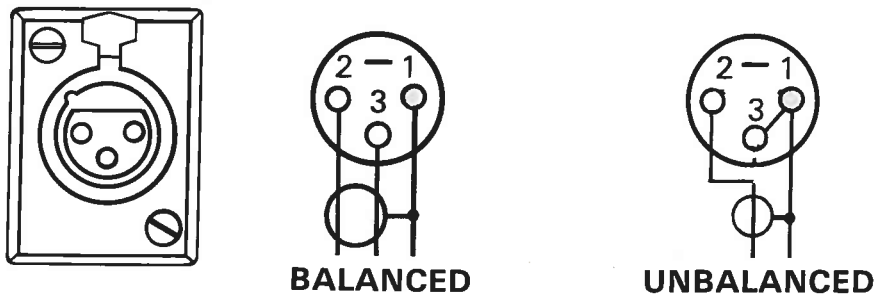


Fig 3.1 XLR Input Connections

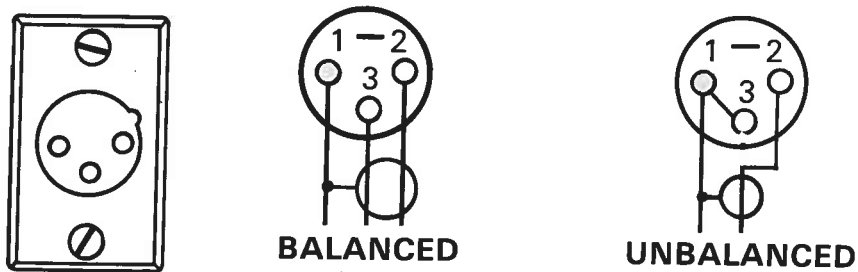


Fig 3.2 XLR Output Connections

The output stage of each band is a sophisticated electronically balanced circuit which can be operated in either balanced or unbalanced mode, without any change in output level, or readjustment. Either the signal -ve or the signal +ve can be grounded by linking directly to Pin 1 on the connector.

The maximum output level into a balanced input is approximately +26dBv, and is reduced by 6dB when unbalanced. However, as stated earlier, the nominal output level is unchanged.

Section 4 – Operation

4.1 Mode

After checking the mains voltage selection and audio connections the unit can be powered up. The "power on" indicator beneath the power switch should light immediately and approximately 3–4 seconds later the output protection relays should be heard to operate.

Removal of the security fascia will allow access to the concealed controls and the main fuse.

4.2 Level Controls

Detented controls for each output allow precise adjustment of the output level for each band. A special attenuation law achieves extremely fine resolution over the majority of the control rotation, but full attenuation when turned fully counter-clockwise.

4.3 Mode Switches

Mode of operation is selected by the mode select switches in the centre of the control panel. For 4 way operation, neither switch should be depressed. Depressing the right hand mode select switch selects 3 way operation. This bypasses the low pass filter on the High Mid output, thereby functioning as the treble output.

With only the left hand mode select switch depressed, 2 way operation is engaged, which bypasses the low pass filter on the Low Mid output, which will now function as the Treble output. It is essential that the correct output sockets are used.

Mode	Bass	Output Connector		Treble
		Low Mid	High Mid	
2 way stereo	Bass	Treble	–	–
3 way stereo	Bass	Mid	Treble	–
4 way stereo	Bass	Low Mid	High Mid	Treble

N.B When operating in 2 or 3 way modes, signals will still appear on the unused outputs, so the output level controls should be turned down.

However, in some cases this facility could be put to good use by using special system programming modules to provide independent outputs for other purposes. For instance the unit could be configured as a double 2 way stereo crossover, or as a 3 way stereo crossover with an independent flat response output (via the Treble output) for a separate monitor system, or even a recording output.

4.4 Phase Switches

The phase reverse switches insert a 180 degree phase reversal into both the left and right outputs of the selected band. This allows correction of the phase shift introduced by certain configurations of crossover slope. It is also useful to correct for miswired speaker systems. The above conditions will usually cause a notch to occur at the crossover frequency, which can be observed on a real time analyser.

Phase cancellation can also occur because of less than ideal placement of the various drive units in relation to each other. For instance, if the voice coils (ie the sound point sources) are not vertically aligned in the same plane, a time - delay is introduced which could mean the partial cancellation of a band of frquencies to which both upper and lower frequency drive units are responding, ie at the crossover frequency.

4.5 Peak Indicators

The signal level at the input is sensed by a peak responding circuit, operating at a level 6dB below the point where input clipping will occur. The maximum input level is +20dBv. Short duration peaks exceeding +14dBv will cause the LED to flash, with higher levels ultimately causing continous illumination.

4.6 Speaker Protection

When applying power to a large speaker installation damage can be caused by turn-on transients overloading the drive units. The DD1000 has been engineered to prevent this problem by the inclusion of delayed turn-on circuitry, which only connects the outputs after 3-4 seconds, allowing sufficient time for any equipment preceeding the crossover to settle.

Similarly, if a mains power failure occurs, the crossover will immediately isolate the outputs from possible transients produced by the mixer.

The DD1000 makes it safe to power up and power down the system together, although avoid powering up or down equipment preceeding the crossover whilst the crossover and amplifier systems remain powered.

Section 5.....System Programming

5.1 SPM 1 Plug – in Filter Card

The SPM 1 card holds all the associated components to create two filters. The values of components required to fix a given frequency are given in Tables 1 and 2 following. Refer to the block diagram below for component reference numbers.

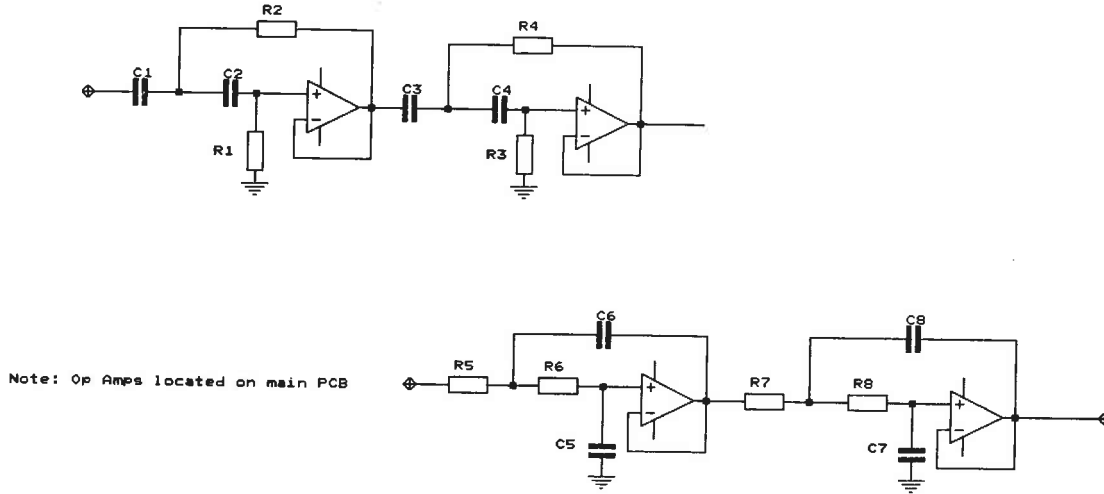


Fig 5.1 SPM 1 Filter Card Circuit Diagram

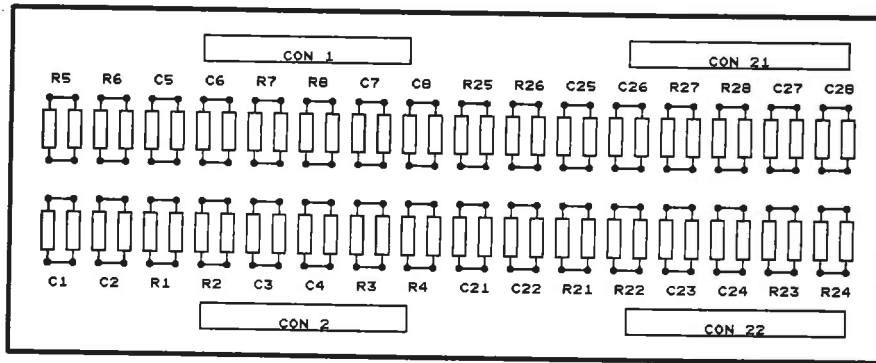


Fig 5.2 SPM 1 Filter Card PCB Layout

TABLE 1

DOUBLE BUTTERWORTH 24dB/OCTAVE FILTERS
(Linkwitz - Riley)

FREQ (Hz)	Low Pass		High Pass	
	R5 , R6	R7 , R8	R2 , R4	R1 , R3
100	As	R2, R4	270//39	68
125	"		150//33	270//68
150	"		150//27	1.2M//47
200	"		390//68	270//39
250	"		150//15	150//33
300	"		220//12	150//27
350	"		56//12	180//22
400	"		56//10	390//18
450	"		100//8.2	100//18
500	"		6.8//6.8	150//15
550	"		68//6.8	68//15
600	"		33//6.8	220//12
650	"		82//5.6	82//12
700	"		39//5.6	56//12
750	"		120//4.7	100//10
800	"		47//4.7	56//10
850	"		27//4.7	39//10
900	"		120//3.9	100//8.2
950	"		47//3.9	56//8.2

All Resistor values are in kOhms.

47//39 denotes 47kOhms in parallel with 39kOhms

	C1,2,3,4,5,7	C6,8
100 – 950 Hz	0.033uF	0.033uF//0.033uF
For freq x 10	0.0033uF	0.0033uF//0.0033uF
For SPM1 (DD1000) R1 = R21, C1 = C21 etc.		

TABLE 2

BESSEL 24 dB/OCTAVE FILTERS

FREQ (Hz)	Low Pass				High Pass			
	R5	R6	R7	R8	R1	R2	R3	R4
100	150//270	180//330	56//560	120//180	120//180	82//330	180//390	56//330
125	100//330	120//390	82//82	68//390	68//390	82//150	100	39
150	100//180	120//220	39//270	47	56//330	47//680	82	47//100
200	56//330	68//390	27//560	39//470	39//470	33	68//680	27//220
250	39	47	22//330	33//220	33//220	39//82	100//100	22//150
300	39//180	39	18//330	27//220	27//220	22	47//330	27//39
350	27	33	15//680	22//330	22//330	22//120	39//390	15//150
400	27//220	33//270	15//82	18	18	33//33	33//560	12
450	22//820	27//680	12//220	27//39	27//39	15//680	47//68	12//100
500	22//150	27//180	15//33	15//330	15//330	22//33	27//330	10//220
550	18//680	27//100	10//150	15//100	15//100	12	27//150	10//68
600	18//150	39//39	10//56	12	12	11	33//56	8.2//330
650	15	18	8.2//220	12//150	12//150	10	22//150	8.2//68
700	15//180	18//220	8.2//68	15//33	15//33	10//180	18	6.8
750	15//82	18//120	6.8	10//220	10//220	12//33	22//68	10//18
800	12	15//560	10//18	18//18	18//18	8.2	18//120	10//15
850	12//220	27//27	12//12	10//56	10//56	8.2//150	15	5.6
900	12//100	18//47	5.6	8.2//330	8.2//330	8.2//68	15//180	5.6//120
950	10	12	5.6	15//15	15//15	6.8	15//100	10//10

All resistor values in kOhms.

150//270 denotes 150kOhms in parallel with 270kOhms.

	C5	C6	C7	C8	C1	C2	C3	C4
100-950 Hz	.01	.01//.001	.01	.022//.0047	.033	.033	.033	.033
Freq x 10	.001	.001//.0001	.001	.0022//.00047	.0033	.0033	.0033	.0033

All capacitor values in uF.

For SPM 1 (DD1000) R1=R21 C1=C21 etc.

Section 6.....Servicing

Although the DD1000 crossover has been designed and constructed with high quality conservatively rated components, servicing may occasionally be required.

Fast and easy access to all parts of the circuitry can be obtained by removal of the top and bottom panels, by first removing the top and bottom front strips, which are held in place by 2 countersunk M3.5 screws, in order to lift out the panels.

All major components are located on the main printed circuit board, into which can be plugged 3 system programming modules. All components are clearly marked with their schematic reference number.

Section 7.....Theory of Operation

7.1 Input Section

The Input amplifier is a DC couple differential stage, formed from one section of a quad amplifier package type TL074. The gain of this stage is -6dB. The output of the Input stage is coupled to a gain stage which normally returns the signal level list in the input stage. Provision has been made in this stage for gain adjustment, thereby allowing operation with input levels which differ from the nominal +4dBv.

The gain stage is then coupled to a Sallen and Key subsonic filter, giving a 12dB/octave Butterworth response, with a turnover frequency of 25 Hz. This will effectively remove low frequency signals such as stage rumble, and other potentially damaging signals.

At this point the signal path is split to feed the filter bank and peak level indicator.

7.2 Peak Level Indicator

The peak level indicator senses when the signal level exceeds a preset potential, which is normally set at 6dB before clipping occurs. Under normal conditions the op-amp output is biased positive by the negative voltage applied to the inverting input. When the signal level exceeds the threshold voltage, the op-amp swings negative, turning the peak led on. A capacitor from the output to the non-inverting input ensures that even short duration transients will still be observed.

7.3 Filter Bank

The filter chain consists of three uncommitted quad op-amps, located beneath the system programming modules. Components located on each module determine the function of each op-amp in this section to perform either high-pass, low-pass or flat amplifier characteristics.

The 4 outputs of the filter bank connect to the detented level controls via the 2 way and 3 way mode switches in the case of the Low Mid and High Mid sections which can bypass the low-pass section in their respective filter chain.

7.4 Output

The output amplifiers are electronically balanced and consist of a differential-in/differential-out circuit providing phase reversal by reversing the input connections through the phase reverse switches.

The stage is unusual in that it may be operated into either a floating input or may be unbalanced to either output terminal without loss of signal level. The output condition is sensed by 2 extra feedback loops which cross couple the 2 op-amps to increase the gain by 6dB, thereby compensating for the loss of drive from the unbalanced side.

The signal from the output amplifiers is switched through to the XLR connectors via the delayed turn-on protection relays, driven from the unregulated power supply, to achieve a rapid release of the relay in the event of a power failure.

7.5 Power Supply

The power supply is a conventional arrangement of 2 monolithic regulators providing a bi-polar 15 volt supply. Sufficient regulator headroom is maintained to enable the circuit to work efficiently over a wide range of mains voltage variations.

Section 8.....Schematics