

# **DS400 PSU400**

**MIC / LINE Distribution System  
Operating Instructions**

## **XTA Electronics Ltd.**

**Riverside Business Centre,  
Worcester Road,  
Stourport-on-Severn,  
Worcs. DY11 9BZ.  
England**

**Tel : 0299 879977 (Intl. +44 299 879977)**

**Fax: 0299 879969 (Intl. +44 299 879969)**

**USA Distribution:**

## **Group One Ltd.**

**80, Sea Lane,  
Farmingdale,  
N.Y. 11735  
U.S.A.**

**Tel: (516) 249-1399**

**Fax: (516) 753-1020**

**Contents**

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Safety Warnings ..... 1

Unpacking the DS400 ..... 1

Introduction ..... 2

Front Panel Functions ..... 3

Rear Panel Functions ..... 4

Specifications ..... 6

Warranty ..... 7

System Grounding ..... 7

Operating Notes ..... 10

DS400 Circuit Description ..... 10

PSU400 Circuit Description ..... 11

Schematics ..... 12

## Thanks

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Thank you for choosing the XTA DS400 for your application. Please spare a little time to digest the contents of this manual (figuratively speaking), so that you obtain the best possible performance from this unit.

All XTA products are carefully engineered for world class performance and reliability.

If you would like further information on this or any other XTA product, please call us.

We look forward to helping in the near future.

XTA Electronics Ltd.

## Safety Warnings

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Please note the following information which is provided for your safety:

- Check correct operating voltage is set on the power supply before connecting mains power.
- Do not expose this unit to rain or moisture.
- Do not expose this unit to excessive heat.
- Replace all fuses with correct type only.
- Do not remove the covers from this unit. No user serviceable parts inside - refer all servicing to qualified personnel.

The mains power cord to the power supply is fitted with a safety earth (ground) connection. Do not operate this unit with this connection removed.

## Unpacking the DS400

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After unpacking the unit please check carefully for damage. If damage is found, please notify the carrier concerned at once. Any claim must be instigated by you, the consignee. Please retain all packaging in case of future reshipment.

## Introduction

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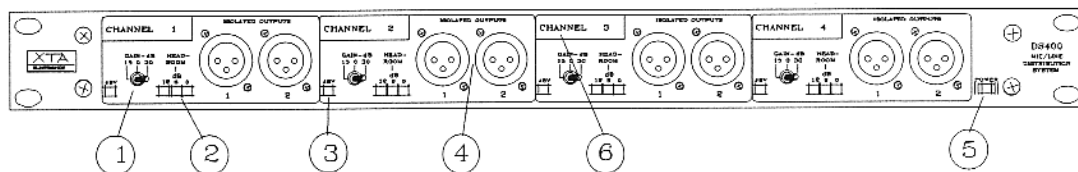
As the need for multiple feeds has evolved, with the increase in simultaneous broadcast and recording of live concerts, so too have the performance expectations of both engineers and customers alike. The considerable signal quality 'cost', associated with traditional passive-splitter systems, due to multiple loads and long cable runs, is now widely recognised. Microphones often encounter very difficult and unpredictable loads, with impedances well below their design specifications. The result of all these parallel connections is an obvious degeneration in sound quality, and a lack of level. Although active-splitters should, and often do, solve these problems, they usually introduce more of their own. With insufficient headroom to handle line level signals or keyboards and poor noise performance, most devices simply do not provide the ideal solution. Often grounding problems are also encountered. The DS400 Mic / Line Distribution System has been carefully engineered to overcome the limitations and problems of conventional splitters and provides a new level of performance and reliability.

The XTA DS400 Mic / Line Distribution System is a high quality active distribution / splitter unit containing four channels of processing in 1U of rack space. Each channel features one actively balanced input and a total of four outputs, two of which are individually actively balanced and normally connected to Front Of House and Stage Monitor consoles. The two remaining outputs are transformer isolated and located on the front panel of the unit. These are typically used as broadcasting or recording feeds. Unlike most designs, the DS400 will accommodate line level signals up to +18dBu and features a three point headroom meter for each channel. A maximum of 30dB gain is available via the three position Gain switch. This allows sufficient gain to be applied to low level signals, such as dynamic microphones, to avoid the poor noise performance often associated with active mic splitters. Phantom power (48VDC) is provided via the PSU400 power supply and is switchable to each input by selecting 'Phantom Power' on the appropriate Front Of House console input. The DS400 is designed to reduce system grounding problems; please refer to the 'System Grounding' section further on in this manual for more information.

The external PSU400 power supply is designed to power a maximum of 14 DS400 units (56 channels) and uses a fail safe design for reliability. Two completely separate supplies are housed in a single chassis. The IEC power connections are also duplicated. Either supply is capable of powering a full 56 channel system should the other supply fail. This also means that the supply is considerably over-rated for normal operation, further improving reliability. The rear of the PSU400 houses 14 lockable DEE connectors for direct connection to each DS400 unit. The PSU400 is of rugged construction, with heavy duty 2U high steel chassis and 5mm thick front panel.

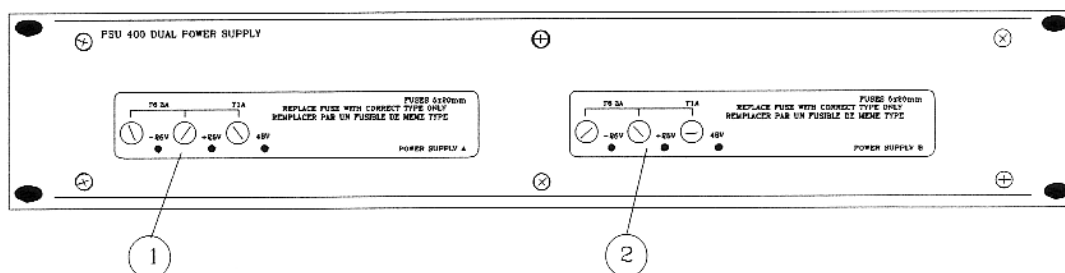
## Front Panel Functions

### DS400



- 1. Gain Switch** - sets gain for the channel to 0dB, 15dB, or 30dB.
- 2. Headroom Meter** - displays available headroom before system clipping occurs. The three LED's display 0, 6 and 12dB of headroom, with the red 0dB LED set at 3dB below clipping (ref. 1kHz).
- 3. 48V. LED** - lights when phantom power has been selected for the channel ( on the appropriate F.O.H console input channel).
- 4. Isolated Outputs** - two identical transformer - balanced outputs featuring high voltage isolation, for use as broadcast or recording feeds or wherever independent outputs are required. These connections are wired as follows, Pin 1= screen (shield), Pin 2= Hot, Pin 3= Cold.
- 5. Power LED** - a green LED lights when power is connected to the unit.
- 6. Channel Ident** - a space is available to allow numbering of each channel, for multi-unit installations.

### PSU400



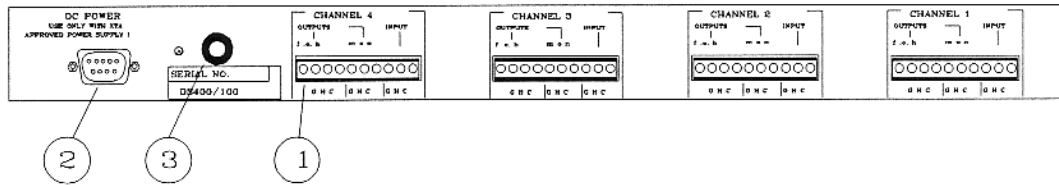
- 1. Channel A** - Fuses are provided for each of the three DC. supply rails produced by the PSU400. An LED is also provided for each supply rail. Should a fuse blow, the appropriate LED will not light. Please replace all fuses with the correct type, as shown on the front panel legend.
- 2. Channel B** - fuses and LED's are duplicated for channel B.

**Warning** disconnect mains power before changing fuses.

**Please Note.** The PSU400 is a fail-safe dual channel design. Should a fuse fail on either channel, the other channel will automatically provide the additional current needed. The faulty channel should, of course, be repaired as soon as possible.

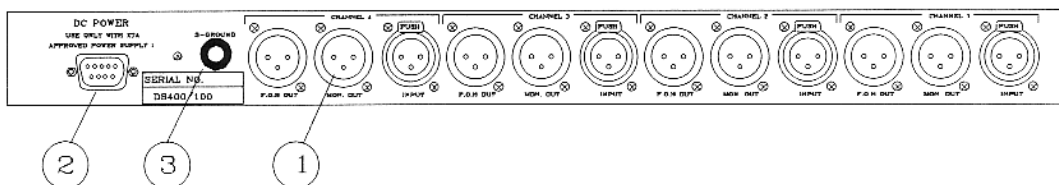
## Rear Panel Functions

### DS400 (K version)



1. **Audio Connector** - A separate 10 way connector is provided for each channel. The corresponding plug features screw terminals allowing quick termination of system wiring, giving the advantages of barrier strip plus the bonus of easier servicing and the ability to pre-wire. Each connector is marked with channel input, Front Of House console output (FOH.) and Stage Monitor console output (MON.). All terminations are fully balanced, where H= Hot pin, C= Cold pin and G= Screen (shield) pin. Please Note: Pin 10 (left hand pin of the connector) is not used.

### DS400 (XLR version)

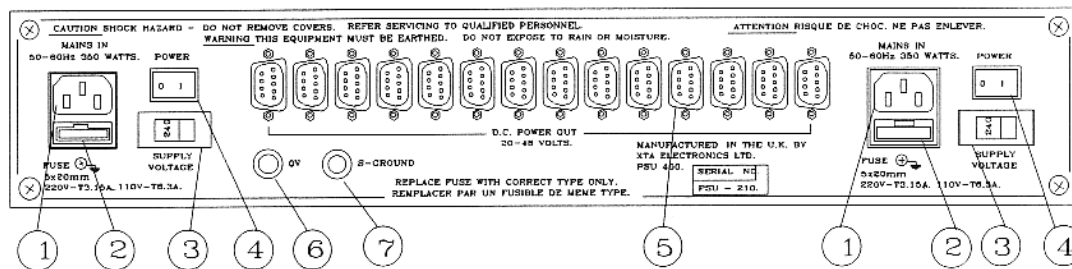


1. **Audio Connectors** - Separate 3 pin XLR type connectors are provided for each input and output. All terminations are fully balanced, where pin 2= Hot, pin 3= Cold and pin 1= Screen (shield).

#### Please note.

- The DS400 is designed for use with fully balanced systems, pins 'G' are not therefore connected to signal ground. They are connected to the S.Gnd terminal on the unit. Cable screen (shield) connections only, should normally be made to the 'G' pins - screen connections would then be left floating at the console end. See 'System Grounding' for further information.
2. **DC Power** - A 9 way lockable DEE connector is used to connect the DS400 and PSU400 units using the pre-wired cable provided.
  3. **S.Gnd Terminal** - 'G' pins (screens) for each audio connector in the unit are connected to this terminal. The chassis of the unit is also connected here. The S.Gnd terminals of all DS400 units are normally bussed together and connected to the system 'dirty ground' via the S.Gnd terminal on the PSU400 Power Supply. See 'System Grounding' for further information.

## PSU400



1. **Mains Power** - is connected via 2 standard IEC sockets, channel A being to the right of the panel. Two compatible power cords are supplied with the unit.
2. **Mains Fuses** - are located in the mains inlet sockets. Spare fuses are provided within the pull-out compartments. Always replace fuses with the correct type, as shown on the rear panel legend.
3. **Voltage Selector** - switches between two nominal operating voltages. Please ensure this is set for the correct voltage before operating. Disconnect power to the unit before resetting this selector.
4. **Power Switch** - a double pole switch is provided for each channel, isolating both live and neutral connections.
5. **DC Power Out** - fourteen lockable 9 way DEE connectors allow direct connection of up to fourteen DS400 units, via the cable provided with each unit. Each connector provides nominally +25Vdc, -25Vdc, 48Vdc for phantom power and a supply ground (0V).
6. **0v Terminal** - is connected to the supply grounds (0V) of both A and B supplies. This terminal is not normally used.
7. **S.Gnd Terminal** - is connected to chassis ground and hence to mains ground via the power cord. S.Gnd terminals on all DS400 units are normally bussed and connected to this terminal.

## Specifications

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### DS400

<b>Inputs</b>	Four electronically balanced. ♦
<b>CMRR</b>	>65dB @ 1kHz.
<b>Outputs</b>	
F.O.H	Four electronically balanced. ♦
MON.	Four electronically balanced. ♦
Isolated Feeds	Eight transformer balanced.
Source Imp.	< 60 ohms.
Min. Load	600 ohms.
Max. Level	+18dBm @ 1kHz.
<b>Gain</b>	0,15,30dB via 3 position switch
<b>Headroom Meter</b>	3 point LED @ 3,9,15 dB below clipping.
<b>Phantom Power</b>	48VDC switched via F.O.H. console phantom power switch with front panel LED indication.
<b>Frequency Response</b>	+/- 0.5dB 20Hz - 20kHz.
<b>Equivalent Input Noise</b> (20-20kHz unweighted)	0dB Gain : <-102dBm 15dB Gain: <-114dBm 30dB Gain: <-124dBm
<b>Distortion</b>	<0.01% @ 1kHz +4dB output
<b>Connectors</b>	
Input,FOH and MON outputs	10 way Klippon multipole (4). [optional 3 pin XLR (12)]
Isolated Outputs	3 pin male XLR (8).
DC Input	9 way Male lockable DEE type.
<b>Power Requirements</b>	Nominal +/- 25VDC, 48VDC (supplied by PSU400 power supply).
<b>Weight</b>	3.5kg. (7.7lbs)
<b>Size</b>	1U * 19" * 9.25" (482 * 235mm)

♦ = Optional transformers available.

### PSU400

<b>Outputs</b>	+25VDC @ 4.5A unregulated. (1 channel only). -25VDC @ 4.5A unregulated. (1 channel only). +48VDC @ 0.7A regulated. (1 channel only).
<b>Power requirements</b>	110/220V +/- 15% @ 50/60Hz.
<b>Power consumption</b>	< 350VA
<b>Connectors</b>	
DC output	9 way Female lockable DEE type (14).
Power	3 pin IEC (2).
<b>Weight</b>	10kg. (22lbs)
<b>Size</b>	2U * 19" * 11.5" (482mm * 290mm).



## Warranty

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

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

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

## System Grounding

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### The problem

The efficient grounding of sound systems has always been difficult and is often thought of as a 'black art'. With the increasingly complex systems required today, these problems are getting worse.

The DS400 is designed to minimise grounding problems in the systems in which it is installed.

The two main problems encountered are 'Hum Loops' caused by two or more pieces of equipment with different ground references being interconnected and radio interference, caused by the screens of increasingly long lengths of cable acting as 'aerials' and shunting that energy onto a ground reference used by a unit.

### The solution

The DS 400 has been designed to alleviate these problems by having a screen ground that is completely independent of the 0 volt reference inside the unit. The screen ground is connected to pin 1 of the XLR's and to the G pins of the multipole connectors on the rear panel. These screen grounds are "bussed" together and terminated at the screen ground terminal post on the rear panel. This screen ground or 'Dirty Ground' is not connected to the unit's own 0 volt reference. There is however a 22R resistor between screen ground and 0 volts for safety. The 0 volt reference for the unit is derived in the PSU400 where it is connected via a 22R safety resistor to the ground pin of the incoming I.E.C. mains connectors.

Because phantom powered mic's and D.I. Boxes need their phantom power developed from screen potential, phantom power in the DS400 is referenced to screen ground, not to the 0 volt reference.

### System Grounding using the DS400

Firstly, it is recommended that all equipment used with the DS400 should be balanced. Any components not balanced should have a suitable balancing system used with them

e.g.. D.I. box. If unbalanced sources or destinations are to be used see figures 5 and 6. for more information.

Screens used in a balanced system are only needed to ensure that radio frequency and hum are not induced into the conducting pairs. Therefore, to avoid hum loops, they should only be joined at one end. The important exceptions are when, either the source has no other ground connection, or needs phantom powering e.g. microphones or D.I. boxes. Because most sources coming from the stage do not have an internal ground, it is sensible to connect all the grounds in the multicore going to the stage boxes, then use cables with their grounds lifted between the source and the stage box for any exceptions.

As the DS400 has the facility for bussing screens together, it is recommended that all screens are connected at the DS400. Screen ground terminal posts on all DS400 units should be joined together and connected to the screen ground post on the PSU400, (which is internally connected to the incoming I.E.C mains inlet). It should be noted that the chassis of the DS400 and PSU400 are connected to screen ground, so earth loops via the rack mount strips should not develop. All multicores going to mixing consoles, recording trucks, etc. should have screens lifted at the desk end. Note. On some consoles, when phantom power is switched 'on' this overrides the ground lift switch on that channel, without any indication that it has done so. For this reason it is recommended that screens are lifted on the incoming connector to the console, rather than with the earth lift switch.

## System wiring

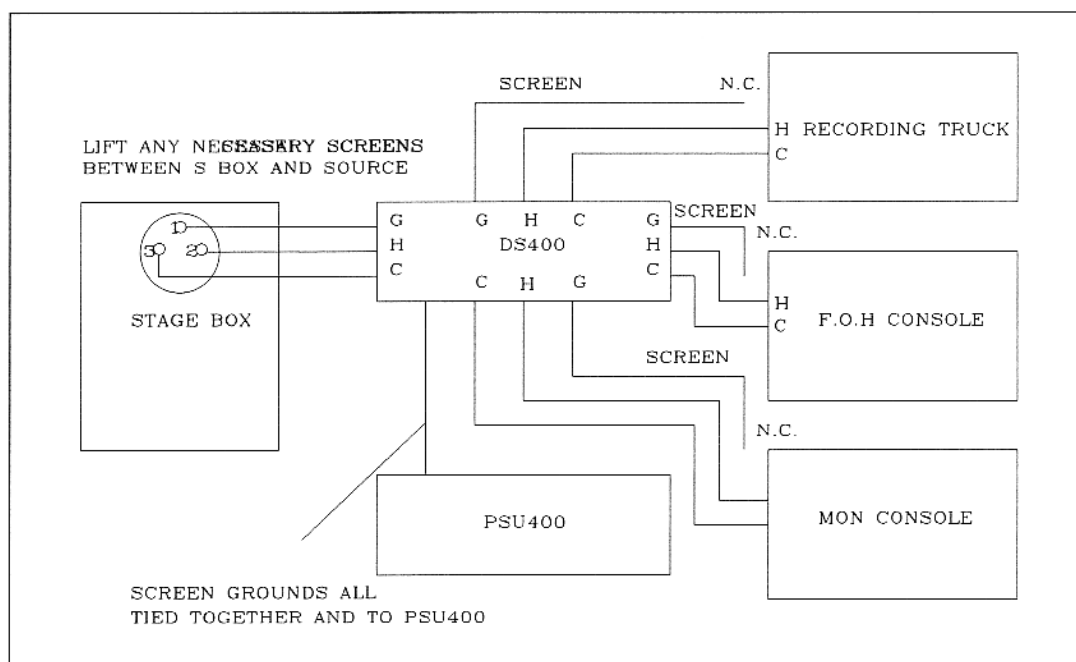
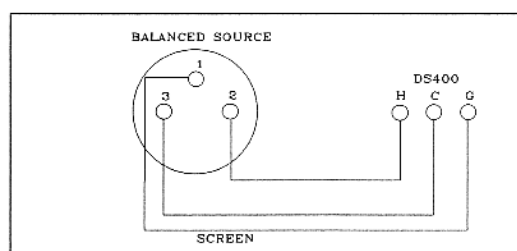


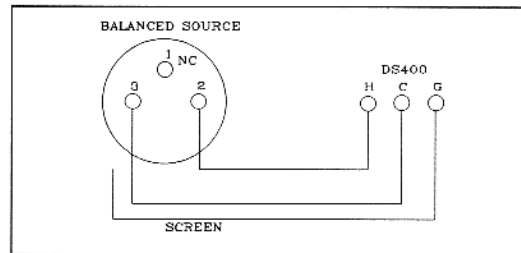
Figure 1.

## Balanced Interfacing

**Figure 2.** Balanced source without it's own ground or needing 'phantom power' - to DS400 (balanced in). E.g.. microphone or DI box.

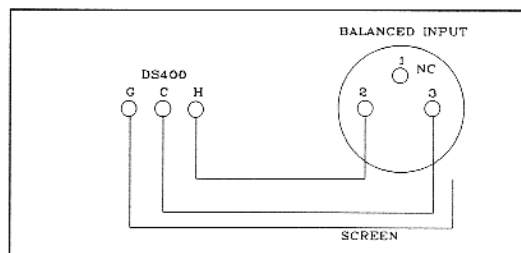


**Figure 3.** Balanced source with it's own ground connection - to DS400 (balanced in).



**Figure 4.** DS400 Output (balanced) - to balanced input.

Note. The screen could be joined at the input and not at the DS400 if required.

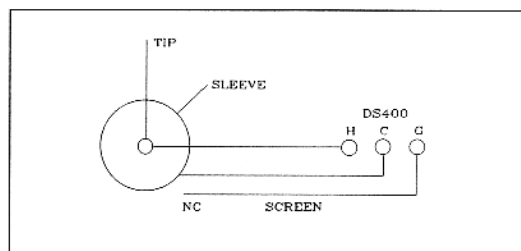


## Unbalanced Interfacing

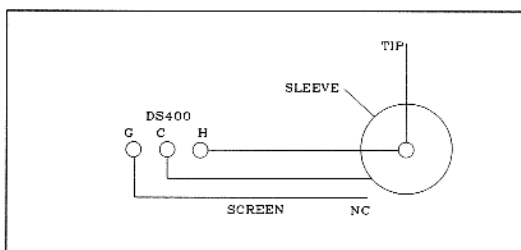
Note. We recommend that any unbalanced equipment be transformer or electronically balanced before use in professional systems.

**Figure 5.** Unbalanced source with its own connection to ground via mains inlet or rack mount strips.

Note that for this system to work as 'pseudo balanced' there must be equal source impedance from tip and sleeve. Some manufacturers provide a third terminal which has equal impedance and is not connected to ground, use this terminal for cold if possible.



**Figure 6.** DS400 (balanced out) to unbalanced input on a unit with it's own earth reference via I.E.C. mains inlet or rack mount strips.



## Operating Notes

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Generally, operating the DS400 is very straight forward, however certain functions may not be immediately obvious and these are discussed here.

**FOH / MON. Gain Trim.** As factory set, gains of all four outputs are the same, however presets (VR102,202,302,402) are provided within the unit for each channel, to allow adjustment of both FOH and MON. output gains (simultaneously). This enables the user to set gains that give preferred console gain control positions, or simply optimise noise or headroom requirements.

**Phantom Power.** 48Vdc phantom power is provided to the DS400 by the PSU400 power supply. This is connected to the DS400 channel input only when 'Phantom Power' is selected on the FOH console channel connected to the appropriate FOH connector pins on the DS400. This is achieved by detecting a DC voltage on the FOH output which in turn switches a relay connecting the internal 48V supply to the channel input.

## DS400 Circuit Description

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### DS400

The DS400 contains four identical sections. Only one channel is described here.

#### Input Section

The signal enters through connector CN1 and passes to the electronically balanced input amplifier stage formed by TR3,TR4 and IC1A. CMR is factory set for this input by VR1. R21,R22 and R23 are selected via gain switch SW1 to give gains of 0dB, 15dB and 30dB, measured input to output. The input is AC coupled by C5 and C6. RF rejection and HF stability are assured by C7,C8,C9,C12 and C13.

#### Phantom Power

48V Phantom power is connected to both Hot and Cold input pins via relay RL1 whenever a DC voltage is detected on the FOH output connector pins. This DC voltage is summed by R7 and R8 and attenuated by R3 and R4. R7,R8 and C1 form a lowpass filter which removes audio frequencies from the control voltage and R5 and R6 set the input threshold at which TR1 switches 'on'. As the input voltage on C1 rises TR1 switches, turning on relay RL1 and LED D9 (48v). Response time of the circuit is 'slugged' by C1,C26 and C27.

#### Headroom Meter

From IC1A the signal passes via 'attack' resistor R27 to rectifier D6, storage capacitor C14 and release resistor R28. This rectified signal then passes to three inputs of comparator IC5. R29, 30, 31 and 32 set thresholds for the three sections. Outputs of IC5 are 'low' until input threshold is exceeded. The outputs then switch 'high' and the appropriate LED illuminates.

#### Gain Trim

The output of IC1A feeds potential divider VR2 and R26. VR2 is the gain trim control for FOH and MON. outputs and is normally factory set to give unity gain input to output, with

'0dB' gain selected. This stage is buffered by voltage follower IC1B and passes to the FOH and MON. output drivers.

### **FOH and MON. Outputs**

The outputs of IC1B drive two identical cross-coupled high performance balanced output drive circuits, based around IC3 and IC4. Output balance is factory set with VR3 and VR4. The signal from these stages is AC coupled by C20,21,26 and 27 and passes to connector CN1.

### **Isolated Outputs**

The output of IC1A feeds output driver IC2, which drives the primary of TX1. Each of the two secondaries of TX1 feed their own balanced output connector CN5 and CN6.

### **Regulator Section**

DC power is connected to CN50 from the PSU400 power supply. Unregulated DC voltages of +/- 25V (nominal) pass through fuses FS50 and FS51, via smoothing capacitors C50 and C51, to regulators IC50 and IC51. The outputs of IC50 and IC51 are decoupled and connected to the power LED and integrated circuits. Regulated 48VDC (Phantom power) passes through FS52 and via R52,C56 to the four phantom power relays.

## **PSU400 Circuit Description**

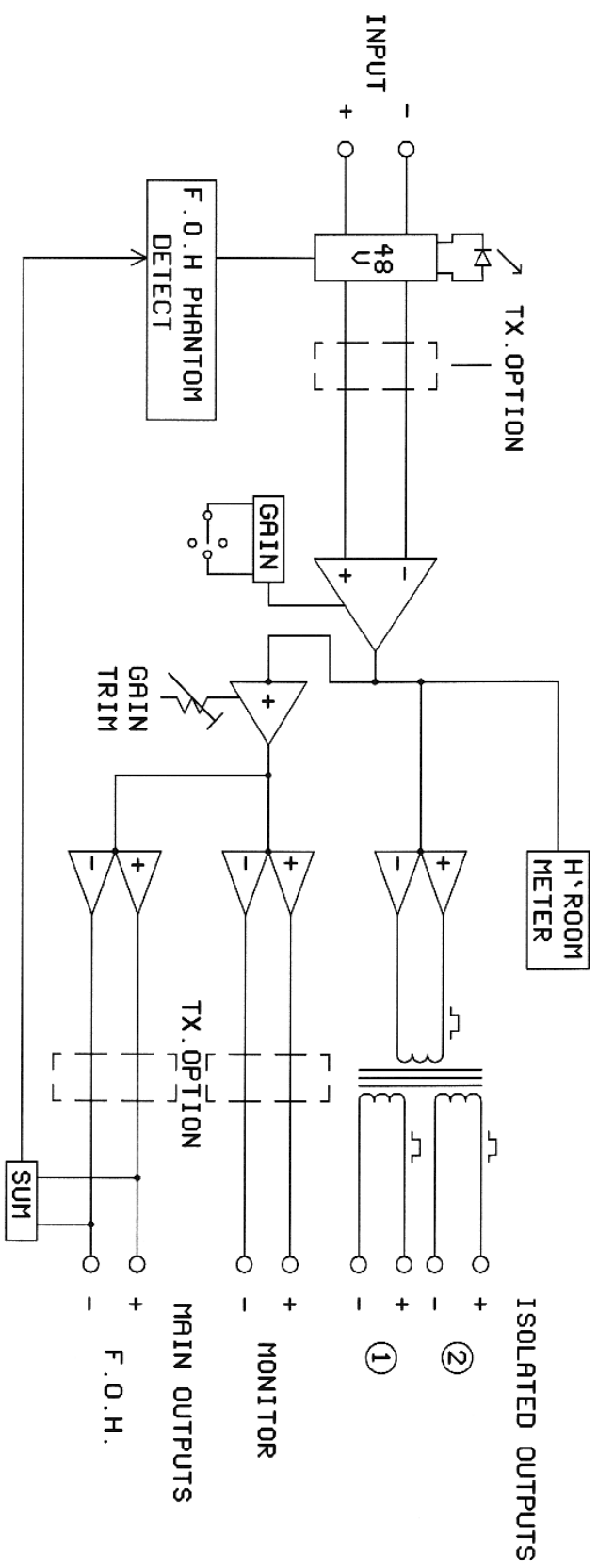
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The PSU400 dual rail power supply contains two identical power sections. The outputs of these two supplies are diode summed on to the DC output connector PCB buss, to provide fail-safe operation. Only one channel is described here.

Mains power is connected to the IEC connector CN1 and passes through the integral fuse F1, to the double pole power switch SW1. The low field toroidal power transformer features twin primary windings which are connected in series or parallel by SW2 to give 110/220V nominal operation. The three secondaries drive bridge rectifiers BR1,BR3 and BR5, via front panel fuses F2,F3 and F4. The three rail LED's are connected post fuse and so extinguish to identify blown fuses.

The two low voltage secondaries are smoothed by C4 and C6 and pass to the output connector buss via BR4 and BR6. The nominal output of these supply rails is +/-25V at normal loads.

The Phantom power secondary is smoothed by C1 and C2 and regulated to 48VDC by IC1. The output of IC1 passes to the output connector buss via BR2.

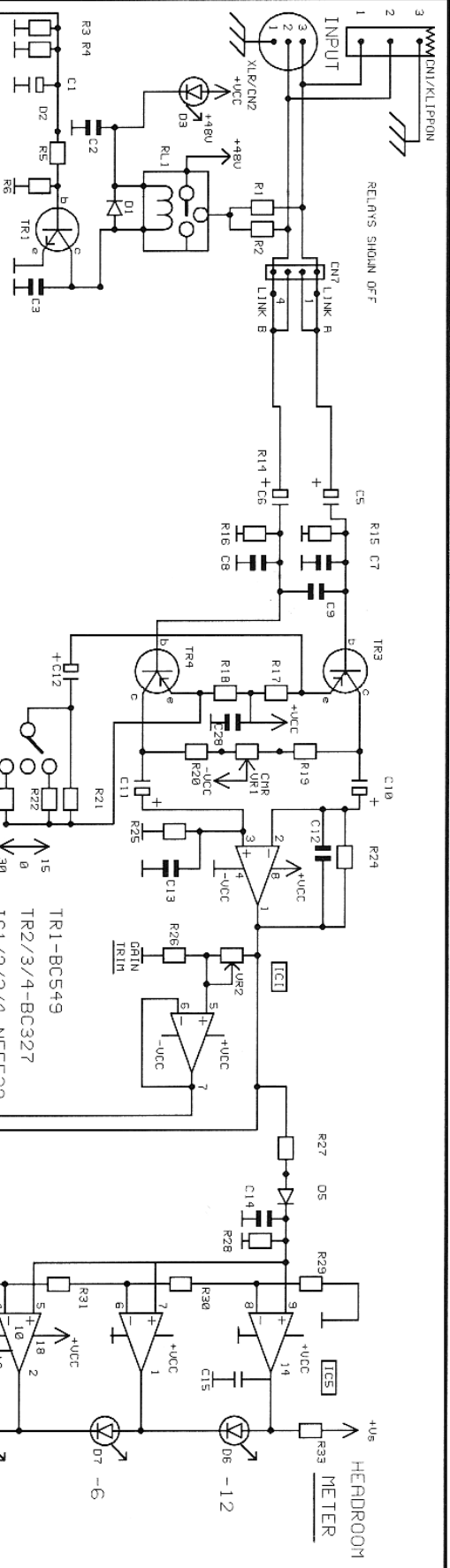


DS 400 BLOCK DIAGRAM

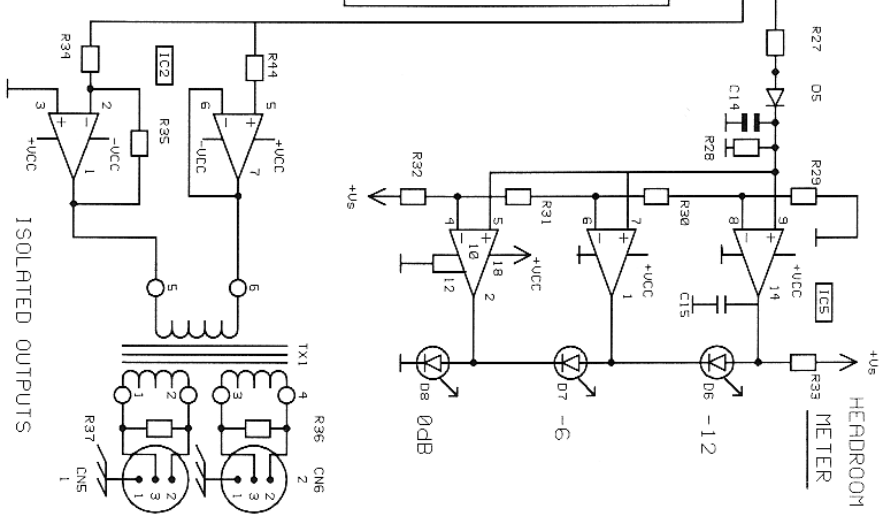
XTR ELECTRONICS LTD

DATE 16/11/92

DWG S0007\_2



TR1-BC549  
 TR2/3/4-BC327  
 IC1/2/3/4-NES532  
 IC5-LM339



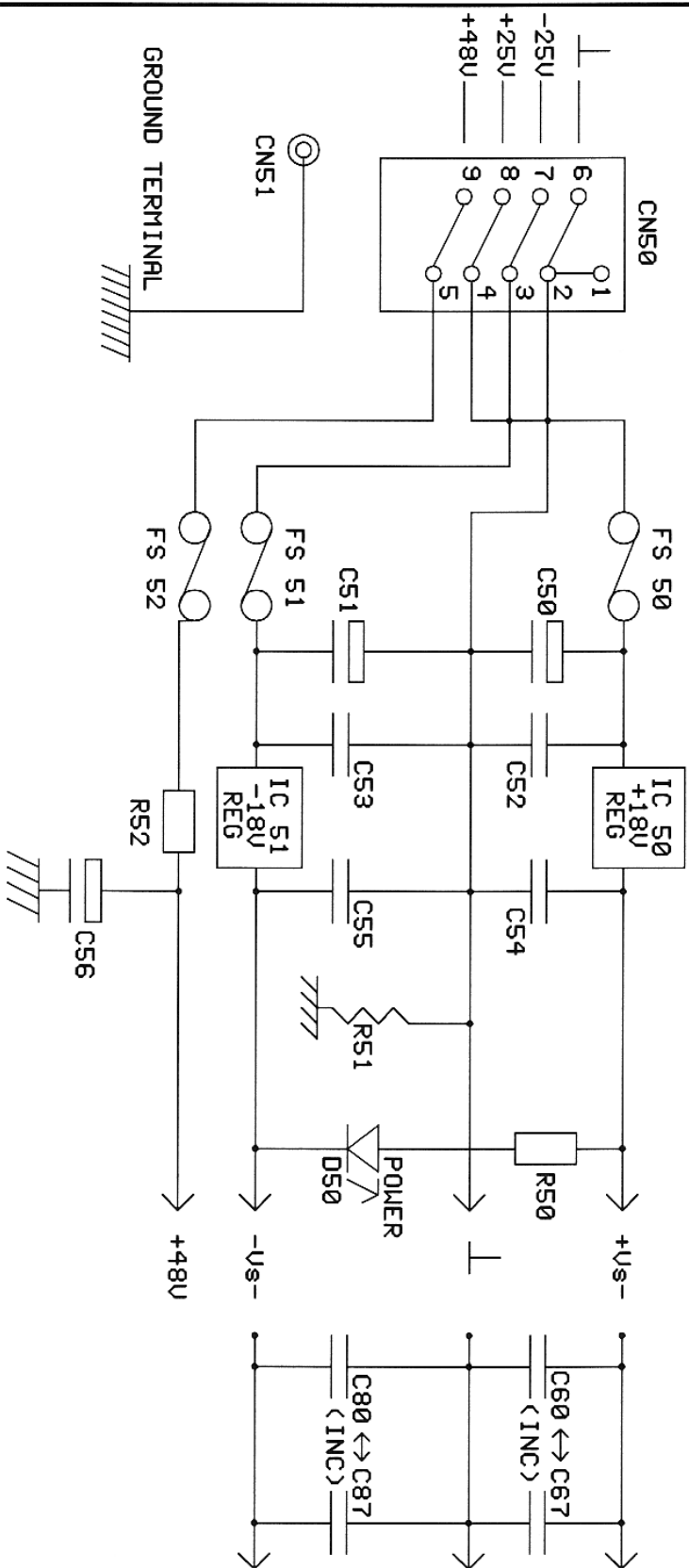
# DS 400 SCHEMATIC

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D. C. INPUT  
9WAY D-TYPE



DS400 REGULATOR SECTION

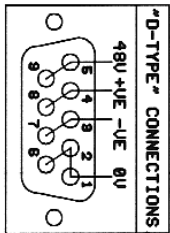
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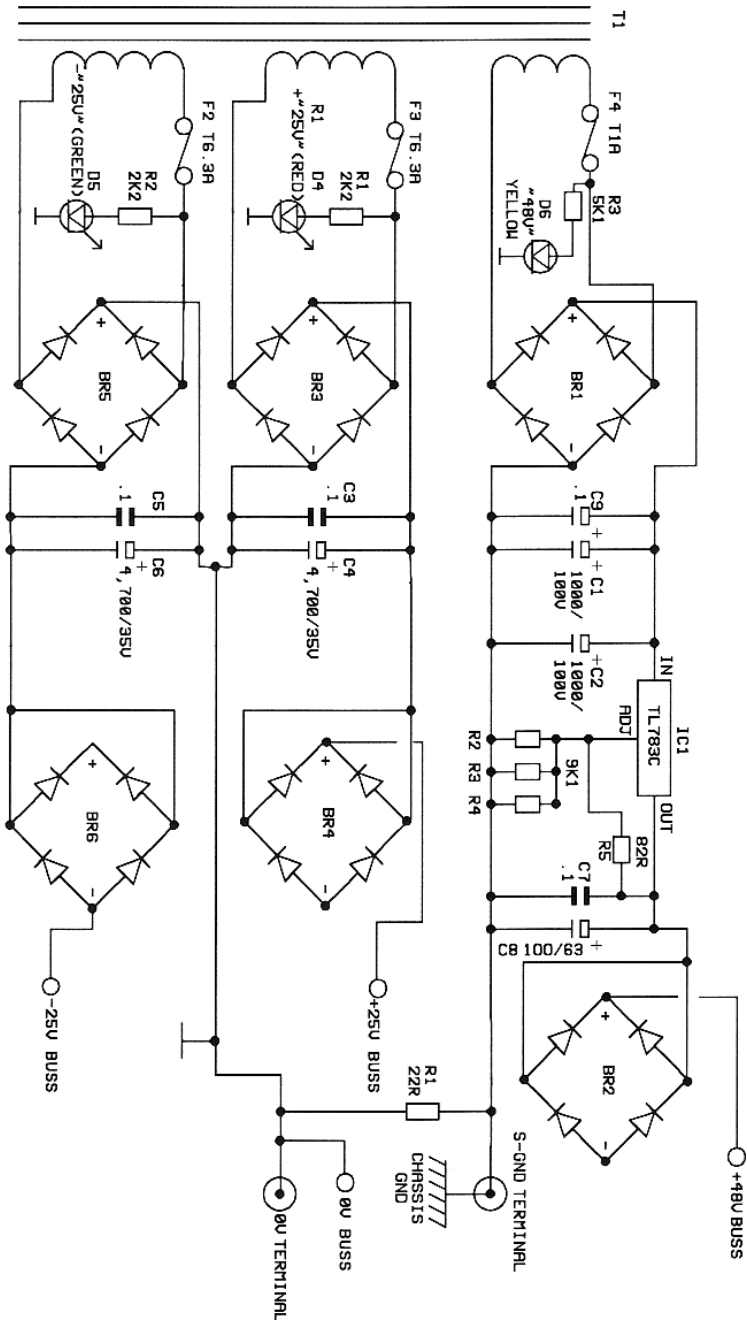
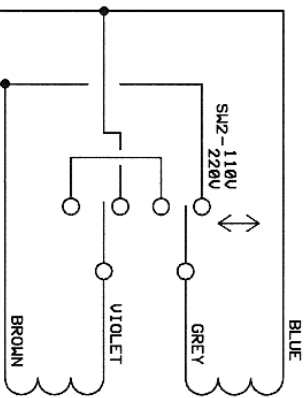
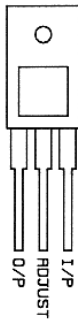
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NOTE: DUAL SUPPLY  
ONLY ONE SECTION  
SHOWN.



VIEWED FROM ABOVE



PSU 400, SERIAL NOS. 211 ONWARDS

XTA ELECTRONICS LTD.

DATE 11/5/93

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