

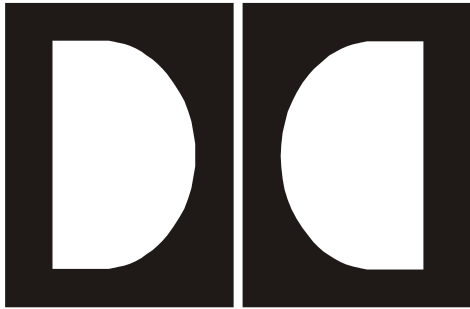
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Model 587
Multichannel Audio
Converter
User's Manual

Part Number 91772

Issue 1

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WARNING: Troubleshooting must be performed by trained technicians. Do not attempt to service this equipment unless you are qualified to do so.

Check that the correct fuses have been installed. To reduce the risk of fire, replace the fuses only with the same type and rating.

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Part Number 91772;
Issue 1
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Regulatory Notices

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

Canada

This Class A digital apparatus complies with Canadian ICES-003.

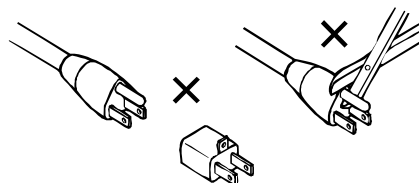
UL

Troubleshooting must be performed by trained technicians. Do not attempt to service this equipment unless you are qualified to do so.

⚠ ***WARNING: Check that the correct fuses have been installed. To reduce the risk of fire, replace the fuses only with the same type and rating. See page vii.***

Exposed portions of the power supply are electrically "hot." In order to reduce the risk of electrical shock, the power cord **MUST** be disconnected when the cover of this equipment is removed.

The ground terminal of the power plug is connected directly to the chassis of the unit. For continued protection against electric shock, a three-pin, correctly wired and grounded (earthed) power outlet must be used. Do not use a ground-lifting adapter and never cut the ground pin on the three-prong plug.



U.K.

As the colours of the cores in the mains lead may not correspond to the coloured markings identifying the terminals in your plug, proceed as follows:

- The core, coloured green and yellow, must be connected to the terminal in the plug that is marked with the letter **E**, or by the ground symbol \equiv , or coloured green, or green and yellow.
- The core, coloured blue, must be connected to the terminal that is marked with the letter **N**, or coloured black.
- The core, coloured brown, must be connected to the terminal that is marked with the letter **L**, or coloured red.

EU

This equipment complies with the EMC requirements of EN55103-1 and EN55103-2 when operated in an E2 environment in accordance with this manual.

IMPORTANT SAFETY NOTICE

This unit complies with the safety standard EN60065. The unit shall not be exposed to dripping or splashing and no objects filled with liquids, such as coffee cups, shall be placed on the equipment. To ensure safe operation and to guard against potential shock hazard or risk of fire, the following **must** be observed:

- o Ensure that your mains supply is in the correct range for the input power requirement of the unit. (GB)
- o Ensure **fuses** fitted are the **correct rating and type** as marked on the unit.
- o The unit **must be earthed** by connecting to a correctly wired and **earthed** power outlet.
- o The **power cord** supplied with this unit must be wired as follows:

Live—Brown Neutral—Blue Earth—Green/Yellow

IMPORTANT – NOTE DE SECURITE

Ce matériel est conforme à la norme EN60065. Ne pas exposer cet appareil aux éclaboussures ou aux gouttes de liquide. Ne pas poser d'objets remplis de liquide, tels que des tasses de café, sur l'appareil. Pour vous assurer d'un fonctionnement sans danger et de prévenir tout choc électrique ou tout risque d'incendie, **veillez** à observer les recommandations suivantes.

- o Le selecteur de tension doit être placé sur la valeur correspondante à votre alimentation réseau. (F)
- o Les **fusibles** doivent correspondre à la **valeur** indiquée sur le matériel.
- o Le matériel **doit être** correctement **relié à la terre**.
- o Le **cordon secteur** livré avec le matériel doit être câblé de la manière suivante:

Phase—Brun Neutre—Bleu Terre—Vert/Jaune

WICHTIGER SICHERHEITSHINWEIS

Dieses Gerät entspricht der Sicherheitsnorm EN60065. Das Gerät darf nicht mit Flüssigkeiten (Spritzwasser usw.) in Berührung kommen; stellen Sie keine Gefäße, z.B. Kaffeetassen, auf das Gerät. Für das sichere Funktionieren des Gerätes und zur Unfallverhütung (elektrischer Schlag, Feuer) sind die folgenden Regeln **unbedingt** einzuhalten:

- o Der Spannungswähler muß auf Ihre Netzspannung eingestellt sein. (D)
- o Die **Sicherungen** müssen in **Typ und Stromwert** mit den Angaben auf dem Gerät übereinstimmen.
- o Die **Erdung** des Gerätes muß über eine **geerdete** Steckdose gewährleistet sein.
- o Das mitgelieferte **Netzkabel** muß wie folgt verdrahtet werden:

Phase—braun Nulleiter—blau Erde—grün/gelb

NORME DI SICUREZZA – IMPORTANTE

Questa apparecchiatura è stata costruita in accordo alle norme di sicurezza EN60065. Il prodotto non deve essere sottoposto a schizzi, spruzzi e gocciolamenti, e nessun tipo di oggetto riempito con liquidi, come ad esempio tazze di caffè, deve essere appoggiato sul dispositivo. Per una perfetta sicurezza ed al fine di evitare eventuali rischi di scossa elettrica o d'incendio **vanno** osservate le seguenti misure di sicurezza:

- o Assicurarsi che il selettore di cambio tensione sia posizionato sul valore corretto.
- o Assicurarsi che la **portata ed il tipo di fusibili** siano quelli prescritti dalla casa costruttrice. (I)
- o L'apparecchiatura deve avere un collegamento di **nessa a terra** ben eseguito; anche la connessione rete deve avere un collegamento **a terra**.
- o Il **cavo di alimentazione** a corredo dell'apparecchiatura deve essere collegato come segue:

Filo tensione—Marrone Neutro—Blu Massa—Verde/Giallo

AVISO IMPORTANTE DE SEGURIDAD

Esta unidad cumple con la norma de seguridad EN60065. La unidad no debe ser expuesta a goteos o salpicaduras y no deben colocarse sobre el equipo recipientes con líquidos, como tazas de café. Para asegurarse un funcionamiento seguro y prevenir cualquier posible peligro de descarga o riesgo de incendio, **se han** de observar las siguientes precauciones:

- o Asegúrese que el selector de tensión esté ajustado a la tensión correcta para su alimentación. (E)
- o Asegúrese que los **fusibles** colocados son del **tipo y valor correctos**, tal como se marca en la unidad.
- o La unidad **debe ser puesta a tierra**, conectándola a un conector de red correctamente cableado y **puesto a tierra**.
- o El **cable de red** suministrado con esta unidad, debe ser cableado como sigue:

Vivo—Marrón Neutro—Azul Tierra—Verde/Amarillo

VIKTIGA SÄKERHETSÅTGÄRDER!

Denna enhet uppfyller säkerhetsstandard EN60065. Enheten får ej utsättas för yttre åverkan samt föremål innehållande vätska, såsom kaffemuggar, får ej placeras på utrustningen." För att garantera säkerheten och gardera mot eventuell elchock eller brandrisk, **måste** följande observeras:

- o Kontrollera att spänningsväljaren är inställd på korrekt nätspänning. (S)
- o Kontrollera att **säkringarna** är av **rätt typ** och för **rätt strömstyrka** så som anvisningarna på enheten föreskriver.
- o Enheten **måste vara jordad** genom anslutning till ett korrekt kopplat och **jordat** el-uttag.
- o **El-sladden** som medföljer denna enhet måste kopplas enligt följande:

Fas—Brun Neutral—Blå Jord—Grön/Gul

BELANGRIJK VEILIGHEIDS-VOORSCHRIFT:

Deze unit voldoet aan de EN60065 veiligheids-standaards. Dit apparaat mag niet worden blootgesteld aan vocht. Vanwege het risico dat er druppels in het apparaat vallen, dient u er geen vloeistoffen in bekertjes op te plaatsen. Voor een veilig gebruik en om het gevaar van elektrische schokken en het risico van brand te vermijden, **dienen** de volgende regels in acht te worden genomen:

- o Controleer of de spanningscarroussel op het juiste Voltage staat. (NL)
- o Gebruik alleen **zekeringen** van de **aangegeven typen en waarden**.
- o Aansluiting van de unit alleen aan een **geaarde** wandcontactdoos.
- o De **netkabel** die met de unit wordt geleverd, moet als volgt worden aangesloten:

Fase—Bruin Nul—Blauw Aarde—Groen/Geel

Voltage Information

The voltage selector, accessible from the rear, allows input voltages in four voltage ranges:

WARNING: Applying voltages higher than selected will damage the unit.

Input Voltages

| Voltage Selector | Range | Frequency | Fuse |
|------------------|----------------|-----------|------------|
| 100 VAC | 85 to 110 VAC | 60 Hz | T 630 mA L |
| 120 VAC | 102 to 132 VAC | 60 Hz | T 630 mA L |
| 220 VAC | 187 to 242 VAC | 50 Hz | T 315mA L |
| 240 VAC | 204 to 264 VAC | 50 Hz | T 315 mA L |

Note: For 230 VAC mains in EU countries, use the 240 V mains selector setting.

Selecting Voltage

1. Remove AC power cord.
2. Use a small, flat-blade screwdriver to open the line-input module cover.

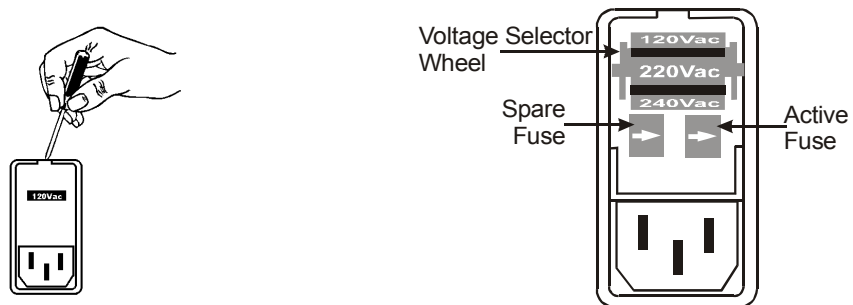


Figure 1-1 Mains-Input Module

3. Lift out the voltage selector wheel.
4. Rotate the wheel until the desired voltage is facing towards you, and replace in the line-input module.
5. Verify that the correct fuse is installed. Replace if necessary.
6. Snap the line-input module cover closed and verify that the correct voltage is visible through the cover window.
7. Replace AC power cord.

Fuse Information

There are two fuses inside the line-input module. The fuse on the left is a spare. Only the fuse on the right is functional. The fuse for 220, 230, and 240 VAC operation is 0.315 amps, and the fuse for 100 and 120 VAC operation is 0.63 amps.

Fuse Replacement

1. Follow steps 1 and 2 on the previous page to access the fuse holders.
2. Lift out the right fuse holder.

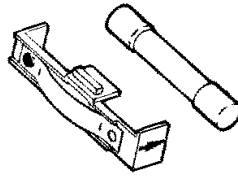


Figure 1-2 Fuse Holder and Fuse

3. Remove old fuse from holder and replace with a new fuse.
4. Insert fuse holder into the line-input module with arrow pointing to the right as indicated on the inside of the line-input module cover.
5. Snap the line-input module cover closed.
6. Replace AC power cord.

Chapter 1

Introduction

The Model 587 Multichannel Audio Converter combines eight channels of 24-bit analog-to-digital conversion and eight channels of 24-bit digital-to-analog conversion in a compact 2-U rack-mount enclosure. An elegant linear power supply uses careful filtering coupled with multiple stages of regulation to provide clean, isolated power to each section of the unit. An internal low-speed, low-noise fan is provided to allow the Model 587 to be installed in virtually any environment. Both of these features help to ensure consistent high performance and long product life.

The analog-to-digital section of the Model 587 uses custom, high-performance 24-bit converter modules that can operate at any sample rate between 30 and 50 kHz via the unit's AES black external reference input. When no sync signal is present, the unit mutes this input to prevent false clocking and uses its internal low-jitter crystal oscillator for asynchronous operation at 48 kHz. Balanced audio is input via eight female 3-pin XLR connectors on the rear panel. Dolby standard double-green LED indicators provide simple and accurate alignment of reference levels. AES/EBU 110 Ω outputs are provided via three male 3-pin XLR connectors on the rear panel. Additionally, an optional input linear protection limiter is provided to prevent digital clipping in the A/D converters.

The digital-to-analog section also uses custom, high-performance 24-bit converter modules capable of operating at any sample rate between 30.08 and 55 kHz. Each module is independently clocked from its respective AES/EBU 110 Ω digital input, provided by three female 3-pin XLR connectors on the rear panel. Front-panel LEDs indicate when each module is locked to the incoming AES stream. Balanced audio is output via eight male 3-pin XLR connectors on the rear panel.

Chapter 2 System Setup

2.1 Cooling

A large, low-speed fan with airflow from the lower front to the upper rear of the product is used to minimize the acoustical noise. To improve reliability when heat is exchanged from neighboring products in a rack, a fan servo is implemented that increases the fan speed (and noise) if the internal air temperature reaches 45°C. The fan noise for internal temperatures below 45°C is <28 dBa. The product can be placed above or below other components in a rack without affecting the reliability or acoustical noise.

2.2 Clock Reference

An internal crystal oscillator generates 12.288 MHz \pm 300 ppm for low jitter, asynchronous 48 kHz analog to digital conversion. In addition the converter clock may be synchronized to an external AES/EBU reference (see Section 3.1.2). Irrespective of the clock source, all the analog-to-digital converters use the same clock signal and are thus time aligned.

2.3 Front Panel

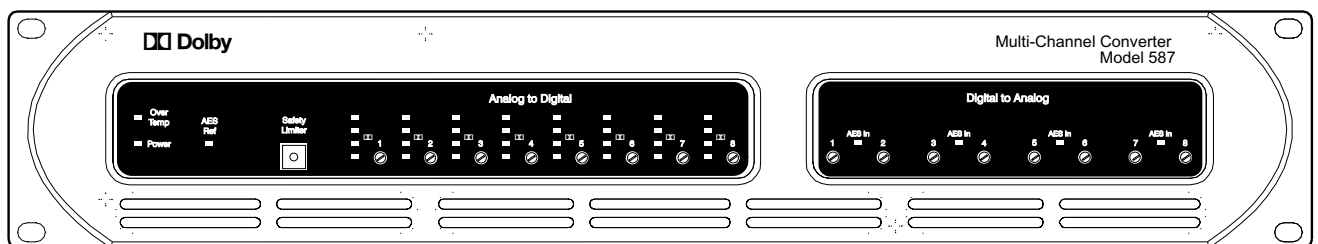


Figure 2-1 Model 587 Front Panel

2.3.1 Over Temp

In the event the internal temperature reaches 60°C or higher, the front-panel **Over Temp** LED will light red. If this occurs, the unit should be turned off. Possible causes for an over temperature indication may be a malfunction of the cooling system, fan failure, or blocked vents.

2.3.2 AES Ref

When an external AES clock reference is provided (see Section 3.1.2), the analog-to-digital converter will automatically switch to this external source and the green **AES Ref** LED will light.

2.3.3 Safety Limiter

A **Safety Limiter** is available on the analog inputs after the gain trim to prevent hard clipping of signals with levels up to +4 dBFS. The limiter reduces the gain for signals between -2 dBFS and +4 dBFS so that the resulting signal is always less than 0 dBFS. Signals that are greater than +4 dBFS will hard-clip. The limiter is enabled when the front-panel push button is depressed and the green LED indicator is lit.

2.3.4 Analog to Digital Level Indicator and Adjustment

Each analog to digital converter has a gain trim with a range of 16 dB located on the front panel. With the trim at center position an input signal of 0 dBu will correspond to -20 dBFS.

Each channel has a four-LED level meter to facilitate the gain trim. The bottom LED lights yellow when the signal level is between -44 dBFS and -21 dBFS (indicating signal presence). The two, middle LEDs light green when the signal is -20 dBFS ± 0.25 dB giving a double green indication for Dolby Level. The red LED lights whenever the input signal is greater than -2 dBFS.

To align the converter for operation with a digital reference level of -20 dBFS, apply a 1kHz tone at local analog reference level to each input and simply adjust the input gain trim until both green LEDs are lit.

To align the converter to other digital reference levels will require the use of digital signal level meter such as the Dolby DM100, (alternatively the input level meter of a digital tape machine or other similar device may be used). In this case, connect the digital output of the appropriate converter to the digital level meter, a 1kHz tone at local analog reference level to the input and adjust the input gain trim until the reference level is achieved as read on the meter.

2.3.5 Digital to Analog Indicator and Adjustment

Each of the eight channels has its own gain trim located on the front panel and an LED to show that the input digital audio receiver is locked. Gain trims provide a range of 16 dB, allowing the operating level to be adjusted from -10 dBu to +6 dBu.

To align the converter requires a digital signal generator and analog level meter. Apply 1kHz tone at local digital reference level to the appropriate digital input, connect the analog level meter to the appropriate output and adjust the output level trim until the reference level is achieved as read on the meter.

Chapter 3 Connectors

3.1 Rear Panel

All input and output connectors are located on the rear panel of the Model 587 Multichannel Audio Converter.

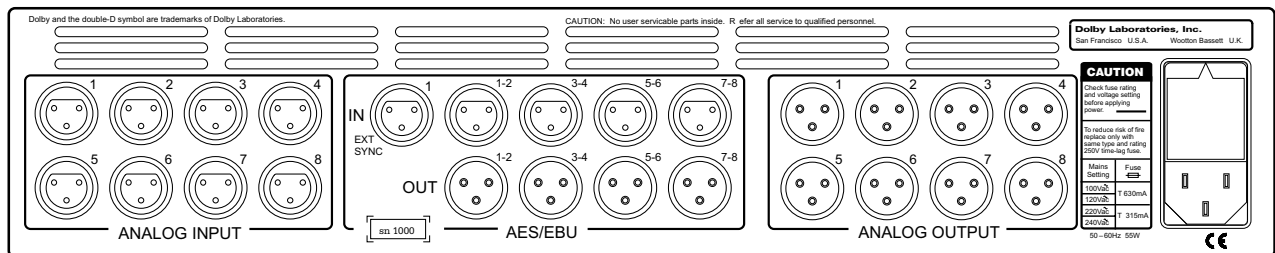


Figure 3-1 Model 587 Rear Panel

3.1.1 Analog Input

Eight female XLR connectors on the rear panel provide balanced analog inputs to the Analog to Digital converters. See Figure 3-2.

The Model 587 accepts balanced audio inputs (at up to +28 dBu without clipping) and includes differential mode RF low-pass filtering, DC block, and ESD protection.

3.1.2 AES/EBU In External Synchronization

A balanced 110Ω XLR connection provides for an AES/EBU external clock reference. See Figure 3-2.

3.1.3 AES/EBU In Connectors

Four AES/EBU female XLR inputs panel provide balanced digital inputs to the Digital to Analog converters. See Figure 3-2.

3.1.4 AES/EBU Out Connectors

There are four AES/EBU outputs, each on male XLR connectors. See Figure 3-3.

3.1.5 Analog Output

The analog outputs are electronically balanced and floating, providing a minimum of +24 dBu into a balanced 600Ω load. Clipping will occur at approximately +20 dBu when driving a single-ended load. See Figure 3-3.

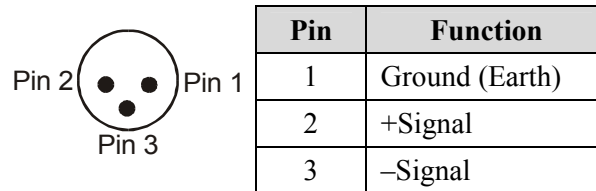


Figure 3-2 Input Connectors

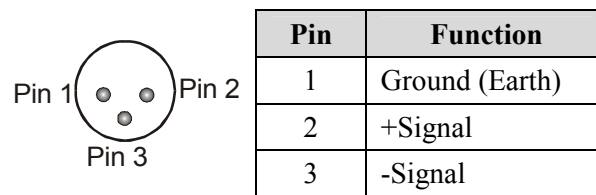


Figure 3-3 Output Connectors

Chapter 4

System Specifications

4.1 General

| | |
|--|--|
| Dimensions | 8.9 x 48.3 x 37.5 cm |
| Net Weight | 7 kg |
| Shipping Weight | 12 kg |
| AC Mains Connector | IEC standard receptacle with voltage selector and fuse |
| Power consumption | 60 W at nominal line voltage |
| Peak inrush current | 4.2 A |
| Operating Temperature | 0°C to 50°C |
| Non-Operating (Storage) Temperature | -40°C to 85°C |
| Humidity | Up to 98% relative humidity, noncondensing |

4.2 Analog-to-Digital Converter Specifications

| | |
|-------------------------------------|---|
| Number of Channels | 8 |
| Nominal Resolution | 24 bits |
| Sampling Rate | 48 kHz internal, 30 to 50 kHz external |
| Nominal Input Level | +4 dBu |
| Nominal Headroom | 20 dB |
| Differential Input Impedance | >20 k Ω |
| Dynamic Range | 105 dB typical |
| THD at 1 kHz | <0.006% |
| Gain Adjustment Range | 16 dB |
| DC Offset | <-48 dBFS |
| Frequency Response at 48 kHz | 17 Hz to 22.1 kHz, +0.05/-0.2 dB |
| CMRR | <-45 dB, 50 Hz to 10 kHz |
| Digital Output Impedance | 110 Ω , transformer coupled |
| Digital Output Voltage | 4 V _{p-p} with 110 Ω load |

4.3 Digital-to-Analog Converter Specifications

| | |
|-------------------------------|-------------------------------|
| Number of Channels | 8 |
| Nominal Resolution | 24 bits |
| Sampling Rate | 30.08 to 55 kHz |
| Nominal Output Level | +4 dBu |
| Nominal Headroom | 20 dB |
| Output Impedance | less than 110 Ω |
| Dynamic Range | 108 dB typical |
| THD at 1 kHz | less than 0.004% |
| Differential DC Offset | -49 dB |
| Common Mode DC Offset | 3 mV |
| Frequency Response | 20 Hz to 20 kHz +0.05/-0.2 dB |
| Gain Adjustment Range | 16 dB |