



# OPTOCORE



## Operating Manual for OPTOCORE X6 Devices

A/D and D/A Converter

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OPTOCORE GmbH  
Lohenstr. 8  
82166 Munich-Gräfelfing  
Germany

## ***Important Safety Instructions***

- Please read this manual carefully.
- Please keep this operating manual in a safe place.
- Heed all warnings.
- Follow all instructions.
- This device may only be used in accordance to the information provided in this operating manual. Ensure that all recommendations, especially the safety recommendations as detailed in this operating manual, are followed before and during the usage of the device.
- Do not use this device near water, for example, in moist or damp rooms.
- Clean only with a dry cloth.
- Do not block or cover any ventilation slits. Install the device in accordance to the operating manual.
- Do not install or place the device near any heat source such as radiators, power-amplifiers, stoves, or any other heat producing equipment.
- Protect the power cord from being walked on, crushed, pinched, or damaged in any other way. Pay special attention to plugs and sockets of the device.
- Never switch on power amplifiers before the complete system is stable and the level meters of the OPTOCORE CONTROL software indicate a normal level.
- Do not place this device on an unstable table, tripod, cart, etc. The device may fall, causing serious damage to the device.
- The device can be disconnected from the power supply by using the appropriate switch or by pulling the plug. These must be freely accessible at all times. The device has to be disconnected during lightning storms or when unused for long periods of time.
- The device must be grounded; any disconnection of the grounding is not permitted.
- The switched-mode power supplies operate with high voltage. Coming into contact with them can lead to considerable electric shocks, which may result in death.
- Only use attachments specified by the manufacturer.
- This device contains no user serviceable parts: only refer to authorized, qualified service personnel for any servicing.
- Your warranty will be voided if you tamper with the internal components.

## Purchaser Information

- **Operating Manual**

Please read this manual – if you call for technical support, we will assume that you have. Study the operating manual carefully in order to familiarize yourself with the device and its operation. It contains numerous information and hints for the proper use of the device.

It cannot be excluded that this operation manual shows typographical mistakes or misprints; it is however regularly revised.

Modifications, which serve the purpose of technical improvement of the device, may be carried out without prior notification.

- **Transport and Shipping**

Always ensure the careful handling of the device. If possible transport or shipping should always occur in special, shock-absorbing transport cases. If these are not available we recommend well-upholstered packaging such as the coated carton in which the device was delivered.

We strongly advise not to use simple flight-cases without rack-in-rack mounting.

- **Environments**

This device can be used in E1, E2, E3, E4, or E5 environments (as listed below) according to the harmonized European standards EN55103-1 and EN55103-2 "Electromagnetic compatibility – Product family standard for audio, video and audio-visual and entertainment lighting control apparatus for professional use"

E1-Residential

E2-Commercial and light industrial

E3-Urban outdoors

E4-Controlled EMC environment e.g. broadcast and TV-studio

E5-Heavy industry

The product is intended for the use in moderate climate.

- **Ventilation**

Do not block or cover any ventilation slits. Install the device in accordance to the operating manual. Leave sufficient ventilation space around the units (at least approx. 200 mm  $\equiv$  7,87" free space behind the rear-panel) and care for free air movement near the ventilation-slits on both sides of the device. Keep the rear of the rack open during operation. Do not set up the device close to equipment producing a lot of heat, for example power-amplifiers. Leave enough space (minimum  $\frac{1}{2}$  RU) to any heat emitting device. An X6 converter may be placed on top or beneath other Optocore products, except DD32, without additional space.

- **Water and Moisture etc.**

To prevent fire or shock hazard do not expose device to the effects of direct sunlight, dust, water, or rain during operation or storage.

- **Cleaning**

Only use a dry linen cloth to clean the device. In case of strong soiling moisten the cloth using a little water and a small amount of household detergent. Never use cleansing agents containing solvents to clean the device.

- **Operating and Storage Temperature**

Operating temperature: 0°C ...50°C  $\equiv$  34°F ... 122°F; ensure proper ventilation

Storage temperature: -20°C ...60°C  $\equiv$  -4°F ... 140°F

- **Power Supply**

The device can be disconnected from the power supply by using the appropriate switch or by pulling the plug. These must be freely accessible at all times. The device has to be disconnected during lightning storms or when unused for long periods of time. The switched-mode power supplies operate with high voltage. Coming into contact with them can lead to considerable electric shocks, which may result in death.

Never disconnect the main plug by pulling the cable, always pull the plug itself.

Power-supply cords should be routed in such a way that they are not likely to be walked on, crushed, pinched, or damaged in any other way. Pay special attention to the plugs and the sockets of the device.

**Replace a damaged power cable immediately.**

The device must be grounded; any disconnection of the grounding is not permitted. Always ensure the correct grounding of the device via the main plug. Never cover the grounding terminal of the plug by means of insulation material!

- **Fuse**

The main fuse cannot prevent an unexpected malfunction of electrical components; it is rather there to protect the user and its environment from damage. Therefore never try to replace the main fuse by any other than the specified D1.0A type (1.0A, slow behavior). Never try to repair or bypass a blown main fuse.

- **Lightning**

For additional protection of this device during lightning storms, or when it is left unattended and unused for a long period of time, unplug the power line. This will prevent damage to the device due to lightning and power line surges. Disconnection from the mains power supply can only be achieved by removing the plug from the mains socket.

- **Interference of external objects and/or liquids with the device**

Never push objects of any kind into the device through openings in the casing. They may come in touch with dangerous voltage points or short out parts that could result in a fire or electric shocks. Never spill liquid of any kind on the device.

- **Cables and Accessories**

Only use attachments specified by the manufacturer.

Only use high quality cable material to connect the device. For the optical data connection exclusively use the specified optical waveguide cables. If not in use, ensure that the optical connectors of both, device and waveguide are closed with the provided lids.

Do not place this device on an unstable table, tripod, cart, etc. The device may fall, which can cause injury and serious damage to the device. Any mounting of the device should follow the manufactures instructions, and should use mounting accessory recommended by the manufacturer.

- **Servicing**

Do not attempt to service this device yourself.

This device contains no user serviceable parts: only refer to authorized, qualified service personnel for any servicing.

The opening of the device is not required for operation as there are no user serviceable components located inside the device. The operation of an opened device is not permitted. It can lead to damage of components due to the absence of required ventilation. The device may not be serviced, altered or modified without authorization of Optocore or an Optocore authorized distributor / dealer. Only qualified service personnel may carry out repair and maintenance work. The warranty will be voided if unauthorized manipulation occurred.

## **CE-Conformity**

This document confirms that the product X6 bearing the CE (Communauté Européenne) label meets all requirements in the EMC directive 2004/108/EG laid down by the Member States Council for adjustment of legal requirements. Furthermore the product complies with the rules and regulations of the low-voltage directive 2006/95/EG. This product bearing the CE label complies with the following standards, ratified by CENELEC (Comité Européen de Normalisation Electrotechnique):

**Electromagnetic compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use**

**EN 55103-1, Emission**

**EN 55103-2, Immunity**

The authorised declaration and compatibility certification lies with the manufacturer and can be viewed on request. Responsible as manufacturer is:

**OPTOCORE GmbH, Lohenstr. 8, 82166 Munich-Gräfelfing, Germany**

**represented by Marc Brunke, Managing Director**

**N.B.** The awarding of the CE label confirms the compliance with legal directives issued for the manufacture and marketing of electronic and electrical devices. As such the CE label is not a "seal of quality" but rather proof that the device bearing the CE label is conform with the electromagnetic compatibility standards laid down in the above named testing regulations.

Munich, 22.04.2008



Marc Brunke

## X6 - A/D and D/A Converter

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## Device Description

Congratulations on your purchase of an X6 A/D and D/A Converter Device. The X6 Series will quickly convince you with its advantages and will facilitate your day-to-day work.

The devices of the X6 series are converter units to transform analog signals to AES/EBU and vice versa. They can function in all kinds of applications where A/D and D/A conversion is needed. In “cooperation” with Optocore’s DD32(E) or PTP32E they are seamlessly integrated into the OPTOCORE® OPTICAL DIGITAL NETWORK SYSTEM. All parameters of the converters can be controlled and monitored with the same software application as all the other Optocore devices, the OPTOCORE CONTROL software. They facilitate a high flexibility to provide the number of analog inputs and outputs required at different positions in temporary or permanent applications. The high quality of the preamps, A/D- and D/A converters make the X6 units ideal for the incorporation into audio systems even if no Optocore network is established. They provide a wide dynamic range with negligible distortion and extremely low noise.

There are three different available versions of the X6: The X6P – 16IN with 16 mic/line inputs, the X6 – 16OUT with 16 line outputs and the X6P – 8/8 with 8 mic/line input – 8 line outputs. The analog XLR inputs include microphone pre-amp, phantom power and selectable gains in 1 dB steps from 0 dB to +66 dB. The analog XLR outputs enable the adjustment of the channel level in two steps: 0dB / –10dB.

All analog inputs are available at the rear panel after pre-amplification. Two analog split outputs per channel can be sent to other devices such as an analog monitor console or recording unit. With two AES/EBU ports on the rear the digital signals are split as well. The function of the second port is software adjustable. Usually it operates as a parallel AES/EBU port. The X6 – 16OUT allows to use the second port for transmitting the incoming AES/EBU channels. The X6P – 8/8 enable the use of the second port as an output of the incoming AES/EBU and analog signals.

The Word Clock IN / OUT and THRU enable the synchronization of the units to an external source and are used to pass on the word clock from one unit to the next. For stand-alone applications, the devices are equipped with an internal word clock.

Up to four X6-units can be connected to the four principle ports of one DD32(E) or PTP32E enabling the exchange of 32 AES/EBU signals (64 channels) and control data. All combinations are possible, e.g. four X6P-16IN providing 64 analog inputs, three X6P-16IN and one X6P-8/8 with 56 inputs and 8 outputs, one X6P-8/8 and three X6-16OUT with 8 inputs and 56 outputs or four X6-16OUT with 64 outputs. The ports include two control data channels. Without the necessity of any external data cable the X6-units can be operated and controlled via the Optocore network with OPTOCORE CONTROL. For the control in stand-alone applications, the USB or RS232 port on the front panel can be used.

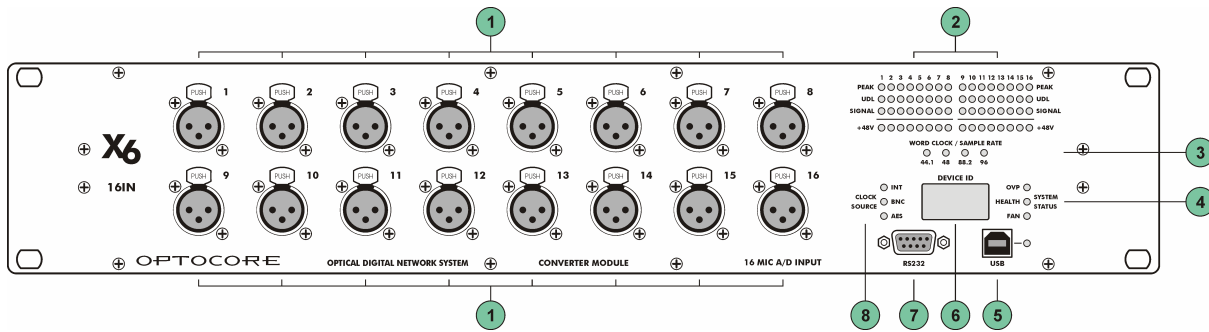
OPTOCORE CONTROL software provides all configuration and control tools including naming, gain setting, and phantom power activation for attached devices, storage and recall of configurations on the computer, off- and online mode, real-time level display of the individual channels in online mode.

The LEDs on the front panel of the X6 units allow an instant overview concerning the status of each channel. They indicate if a channel is present, if a user defined or peak level is reached and the activation of the phantom power.

Due to SMD production the X6 modules fulfill the demand of highest standards occupying only two rack unit of a 19" rack. The FPGA (field programmable gate array) based concept of the internal logic circuitry permits updating of the hardware by the use of the units remote ports, ensuring a continual state-of-the-art device.

## Front Panel

### X6P – 16IN



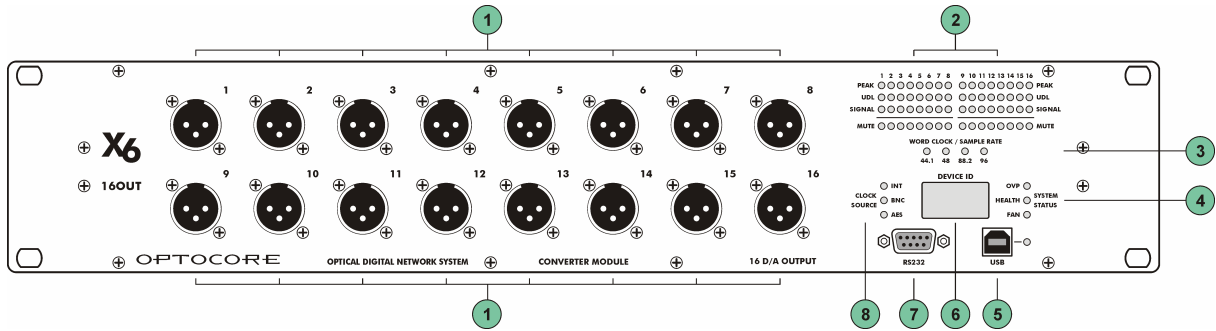
- 1** **XLR inputs** 16 female XLR inputs with preamp and analog 1 dB steps for level adjustment, and switchable phantom power
- 2** **Signal monitor for input channel 1 – 16**

**PEAK** Red: Overflow, input level exceeds max. input level of 18 dBu  $\equiv$  0 dBFS  
**UDL** Yellow: Warning level, input level exceeds 8 dBu  $\equiv$  -10 dBFS (UDL = User Defined Level)  
**SIGNAL** Green: Signal present  $\geq$  -22 dBu  $\equiv$  -40 dBFS  
**+48V** Red: Phantom power is activated
- 3** **Word Clock / Sample rate**

**ON** Yellow: 44.1 / 48 / 88.2 / 96 kHz
- 4** **System status**

**OVP** Red: Over voltage protection ( $>$  300V<sub>AC</sub>) is activated  
**HEALTH** Green: Power supply is correctly working, temperature is below the limit  
**FAN** Green: Fan is correctly working
- 5** **USB** For remote controlling. Green: Indicates data flow
- 6** **Device ID** Displays the device ID in standalone application (for future use)
- 7** **RS232** For remote controlling and upgrading via PC
- 8** **Word Clock LED:** Indicates the selected word clock source:  
**INT:** Internal word clock  
**BNC:** External via BNC Input  
**AES:** External via AES (for future use)

## X6 – 16OUT



- 1

**XLR outputs**

16 male XLR line level outputs (two different output levels: 0 dB/-10 dB)
- 2

**Signal monitor for output channel 1 – 16**

<b>PEAK</b>	Red: Overflow, input level exceeds max. input level of 18 dBu ≡ 0 dBFS
<b>UDL</b>	Yellow: Warning level, input level exceeds 8 dBu ≡ -10 dBFS (UDL = User Defined Level)
<b>SIGNAL</b>	Green: Signal present ≥ -22 dBu ≡ -40 dBFS
<b>MUTE</b>	Red: Channel muted (no AES/EBU input signal present)
- 3

**Word Clock / Sample rate**

<b>ON</b>	Yellow: 44.1 / 48 / 88.2 / 96 kHz
-----------	-----------------------------------
- 4

**System status**

<b>OVP</b>	Red: Over voltage protection (> 300V <sub>AC</sub> ) is activated
<b>HEALTH</b>	Green: Power supply is correctly working, temperature is below the limit
<b>FAN</b>	Green: Fan is correctly working
- 5

**USB**

For remote controlling. Green: Indicates data flow
- 6

**Device ID**

Displays the device ID in standalone application (for future use)
- 7

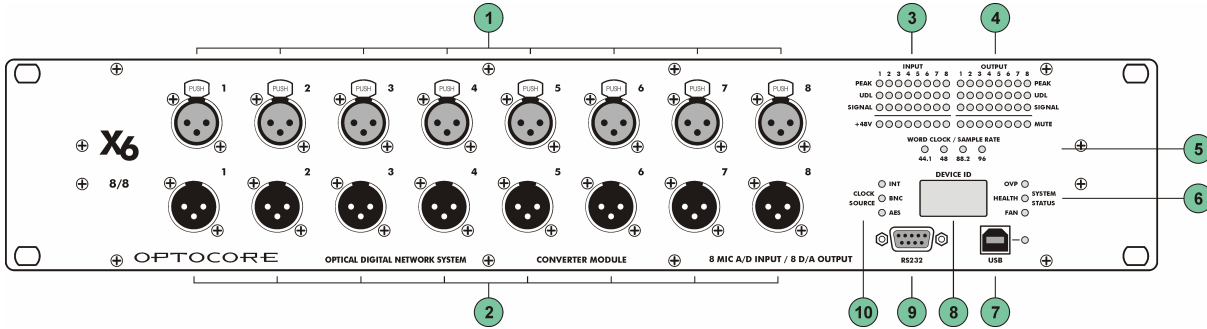
**RS232**

For remote controlling and upgrading via PC
- 8

**Word Clock LED:**

Indicates the selected word clock source:  
INT: Internal word clock  
BNC: External via BNC Input  
AES: External via AES (for future use)

## X6P – 8/8



- 1** **XLR inputs** 8 female XLR inputs with preamp and analog 1 dB steps for level adjustment, and switchable phantom power
- 2** **XLR outputs** 8 male XLR line level outputs (two different output levels: 0 dB/-10 dB)
- 3** **Signal monitor for input channel 1 – 8**

**PEAK** Red: Overflow, input level exceeds max. input level of 18 dBu  $\equiv$  0 dBFS  
**UDL** Yellow: Warning level, input level exceeds 8 dBu  $\equiv$  -10 dBFS (UDL = User Defined Level)  
**SIGNAL** Green: Signal present  $\geq$  -22 dBu  $\equiv$  -40 dBFS  
**+48V** Red: Phantom power is activated
- 4** **Signal monitor for output channel 1 – 8**

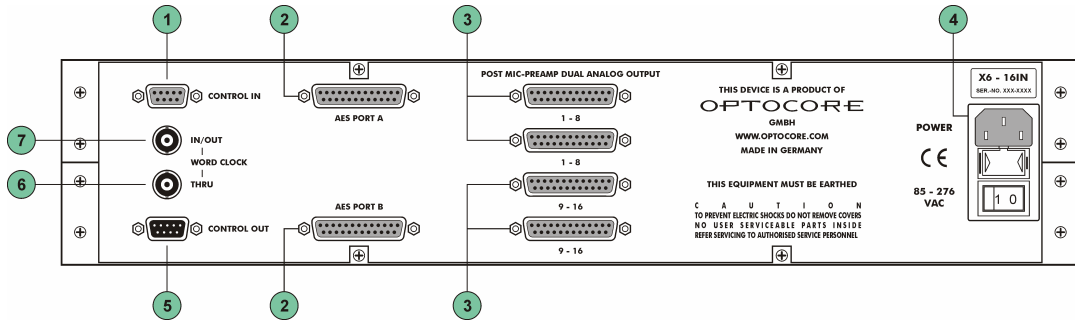
**PEAK** Red: Overflow, input level exceeds max. input level of 18 dBu  $\equiv$  0 dBFS  
**UDL** Yellow: Warning level, input level exceeds 8 dBu  $\equiv$  -10 dBFS (UDL = User Defined Level)  
**SIGNAL** Green: Signal present  $\geq$  -22 dBu  $\equiv$  -40 dBFS  
**MUTE** Red: Channel muted (no AES/EBU input signal present)
- 5** **Word Clock / Sample rate**

**ON** Yellow: 44.1 / 48 / 88.2 / 96 kHz
- 6** **System status**

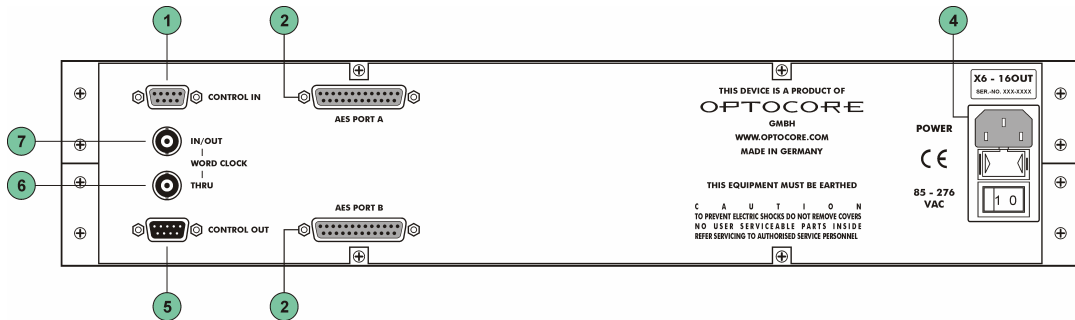
**OVP** Red: Over voltage protection ( $>$  300V<sub>AC</sub>) is activated  
**HEALTH** Green: Power supply is correctly working, temperature is below the limit  
**FAN** Green: Fan is correctly working
- 7** **USB** For remote controlling. Green: Indicates data flow
- 8** **Device ID** Displays the device ID in standalone application (for future use)
- 9** **RS232** For remote controlling and upgrading via PC
- 10** **Word Clock LED:** Indicates the selected word clock source:  
 INT: Internal word clock  
 BNC: External via BNC Input  
 AES: External via AES (for future use)

## Rear Panel

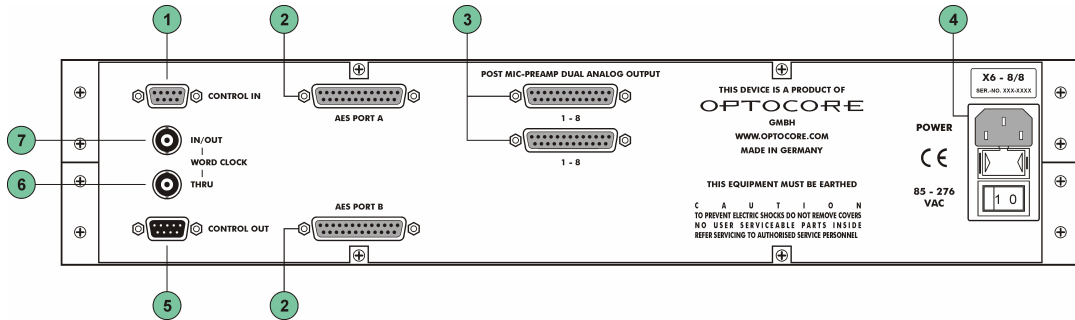
### X6P – 16IN



### X6 – 16OUT



### X6P – 8/8



- 1
**Control IN:** RS 485 connection for control data transmission and word clock distribution (for future use)
- 2
**AES Port A and B:** 2 x 8 RS422 channels for AES data transmission, plus two control data channels
- 3
**Analog output:** Post mic-preamp dual analog output for each input
- 4
**POWER:** Mains input for power supply (100 ... 240 V)
- 5
**Control OUT:** RS 485 connection for control data transmission and word clock distribution (for future use)
- 6
**Word Clock Thru:** BNC connection for Word Clock exchange
- 7
**Word Clock IN/OUT:** BNC connection for Word Clock exchange

## Device Details

### A/D and D/A Converter

24-bit converters and sample rates of 44.1, 48, 88.2 or 96 kHz ensure the high-quality conversion of analog audio signals. (Level definition: 0dB  $\equiv$  +18dBu  $\equiv$  0dBFS)

### Analog Inputs

The inputs include microphone preamps with selectable gain between 0 dB to 66 dB in steps of 1 dB. Phantom Power (+48V) can be activated individually at each input.

### Analog Outputs

The outputs can be individually adjusted in two steps of 0 dB ( $\equiv$  +18 dBu) and -10 dB ( $\equiv$  +8 dBu).

### Analog Split Outputs

The microphone inputs are equipped with two electronically balanced analog split outputs. The Post Mic-Preamp Analog Outputs on the rear panel provide the signals after pre-amplifications at a level of -10 dB, the maximum output voltage is +8 dBu.

Each output has its own amplifier stage. This guaranties that a short-circuit on a channel, caused by external equipment, does not influence the proper function of the other outputs or the channel transmission in the network.

### AES Ports

According to the AES/EBU standard, each physical channel contains two audio channels, i.e. with the eight digital channels of one AES Port 16 audio channels are available.

All X6 units are equipped with two AES Ports labeled A and B. The ports are software adjustable for different connection tasks and can function as an digital split. Both ports can operate parallel. The X6 will automatically take the AES/EBU signals from the port with valid incoming data with the priority of Port A. Port B can be used to pass on the incoming signals as well

Concerning the X6P-16IN both ports are outputs. Only one has to be connected to a DD32(E) or PTP32E for the exchange of digital audio and control data with an Optocore network. The second one can be used as a digital split to pass on the digital signals to other devices with AES/EBU interfaces.

The X6-16OUT gets the AES/EBU signals at Port A or B with priority of Port A. Port B can be set to function as an output in order to pass on the 16 incoming AES/EBU signals to other devices.

Port A of the X6P-8/8 is determined to exchange eight input and eight output channels. Port B can act as a digital split output of the eight analog input channels and the eight incoming AES/EBU signals.

### Word Clock

All units are equipped with a Word Clock IN/OUT and THRU. When used in combination with a DD32(E) or PTP32 the word clock OUT of a network device is connected to the word clock IN/OUT of the X6-series device. The word clock THRU is linked in parallel to the word clock IN/OUT port and simplifies further word clock distribution. In a daisy chain with BNC cables, the word clock is passed on to the following X6, from the word clock THRU to the word clock In/Out of the next X6.

For a stand-alone application, the X6 units are equipped with an internal, high quality and extremely low jitter word clock. One X6 of a combination can act as master in order to pass on the word clock to further X6 units or other devices The word clock is available at the word clock IN/OUT BNC-connector of this device. At the last device a 75-Ohm termination must be applied to avoid cable reflections.

## Power Supply

The power supply units operate with mains voltages of 100 ... 240 V and frequencies of 50 ... 60 Hz. Thus, the device can be used throughout the world without any adjustments or transformers.

The power supply units are 400 V<sub>AC</sub> tolerant and provide an electronic inrush current limitation. The OVP (Over Voltage Protection) LED on the front panel will indicate over voltage at > 300 V, simultaneously suppressing the normal function of the device. When the OVP LED is lit, immediately disconnect the device from the power line to prevent any damage to the device. The power inlet has a fuse, replaceable without opening the device.

**Never bypass the fuse and only use the specified type.**

**Be aware that the switched-mode power supplies operate with high voltages! Coming into contact with them can lead to considerable electric shocks that may result in death! To prevent electric shocks do not remove any covers!**

## Control

All system and device parameters are set on a PC port by use of the OPTOCORE CONTROL. If the X6 units are connected to a DD32(E) or PTP32E by the BI-B cables as shown in Connection Tables the control and audio data are transmitted via the D-Sub-25 interfaces. OPTOCORE CONTROL can control all X6-units in a network. In stand-alone applications, the RS232 or USB port enables the configuration and monitoring of one unit directly attached to the PC.

### X6 with DD32(E) or PTP32E

The control of the microphone preamps, levels etc. is enabled by choosing X6 (X6-16OUT) or X6-1dB (X6P-16IN or X6P-8/8) in the *LOCAL SETTINGS* dialog of the DD32(E) or PTP32 under *PORT SETUP*. Equivalent to the number of AES/EBU ports four X6 units can be connected to one DD32(E) or PTP32E by BI-B cables. The I/O configuration of each port depends on the attached device:

	<i>DEVICE</i>	<i>I/O</i>
<b>X6P-16IN</b>	X6-1dB	16 IN
<b>X6-16Out</b>	X6	16 OUT
<b>X6P-8/8</b>	X6-1dB	8/8 Reverse

If *8/8 REVERSE* is chosen, the physical channels 1-4 (audio channels 1-8) of the D-Sub-25 ports at the DD32 (E) or PTP32E are outputs, the physical channels 5-8 (audio channels 9-16) are inputs. The X6-8/8 AES ports are determined to eight inputs first followed by eight outputs. Accordingly by using the straight-through BI-B cable and choosing *8/8 REVERSE* the inputs and outputs of the DD32(E) or PTP32E and X6P-8/8 are connected correctly.

There is no need to do any configuration of the X6 units. After adjusting the ports of the DD32(E) or PTP32E and connecting the BI-B and word clock BNC cables the X6 can be controlled and monitored with OPTOCORE CONTROL.

### X6 in Stand-Alone Applications

The monitoring and operating facilities are only available if an X6 is directly connected to the PC via RS232 or USB. In order to connect and control more than one X6 with a PC all USB and RS232 interface of the PC or a USB hub can be used. Optocore Control can run multiple times on a PC.

## Connecters and Cables

### AES Ports

According to the RS422/RS485 hardware standard, each channel requires a twisted pair. A common braided shield should enclose the pairs.

Standard computer data cables are sufficient for good quality AES data transmissions over the short distances typically necessary in applications.

The following cable types have been tested:

- Multi-core data cable with common braided shield, Cu-stranded wire 18 X 0.10 mm<sup>2</sup>, nominal gauge 0.14mm<sup>2</sup>, PVC-isolation, outer-diameter 1.05mm, Resistance max. 138mΩ/m, Capacity max. 120pF/m.
- 8-wire, 4-pairs, common braided shield, outer-diameter 6.6mm
- 16-wire, 8-pairs, common braided shield, outer-diameter 8.8mm

### RS232-Connection

Shielded, standard 1-modem cable is sufficient for the RS232 port.

### Connector Hood Quality

Applied locking screws for the D-Sub-types must be acc. to 4-40 UNC. Care should be taken in selecting the right types of connector hoods in order to fulfill the requirements of EMI-radiation directives. Full metal connector hoods should be used, approved acc. to VDE 0871, FCC 20780 and EMC directive 2004/108/EG, providing an reduction > 40 dB on 30 MHz up to 1 GHz. The shielding harness of the cable should have complete contact to the connector hood.

### USB-Connection

For the USB-port use a standard PC/device cable.

### Word Clock-Connection

Word Clock connection: 75 Ω-BNC

### Mains-Connection

Standard power cords with IEC C13 socket can be used.

## Starting Up

### Software Installation

Installation requirement for the software is a functioning computer system with Microsoft® Windows 95/98/2000/NT/XP/Vista® operating system. The computer should be equipped with an USB interface for configuration and remote controlling, and a RS232 interface (or an appropriate USB / RS232 converter) for firmware upgrade. COM 1...4 can be used with a transfer rate of 57 600 Baud. Monitor resolutions of 800 x 600 or 1024 x 768 with 16 Bit color rendering are recommended to view the program. The installation requires approx. 2.5MB of hard-disk space and is carried out in the usual Windows-program manner.

**Please note that the serial interfaces on computers are usually not capable of “Hot Plugging”. Switch off the computer to avoid damage before establishing the serial connection between the Optocore device and the computer.**

The set-up software *OCSETUPXXX.EXE* is available on CD or can be downloaded from [www.optocore.com](http://www.optocore.com). OPTOCORE CONTROL for configuration and remote controlling, and OPTOCORE UPGRADE for firmware upgrading are installed on a PC or Laptop by double-clicking on the *OCSETUPXXX.EXE*. The set-up executable program is self-extracting and provides the OPTOCORE CONTROL SETUP WIZARD. It will establish the necessary directories, a desktop icon for the OPTOCORE CONTROL and firmware upgrade software.

The uninstall procedure of OPTOCORE CONTROL can be carried out with the *ADD OR REMOVE PROGRAMS* tool of Windows, which is usually found under *START / CONTROL PANEL*.

For details about features and handling of OPTOCORE CONTROL, please refer to the *HELP* menu of the software. We strongly recommend getting familiar with the OPTOCORE CONTROL software.

### Setup

Before connecting an X6 unit to any other device, make sure that all devices have a basic set-up in order to be able to operate correctly. For example the principle ports of DD32(E) / PTP32E devices must be set before the X6 units are connected.

If a firmware update is necessary, it is done with the OPTOCORE UPGRADE software under *START / PROGRAM / OPTOCORE / UPGRADE*. Please refer to the *HELP* Menu for further information. For Firmware upgrades, the PC has to be connected via the RS232 Port on the front of the device.

The best approach to check the settings is to connect locally to every single device of the Optocore network with a PC using either RS232 or USB connection, run the OPTOCORE CONTROL software and enter menu *SET / LOCAL SETTINGS*. This dialog enables the definition of the clock source, ports, etc.

- **General -> ID:** No changes are necessary. When using the X6 units with DD32(E) or PTP32E the X6 units are identified automatically by the setting of the principle ports.
- **Clock Setup:** All devices in the network must work with the same sample rate. *CLOCK SOURCE*, allows the selection of Auto (BNC priority), *INT*(internal) or *BNC* (external) word clock signal.
- **Port setup:** Port A of all X6 units is determined to function as I/O of the signals connected to the XLRs on the front. Port B can work as a split port. The different options of Port B are shown in the following table:

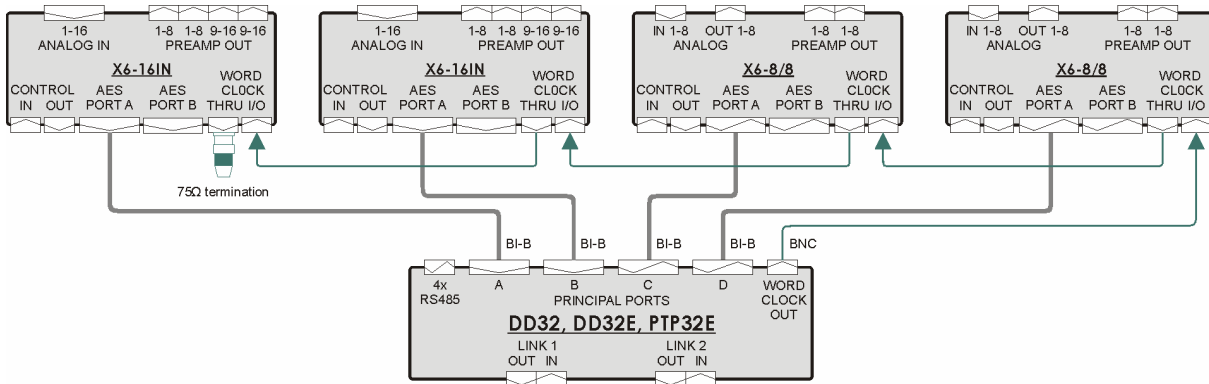
	<i>PORT A</i>		<i>PORT B</i>	
	<b>Setting</b>	<b>Function</b>	<b>Setting</b>	<b>Function</b>
<b>X6P-16IN</b>	16 Out	16 analog IN ↔ 16 AES OUT	16 Out	16 analog IN ↔ 16 AES OUT
<b>X6-16Out</b>	16 In	16 AES IN ↔ 16 analog OUT	16 In	16 AES IN ↔ 16 analog OUT
			16 Out	16 AES IN ↔ 16 AES OUT
<b>X6P-8/8</b>	8/8 Standard	8 analog OUT+ 8 analog IN ↔ 8 AES IN + 8 AES OUT	8/8 Standard	8 analog OUT+ 8 analog IN ↔ 8 AES IN + 8 AES OUT
			16 Out	8 analog IN+ 8 AES IN ↔ 16 AES OUT

Click on *WRITE* first, confirm with *OK*, and then click *CLOSE* to exit the dialog.

**Never switch on power amplifiers before the complete system is stable and the OPTOCORE CONTROL level meters indicates a normal level.**

## Hardware Connection

The X6 units are connected to a DD32(E) or PTP32 by BI-B cables as shown in Connection Tables. The word clock is transmitted by the word clock I/Os and standard 75 Ω cables. The following figure exemplifies the configuration of a 48 send and 16 return system with two Optocore X6-16IN, two X6-8/8 and one DD32(E) or PTP32E.

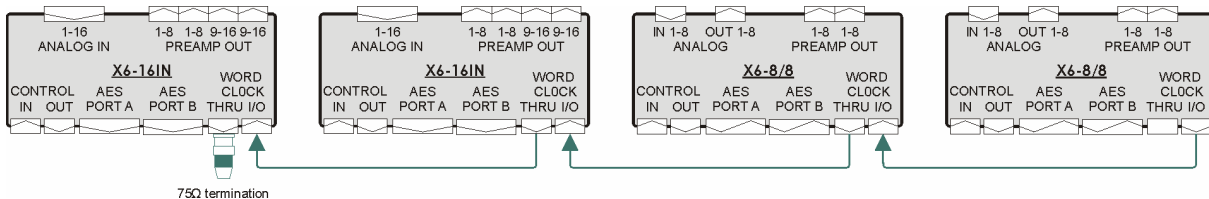


**Fig. 1: Connection of four X6 units and one DD32(E) or PTP32E**

In this example Port A and B of the DD32(E) / PTP32E are inputs, receiving their signals from two X6P-16IN. Port B and C are connected to two X6P-8/8. Each X6P-8/8 transmits four AES/EBU (8 audio channels) outputs and four AES/EBUAES3 inputs. The definition of the ports as inputs and/or outputs and the routing is done with OPTOCORE CONTROL. The control data is transmitted via the AES ports and the BI-B cables as well, the control of the preamps by software or from the console is possible without any further wiring. For word clock distribution the Word Clock OUT of the DD32(E) / PTP32E is connected to the Word Clock IN/OUT of one X6. In a daisy chain with BNC cables, the word clock is passed on to the other X6, from the Word Clock THRU to the Word Clock IN/OUT of the next X6. The BI-B cables (audio and control data transmission) and the BNC cables (word clock) are connected as shown in Fig. 1. At the last device a 75-Ohm termination must be applied to avoid cable reflections.


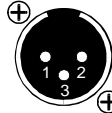
## Word Clock Distribution in Stand-Alone Applications

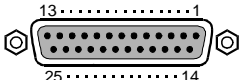
In a stand-alone application one X6 of a combination can act as word clock master by setting the *CLOCK SOURCE* to *INT* and selecting the right sample rate via OPTOCORE CONTROL software menu *SET / LOCAL SETTINGS*. The internally generated word clock is then available at the word clock IN/OUT and THRU BNC-connector of this device and is passed on to the other X6 by BNC cables as shown in Fig. 2. The *CLOCK SOURCE* in OPTOCORE CONTROL software menu *SET / LOCAL SETTINGS* of these devices has to be set to *AUTO* or *BNC*. At the last device a 75-Ohm termination must be applied to avoid cable reflections.

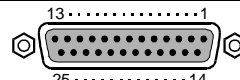


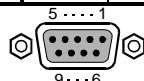
**Fig. 2: Word clock distribution in stand alone applications**

## Connection Tables

Pin-out	Balanced Mic/Line Inputs, Line Outputs			
	Channel		GND	
	Pin	+	2	1
		-	3	
XLR female XLR male	 			

Pin-out	Balanced Post Pre-amp Analog Outputs											
	Channel	1	2	3	4	5	6	7	8	NC	GND	
	Pin	+	24	10	21	7	18	4	15	1	13	2, 5, 8, 11, 16, 19, 22, 25
		-	12	23	9	20	6	17	3	14		
D-Sub-25- female	 Locking system acc. to 4-40 UNC											

Pin-out	AES Ports A + B												
	Channel	RS422 In or Output								Control		GND	
		1	2	3	4	5	6	7	8	9	10		
	AES-Data	1+2	3+4	5+6	7+8	9+10	11+12	13+14	15+16				
	Pin	+	1	2	3	4	5	6	7	8	11	24	10, 12, 13, 23, 25
		-	14	15	16	17	18	19	20	21	9	22	
D-Sub-25- female	 Locking system acc. to 4-40 UNC												

Pin-out	RS232-Port						
	Channel	RS232		Internally bridged	Power		Use 1-modem cable, male – female, to connect to PC
		RXD	TXD		+5VS	GND	
	Pin	3	2	1, 4, 6	7, 8	9	
D-Sub-9- female	 Locking system acc. to 4-40 UNC						

Pin-out	USB-Port				
	Channel	USB			GND
		VBUS	D -	D +	
	Pin	1	2	3	4
USB device-connector					

# OPTOCORE

## BI-B Cable

In order to connect a principal port of a DD32 to an AES port of an X6-series converter device, a BI-B cable with D-Sub-25 connectors is used.

### DD32(E) Principal Port

X1...X8: 16 channels

X9, X10: Control channels

D-Sub-25-male

Fastening system: 4-40 UNC

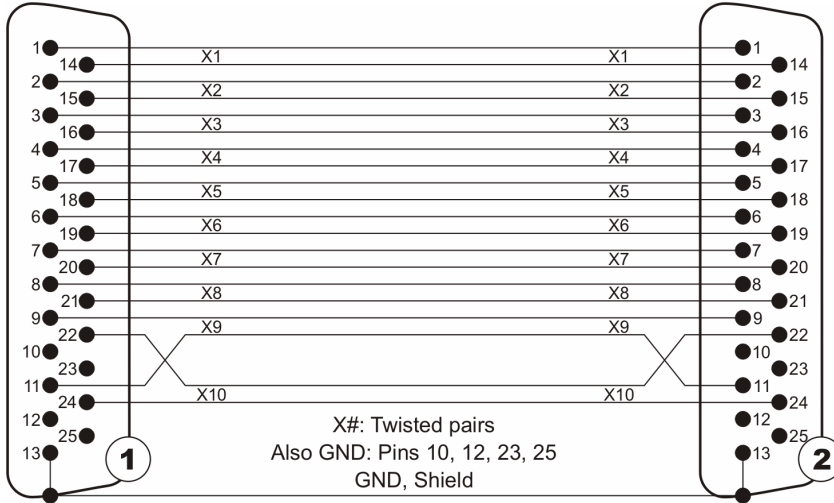
### X6-series AES Port

X1...X8: 16 channels

X9, X10: Control channels

D-Sub-25-male

Fastening system: 4-40 UNC



## Technical Specifications

Analog Audio Inputs		Analog → ADC	
<b>Mic / line inputs</b>	X6-16IN		16
	X6-8/8		8
<b>Gain / steps</b>			0 dB – +66 dB 1 dB steps
<b>Maximum input level</b>	@ 0 dB Gain	18 dBu	@ 66 dB Gain -48 dBu
<b>Frequency response (≤ -1 dB-drop)</b>	@ 48 kHz	15 Hz – 21 kHz	@ 96 kHz 15 Hz – 42 kHz
<b>Input impedance</b>			5 kΩ
<b>Phantom power</b>		selectable per channel	48 V
<b>Distortion THD+N</b>	@ 0 dB Gain	≤ 0,002% ≙ -94 dB	@ 50 dB Gain ≤ 0,025% ≙ -72 dB
<b>Equivalent Input Noise</b>			@ 50 dB Gain -127 dBu
<b>Dynamics</b>	@ 0 dB Gain	≥ 113 dB	@ 50 dB Gain 145 dB
<b>CMR</b>	@ 1 kHz	≥ 60 dB	@ 16 kHz ≥ 54 dB
<b>Crosstalk</b>	@ 1 kHz	≤ -112 dB	@ 16 kHz ≤ -92 dB
<b>Converter</b>			24-bit @ 48 kHz 24-bit @ 96 kHz
<b>Delay</b>	ADC-channels	= 39 / F <sub>s</sub>	@ 48 kHz: 0.82 ms @ 96 kHz: 0.41 ms

Analog Audio Outputs		DAC → Analog	
<b>Line outputs</b>	X6-16Out		16
	X6-8/8		8
<b>Gain / steps</b>			0 dB, -10 dB 2 steps
<b>Maximum output level</b>	@ 0 dB Gain	18 dBu	@ -10 dB Gain 8 dBu
<b>Frequency response (≤ -1 dB-drop)</b>	@ 48 kHz	DC – 21 kHz	@ 96 kHz DC – 42 kHz
<b>Distortion THD+N</b>			@ 0 dB Gain ≤ 0,002% ≙ -94 dB
<b>Dynamics</b>	@ 0 dB	≥ 114 dB	@ -10 dB Gain ≥ 113dB
<b>Converter</b>			24-bit @ 48 kHz 24-bit @ 96 kHz
<b>Delay</b>	DAC-channels	= 28 / F <sub>s</sub>	@ 48 kHz: 0.59 ms @ 96 kHz: 0.29 ms

Post Preamp Analog Outputs			
<b>Balanced outputs</b>	X6-16IN		2 x 16
	X6-8/8		2 x 8
<b>Maximum output level</b>			8 dBu
<b>Source Impedance</b>			20 Ω
<b>Frequency response (≤ -1 dB-drop)</b>			10 Hz...≤100 kHz
<b>Distortion THD+N</b>	@ 0 dB Gain	≤ 0,002% ≙ -94 dB	@ 50 dB Gain ≤ 0,025% ≙ -72 dB
<b>Dynamics</b>	@ 0 dB Gain	≥ 120 dB	@ 50 dB Gain 145dB

AES Ports		Convention EIA / TIA-422	
<b>Channels</b>	AES/EBU		2 x 8
	Number of audio channels		2 X 16
<b>Data rate</b>	Depending on used sample rate		Up to 30 Mbps
<b>Impedance</b>	Termination		330 Ω
	Source		≤ 10 Ω
<b>Drive level</b>	Output		≥ 2 V <sub>pp</sub>
<b>Zero level</b>	Referring to GND		+ 2.5 V
<b>Sense level</b>	Input		≥ 400 mV <sub>pp</sub>
<b>Max. voltage at bus terminals</b>	Referring to GND, including common mode voltage		- 7 V ... + 12 V

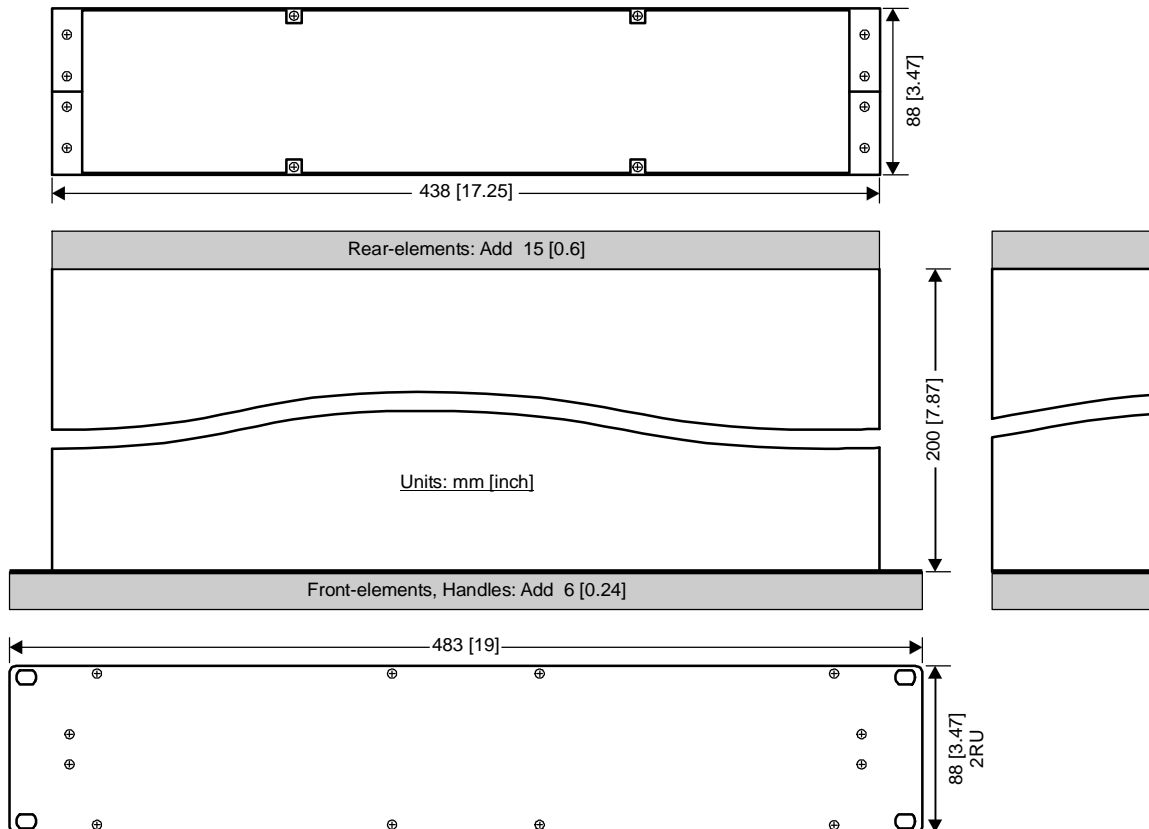
Word clock		Hardware standard 75 Ω / BNC	
<b>Data rate</b>	Depending on used sample rate		Up to 96 kHz
<b>Impedance</b>	Output / Thru		75 Ω
	Input		1k / 75 Ω software switchable, AC coupled
<b>Drive level</b>	Output		≥ 2 V <sub>pp</sub>
<b>Zero level</b>	Referring to GND		+ 2.5 V
<b>Sense level</b>	Input		≥ 400 mV <sub>pp</sub> AC-coupled

Remote Control			
<b>RS232</b>	Convention EIA / TIA-232		R x D, T x D / 57 600 Baud
<b>USB Port</b>			Interface to PC

# OPTOCORE

Power supply	
Type	Switch-mode, universal input
Mains voltage	100 ... 240 V, 400 V <sub>AC</sub> tolerant
Frequency	50 ... 60 Hz
Power consumption	25VA-idle, 30VA-peak
Fuse	D1.0 A, slow behavior, glass 5 mm x 20 mm, acc. to UL 48-14
Inrush current limit	≤ 7 A
Protection circuit	400 V <sub>AC</sub> tolerance, over-voltage, over-current and over-temperature monitor
Security classification	Class 1: basic insulation, connected to the protective grounding conductor
Security regulations	Harmonized European standard EN60065
Mains connector	Including EMI-filter, a fuse and spare-fuse, acc. to IEC-950
Cooling	Via surface and ventilation-slits on both sides

## Dimensions and Weight



## Weight

3,85 kg ≅ 8.49 lbs

**Modifications that serve the purpose of technical improvement of the device may be carried out without prior notification.**

## Warranty and Liability

### Summary of Warranty

Optocore X6 converter units are warranted against defects in material and workmanship for 24 months.

This warranty covers the original purchaser only and is not transferable. Valid evidence for warranty is the official Optocore invoice issued by the distributor / dealer.

Optocore will, at its discretion, repair or replace a defective product, providing that the defect has appeared under normal operating conditions.

This warranty does not cover damage from acts of God, accident, abuse, neglect, contamination, unauthorized modification or misuse, operation outside of the environmental specifications for the product, improper site preparation or maintenance, or abnormal conditions of handling. This would include over-voltage failures, and conditions outside of the products specified ratings, problems with buyer-supplied software or interfacing, or normal wear and tear of mechanical components. Optocore or its distributor / dealer will acknowledge the evaluation of warranty after inspection.

Devices on which the Serial Number has been removed or defaced are not eligible for warranty service.

Failure to properly package and protection of the product during shipping may void this warranty.

### How to Obtain Warranty Service

To return a defective product, please contact your distributor / dealer. Our web site: <http://www.optocore.com/> provides a complete list of Optocore distributors / dealers.

Always ensure the careful handling of the device. If possible, transport or shipping should always occur in special, shock-absorbing transport cases. If these are not available, we recommend well-upholstered packaging such as the coated carton in which the device was delivered.

We strongly advise not to use simple flight-cases without rack-in-rack mounting.

### Declaration of Liability

Optocore accepts no liability for damage caused to other devices through operation of the X6 device.

Optocore is not liable for any damage caused by shipping accidents, misuse, abuse, operation with incorrect AC voltage, operation with faulty peripheral equipment, or improper or careless installation of the device.

Optocore accepts no claims for compensation whatsoever (e.g. cancellation of events).

## Shipping Contents

The standard shipment of an X6 unit contains the following:

- 1 X6 unit
- 1 D1.0A (1.0A, slow behavior) replacement fuses per device  
inserted next to the operational fuses in the power supply inlets.
- 1 operating manual
- 1 BI-B Cable
- 1 BNC word clock cable (75Ohms, 0.5 meters)

Any additionally purchased equipment such as optical wave-guide cables in required lengths, D-Sub cables and adapters, RS232 cables, and international electric cables have been supplied on your request and your purchase order and cannot be listed in the above.

## **Company Information**

### **Mailing Address:**

OPTOCORE GmbH  
Lohenstr. 8  
D-82166 Munich-Gräfelfing  
Germany

### **Telephone:**

+49 – (0)89 – 8999640

### **Facsimile:**

+49 – (0)89 – 89996455

### **Internet:**

[www.optocore.com](http://www.optocore.com)

### **Email:**

[inquiry@optocore.com](mailto:inquiry@optocore.com)