



Operating Manual for OPTOCORE X6R/V3R-FX Network Converter Devices

A/D and D/A Converter for Optocore and SANE

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OPTOCORE GmbH
Alte Allee 28
81245 Munich
Germany

X6R/V3R-FX– A/D D/A Converter for Optocore and SANE

Operating Manual
Rev. 2.5

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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 humid or damp rooms.
- Clean only with a dry cloth.
- Do not block or cover any ventilation slits. Install the device in accordance with the operating manual.
- Do not install or place the device near any heat source such as radiators, power-amplifiers, or any other heat producing equipment.
- Protect the power cord from being stepped 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 pulling the plug. These must be freely accessible at all times. The device should 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 internal components of the switched-mode power supplies operate at very high voltages. Coming into contact with them can lead to considerable electric shock, which may result in death.
- Only use attachments specified by the manufacturer.
- This device contains no user serviceable parts: only refer to authorised, 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 already done so. Study the operating manual carefully in order to familiarise yourself with the device and its operation. It contains vast amounts of information and tips for the proper use of the device.

It cannot be guaranteed that this operating manual will not contain typographical mistakes or misprints. The operating manual is regularly revised and updated.

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

- **Transport and Shipping**

Always ensure careful handling of the device. The device should be transported and shipped in shock-absorbing transport cases. If these are not available, we recommend well-padded packaging such as the coated carton in which the device was delivered.

We strongly advise against the use of light weight flight-cases without shock-absorbing rack-in-rack mounting.

- **Environments**

This device can be used in E1, E2, E3, E4, or E5 environments (as listed below) according to the harmonised 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 use in moderate climates.

- **Ventilation**

Do not block or cover any ventilation openings. Install the device in accordance with the operating manual. Allow for sufficient space around the units (at least 200 mm \equiv 7,87" free space behind the rear-panel of the device) and make sure to allow for air circulation near the ventilation openings on both sides of the device. Keep the rear of the rack open during operation. Do not operate the device close to heat emitting equipment, such as power-amplifiers. Leave sufficient space (minimum ½ RU) between the device and any heat emitting devices housed in the same rack.

An X6R/V3R converter may be placed on top or beneath other Optocore products, except a DD32E, without additional space.

Please note:

Do not populate more than 4 adjacent rack spaces with Optocore devices.

Maintain 1RU of empty space between each 4 RU of Optocore devices.

Keep the equipment rack open during operation.

Ensure air circulation around the devices.

Maintain at least 200mm (~8") clearance behind the rear panel of the devices.

- **Water and Moisture etc.**

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

- **Cleaning**

Only use a dry linen cloth to clean the device. If the unit is very dirty, moisten a 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: $-20^{\circ}\text{C} \dots 50^{\circ}\text{C} \equiv -4^{\circ}\text{F} \dots 122^{\circ}\text{F}$; ensure proper ventilation

Storage temperature: $-20^{\circ}\text{C} \dots 60^{\circ}\text{C} \equiv -4^{\circ}\text{F} \dots 140^{\circ}\text{F}$

- **Power Supply**

The device can be disconnected from the power supply by unplugging the power cord. The power cords must be freely accessible at all times. The device should be disconnected during lightning storms or when the device is unused for a long period of time.

Important:

The switched-mode power supplies operate at very high voltages.

Coming into contact with the power supplies can lead to considerable electric shock, 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.

Important:

A damaged power cable must be replaced immediately.

The device must be grounded. Disconnecting the ground is strictly prohibited. Ensure that the device is always grounded using the power connector.

Do not cover the ground connection of the power connector with any kind of insulation material!

- **Fuse**

There is no fuse in the device. The power supplies contain circuitry that protects the device from overload.

- **Lightning**

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

- **Eye Safety**

This product is a Laser Class 1 product. It complies with IEC 60825-1, FDA 21 CFR 1040.10, and 1040.11.

- **External objects and/or liquids**

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

- **Cables and Accessories**

Only use attachments that are specified by the manufacturer of the device.

Use high quality, properly terminated, cables to connect the device. The device should only be used with optical fibre cables that are specified for use with the devices optical transceivers and within the specified power budget of the optical transceivers. When not in use, ensure that the optical connectors on the device and the optical fibre cables are covered with the provided caps.

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 manufacturer's instructions, and should use mounting accessories recommended by the manufacturer of the device.

- **Servicing**

Do not attempt to service this device yourself.

The device contains no user serviceable parts, components or controls. The operation of an opened device is not permitted. Such operation can lead to damage of the device's components due to lack of air flow through the device.

The device may not be serviced, altered or modified without authorisation from Optocore or an Optocore authorised distributor / dealer. Only qualified service personnel may carry out repair and maintenance work on the device. The warranty of the device will be voided if any unauthorized maintenance or repair work has been carried out.

CE/FCC-Conformity

This document confirms that the X6R/V3R-FX 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 and the Restriction of Hazardous Substances Recast Directive 2011/65/EU (RoHS 2). 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

EN 60065, Safety requirements

FCC notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: 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 the instruction manual, may cause harmful interference to radio communication. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by Optocore GmbH could void the user's authority to operate this equipment.

Industry Canada Compliance Statement

This Class[A] digital device complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la class[A] est conforme à la norme NMB-003 du Canada

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

OPTOCORE GmbH, Alte Allee 28, 81245 Munich, Germany

represented by Marc Brunke, Managing Director

N.B. The awarding of the CE label confirms the compliance with legal directives issued for the manufacturer 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 conforms with the electromagnetic compatibility standards laid down in the above named testing regulations.

Munich, 11.12.2013



Marc Brunke

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X6R/V3R-FX - A/D and D/A Converter for Optocore and SANE

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Device Description

Congratulations on your purchase of an X6R/V3R-FX A/D and D/A network converter Device for Optocore and SANE. The X6R/V3R-FX series manual will quickly demonstrate the advantages of the device and help to ease your day-to-day workload in a professional audio-visual environment.

14 in 1 - the X6R/V3R-FX is a network converter unit for Optocore and SANE with the highest degree of flexibility with regards to the I/O configuration. Six different card types enable the complete customisation of the I/O cards, whether for the conversion of analogue signals - 16 inputs, 16 outputs, 8 inputs and 8 outputs, dual microphone inputs with dual independent adjustable gains, or for the integration of AES/EBU channels in the Optocore network - 8 AES/EBU ports switchable to IN or OUT in groups of four; with or without Sample Rate Converter (SRC). Finally X6R-FX unit enables a unique mixture of analogue and AES/EBU I/O in a single 1RU chassis. The X6R/V3R-FX is designed for sample rates up to 192 kHz. Eleven different versions of **X6R** and tree **V3R** are available:

X6R-FX-16MI	⇒ 16 microphone inputs - two 8-channel mic/line input boards
V3R-FX-8MI	⇒ 8 microphone inputs - single 8-channel mic/line input board
X6R-FX-16LI	⇒ 16 line inputs - two 8-channel line input boards
V3R-FX-8LI	⇒ 8 line inputs - single 8-channel line input board
X6R-FX-16LO	⇒ 16 line outputs - two 8-channel line output boards
V3R-FX-8LO	⇒ 8 line outputs - single 8-channel line output board
X6R-FX-8MI/8LO	⇒ 8 microphone inputs and 8 line outputs - single 8-channel mic/line input board and single 8-channel line output board
X6R-FX-8LI/8LO	⇒ 8 line inputs and 8 line outputs - single 8-channel line input board and single 8-channel line output board
X6R-FX-8DualMic	⇒ 8 microphone inputs with two independent preamps each- single 8-channel dual-mic/line input board
X6R-FX-16AE-SRC	⇒ 8 AES/EBU ports (16 audio channels) with sample rate converters - single balanced 8-port AES/EBU SRC board
X6R-FX-16AE	⇒ 8 AES/EBU ports (16 audio channels) - single balanced 8-port AES/EBU board
X6R-FX-8AE/8MI	⇒ 8 AES/EBU ports (16 audio channels) and 8 microphone inputs - single balanced 8-port AES/EBU board and single 8-channel mic/line input board
X6R-FX-8AE/8LI	⇒ 8 AES/EBU ports (16 audio channels) and 8 line inputs - single balanced 8-port AES/EBU board and single 8-channel line input board
X6R-FX-8AE/8LO	⇒ 8 AES/EBU ports (16 audio channels) and 8 line outputs - single balanced 8-port AES/EBU board and single 8-channel line output board

What do the product names refer to?

V3 refers to the channel capacity of the device. Where V is the Roman 5: 5+3=8.

X6 refers to the channel capacity of the device. Where X is the Roman 10: 10+6=16.

R refers to the Optocore Revolution series hardware platform.

The low latency, synchronous, Optocore network provides the capacity to transport and route up to 1024 audio inputs into the X6R/V3R-FX device. The device is equipped with two Optocore fibre connections. The connections are established using the two LC multimode, or single mode, 1Gbit or 2 GBit optical transceivers. The dual redundant ring topology uses the advantages of fibre optical transmission in temporary and permanent applications, especially where long distance transport and high-quality audio are required.

Additionally, the Optocore FX module includes two 64 channel SANE/MADI synchronous audio ports on Cat5 connectors with Ethernet, 4 RS485/422 ports, 100Mbit Ethernet switch and a Word Clock input and output.

The X6R/V3R-FX and X6R/V3R-TP can be used together in a SANE CAT5 Network. Combinations of SANE and OPTOCORE® OPTICAL DIGITAL NETWORK SYSTEM can be done by X6R/V3R-FX and other Revolution FX devices to exchange audio channels and Ethernet. All parameters on the converters can be configured, controlled and monitored with the same software application as all other Optocore devices, OPTOCORE CONTROL software. They allow for the distribution of various I/O channels at different locations throughout your digital Optocore and/or SANE network.

The X6R/V3R-FX is especially designed for rack mounted applications and permanent installation. All cards are equipped with Euroblock / Phoenix connectors. These common installation interfaces provide a simple and cost-efficient connection with other audio equipment.

The X6R-FX with the dual microphone input card removes the problem where only one of the FOH or Monitor engineers can have full gain control of a single microphone input channel. Every microphone input incorporates two independent microphone preamps meaning both can be adjusted individually. Therefore, analogue split boxes with two stage racks to give FOH and monitor engineers the freedom to adjust their mic preamps directly at their own console can be a thing of the past.

The X6R-FX with sample rate converters enables the connection of audio devices operating at different sample rates.

The X6R-FX with combination of an AES/EBU and analogue card allows using 8 AES/EBU pairs switchable to inputs or outputs in groups of four, or using 4 AES/EBU pairs and 8 analogue channels. The entire configuration can be done in the Optocore Control software.

The X6R/V3R-FX with analogue mic input, line input and line output cards allow customised I/O configuration per device. Two/one card slots can be equipped with different cards, so six combinations with 16 inputs, 16 outputs or 8 inputs and 8 outputs can be assembled for the X6R according to the customer's requirements.

The microphone inputs include a high quality microphone preamp, phantom power and selectable gains in 1 dB steps from -4 dB to +66 dB at a maximum input level of 22 dBu. The line inputs are equipped with selectable maximum channel levels of 27 dBu, 22 dBu, 18 dBu, 8 dBu and the line output with a selectable maximum channel level of 22 dBu, 18 dBu, 12 dBu, 8 dBu. The high quality preamps, A/D- and D/A converters make the X6R units ideal for the incorporation into audio systems even if no OPTOCORE network is present. They provide a wide dynamic range with negligible distortion and extremely low noise.

Word Clock input and output connectors allow the Optocore network to be synchronized from an external source as well as for Word Clock be distributed around a facility using the Optocore network. All Optocore and SANE devices are capable of being system masters using their internal clock.

The X6R/V3R-FX units can be operated and controlled via the OPTOCORE network with OPTOCORE CONTROL software without the need for any external data cable. For control in stand-alone applications, LAN, USB or RS232 ports on the front / rear panels can be used.

All Optocore devices are designed and built using the latest programmable microprocessors and FPGA (field programmable gate array) logic circuitry. This allows the devices internal logic to be updated, in the field, ensuring a continual state-of-the-art device.

Optocore devices, and complete networks, are configured and operated using the OPTOCORE CONTROL software. The software provides access to all configuration parameters and controls needed to operate the system, including: naming channels, setting gains and phantom power, routing as well as recall and capture of partial or full system configurations. The software can be operated offline as well as online with level meters for all channels on the network.

The LEDs on the front panel of the X6R/V3R-FX units allow an instant overview on the status of each channel, indicating if audio is present on a channel, if a peak level is reached and the activation of the phantom power per channel.

Card Types

Six types of cards with Euroblock / Phoenix connectors can be incorporated into the card slots

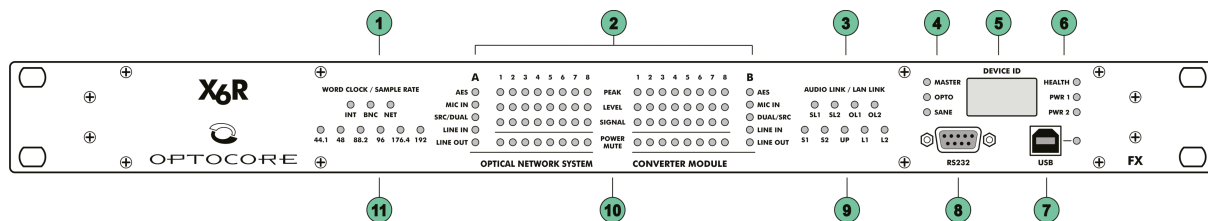
- 8 microphone/line inputs
- 8 line inputs
- 8 line outputs
- 8 microphone/line inputs with two independent preamps per input

- 8 AES/EBU ports with sample rate converters switchable to inputs or outputs in groups of four
- 8 AES/EBU ports switchable to inputs or outputs in groups of four

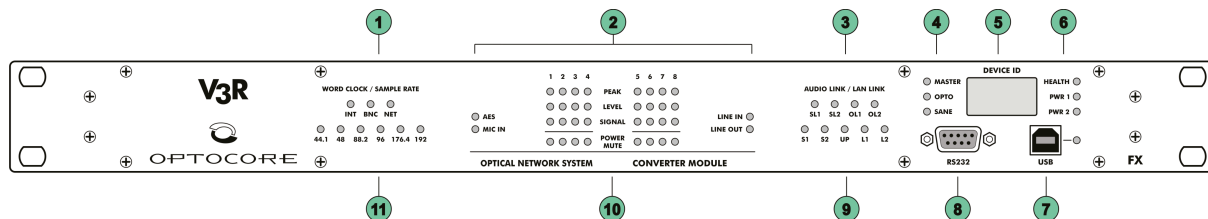
The X6R/V3R-FX is shipped preconfigured with I/O cards according to the order placed with Optocore. The cards are not field-exchangeable.

Front Panel

X6R-FX



V3R-FX



- 1 Word Clock LED:** Indicates the selected word clock source:
 INT: Internal word clock – The device is a system master
 BNC: External word clock via the BNC WC Input
 NET: Word clock received from the network
- 2 Card and Signal Monitor for the 2 x 8 Channels (1 x 8 for V3R)**

A and B Card in slot A and B:

AES: 8 AES/EBU ports (16 audio channels) card
 (only X6R) I/O switchable in groups of four

MIC IN: 8 channel microphone/line input card

SRC/DUAL: 8 AES/EBU ports (16 audio channels) card (LED is ON only together with AES LED) / 16 channel microphone input card with 8 microphone inputs and two independent preamps each (LED is ON only together with MIC LED)
 (only X6R)

LINE IN: 8 channel line input card

LINE OUT: 8 channel line output card

PEAK: Red: Overflow, input level exceeds max. input level of 0dBFS
LEVEL: Yellow: Warning level, input level exceeds -10dBFS
SIGNAL: Green: Signal present \geq -60dBFS, brightness controlled
- 3 AUDIO LINK:**

SL1: Communication is established via SANE 1 (rear panel)
SL2: Communication is established via SANE 2 (rear panel)
OL1: Communication is established via Optocore LINK 1 (rear panel)
OL2: Communication is established via Optocore LINK 2 (rear panel)
- 4 Master LED:** Indicates the Word Clock Master unit

OPTO LED: Optocore communication is established

SANE LED: SANE communication is established

- 5

Device ID Display: Indicates the unique identification number of the device
- 6

HEALTH LED: Green: Power supply to the device works, temperature is below the limit
PWR 1 LED: Power supply 1 is working correctly
PWR 2 LED: Power supply 2 is working correctly
- 7

USB plug and LED: USB connection for remote control and update via PC
Green: Indicates data activity
- 8

RS232 plug: D-Sub-9 RS232 connection for remote control and update via PC
- 9

LAN LINK:

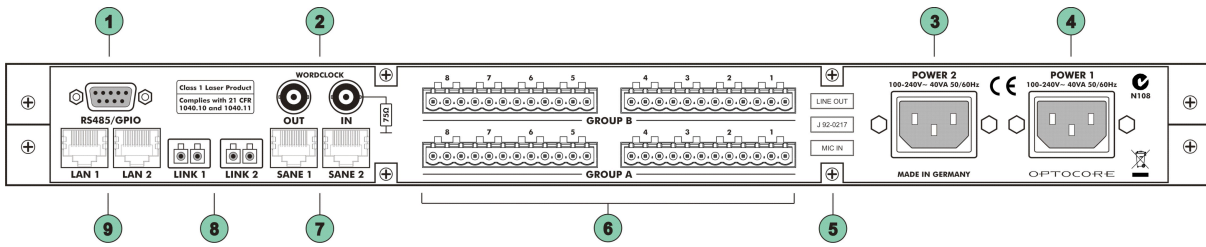
S1: Ethernet communication is established via SANE 1 (rear panel)
S2: Ethernet communication is established via SANE 2 (rear panel)
UP: There is other device with physical Ethernet port enabled on the network
L1: Ethernet communication is established via LAN 1 (rear panel)
L2: Ethernet communication is established via LAN 2 (rear panel)
- 10

POWER / MUTE Mic Card Phantom Power / Output Card Mute
- 11

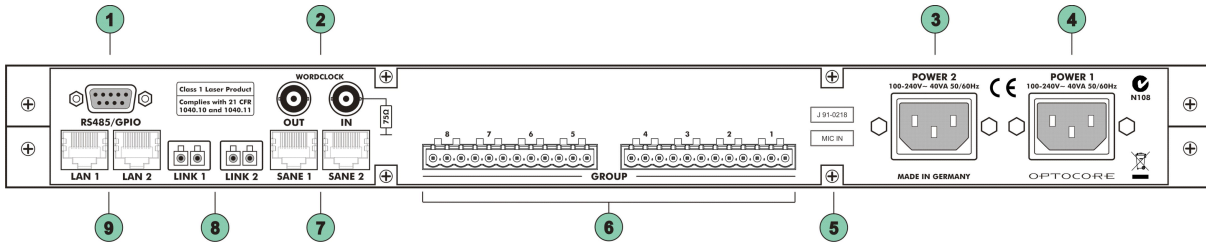
Sample rate LED: Yellow: 44.1 / 48 / 88.2 / 96 / 176.4 / 192 kHz

Rear Panel

X6R-FX with Analogue Input- and Output Cards



V3R-FX or X6R-FX with Dual Microphone



- 1 **RS485:** 4 x RS485/RS422 (D-Sub-9) auxiliary port for data transmission
- 2 **Word Clock IN:** BNC Word clock input allowing synchronization of Optocore devices/network from an external word clock source
Word Clock OUT: BNC Word clock output for synchronization of external devices
- 3 **POWER 2:** Mains input for power supply 2 (100 ... 240 V)
- 4 **POWER 1:** Mains input for power supply 1 (100 ... 240 V)
- 5 **Labels:** I/O card type in the slot(s) and serial number
- 6 **GROUP:** Cards with Euroblock / Phoenix connectors (8 channels) in slot GROUP A and GROUP B at a X6R or in slot GROUP at a V3R
- 7 **SANE 1:** SANE RJ-45 interface for data transmission + 100 Mbit Ethernet
SANE 2: SANE RJ-45 interface for data transmission + 100 Mbit Ethernet
- 8 **LINK 1:** Full-duplex, full bandwidth LC-type optical interface for Optocore transmission (SFP multimode transceiver included, singlemode transiver option available on demand)
LINK 2: Full-duplex, full bandwidth LC-type optical interface for Optocore transmission (SFP multimode transceiver included, singlemode transiver option available on demand)
- 9 **LAN 1:** 100 Mbit RJ-45 Ethernet interface
LAN 2: 100 Mbit RJ-45 Ethernet interface

Device Details

Optocore Fibre Optic Connection

The device is equipped with the Optocore FX communication module. The OPTOCORE® OPTICAL DIGITAL NETWORK SYSTEM utilizes Time Division Multiplex technology (TDM) with a Fibre Channel based 8B10B-NRZI-coding. Static time slots guarantee a synchronous transmission of all channels, at all times, without the use of dynamic bandwidth or latency. All signals connected to the intercom, audio, video, word clock and auxiliary ports of the device are transmitted simultaneously on one fibre while the second fibre of the LINK-Interface receives data from the network. The second LINK-Interface pair is identical to the first one, and can optionally be used for network redundancy.

A/D and D/A Converter

24-bit converters supporting sample rates of 44.1, 48, 88.2, 96, 176.4, 192 kHz ensure the high-quality conversion of analogue audio signals. Sample rates above 96 kHz are available upon request.

Analog Inputs

The microphone inputs include preamps with selectable gain between -4 dB to 66 dB in analogue 1 dB steps. Phantom Power (+48V) can be activated individually on each input. The maximum input level is +22 dBu. It is possible to use microphone inputs for line level sources.

The line inputs gain controls can be individually adjusted in four steps of maximum input level 27 dBu, 22 dBu, 18 dBu and 8 dBu.

Analog Outputs

The outputs gain controls can be individually adjusted in four steps of maximum output level 22 dBu, 18 dBu, 12 dBu and 8 dBu.

SANE Ports

The device is equipped with two RJ45 200MBit SANE Ports, capable of transmitting 64 channels of synchronous audio and 100MBit Ethernet. SANE 2 port is compatible with MADI over Cat protocol.

RS485

The auxiliary ports provide four RS485 ports to establish a maximum of four half-duplex or two full-duplex connections between devices. A wide range of bi-directional and unidirectional standards can be connected to the ports, such as RS485, CAN-Bus (bi-directional, requires special firmware version), or RS422, DMX and MIDI (unidirectional). The ports automatically sense whether they are sending or receiving control data.

The ports and their destinations are configured in the OPTOCORE CONTROL software..

Word Clock

Devices with Optocore/SANE modules are equipped with an internal, high quality, low jitter clock generator as well as Word Clock inputs and outputs. Any device on the network can act as the master of the network and pass Word Clock to networked Optocore/SANE devices.

The internal/networked Word Clock is available at the Word Clock output connector of each device on the network to synchronize non-networked devices.

In standalone network configurations external synchronization is not required.

The Word Clock input termination can be switched on using the OPTOCORE CONTROL software's Local Settings. External termination is not required to avoid cable reflections.

Word Clock master negotiation after any Word Clock source failure is done automatically.

Transmission Delay

The Optocore system delay including the matrix is fixed to 41,6 μ s @ 48 kHz for all channels. The additional transport delay per Optocore unit (<200 ns) in the network is insignificant in comparison. Overall system delay is dependent on the converters used and the length of network cables in the system. Assuming 'normal' cable lengths of <700 m per link, the additional delay is considered marginal.

The transmission delay is constant between any points in the network.

Power Supply

The device is optionally equipped with two power inputs and power supply units. If one power supply fails, due to malfunction of the feeding power line or the power supply unit itself, the device will automatically switch over to the other power supply unit. In order to make the power supply redundant, both power inputs must be connected to the mains supply, if possible to different phases, power supply systems, or even better, one of them to an uninterrupted power supply (UPS).

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

Important:

The switched-mode power supplies operate at very high voltages.

Coming into contact with the power supplies can lead to considerable electric shock, which may result in death.

To prevent electric shock, do not remove any covers of the device.

Control

All system and device parameters are configured using the OPTOCORE CONTROL software.

The system can be configured and controlled centrally, over the Optocore network, with the exception of the initial configuration of the unique identifier (ID) of the device.

The OPTOCORE CONTROL software is capable of running multiple instances on the same PC or by using the OPTOCORE CONTROL software's Client/Server mode.

Please note:

Please refer to the Optocore Quick Start Guide for the basic system configuration and setup.

For more detailed setup please refer to the Optocore Software Manual

X6R/V3R-FX in Network Applications

The monitoring and operational facilities are only available if an X6R/V3R-FX or -TP is connected directly to a PC via LAN, USB or RS232. In order to connect and control more than one X6R/V3R-FX with a PC the Control is transmitted through the network. Optocore Control can run multiple times on one PC or use Server Client Mode.

Third Party Control

Third party protocols for device controlling can be used. It is possible to control Optocore preamps directly from Yamaha, Studer/Soundcraft, SSL, Lawo and Digico consoles with Special Emulation Mode configured. A Multiple Emulation Mode feature enables to control preamps in Optocore network from four different consoles.

Optocore bandwidth allocation

The standard bandwidth allocation of an Optocore network is as follows:

Audio	256 Channels @ 48 kHz – 1 Gbit network 768 Channels @ 48 kHz – 2 Gbit network
RS485 Data	32 Channels
Video	3 CVBS Video Channels *
Ethernet	100 MBit Fast Ethernet *

* If the network is used for transport of Ethernet compatible data the capacity is reduced to one CVBS video channel plus 100 Mbps Fast Ethernet.

Please note:

Optocore R-Series devices equipped with 2Gbit fibre transceivers are required for 2Gbit network operation.

SANE bandwidth allocation

The standard bandwidth allocation of a SANE link is as follows:

Audio	64 Channels @ 48 KHz
Ethernet	100 MBit Fast Ethernet

Connectors and Cables

Optical Connection

Multimode transceivers connected using a 50 µm OM3 fibre cable can be used for applications requiring cable lengths of up to 700 m (worst case).

Single mode transceivers connected using a 9 µm fibre cable can be used for applications requiring cable lengths of up to 70 km (worst case).

The total optical loss should be less than 6dB between transceivers.

For portable applications, such as touring and other temporary installations, ruggedized HMA Expanded Beam Connectors, mounted on 1 RU panels and portable cables on cable drums are available.

Please refer to the Product Brochure available at www.optocore.com.

SANE Ports

Use standard, fully wired, twisted pair cable (Cat 5, Cat 5e, Cat 6) terminated with RJ-45 connectors. SANE utilizes all four pairs of the Cat 5 cable, two pairs for standard Ethernet transmission and two pairs for the SANE synchronous audio transport. A SANE cable shall not exceed a total cable distance of 100 m.

Principal and Auxiliary Ports

Each of the four channels requires a shielded twisted pair cable.

If two or more channels are wired to the same cable, a common braided shield should enclose the pairs.

RS232-Connection

Use a standard shielded RS232 cable.

Connector Hood Quality

Locking screws for D-Sub connectors should be compatible with 4-40 UNC. Care should be taken in selecting the right type of connector hoods in order to fulfil 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 attenuation > 40 dB between 30 MHz up to 1 GHz. The shield of the cable should have contact to the connector hood.

USB-Connection

Use a USB-A to USB-B cable between the PC and the Optocore device.

LAN-Connection

Use a standard twisted pair cable (Cat-5, Cat-6) with RJ-45 connectors.

Word Clock-Connection

Use 75 Ω-coaxial-cable with BNC-connector.

Mains-Connection

Standard power cords with IEC C13 connectors.

Hardware Connection

Example 1

Two or more X6R-FX can be used to create optical ring network based on the Optocore technology. In the following example two X6R-FX with 8 mic/line inputs card and 8 line outputs card are connected with X6R-FX-16LO equipped with two 8 line outputs cards. It creates a network with 16 inputs and 32 outputs, where each input channel can be routed to any output. Adding distant fiber units to the Optocore ring can easily expand the system. Additionally each node channel count can be increased using Optocore TP-type devices connected by SANE protocol. Word clock signal is transmitted through Optocore fiber hence there is no need to use additional 75 Ω cables.

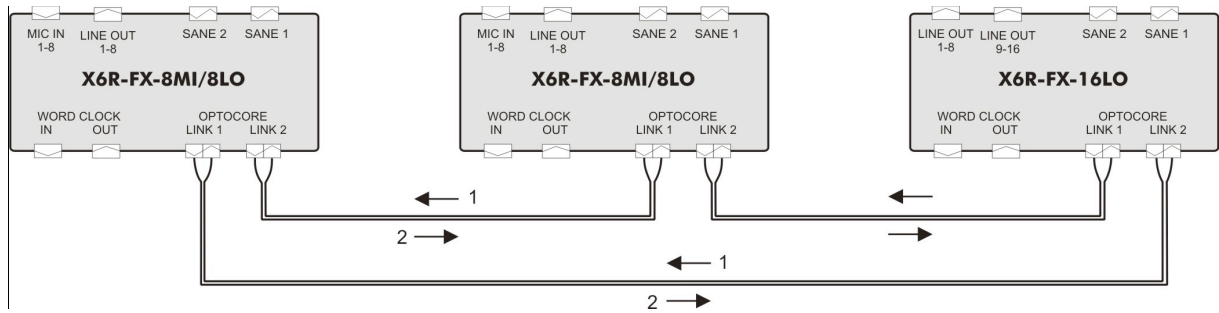


Fig. 1: Connection of three X6R-FX units.

Optocore network shown above in Fig. 1 is a redundant loop created by closing a daisy chain. Diagram demonstrates the signal flow. Every connection is made with crossed duplex fibre single or multimode (depending on system configuration).

Each of the devices in this example is an analogue converter with SANE network interface. The configuration of audio routing is carried out with OPTOCORE CONTROL software.

Example 2

The X6R-FX can be used as a SANE to Optocore converter. The X6R-FX with analog I/O cards is connected with three X6R-TPs with different types of cards and one V3R-TP by CAT5 cables. The word clock is transmitted by SANE and Optocore, so there is no need to use additional 75 Ω cables. The following figure demonstrates the configuration of a 40 send and 24 return SANE system, which can be combined with a bigger Optocore ring. In this example there are two Optocore X6R-TP units using two input cards each - one X6R-TP with two microphone input cards, one X6R-TP with input and output card. There is also one V3R-TP with one output card, one X6R-TP with one DualMic card and one X6R-FX with one input and one output card. All those devices are creating a CAT5 SANE network. The X6R-FX device is used as a bridge between SANE and Optocore network.

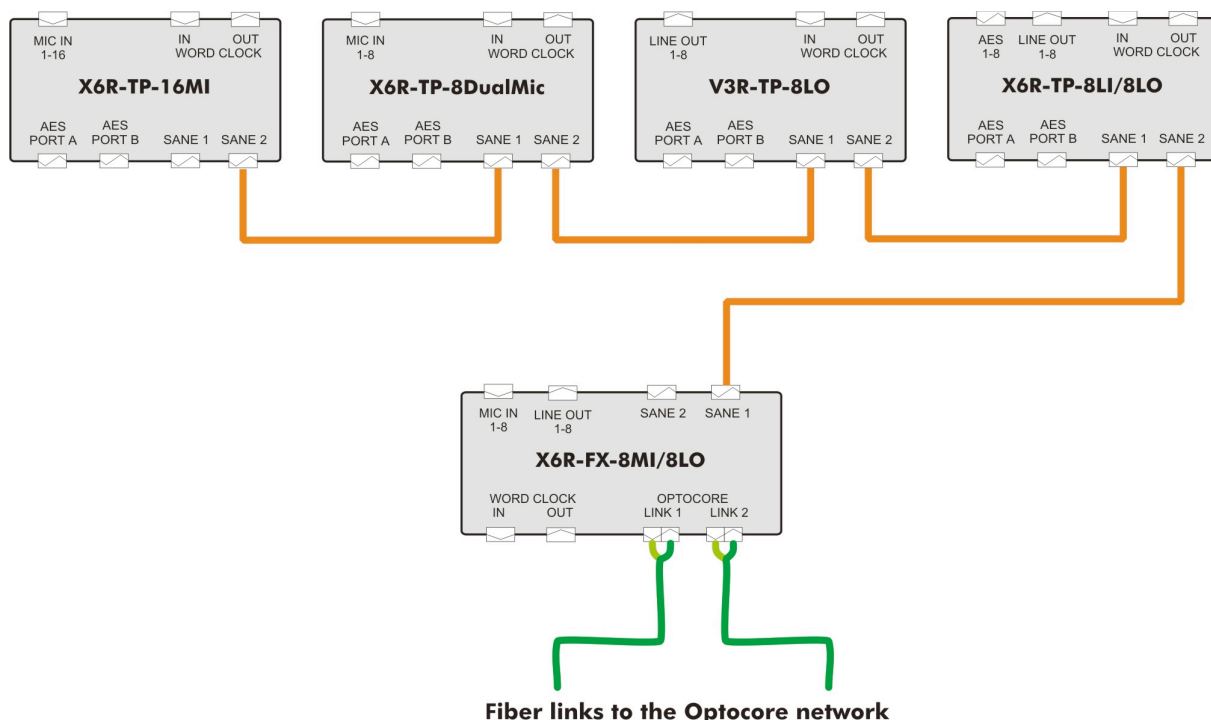



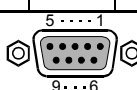
Fig. 2: Connection of three X6R-TP units, one V3R-TP and one X6R-FX.

Each of the devices in this example is an analogue converter with SANE network interface. It is possible to use AES ports, which are built in each TP device to input or extract digital audio channels to/from the network. The configuration of the AES ports as inputs and/or outputs and the routing is carried out with OPTOCORE CONTROL. It is possible to route input channels from other devices in an Optocore ring to the –TP outputs.

The same single CAT5 connection transports audio data, word clock and 100 Mbit Ethernet.

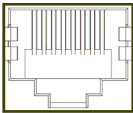
Connection Tables

Pin-out	Balanced Mic/Line Inputs, Line Outputs				
	Each Channel			Euroblock	
	+	-	GND		

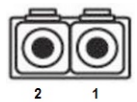
Pin-out		Auxiliary Ports 4 x RS485						
	Channel		RS485				GND	Please assure correct polarity “+” and “-” at both (!) sides / devices when connecting external equipment to the RS485 ports.
			1	2	3	4		
	Pin	+	1	2	3	4	5	
		-	6	7	8	9		
D-Sub-9- female				Locking system acc. to 4-40 UNC				

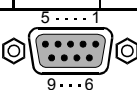
Pin-out			SANE – Synchronous Audio and Ethernet				
			SANE / “MADI” In	SANE / “MADI” Out	Ethernet In	Ethernet Out	A device compatible with 10/100MB Fast Ethernet can be connected to a SANE port for Ethernet data communication.
Pin	+	7	4	3	1		
	-	8	5	6	2		

RJ-45



1 3 5 7
2 4 6 8

Pin-out	Optical Fibre-Port		
			Optocore
			RXD TXD
	Pin	1	2
LC connectors			

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

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

Technical Specifications

Analog Audio Mic Inputs	ADC			
Impedance, Gain / steps	Single and Dual	4.5k Ω	-4 dB to +66 dB	1 dB steps
Maximum input level	@ -4 dB Gain	+22 dBu	@ +66 dB Gain	-48 dBu
SNR	@ -4 dB Gain	122.5 dB(A)	@ +66 dB Gain	81.5 dB(A)
THD+N @ -1dBFS	@ -4 dB Gain	\leq -102 dB	@ +40 dB Gain	\leq -100 dB

Analog Audio Line Inputs	ADC			
Impedance, Gain / steps		10k Ω	-9, -4, 0, +10 dB	4 steps
Maximum input level	@ -9 dB Gain	+27 dBu	@ +10 dB Gain	+8 dBu
SNR	@ -9 dB Gain	127.5 dB(A)	@ +10 dB Gain	108 dB(A)
THD+N @ -1dBFS	@ -9 dB Gain	\leq -102 dB	@ +10 dB Gain	\leq -102 dB

Analog Audio Line Outputs	DAC			
Impedance, Gain / steps		22 Ω	+4, 0, -6, -10 dB	4 steps
Maximum output level	@ +4 dB Gain	+22 dBu	@ -10 dB Gain	+8 dBu
SNR	@ +4 dB Gain	123 dB(A)	@ -10 dB Gain	108 dB(A)
THD+N @ 0dBFS	@ +4 dB Gain	\leq -100 dB	@ -10 dB Gain	\leq -103 dB

Conditions	Reference 0dBFS \equiv 18dBu, Input / Output Termination 150R / 300R, Sample Rate 48kHz. Specs noticed as typical, if not otherwise stated			
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Word clock	Hardware standard BNC - 75 Ω		
Data rate	Depending on selected sample rate	Up to 192 kHz	
Impedance	Output	\leq 5 Ω	
	Input	75 Ω	
Drive level	Output	\geq 1 V _{pp}	
Zero level	Referring to GND	+ 1.7 V	
Sense level	Input	\geq 400 mV _{pp}	

Remote Control	Convention	
RS232	EIA / TIA - 232	57 600 Baud
USB	USB 2.0 - Device	12 Mbit/s
LAN	IEEE - 802.3	10/100 Mbit/s

SANE, LAN	Convention	
Audio	TIA - 568A/B, Optocore	200 Mbit/s
LAN	TIA - 568A/B, IEEE - 802.3	10/100 Mbit/s

Optical Connection	Complies with 21 CFR 1040.10 and 1040.11		
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Power supply			
Type	Switch-mode, universal input		
Mains voltage	100 ... 240 V		
Frequency	50 ... 60 Hz		
Power consumption	Depending on the configuration of the device, 32VA - Max		
Security classification	Class 1: basic insulation, connected to the protective grounding conductor		
Security regulations	Harmonised European standard EN60065		
Mains connector	acc. to IEC-950		
Cooling	Passive, via surface and ventilation-slits on both sides of the device		

Dimensions and Weight

Front panel:	width	483 mm / 19 inch
	height	44 mm / 1.73 inch
	depth	200 mm / 7.87 inch
Rear panel:	width	438 mm / 17.25 inch

Weight

2.7 kg \equiv 4.41 lbs

Please note:

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

Warranty and Liability

Summary of Warranty

OPTOCORE X6R/V3R-FX device is warranted against defects in material and workmanship for 60 months (5 years) from the date of purchase. This warranty does not include mechanical damages caused by misuse. This warranty covers the original registered purchaser only and is not transferable. This warranty does not apply to devices which have been purchased in used condition or demonstrator equipment.

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

This warranty does not cover damage from acts of God, accident, abuse, neglect, contamination, unauthorised modification, misuse, or 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 customer-supplied software or interfacing, or normal wear and tear of mechanical components. OPTOCORE will acknowledge the evaluation of warranty after inspection.

Not covered by this warranty are defects arising from electromagnetic or electrical interferences, deficiency, excess, or surge of electrical supply, air conditioning, or humidity. This also includes repairs made necessary by dirt, abrasion, moisture, rust, corrosion, or similar conditions.

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

OPTOCORE devices contain no user-serviceable components: refer to qualified service personnel for repair or upgrade. The warranty will be void if you tamper with internal components. Please address any questions or inquiries to OPTOCORE or your distributor/dealer.

For a full warranty conditions refer to the Warranty Card attached to every Optocore device with a first shipment.

How to Obtain Warranty Service

When discovering a problem with an OPTOCORE device, you should contact either Optocore directly or a dealer/distributor to determine and confirm a hardware fault. If it is a software issue the hardware must not be returned to OPTOCORE, OPTOCORE will issue a support ticket in this case.

If hardware service is required within the warranty period, take the equipment, along with warranty card, to the nearest authorised OPTOCORE dealer/distributor. The dealer/distributor will make sure that the device is serviced according to the terms of warranty by OPTOCORE or an authorised service centre.

If the equipment needs to be returned directly to OPTOCORE, first contact support@optocore.com.

OPTOCORE requires the serial number of the equipment intended for return, as well as a short description of the problem. If possible, you should also provide us a phone number where you can be reached during regular working hours. 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.

Make sure the equipment being returned is packed carefully to protect it from damage during shipment. OPTOCORE requires that shipments are pre-paid and insured – unless specifically authorized in advance.

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 X6R/V3R-FX 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.

Neither OPTOCORE nor anyone involved in the production of the equipment shall be liable for any indirect, special, disciplinary, consequential, or incidental damages arising out of the use or inability to use this equipment even if OPTOCORE has been advised of the possibility of such damages. In no event shall the liability of OPTOCORE exceed the purchase price of any defective equipment.

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

Shipping Contents

The standard shipment of a X6R/V3R-FX unit contains the following:

- 1 X6R/V3R-FX unit
- 1 fibre patch cable LC-LC
- 2 power cables (according to number of PSU units installed)

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

Please note that due to the Ecology reason standard shipment **does not** contain printed copy of User Manual. All latest OPTOCORE user manuals can be downloaded from the website:

<http://www.optocore.com/index.php/support/downloads>

Printed version of User Manual is available on a special demand. Please contact support@optocore.com if printed version is required.

Contact Information

Mailing Address:

OPTOCORE GmbH
Alte Allee 28
D-81245 Munich
Germany

Telephone:

+49 – (0)89 – 8999640

Facsimile:

+49 – (0)89 – 89996455

Internet:

www.optocore.com

Email:

Inquiry@optocore.com