Operating Manual for OPTOCORE X6R/V3R-FX-INTERCOM

- IC422 for Clear-Com
- IC485 for RTS
- ICAES for AES/EBU based intercom
- IC444 for Audio and GPIO

Intercom devices for Optocore and SANE

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X6R/V3R-FX-INTERCOM – Intercom device for Optocore and SANE

Operating Manual

Rev. 2.8

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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.**

Owner 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. The operating manual contains important information on 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.

- **Operational Environment**

  This device can be operated 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-Residental

  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 a moderate climate.

- **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 ≡ 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 Optocore device may be placed above or below other Optocore products, without a space between the devices for up to 4 adjacent rack spaces.

  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**

  To clean the device, use a dry linen cloth. If the unit is very dirty, lightly moisten a cloth using water and a small amount of household detergent. Never use cleaning agents containing solvents to clean the device.

- **Operating and Storage Temperature**

  Operating temperature: -20°C …50°C ≡ -4°F … 122°F; ensure proper ventilation

  Storage temperature: -20°C …60°C ≡ -4°F … 140°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 power plug by pulling the cable. Always unplug the device.

  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 or form. Pay special attention to the AC mains sockets on 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 insert objects of any kind into the device through openings in the device chassis. The objects may come into contact with dangerous voltages or create short circuits that can 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.

- **Service and repairs**

  Do not attempt to service the device by 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-INTERCOM 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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Device Description

Congratulations on your purchase of an X6R/V3R-FX-INTERCOM, a dedicated interface for intercom connectivity to Optocore and SANE networks. The X6R/V3R-FX-INTERCOM series manual will quickly demonstrate the advantages of the device and help ease your day to day workload in the professional audio visual environment.

The X6R/V3R-FX-INTERCOM series was developed in cooperation with some of the world's leading manufacturers of intercom systems and are fully compatible with Clear-Com or RTS intercom matrices, user key-panels and interfaces.

The X6R/V3R-FX-INTERCOM can be ordered with different quantity and types of inputs and outputs.

For ClearCom intercom systems:
X6R-FX-INTERCOM-**IC422** with **8** **Clear-Com** compatible four-wire intercom ports with serial control.
V3R-FX-INTERCOM-**IC422** with **4** **Clear-Com** compatible four-wire intercom ports with serial control.

For RTS intercom systems:
X6R-FX-INTERCOM-**IC485** with **8** **RTS** compatible four-wire intercom ports with serial control.
V3R-FX-INTERCOM-**IC485** with **4** **RTS** compatible four-wire intercom ports with serial control.

For AES/EBU intercom systems:
X6R-FX-INTERCOM-**ICAES** with **8** **AES/EBU** compatible four-wire ports.

For systems requiring line level I/O and GPIO:
X6R-FX-INTERCOM-**IC444** with **8** **Line Level** inputs and outputs, **8** **GPIO** and an auxiliary power output.
V3R-FX-INTERCOM-**IC444** with **4** **Line Level** inputs and outputs, **4** **GPIO** and an auxiliary power output.

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 **R**evolution series hardware platform.

FX specifies that the device is equipped with Optocore fibre connectivity.

IC422/**IC485**/**ICAES**/**IC444**: specifies the connectivity option of the device.

The IC422 and IC485 provide four-wire intercom ports with line level audio inputs and outputs along with serial data links on RJ45 connectors for communication between intercom matrices and auxiliary devices.

Serial control is routed with the audio, requiring audio to be routed to and from each port in order to establish bi-directional audio and serial communication between matrices, user key-panels and/or interfaces.

The ICAES provide four-wire intercom ports with AES/EBU audio inputs and outputs with control embedded on RJ45 connectors for communication between intercom matrices and auxiliary devices.

Each IC422 and IC485 four-wire intercom port can be used as an independently routed line level input / output using an adaptor from RJ45 to a connector such as XLR. ICAES intercom's AES I/Os can be used as independent digital inputs and outputs with special RJ45 adapter.

The IC422, IC485 and ICAES RJ45 four-wire intercom ports are duplicated with reversed wiring so that either matrices (TO MATRIX) or intercom key-panels (TO PANELS) can be connected to the unit using standard CAT cables, making cabling simple and cost-efficient.

The IC444 provides line level audio inputs and outputs, GPIO (General Purpose Inputs and Outputs) and auxiliary +5V DC and +12V DC power outputs, to power external circuits, on 37 pin D-Sub connectors.

GPIOs are routed with the corresponding audio inputs and outputs, requiring audio to be routed to and from each port in order to establish bi-directional audio and GPIO link.

The low latency, synchronous, Optocore network provides the capacity to transport and route up to 1024 audio inputs into thousands of outputs over a redundant network. Redundant fibre 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 64 channel SANE synchronous audio ports on Cat5 connectors with Ethernet, 4 RS485/422 ports, 100Mbit Ethernet switch and a Word Clock input and output.

Extensive networks of Optocore FX devices and SANE TP devices can be created using devices with different connectivity options to route and transport intercom, audio, serial data, composite video and Ethernet.

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.

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 X6R/V3R-FX-INTERCOM 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.

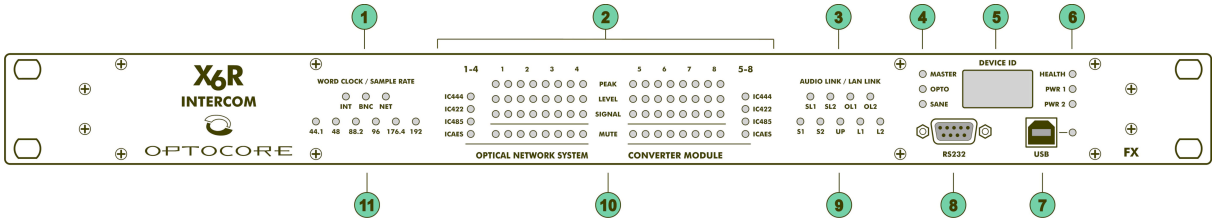
All Optocore devices are designed and built using the latest programmable microprocessors and FPGA (field programmable gate array) logic circuitry. This allows the devices internal logic to be updated, in the field, ensuring a continual state-of-the-art device.

The X6R/V3R-FX-INTERCOM is designed for rack-mounted applications.

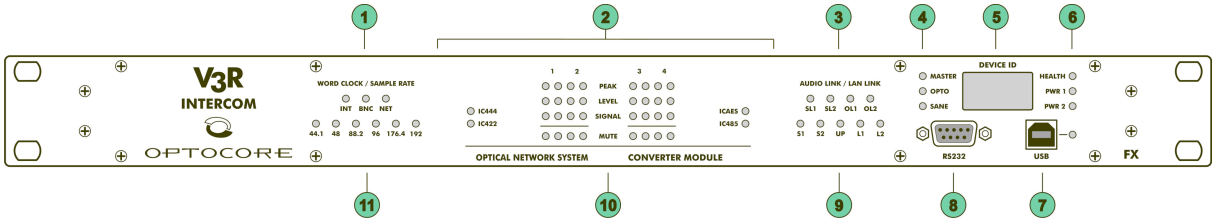
The LEDs on the front panel of the X6R/V3R-FX-INTERCOM units allow an instant overview on the status of each channel, indicating if audio is present, if peak level is reached and if nothing is routed to an output.

Front Panel

X6R-FX-INTERCOM-IC422/IC485/ICAES/IC444



V3R-FX-INTERCOM-IC422/IC485//IC444



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 **Intercom and Signal Monitor for the 8 Duplex Channels (4 Duplex Channels for V3R):**

IC422:	Four-wire intercom ports with bi-directional RS422 (for Clear-Com)
IC485:	Four-wire intercom ports with bi-directional RS485 (for RTS)
ICAES:	Bi-directional AES3 ports
IC444:	Line Level I/O with GPIO

PEAK:	Red: Overflow. Input level exceeds max. input level of 0dBFS
LEVEL:	Yellow: Warning level. Input level exceeds -10dBFS
SIGNAL:	Green: Signal present ≥ -60dBFS. Brightness controlled

3 **AUDIO LINK:**

SL1:	Communication is established on the SANE 1 port (rear panel)
SL2:	Communication is established on the SANE 2 port (rear panel)
OL1:	Communication is established on the Optocore LINK 1 (rear panel)
OL2:	Communication is established on the 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

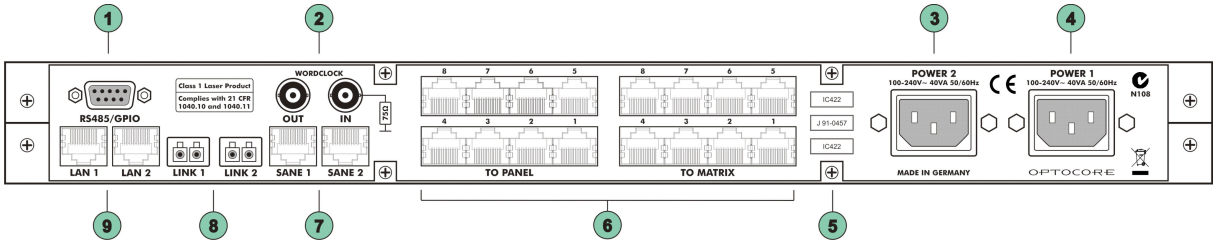
6

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

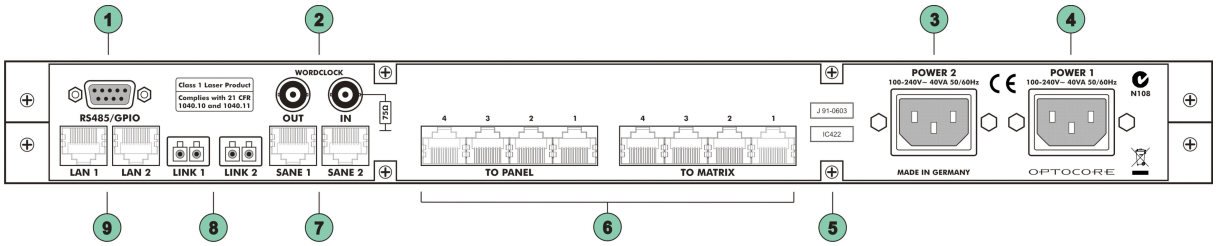
7	**USB plug and LED:**	USB connection for remote control and update via PC Green: Indicates data activity
8	**RS232 plug:**	D-Sub-9 RS232 connection for remote control and update via PC
9	**LAN LINK:**	
	S1:	Ethernet communication is established via SANE 1 (rear panel)
	S2:	Ethernet communication is 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	**MUTE**	Red static: Output mute indicator. Nothing is routed to the output.
11	**Sample rate LED:**	Yellow: 44.1 / 48 / 88.2 / 96 / 176.4 / 192 kHz

Rear Panel

X6R-FX-INTERCOM-IC422/IC485

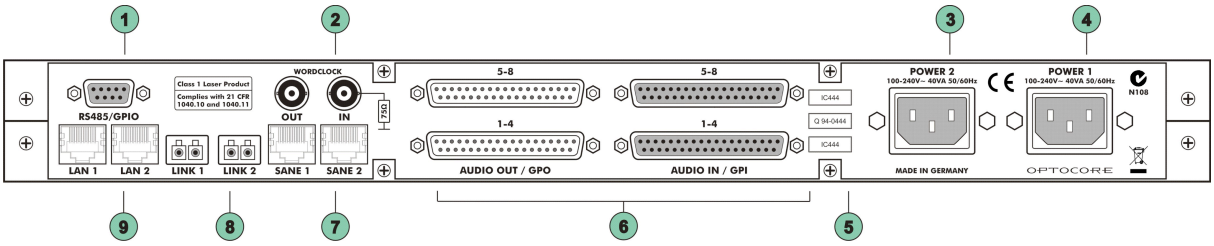


V3R-FX-INTERCOM-IC422/IC485/ICAES

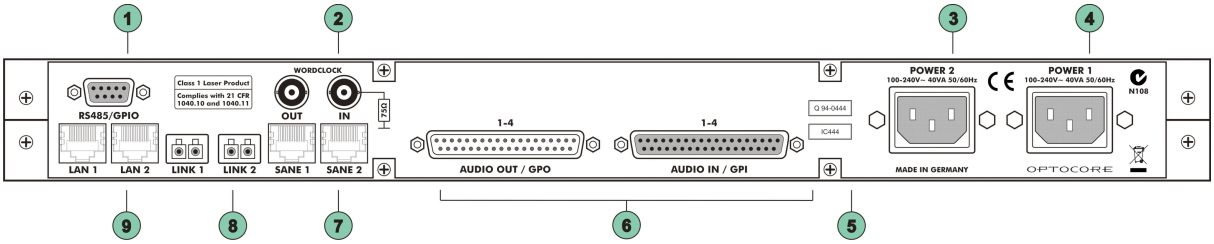


1	**RS485/GPIO:**	4 x RS485/GPIO (D-Sub-9) auxiliary port for data transmission
2	**Word Clock IN:**	BNC Word clock input allowing synchronization of Optocore devices/network from an external word clock source
	Word Clock OUT:	BNC Word clock output for synchronization of external devices
3	**POWER 2:**	Mains input for power supply 2 (100 … 240 V)
4	**POWER 1:**	Mains input for power supply 1 (100 … 240 V)
5	**Label:**	I/O card type in the slot(s) and serial number
6	**TO PANEL:**	RJ45 four-wire intercom ports wired for connection to key-panels or interfaces (8 on X6R-FX-INTERCOM, 4 on V3R-FX-INTERCOM)
	TO MATRIX:	RJ45 four-wire intercom ports wired for connection to an intercom matrix (8 on X6R-FX-INTERCOM, 4 on V3R-FX-INTERCOM)
7	**SANE 1:**	SANE RJ-45 interface for audio transmission + 100 Mbit Ethernet
	SANE 2:	SANE RJ-45 interface for audio transmission + 100 Mbit Ethernet
8	**LINK 1:**	Full-duplex, full bandwidth LC-type optical interface for Optocore transmission (SFP multimode transceiver included, singlemode transceiver option available on demand)
	LINK 2:	Full-duplex, full bandwidth LC-type optical interface for Optocore transmission (SFP multimode transceiver included, singlemode transceiver option available on demand)
9	**LAN 1:**	100 Mbit RJ-45 Ethernet interface
	LAN 2:	100 Mbit RJ-45 Ethernet interface

X6R-FX-INTERCOM-IC444



V3R-FX-INTERCOM-IC444



1	**RS485/GPIO:**	4 x RS485/GPIO (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	**Label:**	I/O card type in the slot(s) and serial number
6	**AUDIO IN / GPI:**	37 pin Female D-SUB connector with: 8 (or 4) line level inputs, 4 optically isolated General Purpose Inputs (GPI) and +5V DC and +12V DC auxiliary power.
7	**AUDIO OUT / GPO:**	37 pin Male D-SUB connector with: 8 (or 4) line level outputs, 4 General Purpose Outputs (GPO) and +5V DC and +12V DC auxiliary power.
8	**SANE 1:**	SANE RJ-45 interface for audio transmission + 100 Mbit Ethernet
	SANE 2:	SANE RJ-45 interface for audio transmission + 100 Mbit Ethernet
9	**LINK 1:**	Full-duplex, full bandwidth LC-type optical interface for Optocore transmission (SFP multimode transceiver included, singlemode transceiver option available on demand)
	LINK 2:	Full-duplex, full bandwidth LC-type optical interface for Optocore transmission (SFP multimode transceiver included, singlemode transceiver option available on demand)
10	**LAN 1:**	100 Mbit RJ-45 Ethernet interface
	LAN 2:	100 Mbit RJ-45 Ethernet interface

Device Details

IC422 and IC485 - Intercom Ports

Each four-wire intercom port is complete with a line level input, line level output and a bi-directional RS422 or RS485 (device specific) serial communication link, allowing seamless integration with Clear-Com or RTS intercom systems.
The intercom ports are duplicated with a reversed pinout (TO MATRIX and TO PANEL) to allow connections to intercom matrix frames, user key-panels and interfaces using straight Cat5 cables.

ICAES - AES3 Duplex Ports

Each duplex port provides one fully 32-bit transparent AES3 input and output on a single RJ45 connector, allowing seamless integration with AES-based intercom systems. Intercom matrix and INTERCOM-ICAES devices must synchronise to the same system clock.

IC444 - Line Level I/O and GPIO

The IC444 module is populated with 37 pin male and female D-Sub connectors. The female connector has 4 line level inputs and 4 optically isolated General Purpose Inputs (GPI). The male connector has 4 line level outputs 4 General Purpose Outputs (GPO). Auxiliary +12V DC and +5V DC power is available on both connectors, allowing up to 100mA of current to be drawn from each IC444 module. The V3R-FX-INTERCOM unit can be equipped with one IC444 module, while X6R-FX-INTERCOM can be equipped with two IC444 modules.

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.

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 a fixed 41,6 µs @ 48 kHz for all channels. The additional transport delay per Optocore unit on the network (<200 ns) 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

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 Ethernet transport the system is reduced to 1 CVBS video channel.

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

Intercom Ports – IC422/IC485/ICAES

Use **TIA/EIA-568-B** standard straight-forward twisted pair cable (Cat-5, Cat-5e, Cat-6) terminated with RJ-45 connectors.
Connect intercom matrix to ports labelled TO MATRIX and intercom user key-panels and interfaces to ports labelled TO PANEL.

Optical Connections

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.

Auxiliary Ports – R485/GPIO

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 Specification

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 connectors.

Power Connection

Standard power cords with IEC C13 connectors.

Hardware Connection

Example 1 – Remote intercom key-panels, interfaces and wireless base stations

The following example demonstrates the use of X6R/V3R-FX-INTERCOM devices with intercom matrix systems.

An X6R-FX-INTERCOM is connected to eight four-wire ports of a central intercom matrix. The four-wire ports, along with RS422 or RS485 control signals (device dependent), are distributed over the fully routable Optocore redundant ring topology network to remote locations.

Intercom key-panels and various interfaces can be connected to the system at the remote locations.

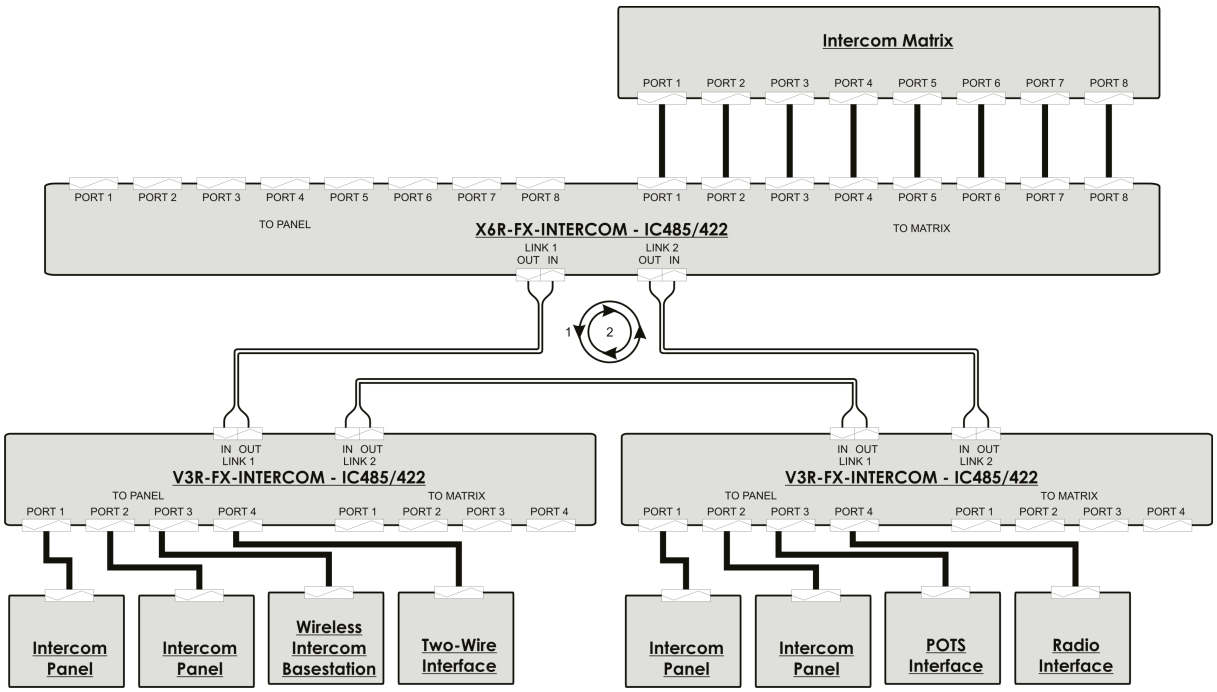


Fig. 1: Signal distribution for intercom key-panels, interfaces and wireless base stations.

Example 2 – Remote line level audio and GPIO

The following example demonstrates the use of X6R/V3R-FX-INTERCOM devices with intercom matrix systems.

An X6R-FX-INTERCOM is connected to eight four-wire ports of a central intercom matrix. The four-wire ports, along with GPIO control signals (device dependent), are distributed over the fully routable Optocore redundant ring topology network to remote locations.

Various interfaces can be connected to the system at the remote locations as shown on the diagram below, including On-Air warning lights, FOH paging systems, radio interfaces and four-wire to two-wire interfaces etc.

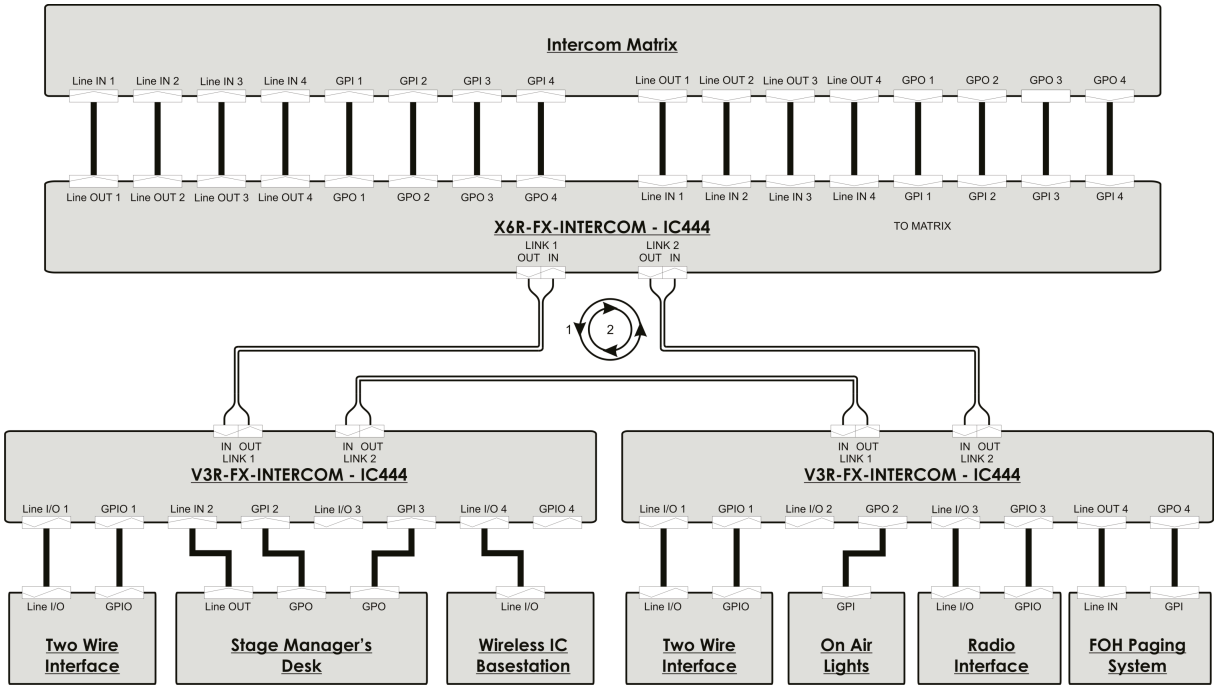


Fig. 2: Signal distribution for intercom key-panels, interfaces and wireless base stations.

Example 3 – Trunking between Intercom Matrices

The following example demonstrates the use of X6R/V3R-FX-INTERCOM devices to link intercom matrices.

A pair of V3R-FX-INTERCOM devices is used to establish an eight channel trunk between two intercom matrices. The four-wire ports are transported over a fully routable Optocore redundant ring topology network. Control for both intercom matrices are connected together using the Optocore network's internal Ethernet switch with an optional connection to a third party trunk controller.

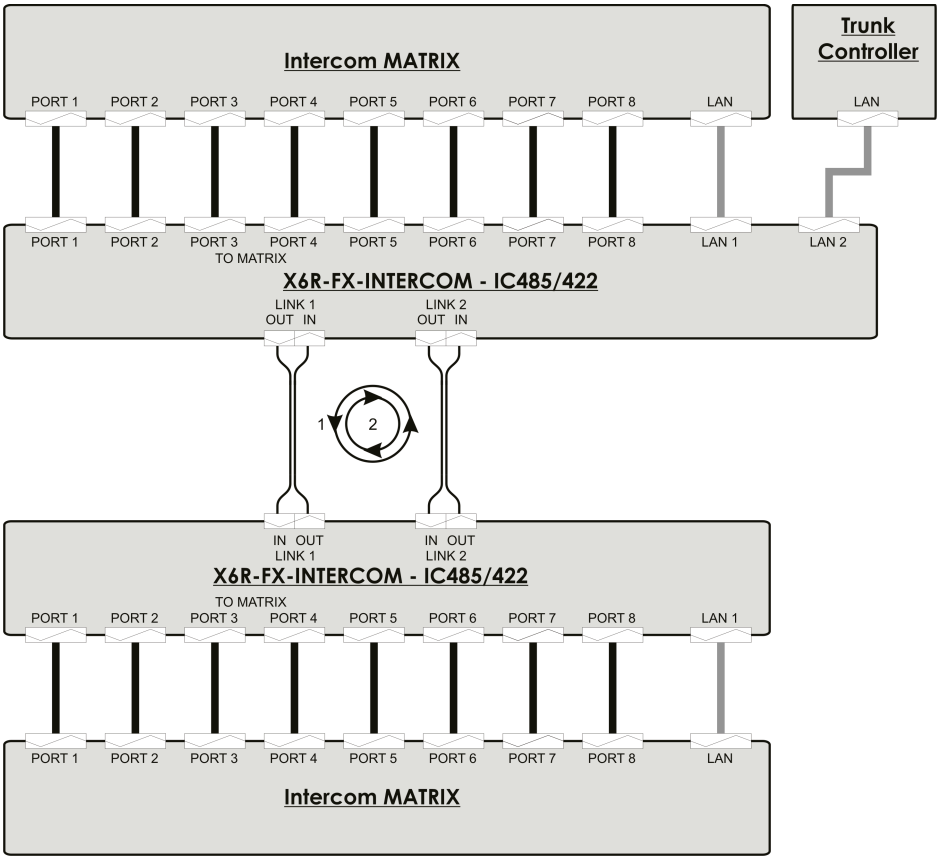


Fig. 3: Two intercom matrices connected using Optocore intercom devices.

Example 4 – Two-wire PartyLine intercom over Optocore

The following example demonstrates the use of X6R/V3R-FX-INTERCOM devices to distribute two-wire PartyLine intercom over Optocore using four-wire to two-wire PartyLine intercom interfaces.

This example shows an Optocore redundant ring topology network consisting of four V3R-FX-INTERCOM devices connected to third party four-wire to two-wire interfaces.
The PartyLine is created by routing bi-directional audio between PartyLine interface A, connected to the first Optocore device in the network, to PartyLine interface B, connected to the second Optocore device in the network. This is repeated throughout the Optocore network.
The two-wire side of interfaces A and B are connected together at each position in the network and a PartyLine has been established over the network.

The PartyLine call lights may be transported over the Optocore network using serial signalling (IC422/IC485) or GPIO (IC444) depending on the four-wire to two-wire interfaces used.

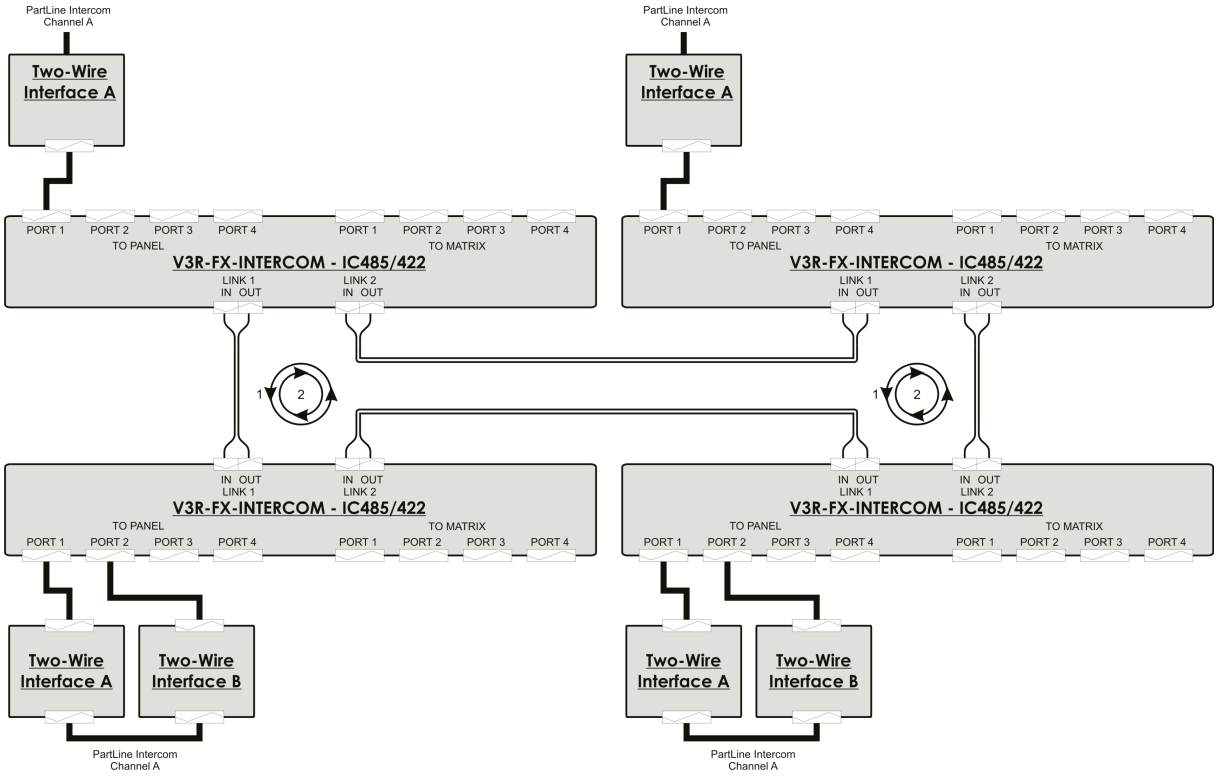


Fig. 4: Two-wire PartyLine intercom over Optocore using V3R-FX-INTERCOM-IC485/422.

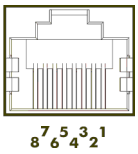
Please note:
The four wire intercom ports are duplicated on the X6R/V3R-FX-INTERCOM devices with reversed wiring.
This allows either matrices (TO MATRIX) or intercom key panels (TO PANELS) to be connected to the unit using standard CAT cables, making cabling simple and cost-effective.

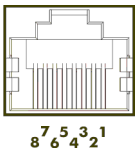
Please note:
Systems from these examples may be seamlessly integrated with all BroaMan DiViNe, Optocore and SANE interfaces, such as the DD32R-FX AES/EBU device, DD4MR-FX and DD2FR-FX MADI devices, X6R-FX/TP and V3R-FX/TP networkable converters.

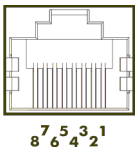
Please note:
Audio can be routed to and from any Optocore device on the on the network.

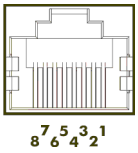
Audio can be routed from an intercom device to any MADI, AES/EBU or analog output on the network.

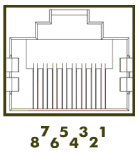
Connection Tables

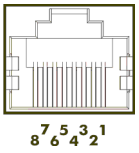
Pin-out	Four-Wire Intercom port - TO PANEL – ClearCom (IC422)						
	Channel		Audio In	Audio Out	RS422 In	RS422 Out	Use this pin-out only for devices loaded with ClearCom modules (IC422)
	Pin	+	3	4	1	7	
		-	6	5	2	8	
RJ-45	 8 7 6 5 4 3 2 1						

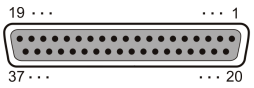
Pin-out	Four-Wire Intercom port - TO MATRIX – ClearCom (IC422)						
	Channel		Audio In	Audio Out	RS422 In	RS422 Out	Use this pin-out only for devices loaded with ClearCom modules (IC422)
	Pin	+	4	3	7	1	
		-	5	6	8	2	
RJ-45	 8 7 6 5 4 3 2 1						

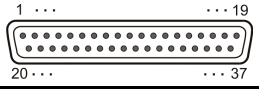
Pin-out	Four-Wire Intercom port - TO PANEL – RTS / Telex (IC485)					
	Channel		Audio In	Audio Out	RS485*	Use this pin-out only for devices loaded with RTS / Telex modules (IC485) * Shows the standard pinout for RS485 on the IC485 module. Other pinouts may be specified at the time of order.
	Pin	+	4	3	7	
		-	5	6	2	
RJ-45	 8 7 6 5 4 3 2 1					RJ45 is physically compatible with RJ11 and RJ12 connectors commonly used for RTS/Telex panels and matrices.

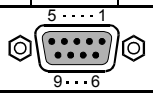
Pin-out	Four-Wire Intercom port - TO MATRIX - RTS / Telex (IC485)					
	Channel		Audio In	Audio Out	RS485	Use this pin-out only for devices loaded with RTS / Telex modules (IC485) * Shows the standard pinout for RS485 on the IC485 module. Other pinouts may be specified at the time of order.
	Pin	+	3	4	7	
		-	6	5	2	
RJ-45	 8 7 6 5 4 3 2 1					RJ45 is physically compatible with RJ11 and RJ12 connectors commonly used for RTS/Telex panels and matrices.

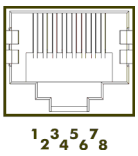
Pin-out	Four-Wire AES port - TO PANEL – AES based intercom systems (ICAES)				
	Channel		TX	RX	Use this pin-out only for devices loaded with AES modules (ICAES)
	Pin	+	3	1	
		-	6	2	
RJ-45					

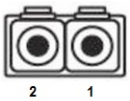
Pin-out	Four-Wire AES port – TO MATRIX – AES based intercom systems (ICAES)				
	Channel		TX	RX	Use this pin-out only for devices loaded with AES modules (ICAES)
	Pin	+	1	3	
		-	2	6	
RJ-45					

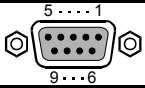
Pin-out	Line Level Inputs / General Purpose Inputs (IC444)											
			Line Level Input				General Purpose Input					Aux. Power	
			1	2	3	4		1	2	3	4	+5V	+12V
	Pin	+	21	23	25	27	+	29	31	33	35	19	37
		-	3	5	7	9	-	11	13	15	17	-	-
		GND	22	24	26	28	GND	30	32	34	36	-	-
D-Sub-37- female							Locking system acc. to 4-40 UNC						

Pin-out	Line Level Outputs / General Purpose Outputs (IC444)											
			Line Level Output				General Purpose Output					Aux. Power	
			1	2	3	4		1	2	3	4	+5V	+12V
	Pin	+	21	23	25	27	NC	29	31	33	35	19	37
		-	3	5	7	9	NO	11	13	15	17	-	
		GND	22	24	26	28	COM	30	32	34	36	-	
							GND	12	14	16	18		
D-Sub-37- male							Locking system acc. to 4-40 UNC						

Pin-out	Auxiliary Port - 4 x RS485						
	Channel		RS485				GND	Please verify the correct polarity of adaptors. Software configurable for duplex (RS485) or simplex (RS422) operation. An adaptor must be constructed for connectivity to MIDI, GPIO and CAN interfaces.
			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							

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

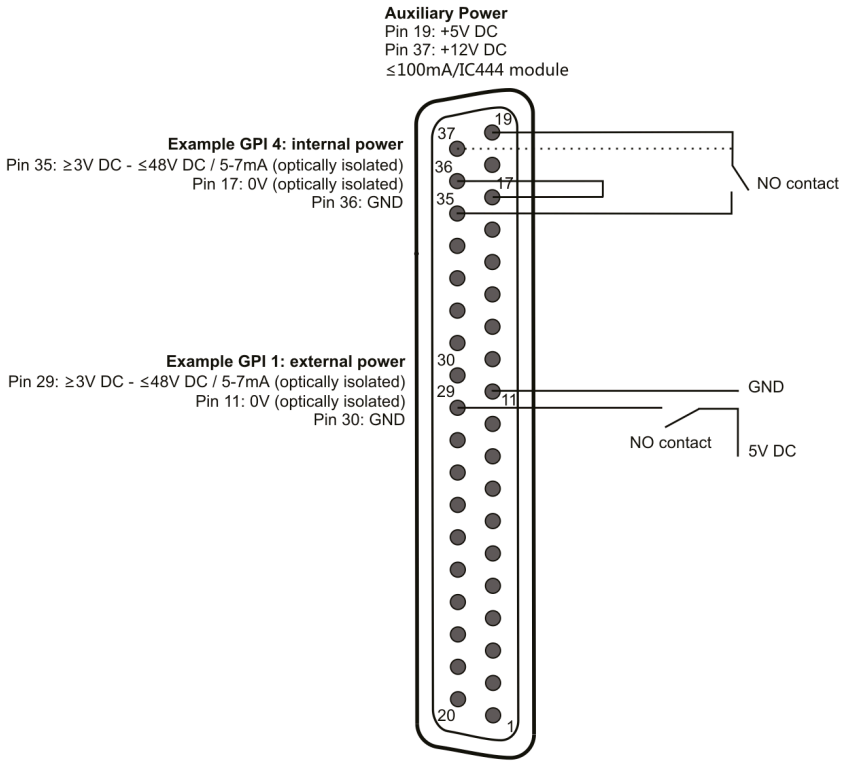
Pin-out	RS232 - Port							
	Channel	RS232		Internally bridged		Power		Use standard RS232 cable, male – female, to connect to PC
		RXD	TXD			+5VS	GND	
	Pin	3	2	1, 4, 6	7, 8	9	5	
D-Sub-9- female								Locking system acc. to 4-40 UNC

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

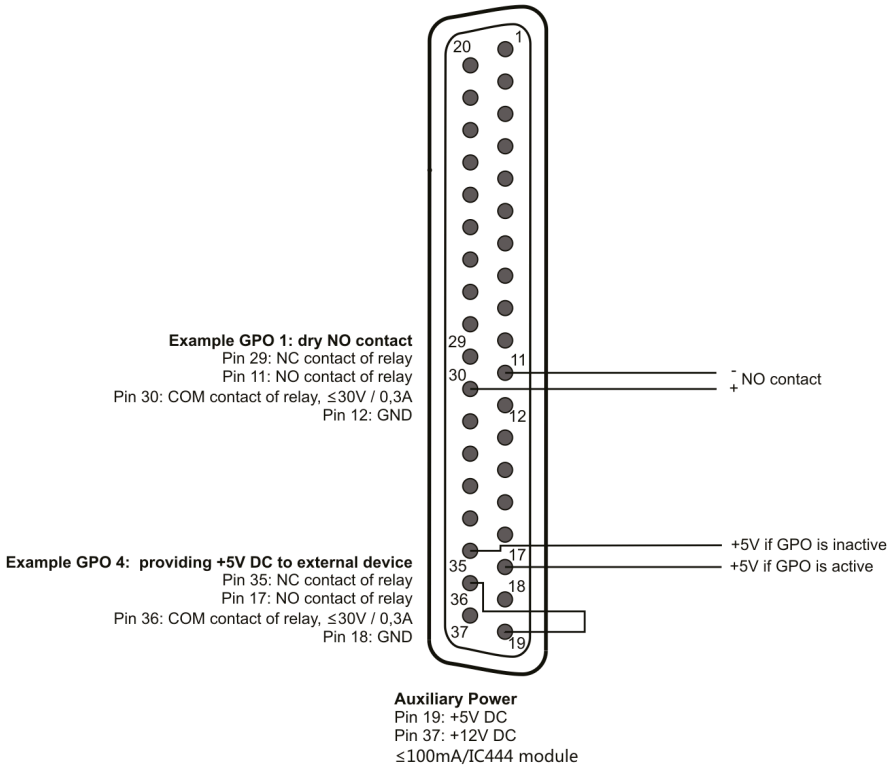
Pin-out	DC Input – Factory Fitted Option				
			12V	GND	
	Pin	+	4	1	
XLR 4 Pin male 					

Connection Examples GPI/GPO IC444 Module

D-Sub 37-Pin female IC444-module
Line In / GPI



D-Sub 37-Pin male IC444-module
Line Out / GPO



Technical Specifications

Intercom	Hardware standard: IC422/IC485: FCC-RJ45, IC444: D-Sub 37 Female, D-Sub 37 Male	
Analog Line Input	Impedance	10 kΩ
- **IC422/IC485/IC444**	Maximum input level	+18 dBu
	SNR	115 dB (A-weighted)
	THD+N @ -1dBFS	≥ 100 dB
Analog Line Output	Impedance	45 Ω
- **IC422/IC485/IC444**	Maximum output level	+18 dBu
	SNR	115 dB (A-weighted)
	THD+N @ -1dBFS	≥ 98 dB
Serial I/O		
- **IC422**	EIA / TIA – 422	
- **IC485**	EIA / TIA – 485	
General Purpose Inputs - GPI	Optically isolated	3...48V DC, 5...7mA
- **IC444**		
General Purpose Outputs - GPO	Relay contacts	DC 30V 2A (resistive load)
- **IC444**		AC 125V 0.6A (resistive load)
Auxiliary Power	+5V DC	≥ 100mA combined per IC444 module
- **IC444**	+12V DC	

AES ports with ICAES	Convention EIA / TIA - 422	
Data rate	Depending on selected sample rate	Up to 30 Mbit/s per channel
Impedance	Termination	120 Ω-switchable / ≥ 96 kΩ
	Source	≤ 10 Ω, Multi-drop feature
Drive level	Output	≥ 2 V_{pp}
Zero level	Referring to GND	+ 1.7 V
Sense level	Input	≥ 400 mV_{pp}
CM-voltage at bus terminals	Referring to GND	- 7 V … + 12 V

Conditions	Reference 0dBFS ≡ 18dBu, Input / Output Termination 150R / 600R, Sample Rate 48kHz. Specs noticed as typical, if not otherwise stated

Word clock	Hardware standard BNC - 75 Ω	
Data rate	Depending on selected sample rate	Up to 192 kHz
Impedance	Output	≤ 5 Ω
	Input	75 Ω
Drive level	Output	≥ 1 V_{pp}
Zero level	Referring to GND	+ 1.7 V
Sense level	Input	≥ 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

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

Dimensions

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 ≡ 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-INTERCOM 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-INTERCOM 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).

Package Contents

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

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

Any additionally purchased equipment such as optical fibre 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.

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