

# AV Over IP

AV has always relied its fundamentals on IT technology, especially since digital signal management prevailed, and the future path is definitely determined by Networked AV aka AV Over IP routing methods.

# UBEX-PRO20-HDMI-F100 / F110 / F120

UBEX is a fiber-optical, scaling AV-Over-IP system which allows

uncompressed 4K UHD@60Hz 4:4:4 signal extension with latency-free multistreaming, designed to use in a 10G Ethernet network. UBEX operates with zero frame latency, provides seamless switching and lossless reproduction of source signals of up to 4K60Hz 4:4:4, without artifacts.

Uncompressed 4K60Hz 4:4:4 data transmission, or visually lossless compression at higher data rates. It has standard, 10 Gbps SFP+ optical modules installed, which are field-exchangeable by the user.

UBEX can transfer two video signals over a single 10G link with minimal compression, which requires half the router size compared to the needs of similar, 10G IP based architectures. With a 20G configuration, UBEX can transfer 4K@60Hz 4:4:4 over two links uncompressed.

## AV OVER IP MULTIMEDIA SYSTEM

The maximum reachable distance is ranging between 400 m and 80 km, depending on the type of singlemode or multimode SFP+ optical modules installed in the device.

The UBEX design also favors dual-screen applications as a single UBEX device can handle 2x HDMI 2.0 video ports. The UBEX F110 model features balanced audio ports and RS-232 and IR control ports, while the top model UBEX F120 also features USB KVM.



Uncompressed  
4K UHD@60Hz 4:4:4



Frame Detector  
(Input signal analysis)



Pixel Accurate  
Reclocking



Multilayer Signal Routing



Instantaneous Switching  
without Signal Latency



Advanced EDID  
Management



USB HID (KVM)



Reliability and Redundancy



4K Scaling



## OPERATION MODES

The UBEX system offers a great variety of operation and usage modes, providing a future-proof, easily extendable and scalable system.

### EXTENDER MODE

In extender mode, two UBEX devices can operate as conventional, high-quality, HDMI 2.0 compatible optical extenders, without applying signal compression and encoding. There are no separate transmitter and receiver UBEX units, the desired operation direction can be selected at boot.

### TRANSCIEVER MODE

UBEX is also capable of transceiver mode, a single unit receiving and transmitting signals simultaneously, this mode can also be selected at boot. One Full 4k video stream can be transmitted while another Full 4k video stream can be received on the same 20G Ethernet link. In a point-to-point extension application, transceiver mode provides a bi-directional video extension. In a virtual matrix configuration (see below) transceiver mode allows a matrix system to reduce the needed number of 10G Ethernet switch ports, as one port can be used as input and output video simultaneously.


### VIDEOWALL SUPPORT MODE

UBEX units in receiver mode can be configured to make a videowall with several layouts. The UBEX videowall wizard helps build a videowall configuration in a couple of minutes.

### MATRIX MODE

UBEX units can connect to create a complex network, and with the help of a UBEX-MMU-X200 Matrix Management Unit (MMU) it is possible to create a virtual matrix with UBEX units as input and output endpoints, and where a central Ethernet switch acts as crosspoint. Such a virtual matrix can be also extremely asymmetrical, as e.g. it could have only a few (or one) devices on the input side, while an almost unlimited number of output end units.



A background image of a modern control room with multiple computer monitors and ergonomic chairs. The room is dimly lit, with the primary light source being the screens, which display various data and graphics. The overall atmosphere is professional and high-tech.

**UBEX has outstanding built-in features and services providing an unparalleled versatility fitting numerous applications.**

## **UNIQUE ADVANTAGES**

### **BROADCAST QUALITY SCALING BASED ON OMNITEK TECHNOLOGY**

The Omnitek Scalable Video Processor within UBEX is a highly configurable set of IP blocks and optional features that together provide a powerful range of tools for multi-video format conversion and image enhancement for a number of ultra-high quality video formats. This scaling technology provides clean, upscaled images when integrating legacy sources with 4K displays, or produces faithful rendering details and integrity of a source when downscaling 4K content to HD displays, with unparalleled processing and clarity.

### **ULTRA LOW LATENCY**

The detectable latency in all configuration modes is sub-frame, consisting of a few lines within a single frame. This is especially remarkable in case of AV-Over-IP, as latency remains so little even in compression is applied to the transferred signal. Of course the smallest latency is achieved when UBEX works without signal compression, which is the default mode of operation in 10G Ethernet networks. To further improve the accuracy and timing of signals, a special, source-locked mode feature has also been developed for UBEX, serving both extender and matrix mode operations.

### **MULTISTREAMING**

The UBEX system is capable of transferring two video signals over a single fiber within the given bandwidth, for instance it is possible to forward two independent Full HD video signals over a single optical line, without compression.

### **FRONT PANEL ADJUSTMENTS**

It is a great help for people in the field that most of the important settings like EDID can be altered in UBEX without connecting a computer, just by using the front panel jog-dial button and the color LCD screen. For setting further properties and fine-tuning your installation a built-in solid color generator is also provided with selectable resolution to display on the sink.

### **SEAMLESS SWITCHING**

UBEX offers true seamless switching between inputs, avoiding glitches which would otherwise be seen when switching between sources.

### **FRAME DETECTOR**

This technology inside UBEX provides information about the pixel count, frequencies and also about the measured pixel clock of the full and the actual frame.



## VERSATILITY HAS A NEW NAME

The UBEX series provides uncompressed 10G IP switching technology in a rugged chassis, a high-end choice for numerous applications in dynamic environments. UBEX has professional, standard SFP+ field connectors, which can be changed by the user to match the requirements of an actual project.

### CONFIGURATION MODES

Using the combination of devices working in transmitter, receiver and transceiver modes, UBEX can perform and improve any function of all traditional AV product classes: extender, splitter, switcher and matrix.

#### SPLITTER

Using one transmitter and a 10G Ethernet switch, A/V signals can be distributed fast and error-free to a virtually limitless number of receivers and sinks.

#### EXTENDER

In a point-to-point configuration, UBEX can operate without a central switch. Distribute full 4K@60 4:4:4 resolution signals with 1G Ethernet, audio and control signals over IP.

#### SWITCHER

A single UBEX in receiver mode connected to a 10G Ethernet switch can distribute a huge number of sources to a single screen, where the number of sources is only limited by the number of ports on the Ethernet switch.

#### MATRIX

By combining UBEX units and a central Ethernet switch a completely scalable matrix system can be created, which can be fully managed by the Matrix Management Unit connected to the same switch. Route video, audio, KVM and control signals from any source to any endpoint.



# FEATURE APPLICATIONS



The UBEX series provides the greatest flexibility in a single device, adjustable to be always the right tool for an actual job: from point-to-point extension over an optical network to multi-zone matrix switching: you can be definite that UBEX can handle any task with ease. However, there are some unique UBEX features that make the device especially fitting to the needs of special application areas.

UBEX can operate as a traditional, point-to-point extender pair and transfer signals natively without compression, and can also connect to an Ethernet network, a unique feature most competition products lack. Therefore it can be an excellent choice for rental companies who can easily use both modes of operation as the actual project requires. It is also a rental specific feature that UBEX always remembers the last used setting configuration, so in case of a momentary lapse of electricity it can continue operation where it was left off automatically, as the last used configuration is re-loaded from memory. UBEX features SFP+ modules, which can be swapped to another type of SFP+ modules by the user, by simply removing one and sliding the other into the connector slot. Depending on the SFP+ module and the optical cable used, UBEX can transmit signals to a range between 400 m and 80 km. The on-scene technician can select and install the best fitting SFP+ module for ad hoc installations and perform the change in seconds.

## RENTAL AND STAGING

Designing and installing AV equipment on a yacht is a sensitive process. The installed system has to fulfill customer demands and possibly exceed them, it has to be versatile and easily integrable with third party systems, devices and networks. Based upon our previous experience gained in marine AV installations, UBEX was designed to have optimal product properties and features for this purpose. It is particularly well applicable to yacht-like environments, and being an Ethernet-based system, it can cooperate glitch-free with any standard, central Ethernet switch.

## MARINE INSTALLATIONS



## BUSINESS OFFICE CENTERS

When corporate organizations move into existing office buildings they need solutions to design, install and integrate AV technology into their conference rooms, boardrooms and other spaces to create efficient ways for company communications in the existing building setting. AN UBEX-based virtual matrix can be created by integrating into an already existing 10 Gbit Ethernet network, where the role of crosspoint will be taken by a standard Ethernet switch. Such a virtual matrix can be extremely asymmetric with any number of input and output endpoints. The UBEX system is flexible and expandable so it is an excellent choice conforming both existing and newly developed office environments, also taking care of the transfer of audio, control and KVM signals.

UBEX is designed to be able to operate conforming data diode network (often also referred to as a unidirectional network) requirements, where data must travel only in one direction to guarantee information safety and security. These networks are common in high security environments including defense, electric power generation facilities, nuclear power stations and similar high security installations. Typically in these configurations two or more networks are connected with changing security classifications. The hardware construction of unidirectional networks only allows data to pass from one side (low side) of a network connection to another (high side), and never the other way around.



## SAFETY-CRITICAL SYSTEMS

Visualization of data or concepts in 3D, in order to expose meaning, increase understanding and help, or to actively contribute to designing in engineering all need low latency, high detail visual imaging. Designing an architectural space that needs to be experienced before being built, or sometimes even a mere concept can also be better shared visually, employing virtual and augmented reality and stereographic 3D. The speed, the color accuracy and the low latency video transfer provided by UBEX are key to 3D visualization that can greatly contribute to a wide variety of projects including 2D/3D/4D image analysis, scientific research visualization, 3D animation, 3D object scanning and also macro-photography and video. An UBEX-based medical visualization system can help examine human anatomy and reconstruct it in a real-time 3D environment for use in surgeries, medical education, simulations and trainings.



## 3D VISUALIZATIONS

## Features

- 4K UHD @ 60Hz 4:4:4 Scaler
- Multistreaming technology (multiple video transmission on a single optical link)
- Video Over IP OR Point-to-Point operation modes: UBEX can also work as a conventional extender, no Ethernet switch is required for simple extension
- Versatile operation modes: dual channel 4K transmitter or receiver or transceiver mode: sending and receiving signals simultaneously
- Operation modes can be changed by rebooting and selecting the desired mode
- Field replaceable SFP+ modules: up to Singlemode (SM) 80 km or Multimode (MM) 400 Meters
- Advanced EDID Management
- 10 Gbps on one (or two) fibers OR 20 Gbps on two (or four) fibers
- Virtual Matrix mode with UBEX units connected to a central Ethernet switch serving as crosspoint, supervised and controlled by a UBEX MMU-X200 Matrix Management Unit
- Front panel jog dial push button and color display
- Front panel feedback LEDs
- Internal power supply and front-to-back cooling air trail
- Source Locked - Low Latency Mode: receivers can be set to source-locked mode when the video transmission latency is very low

### UBEX-PRO20HDMI-F110

- Balanced stereo audio connectors
- Optional control speed connectors (RS-232, IR)

### UBEX-PRO20HDMI-F120

- USB HID (KVM)
- Balanced stereo audio connectors
- Optional control speed connectors (RS-232, IR)

### UBEX-PRO20-HDMI-F100



### UBEX-PRO20-HDMI-F110



### UBEX-PRO20-HDMI-F120





## UBEX Comperation Chart:

	UBEX-PRO20-HDMI-F100	UBEX-PRO20-HDMI-F110	UBEX-PRO20-HDMI-F120	
HW features	Link	20G	20G	20G
	Optical	✓	✓	✓
	Type of videos	HDMI 2.0	HDMI 2.0	HDMI 2.0
	Nr. of video inputs	2	2	2
	Nr. of video outputs	2	2	2
	USB HID (KVM)	x	x	✓
	Balanced stereo analog audio I/O ports	x	✓	✓
	IR I/O and RS.232 control ports	x	✓	✓
	1 Gbps Ethernet	✓	✓	✓
	Nr. of fibers (W/STANDARD SFP+)	4	4	4
Nr. of fibers (W/BIDI SFP+)	2	2	2	
SW features	4K scaling	✓	✓	✓
	Framerate conversion	✓	✓	✓
	4K UHD @ 60Hz 4:4:4	✓	✓	✓
	30 bit deep color support	✓	✓	✓
	Audio embedding and de-embedding	✓	✓	✓
	Advanced edid management	✓	✓	✓
	HDCP 2.2 compliant	✓	✓	✓
	Seamless switching	✓	✓	✓

# UBEX-PRO20-HDMI-R100

Uncompressed AV-Over-IP Multimedia System for 10G Ethernet Networks

Ubex is a fiber-optical, scaling AV-Over-IP system which allows uncompressed 4K UHD@60Hz 4:4:4 signal extension with latency-free multistreaming, designed to use in a 10G Ethernet network. UBEX operates with zero frame latency, provides seamless switching and lossless reproduction of source signals of up to 4K60Hz 4:4:4, without artifacts. It has standard, 10 Gbps SFP+ optical modules installed. The maximum reachable distance is ranging between 400 m and 80 km, depending on the type of singlemode or multimode SFP+ optical modules installed in the device. The UBEX design also favors dual-screen applications as a single UBEX device can handle 2x HDMI 2.0 video ports.

## Features

- 4K UHD @ 60Hz 4:4:4 Scaler
- Multistreaming technology (multiple video transmission on a single optical link)
- Video Over IP or Point-to-Point operation modes: UBEX can also work as a conventional extender, no Ethernet switch is required for simple extension
- Versatile operation modes: dual channel 4K transmitter or receiver or transceiver mode: sending and receiving signals simultaneously
- Virtual Matrix mode with UBEX units connected to a central Ethernet switch
- Front panel jog dial push button, color display and feedback LEDs
- Internal power supply and front-to-back cooling air trail
- Source Locked - Low Latency Mode: receivers can be set to source-locked mode when the video transmission latency is very low



## R-TYPE

**Rugged – Robust – Rental**

The R-type UBEX product variant is specifically designed to withstand the daily wear and tear impacts of dynamic, Rental&Staging type of applications. The devices shares the features of the standard UBEX-PRO20-HDMI-F100 model, with additional features and changes in build and dimensions.

## R-type Features

- Exchangeable cooling air filter inlay
- Reinforced SFP+ module connector, modules can be changed by removing protective top cover
- Standard M10 threads on side and top for safe and secure mounting onto truss assemblies
- Mounting ears and loops for secondary safety clamps
- Various reinforced optical and power connector type options (see table for details)

UBEX-Pro20-HDMI-R100	Product Name	SFP+ Module Installed	Optical Connector(s)	Ethernet Port for Control	Power Connector
	2xMM-2xDUO	2x10G SFP+ multimode	2x Neutrik OpticalCON DUO	1x Neutrik EtherCON	Neutrik PowerCON True 1
	2xSM-2xDUO	2x10G SFP+ singlemode	2xNeutrik OpticalCON DUO	1x Neutrik EtherCON	
	2xMM-QUAD	2x10G SFP+ multimode	1x Neutrik OpticalCON QUAD	2x Neutrik EtherCON	
	2xSM-QUAD	2x10G SFP+ singlemode	1x Neutrik OpticalCON QUAD	2x Neutrik EtherCON	
	2xSM-BiDi-DUO	2x10G BiDi SFP+ singlemode	1x Neutrik OpticalCON DUO	2x Neutrik EtherCON	



## UBEX Matrix Management Unit UBEX-MMU-X200



UBEX-MMU-X200 is a Matrix Management Unit (MMU) for the UBEX AV Over IP optical extender product line. With a standard non-blocking 100G Ethernet switch installed as crosspoint, a virtual matrix can be created with UBEX devices connected to the IP network as input and output endpoints. The virtual matrix established requires to be managed and controlled by the MMU also connected to the Ethernet switch.

The MMU builds and constantly updates a database of the UBEX endpoints connected, displaying a traditional crosspoint view of the virtual matrix in the Lightware Device Controller (LDC) software or the built-in web, also displaying connected, but inactive units.

Users connect and communicate directly with the MMU in matrix mode, and MMU connects to and relays communication to the endpoint UBEX units.

The MMU displays information about endpoints and the overall virtual AV network, backup and restore functions are also provided to save and load the configuration.

The MMU also manages the firmware upgrades of the connected endpoint UBEX devices, it is possible to initiate and update of the firmware on all UBEX units present in the network. Based on the communication with the UBEX endpoints, the MMU manages and supervises bandwidth use efficiency.

The MMU also serves as an interface for third party control systems and includes Lightware's proprietary Advanced EDID Management technology.

This device has standard one RU size and can be installed in a rack with the help of the rack ears. UBEX-MMU-X200 has an internal power source running on standard 110/220V connected via a standard IEC port to mains.

### Features

- Easy access front panel Ethernet and USB ports for device control
- Rear panel RS-232 and Ethernet ports for third party control input
- UBEX network connection: RJ45 1 Gbps Ethernet port or 1 Gbps SFP link module
- Jog-dial push button and color display
- Advanced EDID Management
- IEC standard, 110/220V power inlet port
- Standard, 1 RU size to be installed on rack with supplied rack ears