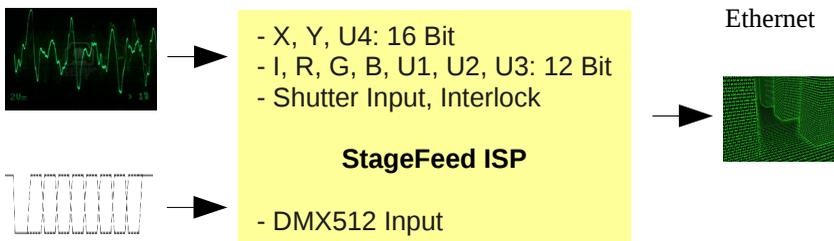


Congratulations on your purchase of this innovative high-tech tool.

StageFeed ISP is a pocket size media converter used for the conversion of analog laser projector signals and DMX512 laser projector control to binary Ethernet data streams. The converter captures all ISP signals, has a superior resolution in frequency and accuracy and can easily copy signals of high-end systems into the digital domain.

StageFeed ISP receives an ILDA Standard Projector (ISP) input and provides packetized data streams. Both subsets are implemented, the analog ISP-DB25 input as well as a DMX512 input for use with ISP-DMX.



For its network output, the converter implements a preliminary version of IDN, the ILDA Digital Network protocol currently under development. The converter captures its analog inputs simultaneously and transmits a stream of samples, packed into IP-packets, to configured and/or registered hosts.

Both streams (waveforms and DMX512) are packetized, time stamped and precisely transmitted to keep a close match between the time on the wire and the time in the packet, since this is important for network jitter evaluation and re-synthesis latency. DMX512 data is transmitted in blocks of sub-frame length to be able to achieve ultra low latencies.

Due to the pure waveform-oriented signal processing and transmission, the converter can handle any content on its inputs, that remains within the electrical limits. This includes all frame-less content such as abstracts or Lissajous figures.

The converter can be used in conjunction with StageMate ISP to build a bridge across (or tunnel through) a network to teleport waveforms from one end to another in real time. When directly connecting the converters by an RJ-45 patch cable, the devices act as a digital substitute for an analog ISP cable. This peer mode is always available and requires no configuration. For more complex setups or in conjunction with other senders, the converter supports AutoIP, DHCP and static configuration. It further supports mature mechanisms for enumeration and configuration.

System Features:

- Fully implemented ISP-DB25 and ISP-DMX ports.
- IDN (ILDA Digital Network, under development) on 100 MBit Ethernet.
- Zero configuration ILDA ISP cable substitute in conjunction with StageMate ISP peer mode.
- Compatible receiver scan, nonvolatile storage and building of bridges; the scan works for directly connected devices and across switches.
- Support for configured, self initiated bridges and externally initiated bridges to be used with monitors and recorders.
- Receiver configuration through UnitID and IP address to support dynamic address assignments and static assignments behind routers.

Hardware Features

- 3x16 Bit ADC for X, Y, User 4 signals.
- 7x12 Bit ADC for I, R, G, B, User 1, User 2, User 3 signals.
- Interlock loop monitoring.
- Calibrated ADC inputs (offset and gain).
- Nominal throughput of 100.000 samples per second, full resolution, all channels simultaneously (200.000 samples per second maximum).
- 100 MBit Ethernet MAC/PHY with auto MDI-X.
- Power supply through a Micro-USB socket (PC or mobile charger).
- Hand/Pocket-Size adapter, 60 x 56 x 19 mm.

Connectors and Indicators



1. DMX512 LED (green): signals ISP-DMX input activity.
2. ISP LED (green): signals ISP-DB25 interlock closed.
3. Micro USB Connector: power supply, 5V/300mA.
4. Power LED (green): signals applied power.
5. RJ45 Connector: 100MBit Ethernet, auto MDI-X / crossover.
6. Bridge LED (blue): indicates a fully operational bridge (solid) or the search for configured partners (blink)
7. Error LED (red): signals boot up, conflicts and internal errors.
8. Push Button: configuration reset, press for under 5 seconds during boot up for user configuration reset (common parameters); for factory reset (all parameters), press for more than 5 seconds; during operation, press for network scan and persistent partner configuration (clears in case no partner can be found).
9. Peer LED (green): indicates a zero-configuration peer link.
10. Link LED (green): standard Ethernet link/activity LED, indicates an active link to another Ethernet PHY.

11. ISP-DMX

2.5mm Jack	DMX512	XLR5	XLR3
Tip	DMX-	2	2
Ring	DMX+	3	3
Sleeve	Ground	1	1

Due to space restrictions of the pocket-sized unit, the DMX512 output uses a 2.5mm jack socket. Optionally available adapters, custom cables or DMX512 and audio adapters 2.5mm -> 3.5mm -> XLR etc. may be used.

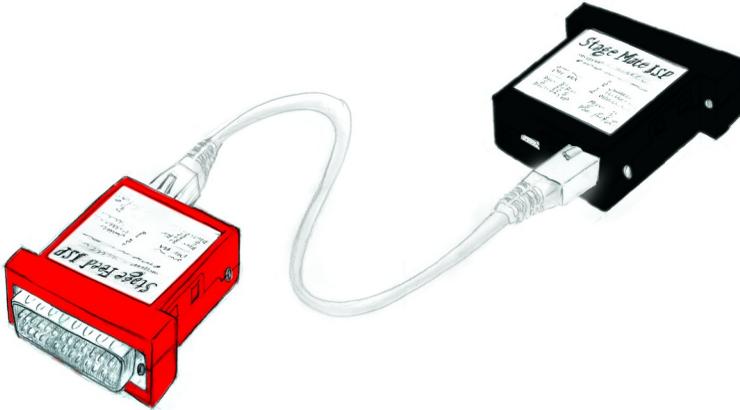
12. ISP-DB25

1	X +	14	X -
2	Y +	15	Y -
3	Intensity +	16	Intensity -
4	Interlock A	17	Interlock B
5	R +	18	R -
6	G +	19	G -
7	B +	20	B -
8	User 1 +	21	User 1 -
9	User 2 +	22	User 2 -
10	User 3 +	23	User 3 -
11	User 4 +	24	User 4 -
12	Projector return (not used)	25	Ground
13	Shutter		

StageFeed ISP samples X, Y and User 4 with 16 bit resolution and accepts +/- 10V truly differential (both lines can carry up to +/- 10V with respect to ground). Intensity, R, G, B, User 1, User 2 and User 3 have 12 bit resolution and accept 0..5V truly differential (both lines can carry +/- 10V with respect to ground). The interlock is used as an operation enable condition and is monitored with a digital waveform and edge detection. The converter is designed to be connected directly to ISP-DB25 compatible outputs.

Peer Mode

Digital ILDA ISP (ILDA Standard Projector) cable substitute

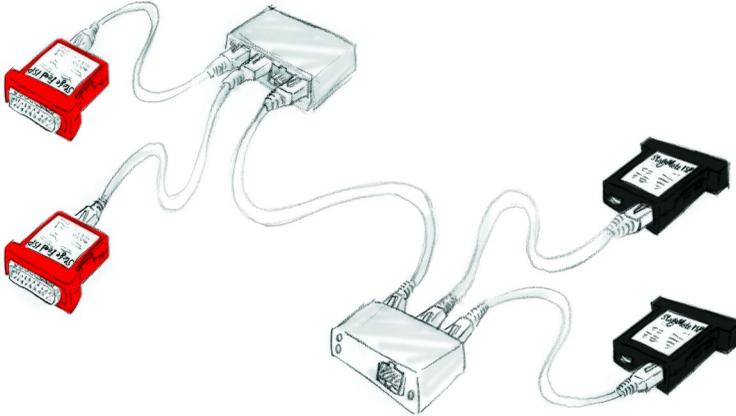


This mode is used as a direct substitute for the ILDA ISP-DB25 and ISP-DMX cables used with most laser projectors. Both converters (StageFeed ISP and StageMate ISP) are connected directly to each other via a standard Ethernet patch cable. Cable length should remain within the 100-meter limit of Cat5/Cat5e cabling.

Auto negotiation detects the peer and does all configurations without user intervention. When connected, the left Peer-LED on both RJ45 sockets light up and StageFeed ISP indicates the bridge with its blue LED.

DB25 signal streaming starts when StageFeed's interlock is closed and DMX512 streaming starts when data is received. StageMate indicates the active session with its blue LED. Both converters indicate streaming with their green ISP and DMX512 LEDs.

Domain mode

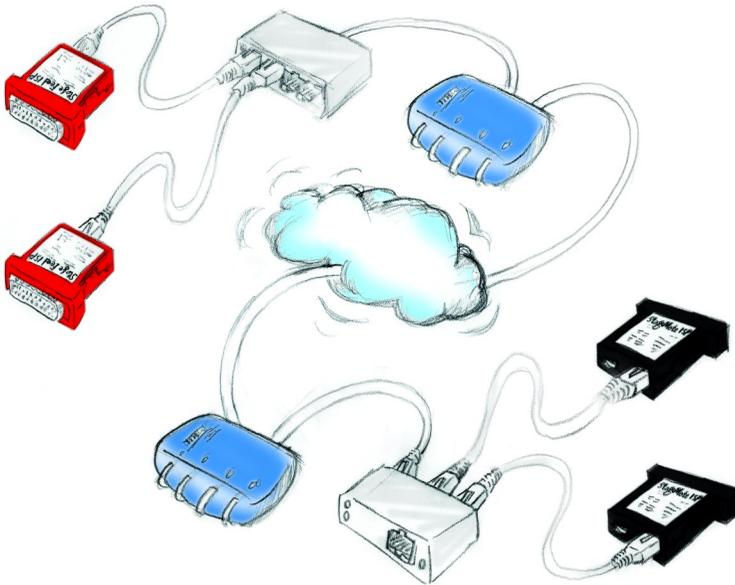


This mode is used to bridge large distances, isolate devices electrically or use existing networking infrastructures. All streams originating from StageFeed ISP converters are combined with an Ethernet switch and transmitted across copper or fiber cables. Then split by a second Ethernet switch and fed into the StageMate ISP converters. The mode can be used to replace ISP-DB25 splitter cables by configuring StageFeed to establish multiple bridges.

StageFeed needs to be paired with one or multiple StageMates. This is done by either connecting the converters directly with a patch cable (Peer Mode) or connecting StageFeed and its StageMates through a separate switch. Once the links are up, StageFeed's button must be pressed with a pin-like tool. The blue bridge-LED will flash and the setup is stored. Pairing information can be noted on the converters backsides. Dividing can be done simply by pressing StageFeed's button while NO Ethernet cable is plugged into its RJ-45 socket.

When connected in the target setup, StageFeed starts building the stored bridges. A solid blue LED indicates that all bridges are up. A flashing blue LED indicates that one or more link partners could not be found.

Routed mode



This mode can be used to bridge even larger distances or infrastructures. Since there is no common broadcast domain, StageFeed has no way of identifying its partner using the unique UnitID. Setup is more complicated and IP addresses are the only way of finding the configured StageMate.

Either the IP addresses of all StageMates have to be configured statically or DHCP has to guarantee that the assigned IP addresses are same for setup and operation. Apart from this, the setup procedure is the same as used in the domain mode.

Please keep in mind, that StageFeed is transmitting real time content and thus requires reasonable bandwidth. StageMate furthermore needs to reassemble the timing in the magnitude of microseconds in order to copy the signals correctly. Package drops, large network jitter or reception of large amounts of back-to-back Ethernet packets will result in dropouts.

Computer Connections

As with any networking device, the destination of the Ethernet data can naturally be a PC, notebook, tablet or smartphone, i.e., practically any device that can receive IP packets and run appropriate software. The stream can be recorded, safety analyzed, filtered or transformed. The converter also features sophisticated mechanisms for scan/enumeration, parameter retrieval and plug and play operation.

Wireless Ethernet

The idea of getting rid of the bulky ISP cables – as well as getting rid of every other cable – is something that appeals to almost everyone, and there is nothing wrong with this. It's brilliantly convenient, and has been proven for years. Others did it, we did it for years - and it just works. The only remarkable thing in this case is that all this is frame-oriented. This means that frames containing laser points or samples (curves and vectors in our case) are transmitted one after another like individual pictures in a movie. One frame is repeated by the converter until the next frame arrives, and so on. StageFeed cannot provide such data on its own, as it lacks the information of where a frame begins and where it ends.

The situation is different, however, when streaming waveforms. This is an uninterruptible stream of samples that needs to reach its endpoint precisely on time. Extreme caution regarding equipment and setup must be taken, and technicians need to know exactly what they are doing. At the moment further research and improvements need to be carried out on link stability, timeouts and long back-to-back transmissions after wireless link recovery. Fallback in TCP and large increases in latency are subject to ongoing research as well. Generally, as long as good industrial routers (sending at 2.4 and 5 GHz simultaneously, with reliant reassembly) are used with directional radio and the Fresnel zone is taken care of – wireless real time streaming is possible, and has been used with success.

And - in the event packets or the entire link are really lost – plug and play saves the day. The IDN stream, sent by StageFeed contains synchronization points that can be used by the receiver to automatically continue its output within a fraction of a second.

Additional Features

StageFeed ISP is composed of three main parts. The main board with converters, Ethernet phy/magnetics, power and sockets; the processor board with FPGA and memory; and the firmware (StageCore1) with FPGA configuration, software and data files.

Being based on reconfigurable hardware and using documented hardware interfaces, StageFeed ISP can run third party configurations and firmware. Alternatively, StageCore1 can be configured for an application and be run on other hardware platforms that implement the required interfaces.

StageCore1 has a modular architecture and is shared among multiple applications. This makes it possible for example, to operate ADC – DSP – DAC inside projectors with analog ISP inputs. StageCore1 will be further developed, extended and improved – and since it defines it's own hardware by configuring an FPGA, be able to perform complex operations in real time, interface to new converters or even implement a digital scanner amplifier.

Optional features (separately licensed)

- ISP signal splitter, support for 2 further receivers (total of 3) for signal duplication or multiplication (more in development).
- Additional drain for remote host initiated brides for monitoring or recording.

Planned StageCore1 features (some possibly require a separate license)

- WiFi research/improvements.
- Channel configuration to scale network bandwidth.
- Digital filter and signal conditioning (DSP).

Configuration Reset

StageCore1 implements a two stage configuration reset concept. The first stage (user configuration reset) is used merely to enable the device to run in a plug and play environment. It usually does not really reset values but changes switches, that were used to enable specific user settings. The parameters set by the user usually remain unchanged.

An example for this is the Ethernet configuration. The user may have set up and enabled a static IP address which may not work with the current network environment. To quickly make the device run again, user configuration reset can be used. This simply disables the static address and switches to the default DHCP/AutoIP setting, which either retrieves an address or finds a link-local address.

The second stage is the factory reset. This can be used to set all configuration parameters to their original conditions. Parameters such as bridge routes, device name or device icon are reset as well.

IDN

The ILDA Digital Network (IDN) combines efforts to establish a standard that is a 100% digital equivalent of the ILDA Standard Projector (ISP). Being an equivalent includes that ISP must be convertible to IDN and vice versa (with IDN being a superset). In order to be established as a standard however, many steps need to be taken, including proof of concept and compatibility to existing standards.

Until that point in time, StageCore1 bridges the gap by implementing a preliminary version of IDN that has all features needed for the operation of StageFeed ISP. If this protocol were proprietary, that would be the end of the story - but IDN aims to be an open standard. With extensions or changes in IDN, StageCore1 will be updated, and a new image of the firmware can be loaded into flash memory as the user so desires or requires.