TechLogix Networx
Signal Connectivity
& Audio-Visual Accessory Guide

AV over IP.   *AV over Fiber.*   *AV over Twisted Pair.*   *Signal Routing & Management.*
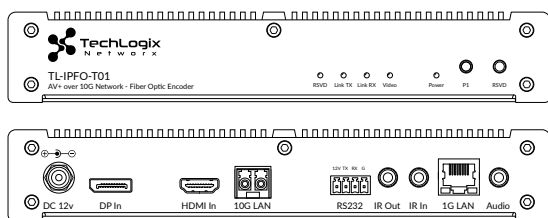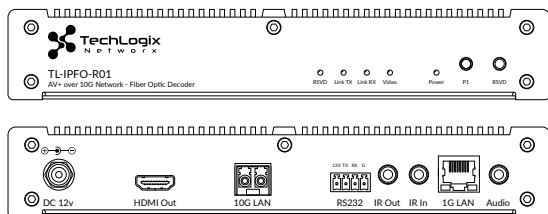
Q1 2017

Many manufacturers offer AV over IP solutions and many manufacturers offer control products, but few manufacturers put both together into a seamless, easy-to-integrate and easy-to-operate system. The TechLogix IPFO system combines AV over IP encoders and decoders with setup, configuration and control software which eliminates the need for extensive programming and third-party control system drivers.

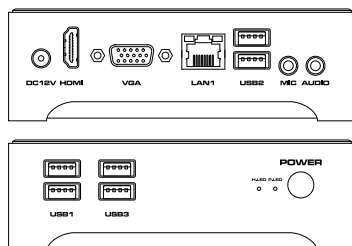| IPFO System Features	
- Fiber-based signal transmission - Point-to-point or many-to-many distribution - 4K seamless switching - Network switch agnostic - True IP switching — can run on a stand-alone network or on a standard data network - Deploys IGMP snooping — won't slow down network data traffic	- Support for HDMI & DisplayPort sources - Built-in video wall processing with bezel correction - 18G HDMI signal support over a 10G network - HDMI 2.0 & HDCP 2.2 compliant - Less than one frame latency - RS232 & IR control signal distribution - 1G Ethernet signal pass-through

The IPFO system leverages Aptovision Blueriver NT+ chipsets to transmit zero-latency 4K@60 4:4:4 HDMI up to 300m (1,000 ft.) over OM3 fiber optic cabling using a 10G network. Multiple encoders and decoders can be blended into a seamless, any-input-to-any-output system using TechLogix TLXpress software.

| TL-IPFO-T01	Transmitter / Encoder
- (1) HDMI & (1) DisplayPort input - (1) SFP+ duplex LC module output - Automatic or manual switching between inputs - 300m extension from the connecting node (decoder or network switch)	- RS232 port for control routing with injectable strings - IR input/output ports for control routing with injectable strings - 1G internal switch Ethernet port - Embedded audio input

| TL-IPFO-R01	Receiver / Decoder
- (1) HDMI output - (1) SFP+ duplex LC module input - 300m extension from the connecting node (encoder or network switch) - De-embedded audio output	- RS232 port for control routing with injectable strings - IR input/output ports for control routing with injectable strings - 1G internal switch Ethernet port

TL-IPTP-CI	Control interface & TLXpress software server
- Connects to the network via a network switch or the Ethernet port on a IPFO Series encoder or decoder - Twisted pair network port - Requires internet access for operation	- Ubuntu Linux operating system - Runs TLXpress server software - Operates as a live controller or as a background logic device - Only one unit required per system

TechLogix pairs IPFO Series hardware with TLXpress software: a single platform for setup, configuration and ultimate system control. Plus, TLXpress is compatible with other manufacturers' technology, including SVSI's N2000 Series, Matrox Maevex Series and any other company leveraging the Aptovision BlueRiver NT/NT+ API.

TLXpress Software	Setup & control software
- Runs on the TL-IPTP-CI control interface - Allows system setup, configuration & control - Designed in HTML5 - Each hardware node requires licensing (TL-IPTP-LIC)	- Requires Chrome browser for live control - TLXpress is compatible with other manufacturers' technology including: SVSI N2000 Series, Matrox Maevex Series & Aptovision BlueRiver NT/NT+
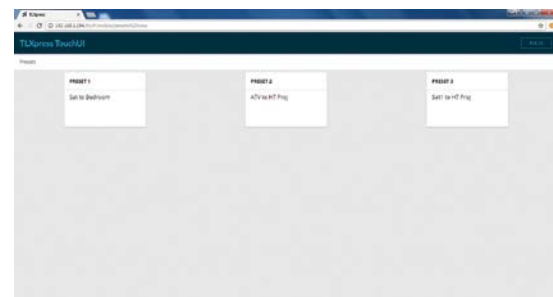
The TLXpress platform provides the benefit of a drag-and-drop architecture, allowing virtually hundreds of encoders and decoders to be identified and programmed in minutes, including preset routing which can be triggered by a third-party control system. TLXpress breaks system deployment into three simple steps:
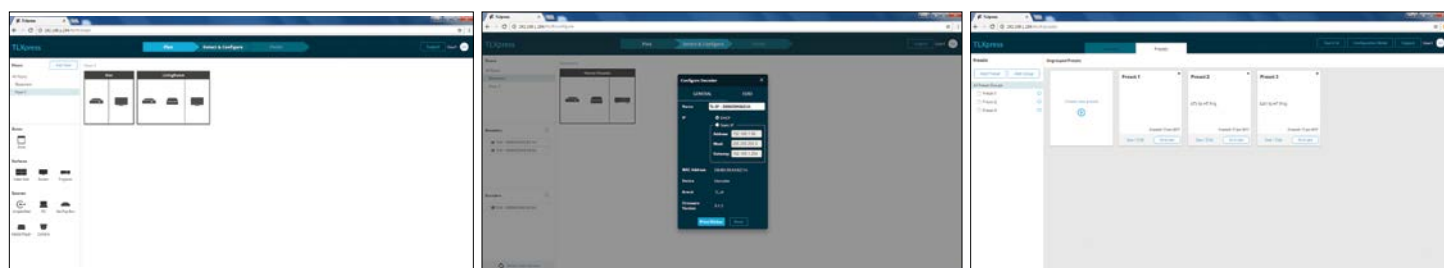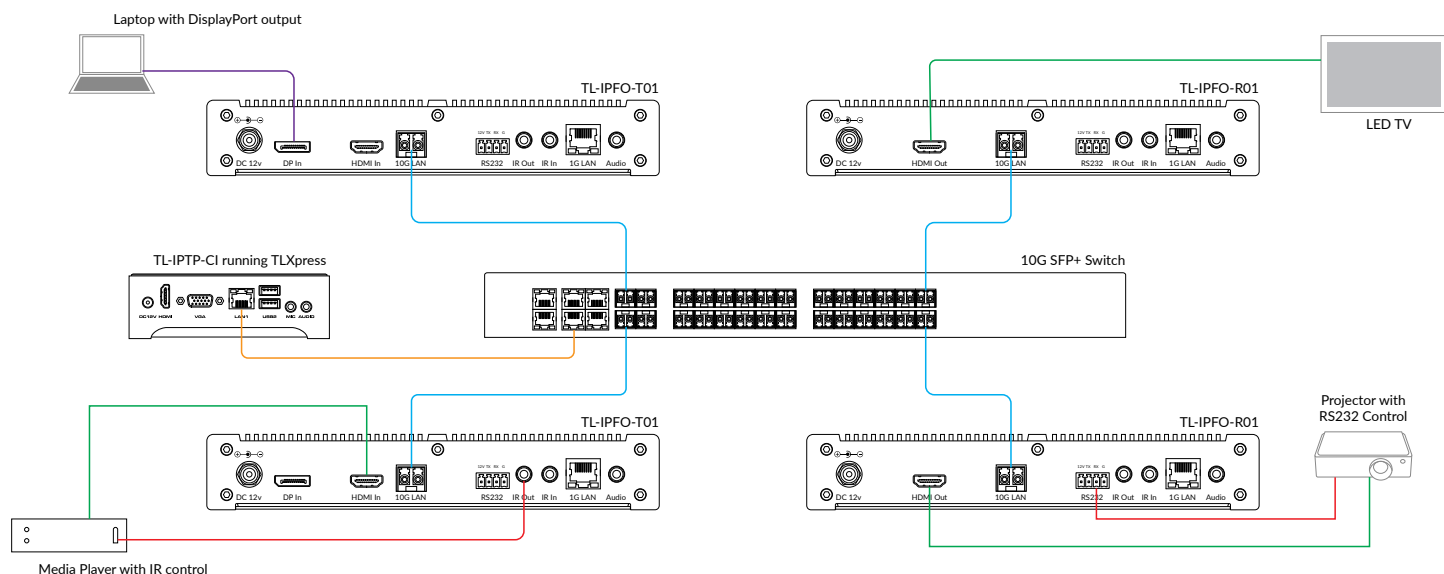
Step 1: *Plan*

1. Create & name virtual floors, rooms & zones
2. Create & name sources & destinations
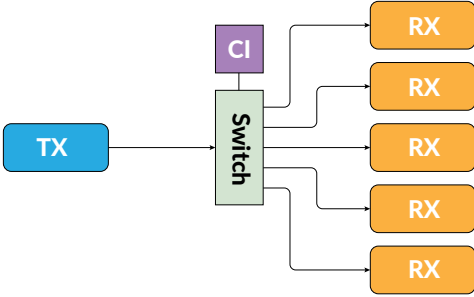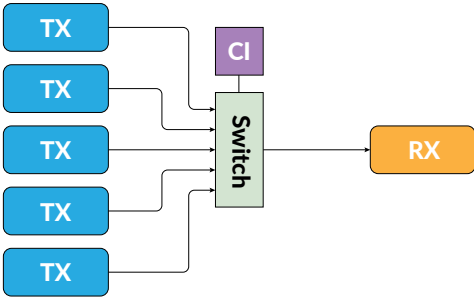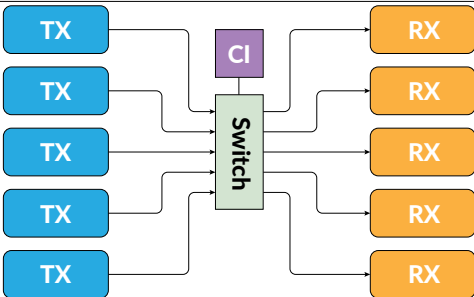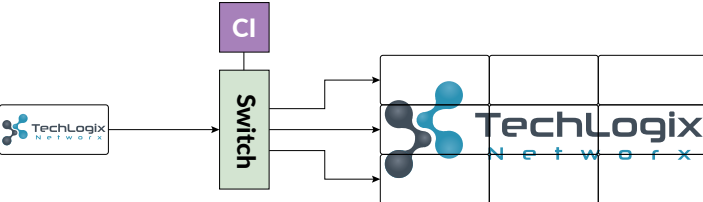
Step 2: *Detect & Configure*

1. Auto-detect compatible encoders & decoders on the network
2. Profile the encoders & decoders
3. Link the encoders & decoders to the sources & destinations

Step 3: *Finish & Control*

1. Export the device & system configuration list
2. Create signal routing presets
3. Trigger presets through a 3rd party control system or "Live View" TLXpress software

Laptop with DisplayPort output

TL-IPFO-T01

DC 12v   DP In   HDMI In   10G LAN   RS232   IR Out IR In   1G LAN   Audio

TL-IPFO-R01

LED TV

DC 12v   HDMI Out   10G LAN   RS232   IR Out IR In   1G LAN   Audio

TL-IPTP-CI running TLXpress

DC 15V HDMI   VGA   LAN   USB2   MIC AUDIO

10G SFP+ Switch

TL-IPFO-T01

DC 12v   DP In   HDMI In   10G LAN   RS232   IR Out IR In   1G LAN   Audio

Media Player with IR control

Projector with RS232 Control

TL-IPFO-R01

DC 12v   HDMI Out   10G LAN   RS232   IR Out IR In   1G LAN   Audio

There are typically five different configurations in which TechLogix IPFO Series products are installed: point-to-point, point-to-many, many-to-point, many-to-many and video wall applications. Some applications even require multiple configurations in a single system, and the IPFO Series is an ideal choice due to the flexible hardware and software design. The below information details various example configurations, as well as the hardware and software required.

Point-to-Point Application	A single encoder connected to a single decoder
Encoder required: **one TL-IPFO-T01** Decoder required: **one TL-IPFO-RO1** Network switch required: **none** Physical control interface: **none** Software required: **none** Licensing required: **none**	TX → RX

Point-to-Many Application	A single encoder connected to multiple decoders
Encoder required: **one TL-IPFO-T01** Decoder required: **multiple TL-IPFO-RO1** Network switch required: **yes** Physical control interface: **one TL-IPTP-CI** Software required: **TLXpress (included with TL-IPTP-CI)** Licensing required: **one TL-IPTP-LIC per encoder & decoder**	TX → CI / Switch → RX, RX, RX, RX, RX

Many-to-Point Application	Multiple encoders connected to a single decoder
Encoder required: **multiple TL-IPFO-T01** Decoder required: **one TL-IPFO-RO1** Network switch required: **yes** Physical control interface: **one TL-IPTP-CI** Software required: **TLXpress (included with TL-IPTP-CI)** Licensing required: **one TL-IPTP-LIC per encoder & decoder**	TX, TX, TX, TX, TX → CI / Switch → RX

Many-to-Many Application	Multiple encoders connected to multiple decoders
Encoder required: **multiple TL-IPFO-T01** Decoder required: **multiple TL-IPFO-RO1** Network switch required: **yes** Physical control interface: **one TL-IPTP-CI** Software required: **TLXpress (included with TL-IPTP-CI)** Licensing required: **one TL-IPTP-LIC per encoder & decoder**	TX, TX, TX, TX, TX → CI / Switch → RX, RX, RX, RX, RX

Video Wall Application	A single encoder connected to multiple decoders
Encoder required: **one TL-IPFO-T01** Decoder required: **multiple TL-IPFO-RO1** Network switch required: **yes** Physical control interface: **one TL-IPTP-CI** Software required: **TLXpress (included with TL-IPTP-CI)** Licensing required: **one TL-IPTP-LIC per encoder & decoder**	TechLogix Networx → CI / Switch → TechLogix Networx

How is the IPFO Series different from other AV over IP solutions?

The IPFO Series doesn't require a stand-alone network.
The system employs Internet Group Management Protocol (IGMP) snooping that maps the high-bandwidth AV signal paths and forces signals to only be sent to the relevant network ports. Standard network traffic is completely unaffected.

The IPFO Series support 18G HDMI on a 10G network.
The IPFO encoders enable slight compression on signals over 10G and the decoders decompress the signals back to their native state. Signals under 10G are not compressed at all.

The IPFO Series is network switch agnostic.
The IPFO system doesn't require a proprietary network switch—almost any 10G switch is compatible with the system.

TLXpress software eliminates the need for 3rd party control system drivers.
The drag-and-drop software allows presets to be created in minutes, and 3rd party control systems simply recall the presets using HTTP.

TLXpress software allows even the most sophisticated system to be installed quickly.
TLXpress software is a drag-and-drop platform that eliminates tedious configuration and command control writing.

Do I need to pay for TL-IPTP-LIC licensing?

If you are using the IPFO Series in a point-to-many, many-to-point, many-to-many or video wall application, TL-IPTP-LIC licensing is required for at least one year. This will allow you to leverage TLXpress software to setup, configure and optionally control the system, as well as receive regular system updates and enhancements.

Is TL-IPTP-LIC licensing required each year?

No, TL-IPTP-LIC licensing is only required for the first year and can be built into the initial cost of the system. Subsequent years of licensing are optional.

What happens if I don't renew the licensing? Will my system still operate?

Yes, the IPFO Series system will still operate as originally installed; however, the system will not receive TLXpress updates and feature enhancements. Plus, the addition of new encoders, decoders and major reconfigurations will require new licensing (just for the added components).

If I let my licensing lapse and then want to upgrade and update the system, can I?

Yes, TechLogix offers "catch up" licensing for systems with lapsed licensing that desire major upgrades or revisions.

The Case for Recurring Revenue

Reoccurring revenue is a hot topic for integrators, and the TechLogix IPFO Series delivers an opportunity for an annual customer contract.

TLXpress requires licensing for many different applications (as outlined on page 3), and this licensing can be renewed on a yearly basis.

Renewing will provide regular system updates, feature enhancements, unlocked TLXpress software for major configuration changes, and preferred customer service and warranties.
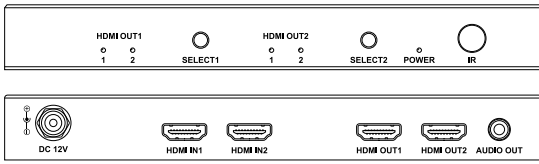
Not renewing after year one won't affect the system performance or configuration; however, the system won't receive updates as new versions and enhancements become available.

Annual end-user TL-IPTP-LIC licensing is a great opportunity to stay close to your customers and create a regular source of revenue.
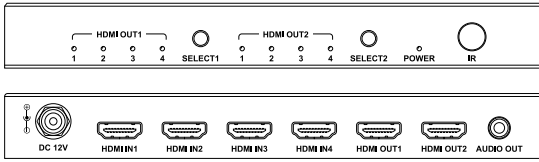
Why isn't the cost of licensing built into the cost of the hardware?

Not all applications require licensing, and building it into the cost of the hardware would drive up hardware costs.

TL-2X2-HD
2x2 HDMI matrix switcher

- (2) HDMI inputs to (2) HDMI outputs
- Manual switching via IR and front panel buttons
- Built-in cable EQ & signal regeneration

- Analog audio de-embedding on output channel 1
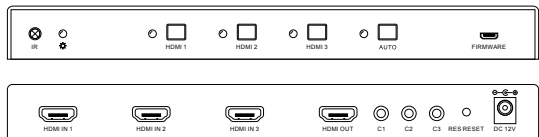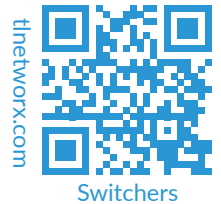- HDMI 1.4 & HDCP 1.4 compliant
- 10G max bandwidth
- 4K@30 compliant

TL-4X2-HD
4x2 HDMI matrix switcher

- (4) HDMI inputs to (2) HDMI outputs
- Manual switching via IR and front panel buttons
- Built-in cable EQ & signal regeneration

- Analog audio de-embedding on output channel 1
- HDMI 1.4 & HDCP 1.4 compliant
- 10G max bandwidth
- 4K@30 compliant

TL-4X1-HD
10G 4x1 HDMI switcher

- (4) HDMI inputs to (1) HDMI output
- Manual switching via front panel, RS232 & IR
- Auto-switching with video sensing

- Analog audio de-embedding
- Audio Return Channel (ARC)
- HDMI 1.4 & HDCP 1.4 compliant
- 10G max bandwidth
- 4K@30 compliant

TL-4X1-HD2
18G 4x1 HDMI switcher

- (4) HDMI inputs to (1) HDMI output
- Manual switching via front panel, RS232 & IR
- Auto-switching with video sensing

- Analog audio de-embedding
- HDMI 2.0 & HDCP 2.2 compliant
- 18G max bandwidth
- 4K@60 compliant

TL-SM3X1-HD
3x1 HDMI switcher with display control

- (3) HDMI inputs to (1) HDMI output
- Manual switching via front panel or through compatible table inserts
- Auto-switching with video sensing

- Controls display via CEC commands
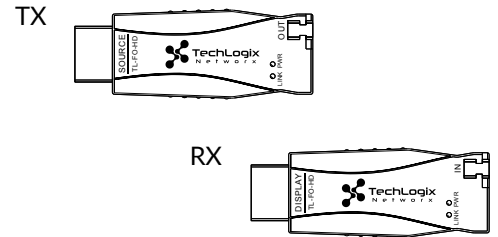- HDMI 1.4 & HDCP 1.4 compliant
- 10G max bandwidth
- 4K@30 compliant

TechLogix manufactures a comprehensive line of presentation switchers that handle HDMI, DisplayPort and VGA signals. Complete information is available online at www.tlnetworx.com or in our *Corporate AV & Light Commercial Design Guide.*
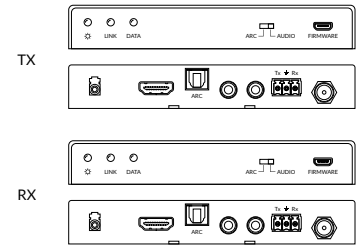
tlnetworx.com

Switchers

www.tlnetworx.com | +1-866-445-4405

TL-FO-DVI — 300m DVI extender set

- Transmit DVI over a single fiber optic cable
- LC connectors for fiber connection
- Male DVI connectors for direct connection to devices

- Single & multimode fiber compatible
- Extend 4K & 1920x1200 video up to 300m (1,000 ft.)
- Powered via USB or standard AC
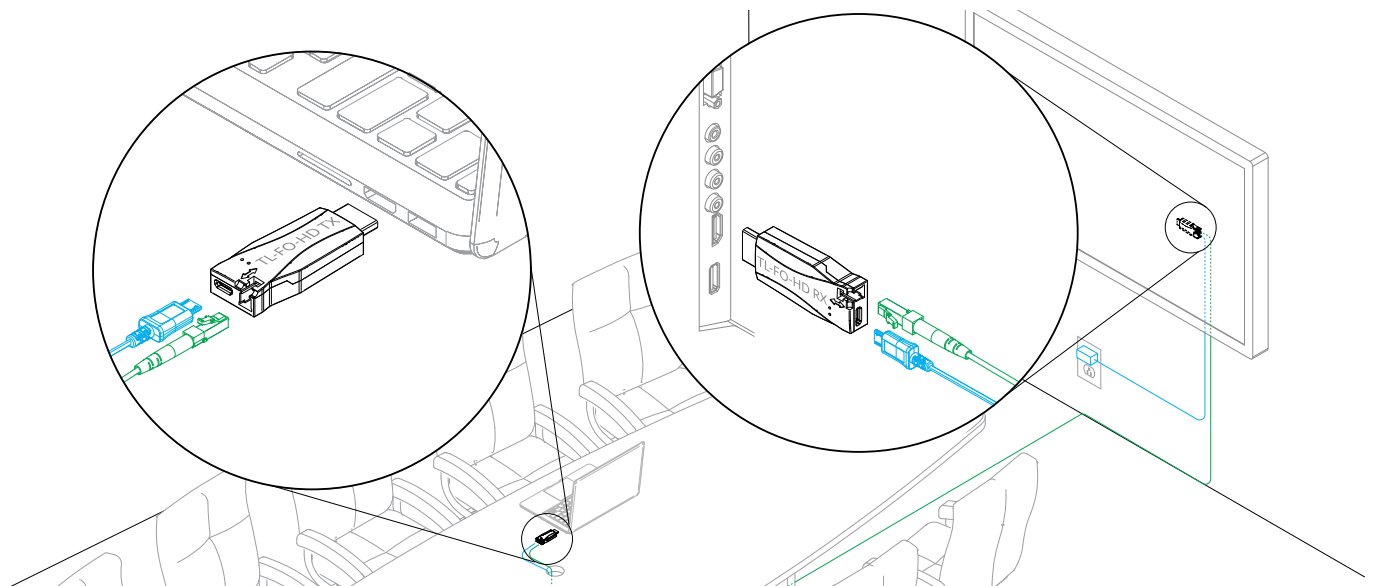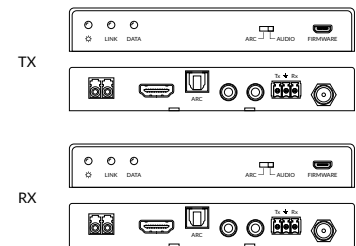- Immune to RF & EM interference
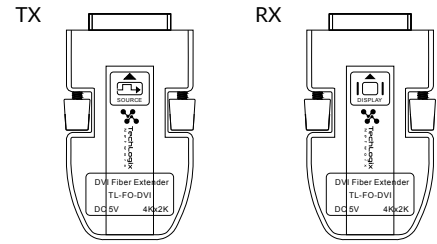
TL-FO-HD — 300m 10G HDMI extender set

- Transmit HDMI over a single fiber optic cable
- LC connectors for fiber connection
- Male HDMI connectors for direct connection to devices
- Single & multimode fiber compatible

- Extend 1080p up to 400m (1,300 ft.)
- Extend 10G HDMI up to 300m (1,000 ft.)
- HDMI 1.4 & HDCP 1.4 compliant
- Powered via USB or standard AC
- Immune to RF & EM interference

TL-FO-HDC2 — 300m 18G HDMI & control extender set

- Transmit HDMI, IR & RS232 over a *single* fiber optic cable
- LC connectors for fiber connection
- Single & multimode fiber compatible
- Audio Return Channel (ARC)

- Extend 18G HDMI up to 300m (1,000 ft.)
- HDMI 2.0 & HDCP 2.2 compliant
- 4K@60 compliant
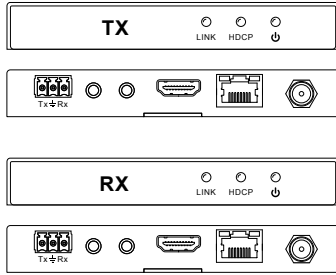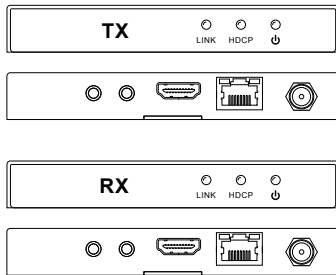- Immune to RF & EM interference

TL-FO2-HDC2 — 300m 18G HDMI & control extender set

- Transmit HDMI, IR & RS232 over *two* fiber optic cables
- LC connectors for fiber connection
- Single & multimode fiber compatible
- Audio Return Channel (ARC)

- Extend 18G HDMI up to 300m (1,000 ft.)
- HDMI 2.0 & HDCP 2.2 compliant
- 4K@60 compliant
- Immune to RF & EM interference

TL-TP100-HDC
100m HDMI & control extender set

- Transmit HDMI, RS232, IR & Ethernet over a single twisted pair cable
- Embedded bi-directional RS232 & IR control
- HDBaseT certified

- Ethernet pass-through
- System powered from either the transmitter or receiver
- Extend 1080p up to 100m (330 ft.)
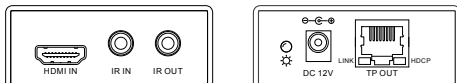- Extend 10G HDMI (4k/60 4:2:0, 4k/30 4:4:4) up to 70m (230 ft.)

TL-TP70-HDC
70m HDMI & control extender set

- Transmit HDMI, RS232 & IR over a single twisted pair cable
- Embedded bi-directional RS232 & IR control
- HDBaseT certified

- System powered from either the transmitter or receiver
- Extend 1080p up to 70m (220 ft.)
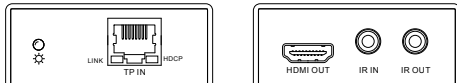- Extend 10G HDMI (4k/60 4:2:0, 4k/30 4:4:4) up to 40m (130 ft.)

TL-TP70-HDIR
70m HDMI & IR extender set

- Transmit HDMI & IR over a single twisted pair cable
- Embedded bi-directional IR control
- ARC on HDMI and transmitter coax output

- System powered from either the transmitter or receiver
- Extend 1080p up to 70m (220 ft.)
- Extend 10G HDMI (4k/60 4:2:0, 4k/30 4:4:4) up to 40m (130 ft.)

TL-TP70-HDIR-LT
70m HDMI & IR extender set

- Transmit HDMI & IR over a single twisted pair cable
- System powered from the transmitter —no power required at the receiver

- Embedded bi-directional IR control
- Extend 1080p up to 70m (220 ft.)
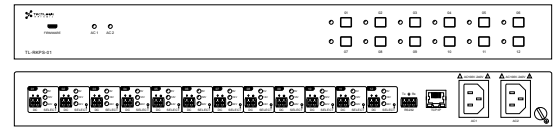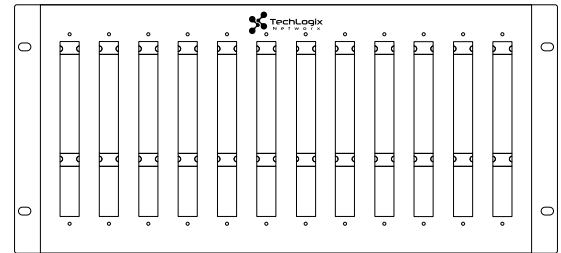- Extend 10G HDMI up to 40m (130 ft.)

TL-TP50-HDIR
50m HDMI & IR extender set

- Transmit HDMI & IR over a single *shielded* twisted pair cable
- IR transmission from the receiver to the transmitter
- System powered at both the transmitter & receiver

- Extend 1080p up to 50m (165 ft.)
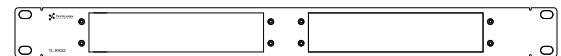- HDMI loop-through for a local display
- Adjustable EDID

| TL-RKPS-01	Rackmount power management
- Provides power to 12 DC-powered devices - Each output channel is individually selectable between 5, 12 & 24VDC - 15W per channel output max / 180W total system max	- Two 100-240VAC power input channels with automatic switching - Remote channel on/off/reset via RS232, Ethernet or built-in webserver - Front panel control & keylock - 100ms sequencing on startup

| TL-RK01	Twelve device rack-mounting system
- Rack mount up to 12 devices - Includes mounting hardware - Includes blanks for unused slots - 5U chassis height (ships flat)	- Quick mount design - Compatible with TechLogix models: TL-TP100-HDC, TL-TP70-HDC, TL-TP70-HDIR

TL-RK02	Four device rack-mounting system
- Rack mount up to 4 devices - Includes mounting hardware - Includes blanks for unused slots - 1U chassis height	- Quick mount design - Compatible with TechLogix models: TL-TP100-HDC, TL-TP70-HDC, TL-TP70-HDIR

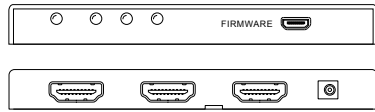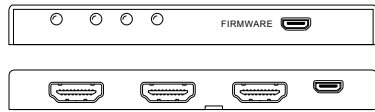| TL-IR-CC	Extender IR coupling cable
- Connects IR outputs from control systems directly to extenders - 33 – 55kHz wide-band compatible	- Supports 3.3V, 5V & 12V IR systems - Control system agnostic - 1.65m (5.4 ft.) length
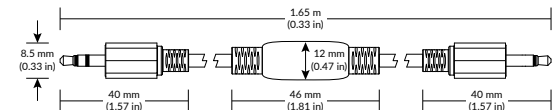
TL-RKPS-01 Rear Panel
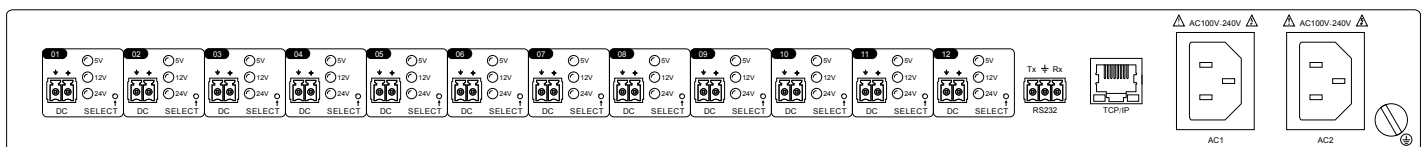
The TL-RKPS-01 eliminates the need for "wall-wart" and "line-lump" power supplies that traditionally clutter the audio-visual rack by providing channel selectable 5, 12 and 24VDC power to up to 12 devices simultaneously.
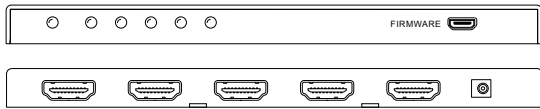
Individual channels are controlled via the front panel, RS232, Ethernet or through a built-in webserver. Additional features such as 100ms startup sequencing, front panel keylock, input channels rated for 100-240VAC, and dual redundant power inputs make the TechLogix power hub incredibly versatile and comparable to most traditional power distribution units.
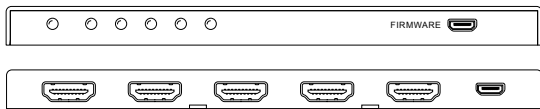
TL-DA12-HD	10G 1x2 HDMI distribution amplifier
- (1) HDMI input - (2) HDMI outputs - HDMI 1.4 & HDCP 1.4 compliant - 102 mm x 70 mm x 11 mm (4.0 in x 2.7 in x 0.4 in)	- EDID pass-through - 10G max bandwidth - 4K@30 compliant

TL-DA12-HD2	18G 1x2 HDMI distribution amplifier
- (1) HDMI input - (2) HDMI outputs - HDMI 2.0 & HDCP 2.2 compliant - 102 mm x 70 mm x 11 mm (4.0 in x 2.7 in x 0.4 in)	- EDID pass-through - 18G max bandwidth - 4K@60 compliant

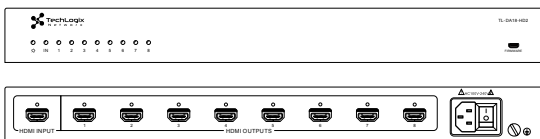| **TL-DA14-HD**	10G 1x4 HDMI distribution amplifier
- (1) HDMI input - (4) HDMI outputs - HDMI 1.4 & HDCP 1.4 compliant - 152 mm x 70 mm x 11 mm (6.0 in x 2.7 in x 0.4 in)	- EDID pass-through - 10G max bandwidth - 4K@30 compliant

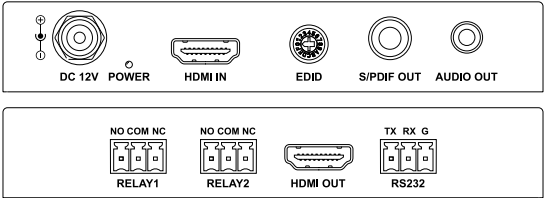| **TL-DA14-HD2**	18G 1x4 HDMI distribution amplifier
- (1) HDMI input - (4) HDMI outputs - HDMI 2.0 & HDCP 2.2 compliant - 152 mm x 70 mm x 11 mm (6.0 in x 2.7 in x 0.4 in)	- EDID pass-through - 18G max bandwidth - 4K@60 compliant

TL-DA18-HD2	18G 1x8 HDMI distribution amplifier
- (1) HDMI input - (8) HDMI outputs - HDMI 2.0 & HDCP 2.2 compliant - 257 mm x 90 mm x 18 mm (10.2 in x 3.6 in x 0.7 in)	- Built-in EDID management - 18G max bandwidth - 4K@60 compliant - Built-in signal EQ & regeneration

TL-WPCT-01BK — Eight button wall plate controller

- Single gang, US-style wall plate
- Eight backlit buttons with adjustable light settings
- Customizable buttons
- Free configuration software: upload with mini USB
- Multiple controller looping for up to 99 units

- Outputs customizable control commands in RS232, RS485, IR & relay
- (3) RS232 ports, (1) RS485 port, (3) IR ports, (2) relay ports
- Built-in IR learning
- Firmware upgradeable
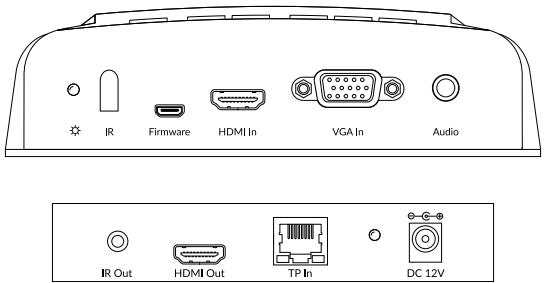
tlnetworx.com

Controllers
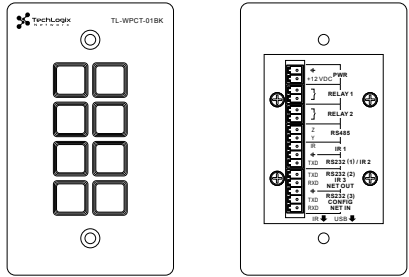
TechLogix manufactures a comprehensive line of control systems and all-in-one systems for meeting rooms, huddle rooms, conference rooms and classrooms. Complete information is available online at www.tlnetworx.com or in our *Corporate AV & Light Commercial Design Guide*.

TL-INCT-01 — In-line automated controller

The TechLogix TL-INCT-01 replaces expensive and complicated control systems with hands-free automation. It "senses" HDMI activity and automatically outputs control commands to connected devices via built-in CEC, RS232 & relay controllers. Commands are customizable and simultaneously output via an HDMI port (CEC), RS232 port, and relay ports.

SMP Series — Signal management system with display control

The TechLogix SMP Series redefines in-room collaboration for meeting and huddle spaces. Available in two configurations, the systems combine source management, display control and signal extension into a single package that installs in minutes.

The SMP Series is designed for table-top collaboration applications.

SM Series — Signal management system with display control

TechLogix SM Series provides both AV switching and display control for the cost of most 40" displays. The systems combine an under-table mounted switcher and up to three table inserts which lock securely to the meeting room table.

The SM Series allows an entire meeting can be run with only two buttons: an "on/off" button which turns the switcher and the display on or off, and a "show-me" button which switches the active input channel to the table insert on which the button was pressed.
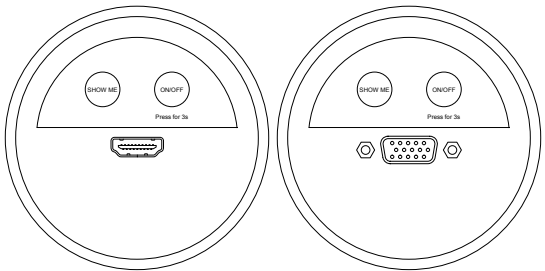
Manufacturers often rate their products by the maximum supported resolution: 720p, 1080p, etc. This works well for older products that support lower resolutions, but 4K and its associated technologies present a bit of a challenge. 4K is not 4K, even though manufacturers often generically label their products as "4K compliant" or "4K ready."

4K comes in a variety of flavors that radically affect the required electronics and cabling, and when you include features like HDR the signal gets pretty beefy fast. Simply calling something "4K" doesn't really do the product or application justice, and it can lead to issues as you start to put generically labeled 4K products together into a system.

Generic Name	HDMI Version	Actual Resolution	Frame Rate	Chroma Sub-Sampling	Color Bit Depth	HDR	Wide Color Gamut	Data Rate (Bandwidth)
1080p	1.4	1920x1080	24 fps	4:2:0	8 bit	No	No	2.23 Gbps
1080p	1.4	1920x1080	60 fps	4:2:0	8 bit	No	No	4.45 Gbps
1080p	1.4	1920x1080	60 fps	4:4:4	8 bit	No	No	4.45 Gbps
4K@30	1.4	3840x2160	24 fps	4:2:0	8 bit	No	No	8.91 Gbps
4K@30	1.4	3840x2160	24 fps	4:4:4	8 bit	No	No	8.91 Gbps
4K@30	1.4	4096x2160	24 fps	4:4:4	8 bit	No	No	8.91 Gbps
4K@60	1.4	3840x2160	60 fps	4:2:0	8 bit	No	No	8.91 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:0	8 bit	No	No	8.91 Gbps
4K@30	2.0	3840x2160	24 fps	4:2:2	10 bit	Yes	Yes	8.91 Gbps
↑ COPPER BASED SYSTEMS ↑				↓ FIBER BASED SYSTEMS ↓				
4K@30	2.0	3840x2160	24 fps	4:4:4	10 bit	Yes	Yes	11.14 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:0	10 bit	Yes	Yes	11.14 Gbps
4K@30	2.0	3840x2160	24 fps	4:4:4	12 bit	Yes	Yes	13.37 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:0	12 bit	Optional	Yes	13.37 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:2	12 bit	Optional	Yes	17.82 Gbps
4K@60	2.0	3840x2160	60 fps	4:4:4	8 bit	Optional	Yes	17.82 Gbps

A significant takeaway on the chart is the copper versus fiber line. While not a hard rule, most copper technologies max out at 10 Gbps over longer distances and therefore will not support higher bandwidth signals. In these applications fiber-based solutions are not only recommended, but are required.