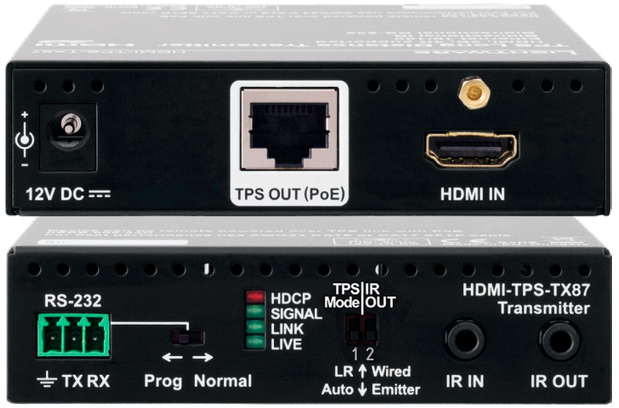
LIGHTWARE

INNOVATIVE. RELIABLE. MADE IN EUROPE.



USER MANUAL

HDMI-TPS-RX87
HDMI-TPS-TX87

HDBaseT™ Multimedia Extender

Bookmark Page



Important Safety Instructions

Class II apparatus construction.

The equipment should be operated only from the power source indicated on the product.

To disconnect the equipment safely from power, remove the power cord from the rear of the equipment, or from the power source. The MAINS plug is used as the disconnect device, the disconnect device shall remain readily operable.

There are no user-serviceable parts inside of the unit. Removal of the cover will expose dangerous voltages. To avoid personal injury, do not remove the cover. Do not operate the unit without the cover installed.

The appliance must be safely connected to multimedia systems. Follow instructions described in this manual.

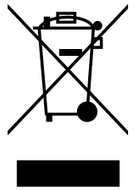
Ventilation

For the correct ventilation and to avoid overheating, ensure enough free space around the appliance. Do not cover the appliance, leave the ventilation holes free and never block or bypass the ventilators (if there are any).

WARNING

To prevent injury, the apparatus is recommended to be securely attached to the floor/wall, or mounted in accordance with the installation instructions. The apparatus shall not be exposed to dripping or splashing, and no objects filled with liquids, such as vases, shall be placed on the apparatus. No naked flame sources, such as lit candles, should be placed on the apparatus.

Waste Electrical & Electronic Equipment (WEEE)



This marking shown on the product or its literature indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. Household users should contact either the retailer where they purchased this product or their local government office for details of where and how they can take this item for environmentally safe recycling. Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

Common Safety Symbols

Symbol	Description
	Direct current
	Alternating current
	Protective conductor terminal
	Equipotential Connector
	On (Power)
	Off (Power)
	Double insulation
	Caution, possibility of electric shock
	Caution
	Laser radiation
	Warning, Rotating fan
	Caution: for indoor use only

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Document Revision History

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v1	2026-05-05	Initial release	Tamas Forgacs
v2	2026-09-11	ToC correction.	Laszlo Zsedenyi

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1

Introduction

Thank you for choosing Lightware's TPS-87 series devices. In the first chapter we would like to introduce the device by highlighting the most important features in the sections listed below:

- Description 7
- Features of the Device 7
- Box Contents 8
- Typical Applications 8

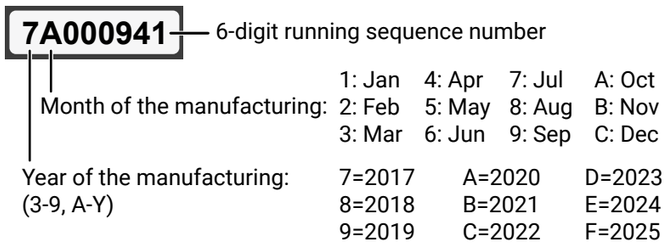
1.1. Description

HDMI-TPS-87 Series

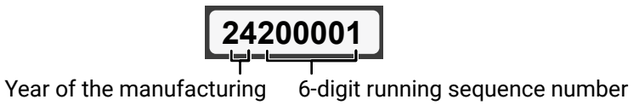
TPS-TX87 and RX87 twisted pair HDBaseT™ extenders provide extension of uncompressed 4K/UHD video with embedded audio for long distances over a single CATx cable. The extender offers uni-directional RS-232 and IR pass-through on the same CATx cable that carries the video signal. The TPS extenders support full HDCP and EDID compliance and work on all standard AV resolutions and also 120 Hz 3D signals. PoE 48V remote powering is available through the single CATx cable, but a local power supply can also be used.

About the Serial Number

Lightware devices contain a label indicating the unique serial number of the product. The structure is the following:



From 1st of October 2024, serial number format of Lightware devices is the following: the first two digits are of the year of manufacture, while the remaining digits make up the running sequence number.



Compatible Devices

TPS-87 extenders are compatible with all Lightware devices with TPS port except the TPS-90 series.

The product is compatible with any HDBaseT™ third party devices.

1.2. Features of the Device



Signal Transmission up to 170m

Video and audio signal transmission (HDMI, RS-232, and Infrared over a single CAT5e…CAT7e cable.



4K and 3D Support

High bandwidth allows extension of resolutions of up to 4K, and even 3D sources and displays are supported.



HDCP-compliant

The extenders fulfill the HDCP standard. HDCP capability on the digital video inputs can be disabled when non-protected content is extended.



Infrared

TPS-87 series extenders are built with Infrared input and output ports which are designed for IR code sending in Pronto Hex format in command injection mode.



Pixel Accurate Reclocking

Each output has a clean, jitter-free signal, eliminating signal instability and distortion caused by long cables or connector reflections.



Remote Power (PoE)

TPS-87 series extenders are PoE-compatible and can be powered remotely via the TPS connection (through the CATx cable) with a compatible power source equipment.

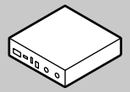
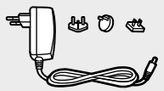


RS-232 Transmission

AV systems can also contain serial port controllers and controlled devices. Bi-directional serial port pass-through supports any unit that works with standard RS-232.

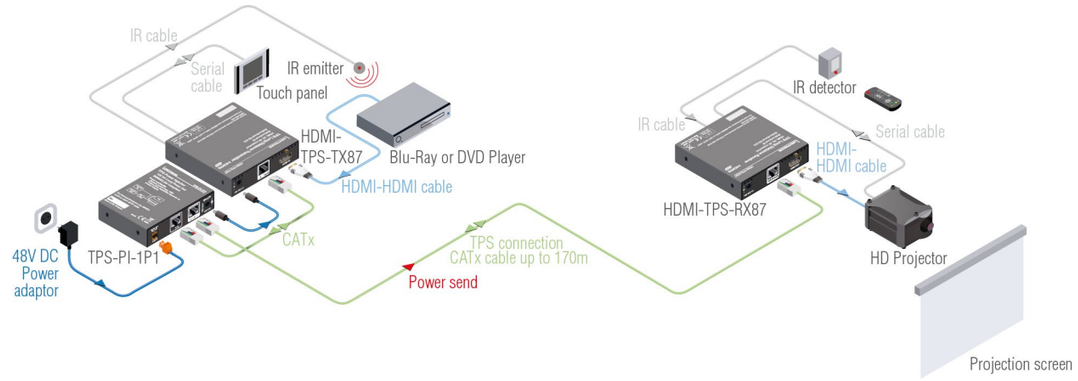
1.3. Box Contents

The assembling of certain accessories can be found in the Mounting Options - Compatibility Table section. Optional accessories can be purchased separately, please contact sales@lightware.com.

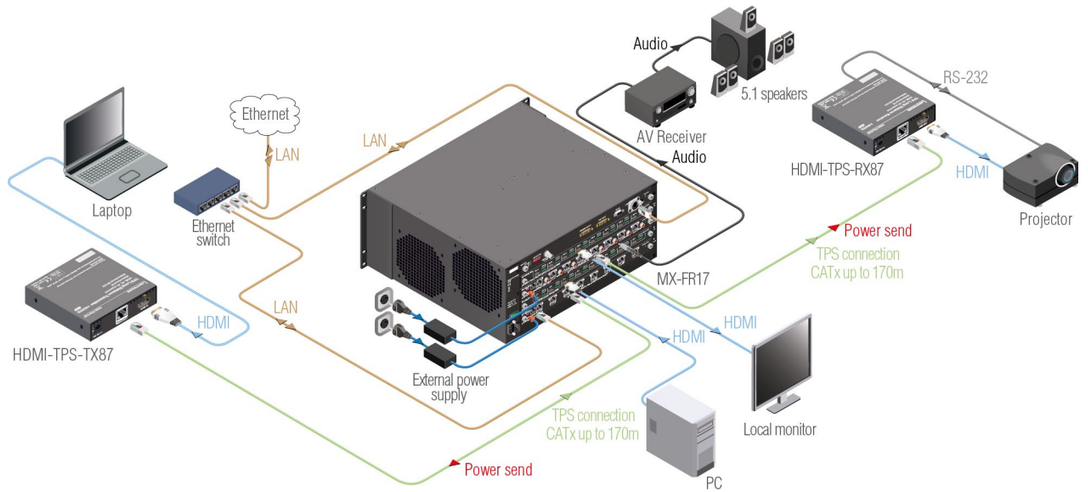
			HDMI-TPS-RX87	HDMI-TPS-TX87
Supplied device		TPS-87 series transmitter/ receiver	✔	✔
Supplied accessories		12V DC power adaptor with interchangeable plugs	✔	✔
		Phoenix combicon 3-pole connector	✔	✔
		Safety & Warranty Info; Quick Start Guide	✔	✔
Optional accessories		Infrared emitter	✔	✔
		Infrared detector	✔	✔

1.4. Typical Applications

1.4.1. Standalone Application - HDMI-TPS-87 Series



1.4.2. Matrix Application - HDMI-TPS-87 Series



2

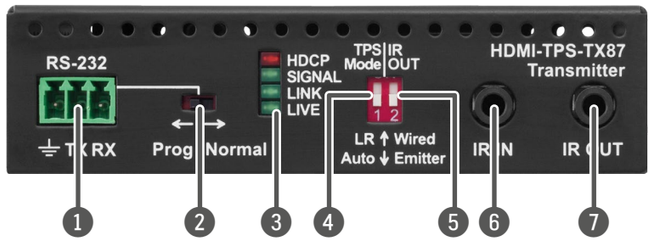
Product Overview

The following sections are about the physical structure of the device, input/ output ports and connectors; software and hardware capabilities:

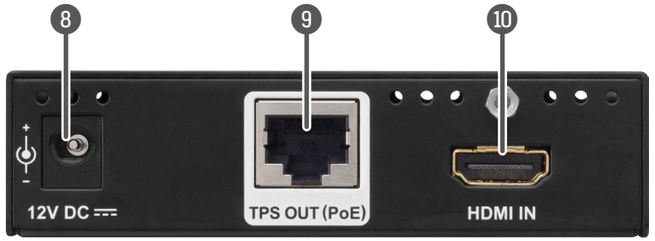
- Front and Rear Views **10**
- Status LEDs **11**
- DIP Switches **11**

2.1. Front and Rear Views

Front View



Rear View



1	**RS-232 port**	Local RS-232 port for bidirectional serial data connection and performing firmware update (programming).
2	**RS-232 switch**	**Normal**: serial data is passed through the device. **Prog**: RS-232 pass-through function is disabled, the device is ready for the firmware update.
3	**Status LEDs**	The LEDs give immediate feedback about the current status of the extender. See the details in the Status LEDs section.
4	**TPS mode switch**	**LR**: Longreach TPS mode; lower resolution (max 1080p), longer distances; **Auto**: TPS mode is determined automatically. See the details in the TPS Mode Switch section.
5	**IR mode switch**	IR output signal modulation switch; the 38 kHz modulation can be switched On (Emitter position) or Off (Wired position).
6	**IR input**	IR signal input connector (for 3.5 mm Jack, 3-pole, TRS plug).
7	**IR output**	IR signal output connector (for 3.5 mm Jack, 2-pole, TS plug).
8	**DC input**	12V DC input for local power supply. See more details about the powering options in the Powering Options section.
9	**TPS port**	TPS (HDBaseT™) port to the other compatible device (extender / matrix / board). The port is PoE-compatible, see more details about the powering options in the Powering Options section.
10	**HDMI port**	Audio/video port for DVI or HDMI signal with HDMI 1.4 standard support.

2.2. Status LEDs

HDCP		Transmitter / Receiver
	off	Video output signal is not encrypted with HDCP.
	on (red)	Video output signal is encrypted with HDCP.
SIGNAL		**Transmitter / Receiver**
	off	No video signal transmission.
	on (green)	Video signal transmission.
LINK		**Transmitter / Receiver**
	off	TPS connection failed between the devices.
	blinking (green)	TPS connection is detected and LPPF link mode is active.
	on (green)	TPS connection is detected and HDBT or LR link mode is active.
LIVE		**Transmitter / Receiver**
	off	No power supply or out of order.
	blinking (green)	Device is powered and ready to use.

2.3. DIP Switches

2.3.1. TPS Mode Switch

The toggle switch on the extenders can be used to toggle between the **LR** and **Auto** TPS modes. If both units have Auto state and there is valid video signal on the transmitter the common mode will be HDBT. If the video signal disappears devices go into LPPF mode.

		Selected mode (RX)	
		LR	**Auto**
Selected mode (TX)	**LR**	LR	LR
	Auto	LR	HDBT

TPS Mode between an Extender and a Port of a Matrix Board

If an extender and a TPS matrix board are paired the board forces the extender to use the settings of the matrix. The extender's TPS mode switch has no effect.

ATTENTION: Always use the Auto mode with third-party devices.

2.3.2. IR Mode Switch

The IR output signal modulation can be selected by the IR mode switch as follows:

- Emitter: the 38 kHz modulation is switched on. In this case an IR emitter can be connected to the IR output port.
- Wired: the 38 kHz modulation is switched off. This option allows to connect a cable between the IR output of the extender and the IR input port of the device desired to remote control.

3

Installation

This chapter is about the installation of the device and connecting to other appliances, also presenting the mounting options and further assembly steps:

- Mounting Options - Compatibility Table **13**
- Electrical Connections **13**
- Connecting Steps **14**
- Powering Options **15**

3.1. Mounting Options - Compatibility Table

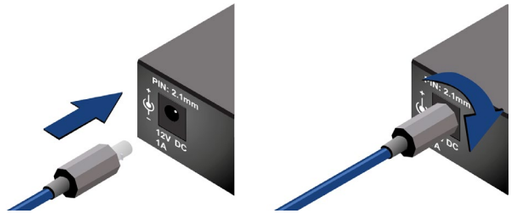
The following table summarizes the compatibility of the HDMI-TPS-87 series devices with the mounting accessories offered by Lightware. The number in the brackets means how many same-size devices can be assembled to the mounting plate. The dimensions are in mm. The following accessories can be ordered separately, please contact sales@lightware.com for the details.

		100.4 W x 100.4 D x 26 H	
		HDMI-TPS-RX87	**HDMI-TPS-TX87**
	**1U High Rack Shelf**	✔ (4x)	✔ (4x)
	**UD Mounting Kit**	✔ (1x)	✔ (1x)
	**UD Mounting Kit Double**	✔ (2x)	✔ (2x)
	**UD Mounting Plate F110**	✔ (1x)	✔ (1x)
	**UD Mounting Plate F120**	✔ (2x)	✔ (2x)
	**PRC-16-312 rackmount cage**	✔ (16x)	✔ (16x)

INFO: See the details about the assembly steps for each model in our Mounting Assembly Guide downloaded from the website.

3.2. Electrical Connections

3.2.1. DC 12V Input Connector



Locking DC connector

Do not forget to turn the plug counterclockwise before disconnecting the power adaptor.

WARNING! Always use the supplied 12V power adaptor. Warranty void if damage occurs due to use of a different power source.

3.2.2. HDMI Input and Output Ports

The TPS-87 series extenders are assembled with standard 19-pole HDMI 2.0 connectors with screw lock for inputs and outputs. Always use 22AWG or higher quality HDMI cables for connecting sources and displays.



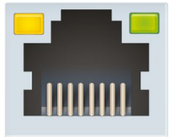
3.2.3. Ethernet Connectors

TPS Connector

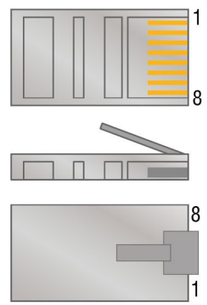
The TPS-87 series extenders provide standard RJ45 connectors for TPS input/output ports. Maximum CATx cable distances can be found in the Maximum Cable Extension section

Wiring of CATx Cables

Lightware recommends the termination of LAN cables on the basis of TIA/EIA T 568 A or TIA/EIA T 568 B standards.



Pin	TIA/EIA T568A	TIA/EIA T568B
1	white/green	white/orange
2	green	orange
3	white/orange	white/green
4	blue	blue
5	white/blue	white/blue
6	orange	green
7	white/brown	white/brown
8	brown	brown



3.2.4. RS-232 Connector

TPS-87 series extenders contain a 3-pole Phoenix connector, which is used for RS-232 serial connection.



Pin nr.	Signal
1	Ground
2	TX data
3	RX data



RS-232 connector pin assignments

RS-232 Output Voltage Levels

- Logic low level: 3V .. 15V
- Logic high level: -15V .. -3V

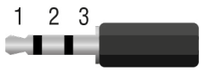
Compatible Plug Type

Phoenix® Combicon series (3.5mm pitch, 3-pole), type: MC 1.5/3-ST-3.5.

3.2.5. IR Connector

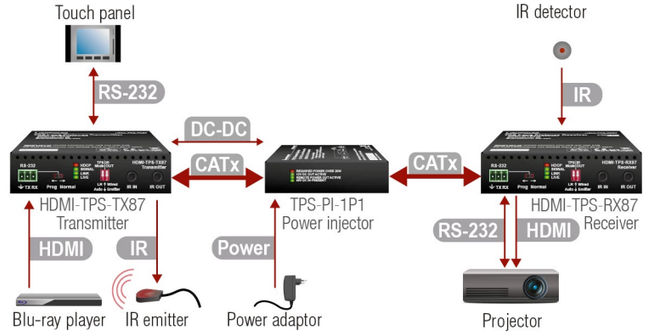
An IR detector and an IR emitter can be connected to the TPS-87 series extenders with TRS (Tip, Ring, and Sleeve) connectors. They are also known as (3,5 mm or approx. 1/8”) audio jack, phone jack, phone plug, and mini-jack plug. The pin assignments are the following for the detector and the emitter:



 **Detector – 3-pole-TRS**		 **Emitter – 2-pole-TS**	
1 Tip	Signal (active low)	1 Tip	+5V
2 Ring	GND	2 Ring	Signal (active low)
3 Sleeve	+5V	3 Sleeve	

INFO: Ring pole of the emitter is optional. If your IR emitter has a three-pole TRS plug, then the Ring and the Sleeve are the same signal (Output -).

3.3. Connecting Steps

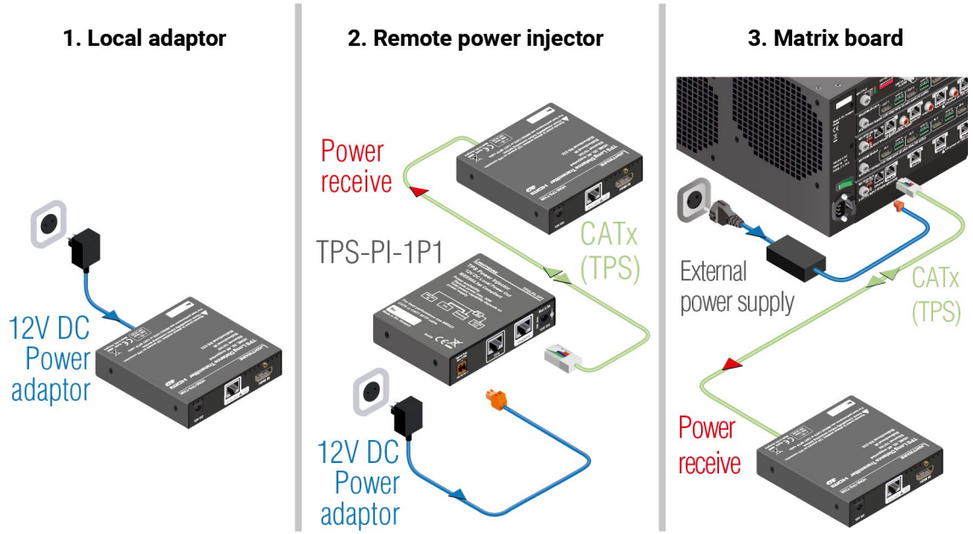


CATx	Connect the TPS output port of the TX to the TPS port of the power injector by a CATx cable.
CATx	Connect the TPS input port of the RX to the TPS+PoE port of the power injector by a CATx cable.
DC-DC	Connect a DC-DC cable between the transmitter and the power injector.
HDMI	Connect a source to the HDMI (DVI-D) input port of the transmitter.
IR	Connect an IR emitter unit to the IR output port of the transmitter.
RS-232	Connect a controller device to the local RS-232 port of the transmitter. Make sure the RS-232 switch is in the **Normal** position.
HDMI	Connect a sink device to the HDMI (DVI-D) output port of the receiver.
RS-232	Connect a serial cable between the sink device and the RS-232 port of the receiver.
IR	Connect an IR detector unit to the IR input port of the receiver.
Power	First connect the power adaptor to the DC input of the power injector, then to the AC power socket. Please check the Powering Options section for the details.

3.4. Powering Options

TPS-87 series extenders fulfill the **PoE PD** standard, which means the TPS port can receive power over the TPS line.

The TPS-87 series devices can be powered in any of the following ways:



WARNING! Warranty void if damage occurs due to the usage of a different power source.

INFO: TPS-TX/RX90 and TPS-TX/RX95 are not PoE-compatible, thus not able to remote power the HDMI-TPS-87 series and vica versa. FP/WP-UMX-TPS-TX97 series contain PoE-compatible remote power function (PD, Powered Device), RX95 and TX95 extenders can be remote powered only by each other.

4

Device Concept

The following chapter describes the features of the TPS-87 series devices with a few real-life examples.

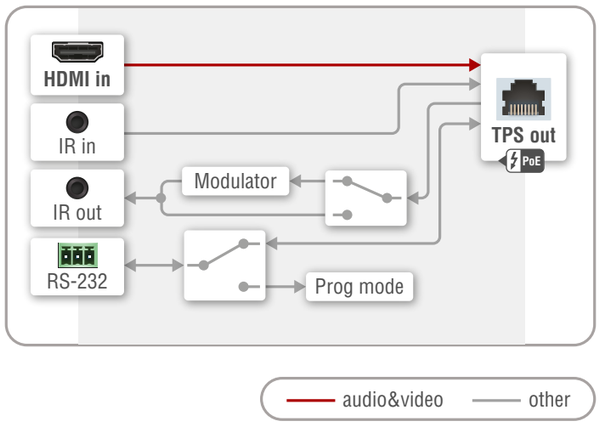
- TPS Extender Concept **17**
- TPS Interface **18**
- Ethernet Interface **18**
- Serial Interface **18**
- Infrared Interface **18**

4.1. TPS Extender Concept

4.1.1. Transmitters

The TPS-87 series transmitters are able to receive digital (HDMI, DVI-D) video signals and embedded digital audio signal as well, and transmit HDBaseT™ (TPS) signal, including HDMI/DVI audio/video signals, RS-232 and Infrared signals.

Port Diagram



Signal transmission of the TPS-87 series transmitters

Description

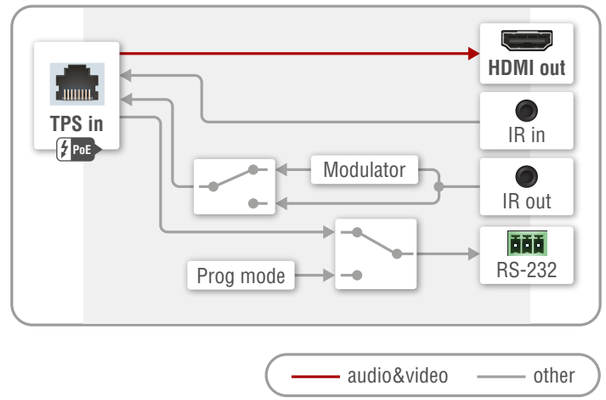
The device can receive HDMI or DVI-D audio/video signal on the HDMI input port; Infrared signal from the IR input port; RS-232 signal from the RS-232 port. All of these are transmitted on the TPS output port toward the HDBaseT™-capable receiver.

See more details about the RS-232 signal in the Serial Interface section and the Infrared mode switching in the Infrared Interface section.

4.1.2. Receivers

The TPS-87 series receivers are able to receive HDBaseT™ (TPS) signal, including HDMI/DVI audio/video signals, and transmit digital (HDMI, DVI-D) video signals and embedded digital audio signal, RS-232 and Infrared signals as well.

Port Diagram



Signal transmission of the TPS-87 series receivers

Description

The device can receive HDMI or DVI-D audio/video signal, Ethernet signal, RS-232 signaland Infrared signal from the HDBaseT™-capable transmitter via the TPS input port, and transmits HDMI or DVI-D audio/video signal on the HDMI output port.

See more details about the RS-232 signal in the Serial Interface section and the Infrared mode switching in the Infrared Interface section.

4.2. TPS Interface

4.2.1. TPS Link Modes

The TPS working mode between the transmitter and the receiver parties is determined by the mode set in them. Both parties influence on the setting which determines the final TPS transmission mode. The following TPS modes are defined:

- **Long reach (LR)**: Longer CATx cable length, less bandwidth (limited resolution). The LPPF mode is not available in LR TPS link mode.
- **HDBaseT™ (HDBT)**: more bandwidth (higher resolutions), shorter CATx cable length. If no video present, the units change to LPPF mode automatically.
- Low Power Partial Functionality (LPPF): Only Ethernet, RS-232 and IR are extended (@9600 baud).

4.2.2. Bi-directional Pass-through Data Lines

The direction of the video extension is fixed from TX towards RX but the pass-through data lines are bi-directional*. It means the RS-232, IR, Ethernet source and sink devices can be connected either to the TX or to the RX and the signal is transmitted to the other extender.

* In fact IR transmission is uni-directional but the extender has two IR channels with different directions.



4.2.3. Toggling Between TPS Link Modes

The toggle switch on the extenders can be used to toggle between the LR and Auto TPS modes. If both units have Auto state and there is valid video signal on the transmitter the common mode will be HDBT. If the video signal disappears devices go into LPPF mode.

		Selected mode (RX)	
		LR	**Auto**
Selected mode (TX)	**LR**	LR	LR
	Auto	LR	HDBT

TPS Mode between an Extender and a Port of a Matrix Board

If an extender and a TPS matrix board are paired the board forces the extender to use the settings of the matrix. The extender's TPS mode switch has no effect.

ATTENTION: Always use the Auto mode with third-party devices.

4.3. Ethernet Interface

The Ethernet port on the RX or on TX can be connected to a LAN hub, switch or router with a LAN cable. The other side behaves as an Ethernet uplink port. The extenders support 10/100 Mbps data transfer rate. The Ethernet port has auto crossover function. It is able to recognize and handle both cable types: patch and cross TP cables.

4.4. Serial Interface

Third party devices with standard RS-232 port are supported as the extenders work in „passthrough" mode. TX and RX provide a 3-pole Phoenix connector. The RS-232 options – the baud rate and the parity bits are set on the third party devices and it can be anything. The extenders support any kind of serial settings.

4.5. Infrared Interface

One emitter and one detector is enough for remote controlling one IR sink device. If there is an IR sink device to be controlled next to the TX and the other one is next to the RX, two emitter- detector pairs are needed. The IR emitter and the detector have standard 3.5 mm TRS (jack) connectors. The emitter's plug has two poles (mono) and the detector's plug has three poles (stereo).

IR Output Mode Switch

The IR output signal modulation can be selected by the front panel switch as follows:

- **Emitter**: the 38 kHz modulation is switched on. In this case an IR emitter can be connected to the IR output port.
- **Wired**: the 38 kHz modulation is switched off. This option allows to connect a cable between the IR output of the extender and the IR input port of the device desired to remote control.

5

Troubleshooting

Usually, if the system seems not to transport the signal as expected, the best strategy for troubleshooting is to check signal integrity through the whole signal chain starting from source side and moving forward to receiver end. The following sections are available in the chapter:

- Use Cases **20**
- How to Speed Up the Troubleshooting Process **20**

5.1. Use Cases

At first, check front panel LEDs and take the necessary steps according to their states. For more information about status LEDs, refer to the Status LEDs section.

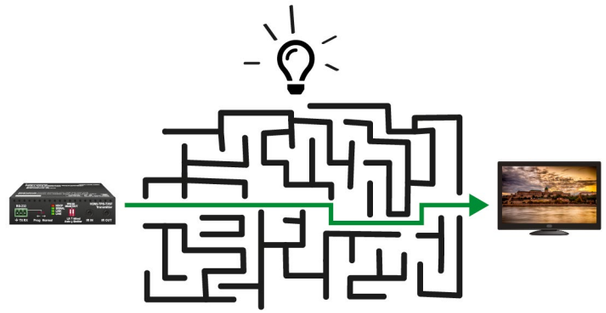
Legend

Link to connections/cabling section.

Link to device operation section.

Symptom	Root cause	Action	Refer to
Audio / Video signal			
No picture on the video output	Device or devices are not powered properly	Check the extenders and the other devices if they are properly powered; try to unplug and reconnect them.	3.2.1
	Cable connection problem	Cables must fit very well, check all the connectors (HDMI and CATx cables).	3.2.2 3.2.3
		Check the wiring of the CATx cables	3.2.3
	TPS mode problem	Check the actual TPS mode and the selected modes of the extenders.	2.3.1
	HDCP mismatch	Connect a HDCP-compliant sink to the extender or transmit non-protected content	6.1
Picture is jittering/ noisy	Incorrect CATx cable type / length is used	Check Lightware's recommendations for CATx cable types and maximum extension length	7.2
RS-232 signal			
Connected serial device does not respond	Cable connection problem	Check the connectors to fit well; check the wiring of the plugs.	3.2.4 7.3

5.2. How to Speed Up the Troubleshooting Process



Lightware's technical support team is always working hard to provide the fastest support possible. Our team's response time is one of the best in the industry, and in the toughest of cases we can directly consult with the hardware or software engineer who designed the product, to get the information from the most reliable source.

However, the troubleshooting process can be even faster... with your help.

There are certain pieces of information that push us in the right direction to finding the root cause of the problem. If we receive most of this information in the first e-mail, or it is gathered at the time when you call us, then there is a pretty high chance that we will be able to respond with the final solution right away.

This information is the following:

- Schematic (a pdf version is preferred, but a hand drawing is sufficient).
- Serial number(s) of the device(s) (it is either printed somewhere on the box or you can query it in the Device Controller software or on the built-in website).
- Firmware versions of the devices (please note that there may be multiple CPUs or controllers in the device and we need to know all of their firmware versions, a screenshot is the best option).
- Cable lengths and types.
- Patch panels, gender changers or anything else in the signal path that can affect the transmission.
- Signal type (resolution, refresh rate, color space, deep color).
- Emulated EDID(s) (please save them as a file and send it to us).
- Actions to take in order to re-create the problem (if we cannot reproduce the problem, it is hard for us to find the cause).
- Photo or video about the problem (for example: "image noise" can mean many different things, it's better if we see it too).
- Error logs from the Device Controller software.
- In the case of Event Manager issue, the event file and/or backup file from the Device Controller software.

The more of the above information you can give us, the better. Please send this information to the Lightware Support Team (support@lightware.com) to speed up the troubleshooting process.

6

Technologies

The following sections contain descriptions and useful technical information on how the devices work in the background. The content is based on experiences and cases we met in practice. These sections help to understand features and technical standards like the following:

- HDCP Management **22**
- Pixel Accurate Reclocking **23**

6.1. HDCP Management

Lightware Visual Engineering is a legal HDCP adopter. Several functions have been developed, which helps to solve HDCP related problems. Complex AV systems often have both HDCP and non-HDCP components. The matrix allows transmitting HDCP encrypted and unencrypted signals. The devices will be still HDCP compliant, as they will never output an encrypted signal to a non-HDCP compliant display device. If an encrypted signal is switched to a non-compliant output, a red screen alert or muted screen will appear.

6.1.1. Protected and Unprotected Content

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable – even if the content is not copyrighted. This can cause trouble if an HDCP capable device is connected between the source and the display. In this case, the content cannot be viewed on non-HDCP capable displays and interfaces like event controllers. Rental and staging technicians often complain about certain laptops, which are always sending HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. Even though HDCP encryption is not required all the time (e.g. computer desktop image), certain laptops still do that.

To avoid unnecessary HDCP encryption, Lightware introduced the HDCP enabling/disabling function: the HDCP capability can be disabled in the Lightware device. If HDCP is disabled, the connected source will detect that the sink is not HDCP capable, and turn off authentication.

6.1.2. Disable Unnecessary Encryption

HDCP Compliant Sink

All the devices are HDCP-compliant, no manual setting is required, both protected and unprotected contents are transmitted and displayed on the sink.



Not HDCP-compliant Sink 1.

Not-HDCP compliant sink is connected to the matrix. Some sources (e.g. computers) always send HDCP encrypted signals if the receiver device reports HDCP compliancy, however, HDCP encryption is not required all the time (e.g. computer desktop image). If HDCP is enabled in the matrix, the image will not be displayed on the sink.



Setting the HDCP parameter to Auto on the output port and disable HDCP on the input port, the transmitted signal will not be encrypted if the content is not protected. Thus, non-HDCP compliant sinks will display non-encrypted signal.

Not HDCP-compliant Sink 2.

The layout is the same as in the previous case: non-HDCP compliant display device is connected to the matrix but the source would send protected content with encryption. If HDCP is enabled on the input port of the matrix, the source will send encrypted signal.



The sink is not HDCP compliant, thus it will not display the video signal, but no picture on video output. If HDCP is disabled on the input port of the matrix, the source will not send the signal. The solution is to replace the display device with an HDCP-capable one.

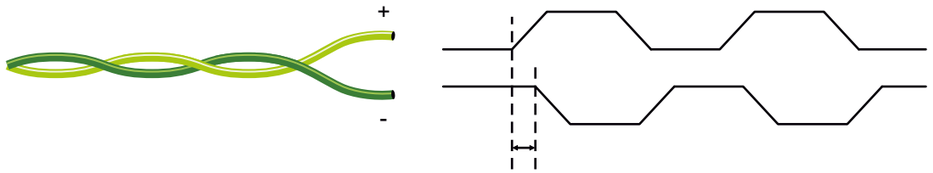
6.2. Pixel Accurate Reclocking

Signal reclocking is an essential procedure in digital signal transmission. After passing the reclocking circuit, the signal becomes stable, jitter-free, and can be transmitted over more equipment like processors or event controllers. Without reclocking, sparkles, noise, and jaggies appear on the image.

Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew, but inter-pair skew as well. The Pixel Accurate Reclocking circuit eliminates the following errors:

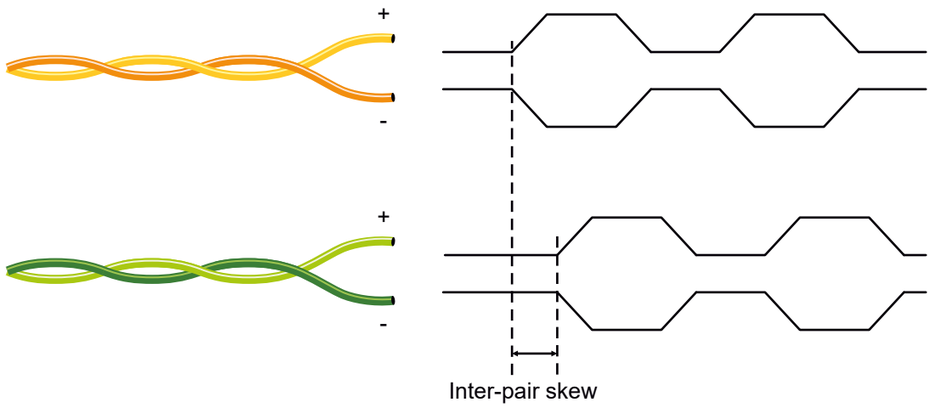
Intra-pair skew

Skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It's caused by different wire lengths or slightly different wire construction (impedance mismatch) in the DVI cable. It results in jitter.



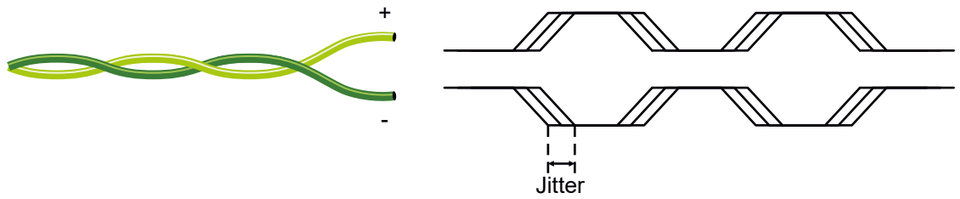
Inter-pair skew

Skew between two differential wire pairs in a cable. It is caused by different wire pair lengths or different number of twists in the DVI cable. Too much inter-pair skew results in color shift in the picture or sync loss.



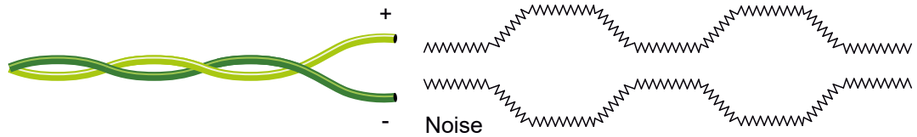
Jitter

Signal instability in the time domain. The time difference between two signal transitions should be a fixed value, but noise and other effects cause variations.



Noise

Electromagnetic interference between other electronic devices such as mobile phones, motors, etc. and the DVI cable are coupled onto the signal. Too much noise results in increased jitter.



7

Appendix

Tables, drawings, guides, technical details and the hashtag keyword list as follows:

- Specification **25**
- Maximum Cable Extension **27**
- Cable Wiring Guide **27**
- Mechanical Drawings **27**
- Further Document Information **28**
- Limited Warranty Statement **28**

7.1. Specification

INFO: Specifications are subject to change without notice.

General

Compliance	CE, UKCA
EMC (emission)	EN 55032:2015+A1:2020
EMC (immunity)	EN 55035:2017+A11:2020
RoHS	EN 63000:2018
Electrical safety	EN 62368-1:2024
Warranty	3 years
Cooling	Passive
Operating temperature	0 to +50˚C (+32 to +122˚F)
Storage temperature	-40° to +85˚C (-40° to +185˚F)
Operating humidity	10% to 90%, non-condensing

Power

Power supply option	External power adaptor / PoE PD via TPS port
Supported power source	100-240 V AC; 50/60 Hz
Supplied power	12V DC, 2.5A
AC power plug	Interchangable (EU, UK, JP/US, AUS/NZ)
DC power plug	Locking DC connector (2.1/5.5 mm pin)
Power consumption (TX)	4.5 W
Power consumption (RX)	6.5 W
Heat dissipation (TX)	16 BTU/h
Heat dissipation (RX)	23 BTU/h

Enclosure

Rack mountable	Yes, with mounting accessories, check the Mounting Options - Compatibility Table
Enclosure material	1 mm steel
Dimensions in mm	100.4 W x 100.4 D x 26 H
Dimensions in inch	3.95 W x 3.95 D x 1 H
Weight (TX)	300 g (0.66 lbs)
Weight (RX)	320 g (0.7 lbs)

Video Input

HDMI Input

Connector type	19-pole HDMI Type A receptacle
Standard	DVI 1.0, HDMI 1.4
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0) up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0) 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	all formats in the line with HDMI 1.4 standard
3D support	Yes
Color space	RGB, YCbCr
EDID support	Transparent
CEC support	Transparent
Reclocking	Pixel Accurate Reclocking

TPS Input

Connector type	RJ45 female connector
Power over Ethernet	PoE PD (IEEE802.3af)
Data rate	10GBase-T
Compliance	HDBaseT™
HDCP compliance	HDCP 1.4
Transferred signals	Video, Audio, RS-232, Infrared, Ethernet, CEC
Color space	RGB, YCbCr
Video latency	0 frame
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0) up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0) 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	all formats in the line with HDMI 1.4 standard

* All standard VESA, CEA and other custom resolutions up to 300MHz (HDMI1.4a) are supported.

Video Output

HDMI Output

Connector type	19-pole HDMI Type A receptacle
Standard	DVI 1.0, HDMI 1.4
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0) up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0) 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	all formats in the line with HDMI 1.4 standard
3D support	Yes
Color space	RGB, YCbCr
EDID support	Transparent
CEC support	Transparent
Reclocking	Pixel Accurate Reclocking

TPS Output

Connector type	RJ45 female connector
Power over Ethernet	PoE PD (IEEE802.3af)
Data rate	10GBase-T
Compliance	HDBaseT™
HDCP compliance	HDCP 1.4
Transferred signals	Video, Audio, RS-232, Infrared, Ethernet, CEC
Color space	RGB, YCbCr
Video latency	0 frame
Supported resolutions at 8 bits/color *	up to 4096x2048@30Hz (4:4:4) or 4096x2048@60Hz (4:2:0) up to 3840x2160@30Hz (4:4:4) or 3840x2160@60Hz (4:2:0) 1920x1080@60Hz (4:4:4) up to 12 bits/color
Audio formats	all formats in the line with HDMI 1.4 standard

* All standard VESA, CEA and other custom resolutions up to 300MHz (HDMI1.4a) are supported.

Control Ports

RS-232 Serial Port

Connector type	3-pole Phoenix® connector
Number of ports	1
Baud rates	between 9600 and 115200 baud
Data bits	8
Parity	None / Odd / Even
Stop bits	1 / 2
Output voltage: Low level	from 3V to 15V
Output voltage: High level	from -15V to -3V

Infrared Input Port

Connector type	3.5mm TS (approx. 1/8” jack

Infrared Output Port

Connector type	3.5mm TRS (approx. 1/8” jack
Output signal	Modulated (38kHz)

7.2. Maximum Cable Extension

Resolution	Pixel clock rate	Cable lengths (Auto / Longreach TPS mode)		
		CAT5e AWG24	CAT7 AWG26**	CAT7 AWG23
1024x768@60Hz	65 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1280x720p@60Hz	73.8 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1080p@60Hz / 24bpp	148.5 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1200@60Hz	152.9 MHz	100 m / NA	90 m / NA	120 m / NA
1600x1200@60Hz	162 MHz	100 m / NA	90 m / NA	120 m / NA
1920x1080@60Hz / 36bpp	223.6 MHz	70 m / NA	70 m / NA	100 m / NA
3840x2160@30Hz UHD	297 MHz	70 m / NA	70 m / NA	100 m / NA
4096x2160@30Hz 4K	297 MHz	70 m / NA	70 m / NA	100 m / NA

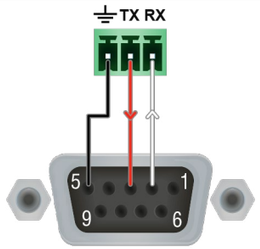
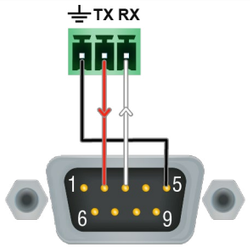
* With Long reach operation mode, which supports pixel clock frequencies up to 148.5 MHz.

** When remote powering is used with AWG26 cables, distances are 20% shorter.

7.3. Cable Wiring Guide

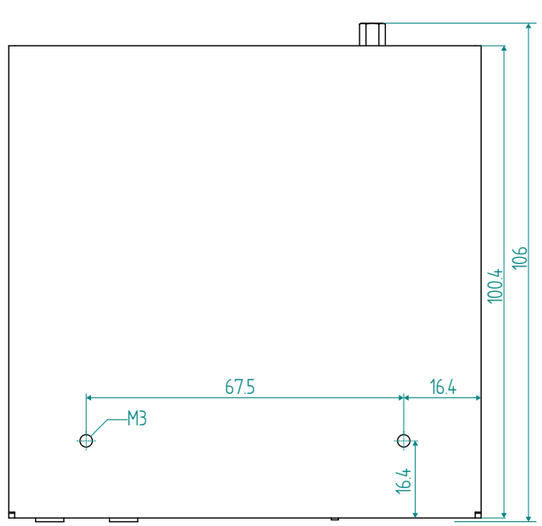
Serial Ports

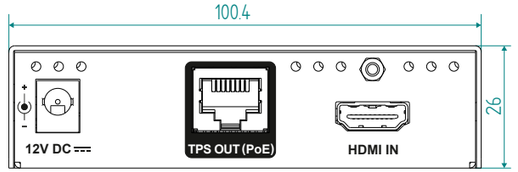
The device is built with a 3-pole Phoenix connector. See the examples below of connecting to a DCE (Data Circuit-terminating Equipment) or a DTE (Data Terminal Equipment) type device:

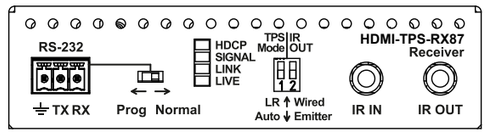
Lightware device and a DCE D-SUB 9 and Phoenix	Lightware device and a DTE D-SUB 9 and Phoenix
 2: TX data 3: RX data 5: Ground	 2: RX data 3: TX data 5: Ground

7.4. Mechanical Drawings

Dimensions are in mm. Both the transmitter and the receiver have the same sized enclosure.







7.5. Further Document Information

Symbol Legend

The following symbols and markings are used in the document:

WARNING! Safety-related information that is highly recommended to read and keep in every case!

ATTENTION: Useful information for performing a successful procedure; it is recommended to read.

DIFFERENCE: Feature or function that is available with a specific firmware/hardware version or product variant.

INFO: A notice, which contains additional information. Procedure can be successful without reading it.

DEFINITION: The short description of a feature or a function.

TIPS AND TRICKS: Ideas that you may have not known yet, but can be useful.

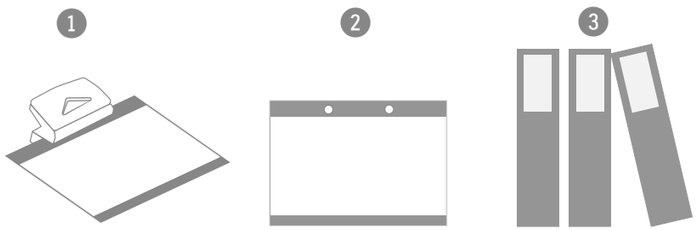
Navigation Buttons

Buttons in the PDF version		Buttons in the HTML version	
	Navigate to the **Table of Contents**.		Open the main **Table of Contents**.
	Go back to the **previous page**. If you clicked on a link previously, you can go back to the source page by pressing the button.		Navigate to the **Online User Manuals** webpage.
	Navigate to the **Bookmark page**.		Navigate to the **Bookmark page** in this User Manual.
	Visit www.lightware.com.		Download the **PDF version** of the User Manual.

About Printing

Lightware Visual Engineering supports green technologies and eco-friendly mentality. Thus, this document is made primarily for digital usage.
If you need to print out a few pages for any reason, follow the recommended printing settings:

- Page size: A4
- Output size: Fit to page or Match page size
- Orientation: Landscape



TIPS AND TRICKS: Thanks to the size of the original page, a border around the content (gray on the second picture below) makes it possible to organize the pages better. After punching holes in the printed pages, they can easily be placed into a ring folder.

7.6. Limited Warranty Statement

1. Lightware Visual Engineering PLC (Lightware) warrants to all trade and end user customers that any Lightware product purchased will be free from manufacturing defects in both material and workmanship for three (3) years from purchase unless stated otherwise below. The warranty period will begin on the latest possible date where proof of purchase/delivery can be provided by the customer. In the event that no proof can be provided (empty 'Date of purchase' field or a copy of invoice), the warranty period will begin from the point of delivery from Lightware.

1.1. 25G and MODEX product series will be subject to a seven (7) year warranty period under the same terms as outlined in this document.

1.2. If during the first three (3) months of purchase, the customer is unhappy with any aspect of a Lightware product, Lightware will accept a return for full credit.

1.3. Any product that fails in the first six (6) months of the warranty period will automatically be eligible for replacement and advanced replacement where available. Any replacements provided will be warranted for the remainder of the original unit's warranty period.

1.4. Product failures from six (6) months to the end of the warranty period will either be repaired or replaced at the discretion of Lightware. If Lightware chooses to replace the product, then the replacement will be warranted for the remainder of the original unit's warranty period.

2. The above-stated warranty and procedures will not apply to any product that has been:

2.1. Modified, repaired or altered by anyone other than a certified Lightware engineer unless expressly agreed beforehand.

2.2. Used in any application other than that for which it was intended.

2.3. Subjected to any mechanical or electrical abuse or accidental damage.

2.4. Any costs incurred for repair/replacement of goods that fall into the categories above (2.1., 2.2., 2.3.) will be borne by the customer at a pre-agreed figure.

3. All products to be returned to Lightware require a return material authorization number (RMA) prior to shipment, and this number must be clearly marked on the box. If an RMA number is not obtained or is not clearly marked on the box, Lightware will refuse the shipment.

3.1. The customer will be responsible for in-bound, and Lightware will be responsible for out-bound shipping costs.

3.2. Newly repaired or replaced products will be warranted to the end of the originally purchased product's warranty period.