SLIM 70-PRO

User Manual

SY-HDBT-70SP-T
SY-HDBT-70SP-R

4K HDBaseT extender
70m @1080p or 40m @4K

HDBaseT Transmitter (SY-HDBT-70SP-T) supports:
HDMI 2.0, Test Pattern, Down-Scaler, EDID & HDCP control,
Audio de-embed, CEC & Temperature control, diagnostics, iPoC

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Contents

FEATURES 4
CONNECTORS AND CONTROLS 4
Front 4
SY-HDBT-70SP-T 4
SY-HDBT-70SP-R 4
Rear 5
SY-HDBT-70SP-T 5
SY-HDBT-70SP-R 5
USING THE SY-HDBT-70SP-T AND SY-HDBT-70SP-R 6
RJ-45 WIRING 7
TEST PATTERN AND KEEP-ALIVE FEATURES 7
DOWN-SCALING 7
CONNECTING TO THE IR PORTS 7
RS232 CONTROL COMMANDS 8
SY-PCTools 8
HELP Command 8
Output HDCP Command 8
EDID Commands 9
4K Down-Scaling 9
Video Keep Alive (No Signal Handling) 10
Test Pattern 10
Safety Temperature 10
Diagnostic Commands 11
CEC Commands 12
SPECIFICATIONS 13
General 13
Video and Audio 13
Power Supply 14
Environmental and Physical 14

PACKAGE CONTENTS 14
Safety Instructions 15
After Sales Service 15

Thank you for purchasing the Slim70-Pro Extender Set.

This HDBaseT extender is designed with the professional AV installers in mind. The many extensive features assist in system integration, validation and maintenance. It is still the slimmest HDBaseT extender in the world with tremendous flexibility and extraordinary capabilities.

Installation precautions

This product has special circuitry to protect it against moderate surges and static discharges. However, to ensure reliable operation and long service life, it is important to take the necessary precautions against any spikes, surges and static discharges.

Place the units away from heat sources and allow adequate ventilation.

Shielded cable and in particular cat6, cat6a or cat7 is highly recommended. As much as possible cables should be routed away from any noisy sources and avoiding long runs in close proximity to mains cables.

The Slim70-Pro HDBaseT Extender set supports all input resolutions to 4K60 4:4:4, with bi-directional IR, and two independent pass-through RS232 ports. The main RS232 channel (Tx/Rx) is also used for controlling the many features. The second RS232 channel (T2, R2) can also be used for RTS/CTS handshaking.

The transmitter unit (SY-HDBT-70SP), also supports de-embedded audio (L/R and Mini-Toslink optical output), as well as many useful features such as: HDCP management, EDID settings, video Down-Scale, Test Patterns, Video Keep Alive, Temperature & CEC control, diagnostics.

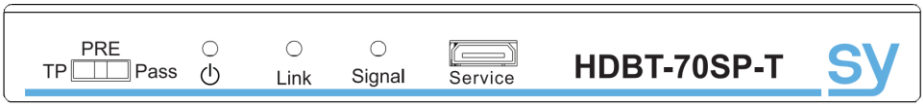
Features

- HDMI input supports up to 18G HDMI 2.0 (4K60 4:4:4)
- Transmission length up to 70m @1080p, or 40m @4K
- Test Patterns, 4K down-scale, Video Keep Alive, CEC control, etc
- Extensive EDID and HDCP control
- Temperature measurement, control and protection
- Audio extraction to Mini-Toslink and 3.5mm L/R outputs (Transmitter unit)
- Bidirectional IR and two independent RS232 ports
- iPoC safely provides power to both units using a single 48V PSU
- **SY-PCTools:** For easy control and diagnostics of enhanced features

Connectors and Controls

Front

SY-HDBT-70SP-T

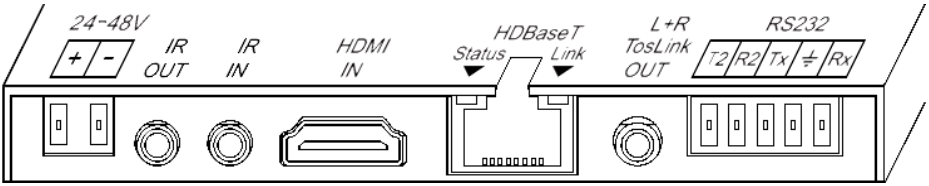


SY-HDBT-70SP-R

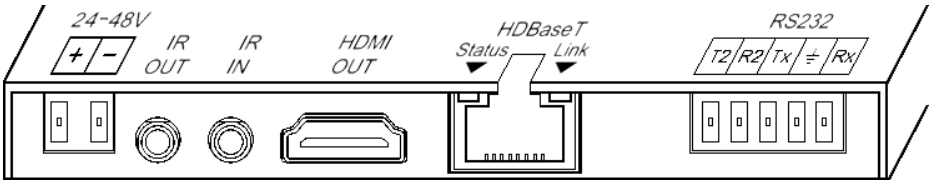
Name	Description
EDID Switch (SY-HDBT-70SP-T)	• **TP:** Generate a Test Pattern (RS232 command configurable). Default Test Pattern is Chequerboard at 1080p • **PRE:** Pre-defined HDMI input EDID. There are 16 EDID options selectable from RS232 commands. Default pre-define EDID is 4K60 (4:4:4) 2.0CH • **Pass:** Use the EDID data from the display device.
Power LED	Lit when the unit is powered
Link LED	Lit when the HDBaseT Transmitter and Receiver are linked together
Signal LED	Lit when there is video signal transmission through HDMI cable
Service port	Used for firmware updating (do not use as a USB port)

Rear

SY-HDBT-70SP-T



SY-HDBT-70SP-R



Name	Description
24-48V	Two way 3.5mm phoenix connector. 24 to 48V supply input
IR OUT	IR output – Connect to IR emitter
IR IN	IR input – Connect to IR eye
HDMI IN	HDMI input from external source
HDMI OUT	HDMI output to display
HDBaseT	HDBaseT RJ45 connection - (with iPoC)
RS232	• **Tx, Rx and GND** connections A general-purpose pass-through RS232 port. This port is also used to control the Transmitter/Receiver units – see **RS232 Control Commands**. • **T2, R2 and GND** connections Independent second RS232 (pass-through) data port for any baud rate up to 57600. These can also be used as RTS/CTS handshaking lines, see **Figure 1**.
Mini Toslink – (SY-HDBT-70SP-T)	• L/R Analogue Audio Output 3.5mm Stereo Jack. 20Hz – 20kHz, 1.5Vrms max • Mini- Toslink – Optical S/PDIF Audio Output

Notes:

1. The RJ45 connector shielding ensures proper utilisation of full STP/FTP cat cables, such as cat-5e STP or cat-6a. Shielded cat cables are recommended for noisy environments.
2. The iPoC function ensures safe powering of the remote unit. In this way only one PSU is required at either the Transmitter or Receiver end. The iPoC circuitry interrogates the remote device and delivers 48V power only if a compatible device has been identified; otherwise it does not provide any power. In this way it is much safer to connect to other HDBaseT devices such as projectors with built-in HDBaseT.
3. Extracted Audio output is available as Analogue L/R (3.5mm stereo), as well as optical Mini-Toslink (S/PDIF).

Using the SY-HDBT-70SP-T and SY-HDBT-70SP-R

- Connect a video source to the Transmitter (SY-HDBT-70SP-T) HDMI input connector and the remote display device to the Receiver (SY-HDBT-70SP-R) HDMI output connector.
- Ensure the catx cable is wired correctly – see **RJ-45 Wiring** for connection details.
- Plug the cat5e/6/6a cable into the RJ45 jacks of Transmitter and Receiver units.
- If needed, connect any optional inputs and outputs such as audio, IR or RS232.
- Power up the extender by connecting the 48V DC power adaptor to either Transmitter or Receiver unit – Only one PSU required with iPoC function (intelligent PoC).
- Audio connection can be made with either 3.5mm Stereo jack (L/R), or optical Mini-Toslink using the combi port on the Transmitter unit.
- For simple RS232 pass-through communication use Tx Rx lines. These lines are also used for controlling the Slim70-Pro units (see **RS232 Control Commands**).
- When RTS/CTS handshaking is also required, connect R2 to RTS and T2 to CTS of the control device, as shown in the following wiring diagram:

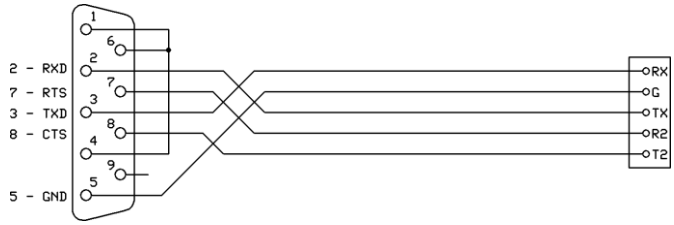


Figure 1 - RS232 Wiring with optional RTS/CTS Handshakes

- Slim70-Pro can support two independent RS232 channels. T2/R2 can be used as a second independent pass-through RS232 channel, as per below diagram:

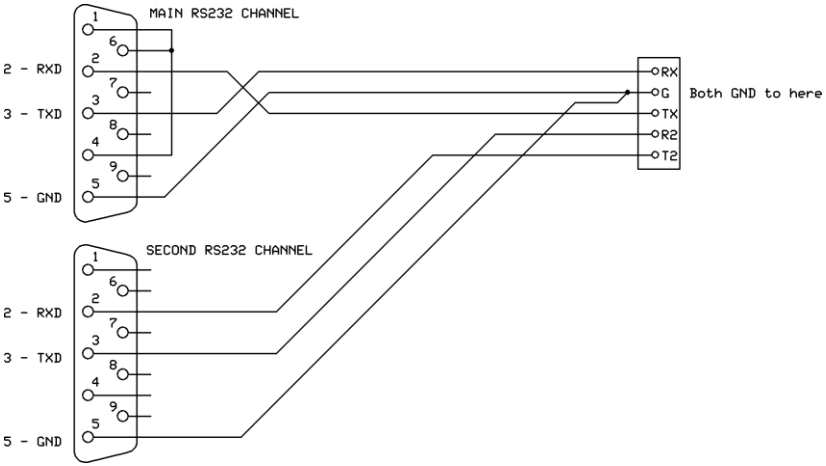
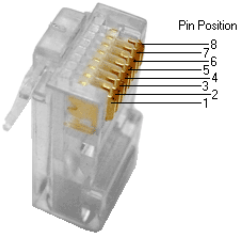


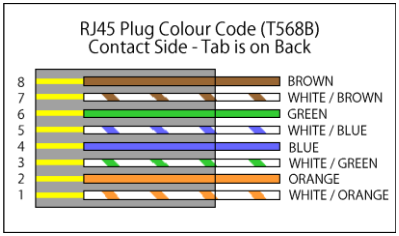
Figure 2 - Dual Independent RS232 Wiring

- If the R2/T2 terminals are not required, they can be left as not connected.

RJ-45 Wiring

Both connectors must be wired identically.





HDBaseT signals will NOT pass through any Ethernet device, the HDBaseT port on the SY-HDBT-70SP-T must be connected directly to the HDBaseT port on the SY-HDBT-70SP-R.

Please do make sure that the Cat6 cable uses 4 pairs of 23AWG solid copper wires. Do not use inferior copper clad cables as these exhibit much higher resistances.

Test Pattern and Keep-Alive Features

The Slim70-Pro extenders also provide a built-in Test Pattern generator that is useful to verify the integrity of connections from the transmitter through to the display device. Several test patterns at different resolutions are provided. See **Test Pattern** in the **RS232 Control Commands** section. Test pattern can be generated using the transmitter front panel switch (TP).

The **Video Keep Alive** (No Signal Handling) feature also uses the saved test pattern setting, ensuring a video signal is always present at the receiver HDMI output in the event of input video loss.

See **Video Keep Alive** (No Signal Handling) in the **RS232 Control Commands** section.

Down-Scaling

The Slim70-Pro transmitter can accept 4K50/4K60 4:4:4 (18G) HDMI 2.0 signals. The built-in down-scaler ensures appropriate scaling to maximum HDBaseT bandwidth of 10.2G, whilst providing compatibility with of the display unit. Three scale options are available as per below:

1. Down-Scale any 4K resolution to 1080p
2. Convert 4K60 4:4:4 signals to 4K60 4:2:0 (colour-space conversion)
3. Auto: Provides optimal resolution / colour-space option, based on cable length and display capability.

See **4K Down-Scaling** in the **RS232 Control Commands** section.

Connecting to the IR Ports

The IR IN and IR OUT ports on the rear of the Transmitter/Receiver units may be used to send IR remote control data between the two units. The following table details the wiring connections for the IR input and output ports:

3.5mm Jack Terminal	IR Eye (Receiver)	IR Bud (Emitter)
Tip	5V	5V
Ring	IR Signal	Not applicable
Sleeve	Ground	IR Signal

RS232 Control Commands

The many features of Slim70-Pro transmitter/receiver units can be managed using RS232 commands (Tx, Rx port). The ASCII commands given in this section use the following port settings:

Baud Rate:	57600
Data Bits:	8
Parity:	None
Stop Bits:	1

Notes:

1. All commands in this section must be sent in uppercase and are always terminated with the ASCII carriage-return character, 0x0d (represented by the ↵ symbol).
2. All responses are terminated with the ASCII carriage-return character, 0x0d.
3. All spaces shown in the commands are required. Lowercase letters are used as value placement indicators, the required value or identifier is given in the **Details** panel for the respective command.
4. The RS232 commands can be sent to either the SY-HDBT-70SP-T or SY-HDBT-70SP-R without regard for the actual unit being controlled. Any command containing **TX** is always routed to the SY-HDBT-70SP-T and all **RX** commands routed to SY-HDBT-70SP-R.
5. All RS232 communications are passed through regardless of baud rate or other settings. This allows the use of third-party RS232 communication without having to set the protocol specifics – Just pass-through.

SY-PCTools

SY-PCTools is a PC software package that allows the user to interface/control most of SY products, all within one Tool. Please interface with RS232 (Tx, Rx) port of Slim70-Pro (transmitter or receiver) via a com-port (or USB to RS232 dongle). The control panel provides a very simple and easy interface for managing /monitoring the Slim70-Pro set. This is highly recommended for installation as well as possible maintenance requirements.

All the following commands, except for the HELP command are included in the SY-PCTools software, downloadable from the SY website.

HELP Command

This command returns the complete list of supported control commands, with examples.

Commands	Command Receive
`GET TX HELP↵`	Get the current Transmitter Commands list
`GET RX HELP↵`	Get the current Receiver Commands list

Output HDCP Command

The following commands are used to select the HDMI output HDCP modes:

Commands	Details
`SET TX HDCP-OPTION w↵` (default: Follow input)	w is one of following characters: FORCE-1.4 FORCE-2.2 FORCE-OFF (cascade mode) FOLLOW-INPUT (default)
`GET TX HDCP-OPTION↵`	Get the current HDCP mode

EDID Commands

Any of the following pre-defined EDID settings can be selected as the active EDID when the front EDID switch on the SY-HDBT-70SP-T is set to the **PRE** position. The selection is done using the RS232 command given in the following table:

• 4K60-2.0 (default) • 4K60-5.1 • 4K30-2.0 • 4K30-5.1 • 1080P60-2.0 • 1080P60-5.1 • 720P60-2.0 • 1024x768P60	• 1920x1200 • 1680x1050 • 1600x1200 • 1440x900 • 1400x1050 • 1360x768 • 1280x1024 • MANUAL

Commands	Details
SET TX PREDEFINE-EDID w↵ (default: 4K60-2.0)	Set the Pre-define EDID data Where: **w** is one of the 16 EDID options as given above.
GET TX PREDEFINE-EDID↵	Get the current EDID setting

When a specific EDID is required, it is recommended to use SY-PCTools (select SLIM70 PCTool from list of tools menu) - load and save the EDID file and then select the MANUAL EDID option by sending the **SET TX PREDEFINED-EDID MANUAL**↵ command to enable it.

To use the display EDID directly, set the switch on the transmitter to the **Pass** position.

4K Down-Scaling

Compatibility with 1080p display units is assured by down-scaling any 4K (24/25/30/50/60Hz) signal to 1080p. All 1080p or less signals are simply passed through.

For 4K display requirements, 4K60 4:4:4 (or 4K50 4:4:4) input signals can be down-scaled to 4K50/60 4:2:0, ensuring the 10.2Gbps maximum output bandwidth is not exceeded (Max. 40m). All lower bandwidth signals (< 10.2Gbps) such as 4K30 4:4:4, 1080p are just passed through.

There are three options available:

- **1080p:** Down-Scale any 4K signal to 1080p
- **4K60-420:** Convert 4K50/60 4:4:4 to 4K50/60 4:2:0 - (colour space conversion)
- **Auto:** cat5e/6/6a cable and the display capabilities are analysed for optimal resolution / colour space (4K 4:2:0 or 1080p) for 4K50/60 4:4:4 input.

Note: The frame rate is not altered – only the resolution or colour space is changed.

The following command selects the 4K handling mode:

Commands	Details
SET TX 4K-HANDLE w↵ (default: Auto)	**w** is one of following options: **1080P** **4K60-420** **AUTO** (default)
GET TX 4K-HANDLE↵	Get the current 4K handling mode

Video Keep Alive (No Signal Handling)

When there is no signal present at the Transmitter (SY-HDBT-70SP-T), two options are available:

- Output current Test Pattern – Maintain output Video stream (Video Keep-Alive)
- No timing output (default) – No output video; hence video drop-out

The following commands select the VKA modes:

Commands	Details
`SET TX NO-SIGNAL-HANDLE TEST-PATTERN↵`	Output Test Pattern when no input signal
`SET TX NO-SIGNAL-HANDLE NO-TIMING↵`	No output when no signal – VKA off (default)
`GET TX NO-SIGNAL-HANDLE↵`	Get the current No Signal Handling mode

Test Pattern

Slim70-Pro transmitter (SY-HDBT-70SP-T) has 12 test patterns and 5 resolution settings available. The selected Test Pattern can be activated using the TP switch setting on the transmitter.

Commands	Details
`SET TX TEST-PATTERN x y↵` (default: 1080p Checkerboard)	x is Pattern - select one of following options: BLACK, RED, GREEN, BLUE, WHITE, RED_RAMP, GREEN_RAMP, BLUE_RAMP, PRBS, RAMP, STRIPE, CHECKER-BOARD (default) y is Resolution - select one of following options: 4K30, 4K25, 4K24, 1080P60, 720P60
`GET TX TEST-PATTERN↵`	Get the current Test Pattern mode

Safety Temperature

The following commands can set the Power Off, Warning, and Re-Power temperatures:

Commands	Details
`SET TX SAFE-TEMP-ONOFF ON↵` `SET RX SAFE-TEMP-ONOFF ON↵`	Enable Transmitter safety temperature handling Enable Receiver safety temperature handling
`SET TX SAFE-TEMP-ONOFF OFF↵` `SET RX SAFE-TEMP-ONOFF OFF↵`	Disable Transmitter safety temperature handling Disable Receiver safety temperature handling
`SET TX SAFE-TEMP-VALUE x y z↵` `SET RX SAFE-TEMP-VALUE x y z↵`	Set warning temperature x Set shutdown temperature y Set re-power temperature z Default TX settings: x=70, y=75, z=65, the unit is °C Default RX settings: x=75, y=80, z=70, the unit is °C
`GET TX SAFE-TEMP-VALUE↵` `GET RX SAFE-TEMP-VALUE↵`	Get the current Transmitter safety temperature values Get the current Receiver safety temperature values

Notes:

1. For the **SAFE-TEMP-VALUE** commands, the following rule must be followed:
   Shutdown (y) > Warning (x) > Re-Power (z) > 55.
2. When the device enters the Temperature Warning condition, the red PWR LED will slow flash once every two seconds. When the device enters the power off condition due to excessive overheating, the red PWR LED will fast flash three times a second.
3. An automatic GET TX/RX SAFE_TEMP_VALUE RS232 response is reported (sent), in case of Temperature Warning / Power Off condition.

Diagnostic Commands

Diagnostic tools such as Cable Length, Signal Error, Link/Signal Status, Test Pattern, Voltage Values, are most useful during installation, using a PC (or laptop) together with an RS232 interface (or USB to RS232 dongle).

As well as these, other diagnostic commands such as, Input HDMI signal details, Pulse HPD, Temperature values, can be invaluable for overall system fault finding and trouble shooting.

The SY-PCTools provides an easy and simple way to run these diagnostics efficiently, as well as setting up the special features of Slim70-Pro extender set.

Diagnostic Commands	Details
Cable length	
`GET TX CABLE-LENGTH↵`	`GET TX CABLE-LENGTH wM,` w=20,30…70
`GET RX CABLE-LENGTH↵`	`GET RX CABLE-LENGTH wM,` w=20,30…70
Link/Signal Status	
`GET TX LINK-STATUS↵`	Returns Transmitter link **on** or link **off** status
`GET RX LINK-STATUS↵`	Returns Receiver link **on** or link **off** status
`GET TX SIGNAL-STATUS↵`	Returns Transmitter signal **on** or signal **off** status
`GET RX SIGNAL-STATUS↵`	Returns Receiver signal **on** or signal **off** status
Signal Error	
`GET TX SIGNAL-ERROR↵`	GET TX SIGNAL-ERROR w, w=1, 2, 3…
`GET RX SIGNAL-ERROR↵`	GET RX SIGNAL-ERROR w, w=1, 2, 3…
Input HDMI Signal Detail	
`GET TX INPUT-HDMISIGNALS↵`	Get the current input HDMI signals information
Pulse HPD	
`SET TX PULL-HPD↵`	Forces HDMI HPD low for 200ms on SY-HDBT-70SP-T
`SET RX PULL-HPD↵`	Forces HDMI HPD low for 200ms on SY-HDBT-70SP-R
Voltage Values	
`GET TX SUPPOC-VOLTAGE↵` `GET RX SUPPOC-VOLTAGE↵`	Get the current TX Supply & iPoC Voltages Get the current RX Supply & iPoC Voltages
Temperature Read	
`GET TX CPU-TEMP↵`	**GET TX CPU-TEMP wC**, where w is the temperature (number) For example, **GET TX CPU-TEMP 48C** means 48℃
`GET RX CPU-TEMP↵`	**GET RX CPU-TEMP wC**

- **Cable Length:** cat6 cable length between 20-70m is reported back
- **Link Status:** Indicates the Transmitter/Receiver units are intercommunicating correctly.
- **Signal Status:** Indicates video signal activity on HDMI input / Output
- **Signal Error:** Indicative of cat6 signal line quality
- **Input HDMI Signal details:** Detailed information about input HDMI video signals, such as: Resolution, Refresh Rate, Colour Depth, HDR Setting, Compressed Audio Setting, Audio Rate, Audio Channels, HBR and HDCP.

- **Pulse HPD:** This command forces the HDP line low for 200mS, which has a similar effect as HDMI cable disconnection/reconnection.
- **Voltage Values:** Power supply and iPoC power voltage level measurements are reported.
- **Temperature Read:** Transmitter and Receiver temperatures closest to the main heat source can be read. This temperature will be higher than the device surface temperature.

CEC Commands

The following group of RS232 commands are only possible with display devices that support CEC commands. Use the **Display Connection Status** RS232 command to determine the CEC capability when the display device is fully powered.
CEC commands are most useful when it is not practical to use RS232 connection to the display.

CEC Commands	Details
Display On	
`SET TX DISPLAY-ON↵`	Set Display to the ON state
Display Off	
`SET TX DISPLAY-OFF↵`	Set Display into the standby state
Volume Increase	
`SET TX CEC-VOLADD↵`	Increase sound volume
Volume Decrease	
`SET TX CEC-VOLDEC↵`	Decrease sound volume
Volume Mute	
`SET TX CEC-MUTE↵`	Mute/Unmute sound volume (Toggle)
Display Connection Status	
`GET TX READ-DISPLAY↵`	Get the current Connected/Disconnected info
Display Power Status	
`GET TX DISPLAY-POWER↵`	Get the current display device power on/off info

Specifications

General

HDMI Version	Input: HDMI 2.0 - HDR and HBR supported
Max Bandwidth	Input: 18 Gbps (4K60 4:4:4) output: 10.2 Gbps (4K60 4:2:0)
HDCP Compliance	Input HDCP: 1.4 and 2.2 Output HDCP: Fully controlled – Pass, 1.4, 2.2, Cascade mode
RS232 (Control Commands – Tx, Rx)	57600 baud, 8 data bits, 1 stop bit, no parity
RS232 (Pass-Through – Tx, Rx)	Any baud rate to maximum of 115200.
RS232 (Pass-Through – T2, R2)	Any baud rate to maximum of 57600. (or use as CTS, RTS)
IR IN, IR OUT	25-60 KHz carrier frequency

Video and Audio

Input Video Formats Supported	All VESA resolutions to 4096x2160p (18G), and all 3D formats – Examples: 4096x2160p 24/25/30/50/60Hz 3840x2160p 24/25/30/50/60Hz 2560x1440 50/60Hz 2048x1152 50/60Hz 1920x1080p 24/25/30/50/60Hz 1920x1080i 50/60Hz 1280x720p 50/60Hz All PC resolution including 1920x1200 – Examples: 1920x1200 60/75Hz 1360x768 60/75Hz 1680x1050 60/75Hz 1280x1024 60/75Hz 1600x1200 60/75Hz 1280x960 60/75Hz 1440x900 60/75Hz 1280x800 60/75Hz 1400x1050 60/75Hz 1024x768 60/75Hz 1366x768 60/75Hz 1152x864 60/75Hz
Colour space	RGB, YCbCr 4:4:4, 4:2:2, 4:2:0
Colour depth	8, 10, 12 bits
Down-Scaler (output)	1080p: All 4K inputs scaled down to 1080p 4K60-420: Convert 4K50/60 4:4:4 inputs to 4K50/60 4:2:0
Output Video	Down-scaled signals, with all others as Pass-through video
Audio Formats Supported	2.0 / 2.1 / 5.1 / 7.1 channel LPCM, Dolby, AC3, DTS
Audio Outputs (de-embed) (SY-HDBT-70SP-T)	Mini TosLink (optical) 3.5mm analogue stereo (L/R)

Power Supply

Power Consumption (Tx + Rx)	9W max. (Tx: 3.5W, Rx: 5.5W)
PSU Rating	48V @ 0.5A (operating voltage range: 24V to 48V)

Environmental and Physical

Operating Temperature Range	0 to +40°C (+32 to +104°F)
Operating Humidity Range	10 to 90 % RH (non-condensing)
Dimensions (L x W x H)	109 x 74 x 11.5 mm (excluding connectors)
Weight (Unit only)	Transmitter: 165g Receiver: 165g

Package Contents

Item	Qty
SY-HDBT-70SP-T unit	1
SY-HDBT-70SP-R unit	1
Brackets	4
5 pin female captive screw connector	2
IR Emitter / IR Receiver (eye) set	1
48V DC/0.5A Power Adapter With interchangeable fittings for UK, EU and US	1

Notes:

1. **Heat Management:** The Slim70-Pro HDBaseT extender has been designed in a revolutionary manner, by directly using the casing as a heatsink for power dissipation. This technique ensures the actual chipsets are running at lower temperatures as the heat generated is dissipated to the environment more efficiently. As a result, the system long term reliability and life-expectancy is significantly improved.
2. It is normal for these devices to run hot (in particular the Receiver unit) – Please ensure adequate ventilation and avoid placing them close to any other heat source.
3. The Slim70-Pro units are also equipped with option of temperature control, thus ensuring that in the event of an excessive temperature rise, the units can safely shut down.

Safety Instructions

To ensure reliable operation of this product as well as protecting the safety of any person using or handling these devices while powered, please observe the following instructions.

1. Do not operate these products outside the specified temperature and humidity range given in the above specifications.
2. Ensure that these products are adequately ventilated to allow them to operate efficiently as these products do generate heat during normal operation.
3. Repair of the equipment should only be carried out by qualified professionals as these products contain sensitive devices that may be damaged by any mistreatment.
4. Only use this product in a dry environment. Do not allow any liquids or harmful chemicals to come into contact with this product.

After Sales Service

1. Should you experience any problems while using this product, firstly refer to the Troubleshooting section in this manual before contacting SY Technical Support.
2. When calling SY Technical Support, the following information should be provided:
    - Product name and model number
    - Product serial number
    - Details of the fault and any conditions under which the fault occurs.
3. This product has a two years standard warranty, beginning from the date of purchase as stated on the sales invoice. For full details please refer to our Terms and Conditions.
4. SY Product warranty is automatically void under any of the following conditions:
    - The product is already outside of its warranty period
    - Damage to the product due to incorrect usage or storage
    - Damage caused by unauthorised repairs
    - Damage caused by mistreatment of the product
5. Please direct any questions or problems you may have to your local dealer before contacting SY Electronics.

NOTES: