



6 x 6 Video Matrix System



L66P

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3	26/05/14	Product name update

Attention:

- During initial set up and during any changes to the installation, please switch off and unplug mains power (from this system and any equipment that is to be connected to it) prior to connecting any leads / cables. Plug in and switch power back on again after all interconnection leads are in place.
- Do not run HDBaseT / Zone Cat5e/6 cabling with or in close parallel proximity to mains power cables.
- Do not connect any part of this equipment to Power Over Ethernet devices. Damage may result.
- During operation the Leaf L66 and associated LB1 breakouts may feel warm to the touch. This is quite normal. Please ensure that these items have sufficient cool air flow around them.

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1 Introducing the Leaf L66P

1.1 Overview

The Leaf Video Matrix L66P package comprises a Leaf **L66** interface unit and six Leaf **LB1** breakouts. It is designed to accept HDMI A/V sources at its inputs on the L66 and route them to remotely located LB1 breakouts. In this document, each input signal source is termed a *source* and each output and breakout is called a *zone*.

Additional features include infrared (IR) control through feed and single direction RS232 data transmission from the connected control system to any of the LB1 breakouts.



Leaf L66



Leaf LB1s

Interconnection between a Leaf L66 and associated LB1 breakouts is via one single cat5e/6 cable for each breakout. Single cat5e /6 cable interconnect between these components is made possible through the use of HDBaseT technology. This technology enables Video and Audio, as well, IR and RS232 data to be all sent by a single cable per zone over distances of up to 60 – 70 metres cable length.

Cabling specifications and information can be found in supplementary documentation.

The Leaf system is designed to be controlled via RS232 commands from 3rd party control systems. Control of basic switching functions can be (also or instead) achieved via a proprietary Leaf controller such as the Leaf TC3 connected by 6 wire Telco cable and RJ12 (6P6C) modular connectors.

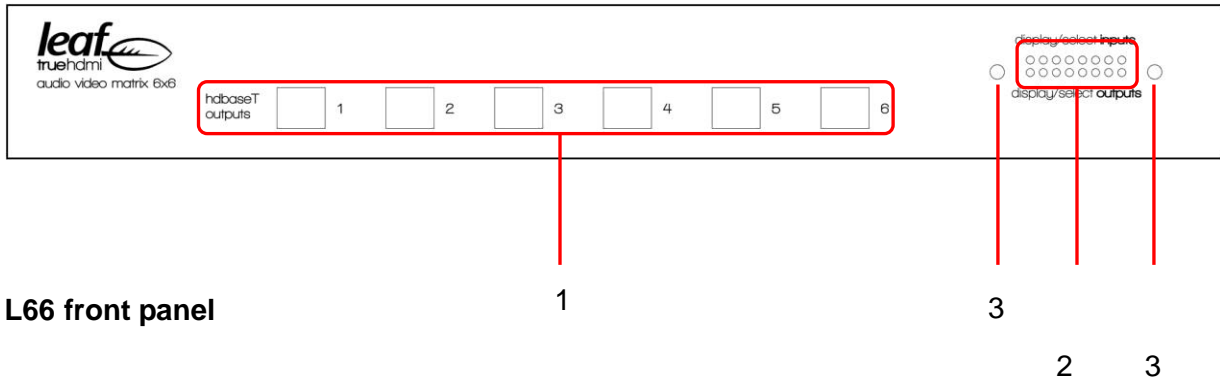
Manual control of the basic switching functions can be also be achieved by the use of front panel mounted buttons on the L66. See 5.3 - 5.4 for details. A corresponding set of display LEDs provide user feedback of the signal routing.

The L66 is built into a rack-mountable metal housing and is supplied with rack mounting ears. It is also fitted with feet should table / desktop mounting be preferred.

Front Panel Layout

The L66 front panel is fitted with connectors, visual indicators and control buttons as depicted below.

1. 6 x HDBaseT RJ45 type ports labelled HDBaseT outputs for connection to the zone breakouts (LB1)
2. 16 x LED indicators
3. 2 x press button switches

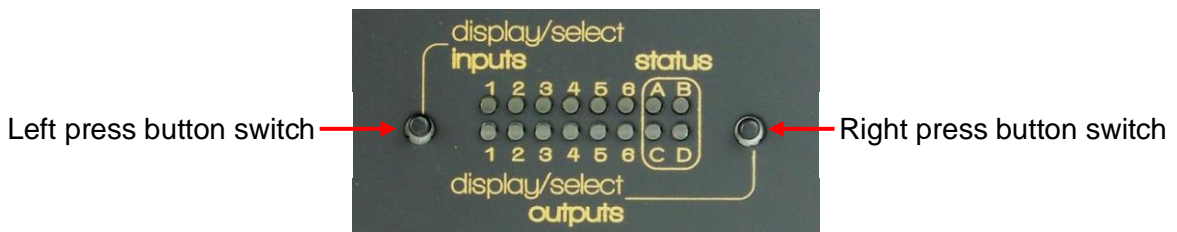


1.2 HDBase T Connections



Each Leaf breakout is connected to the interface by way of a single Cat5e/6 cable to the HDBaseT output or zone ports on the front panel.

1.3 Front Panel LED display and selection buttons



L66

16 multi colour (**green** / **cyan** / **blue**) Light Emitting Diodes (LEDs) and 2 press button switches are fitted at the right hand end of the front panel.

The LEDs are arranged in two rows of 8.

The top row of LEDs relate to the input sources 1 to 6 from left to right and Status LEDs A and B.

The lower row of LEDs relate to the output zones 1 to 6 from left to right and Status LEDs C and D.

Green LEDs indicate actively switched inputs and outputs.

Cyan LEDs indicate exclusive source (zone lock) switched inputs and outputs.

Blue LEDs indicate a switching function or a supervisory function in progress.

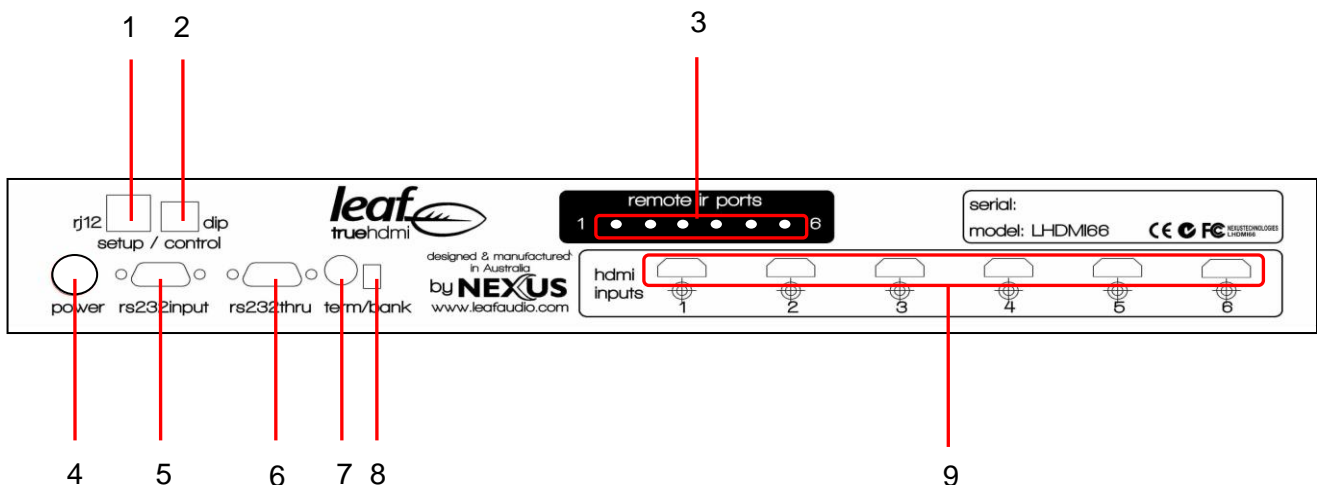
The 2 press buttons can be used for manual source to zone selections and other special functions.

See sections 5.2 to 5.4 for further information on the LEDs and press button switches.

2 Rear panel layout:

The L66 rear panel has the following fittings as depicted below.

1. 1 x RJ12 type Leaf Control input port
2. 1 x 4 way Dip Switch module
3. 6 x 3.5mm Tip Ring Sleeve sockets for connection of IR devices
4. 1 x 4 pin DIN Power connector receptacle
5. 1 x RS232 serial control input connector
6. 1 x RS232 serial control out connector
7. 1 x 16 position rotary Bank Select switch
8. 1 x RS232 Terminate switch
9. 6 x HDMI Input or source ports.



2.1 RJ12 control port

The 6 wire RJ12 port enables the L66 to be controlled by a proprietary LEAF controller such as the TC3.

2.2 4 way DIP switch module

The rear panel accessible 4 position DIP switch controls functionality of the L66. The table below summarizes the settings:

NOTE: The interface will only read the DIP switch settings on power-up. The unit must be powered off and then back on again for it to respond to any change of the DIP switch settings.

DIP SWITCH	OFF (down)	ON (up)
1	Global IR direction IN IR RX detectors at LB1 breakouts IR TX blasters at L66	Global IR direction OUT IR RX detectors or devices at L66 IR TX blasters at LB1 breakouts
2	IR Input device type (Applies when DIP 1 =ON) IR RX detectors (e.g. Leaf Hammerhead) at L66	IR Input device type (Applies when DIP 1 =ON) IR direct drive from control system* (5 volt only) at L66 *Must connect IR IN with a stereo (tip,ring,sleeve) plug at the Leaf end with the <u>ring floating / not connected</u> or with the ring connected to tip.
3	Normal Mode	Compatibility Mode
4	Future Function	Future Function

Table 1: Dip Switch Settings

2.3 3.5mm IR ports

The 3.5mm Remote IR connectors are used for routing external IR control signals in one direction between the L66 and the connected LB1 breakouts. These connections are treated as through connections. That is, IR port 1 connects to the breakout connected to Zone 1, through to port 4 being connected to the breakout at Zone 4.

The IR ports support direct connection and drive of Leaf “hammerhead” and other compatible 5 volt, 3 wire (Tip Ring Sleeve / stereo plug) IR detectors to Leaf LB41 and other compatible 2 wire (mono plug) IR blasters.

The system wide operating direction of the IR detectors and blasters (either Hub to Zones or Zones to Hub) is configurable by DIP Switch 1.

If the IR Direction is set to “Hub to Zones” by DIP switch 1, the IR ports on the L66 can be further configured by DIP Switch 2 to accept direct IR drive from an external control system or similar instead of stand-alone IR detectors.

For this configuration, Stereo (Tip Ring Sleeve) 3.5mm leads must be used instead of Mono leads for the IR interconnections from the control system to the Leaf L66. The “Ring” connection of these leads at the L66 end (or both ends) must be left “floating” / not connected.

(See table 1 for DIP switch configuration details.)

If the IR input type is set to IR RX detector (DIP Switch 2 OFF/down):
then the IR output will be automatically modulated at 38Khz.

If the IR input type is set to IR direct drive (DIP switch 1:ON/up & DIP switch 2 ON/up):
then the received IR input will be directly passed through to the IR output.

Any external IR drive voltage should not exceed 5V.

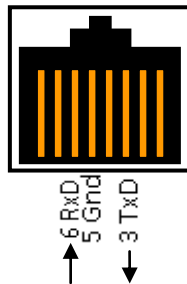
2.4 RS232 from control system to LB1 Breakouts

The LEAF L66 system allows RS232 commands to be sent from a connected control system directly to the RS232 (RJ45) ports on the LB1 breakouts.

This is achieved through specific commands in the Leaf Driver software. Refer to specific Leaf Serial Command documentation for further information.

Connection from these ports to RS232 equipment would typically be achieved through the use of RJ45 to DB9 RS232 adaptor leads. Leaf Audio has suitable RJ45 to RS232 (DB9) Female adaptor leads (LT45DB9Female) available for sale. Male DB9 RS232 connection may require the additional of M-M gender bender(s).

For convenience the pinouts of the RJ45 type RS232 port is shown below.

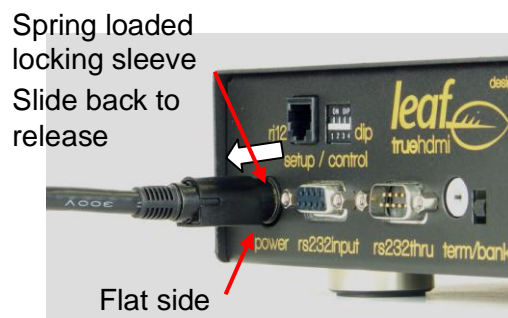


RJ45 type RS232 port(s)
receptacle LB1 (Front view)

2.5 4 pin DIN power connector

The L66 requires 4 Pin 12V power.

WARNING. Failure to use the correct power supply as provided by Leaf Audio may result in incorrect operation and / or damage to the Leaf Matrix system.



The power supply is fitted with a locking connector. Be sure to slide back the locking sleeve on the plug before attempting to connect or disconnect it at the L66. The correct connector orientation for this model is “Flat Side down”.

2.6 RS232 Serial Control connectors

The unit can be controlled by serial commands through the RS232 input port. Typically this would be connected to a control system with a straight through DB9 Male to Female RS232 lead. Some control systems may require only the TxD, RxD and Gnd wires of an RS232 lead to be connected. The pin configurations of these 3 connections on the DB9 plug is: TxD = Pin 2, RxD = Pin3, Gnd = Pin5.

2.6.1 Single L66 use

- The RS232 Input port is used for controlling the unit.
- The TERM (Termination) switch (ref: para 2.8) must be set to ON (Up).

2.6.2 Multiple L66 use

- Multiple units can be chained together and addressed on the same RS232 link by connecting the RS232 thru (out) port on one unit to the RS232 input port of the next unit.

The last unit in the chain must have the TERM (Termination) switch (ref:para 2.8) set to ON (Up), while all other units in the chain must have this switch set to OFF (Down). The RS232 Input port is used for controlling the units.

2.7 Bank Select Switch

- The 16 position rotary BANK switch selects the RS232 bank address for the unit as per the following Bank Select Table.

BANK SELECT SWITCH	L66 OUTPUT ADDRESS (ZONE NUMBER)		
	Physical	Logical	Hex
0	1 to 6	0 to 5	00h to 05h
1	7 to 12	6 to 11	06h to 0Bh
2	13 to 18	12 to 17	0Ch to 11h
3	19 to 24	18 to 23	12h to 17h
4	15 to 30	24 to 29	18h to 1Dh
5	31 to 36	30 to 35	1Eh to 23h
6	37 to 42	36 to 41	24h to 29h
7	43 to 48	42 to 47	2Ah to 2Fh
8	49 to 54	48 to 53	30h to 35h
9	55 to 60	54 to 59	36h to 3Bh
A	61 to 66	60 to 65	3Ch to 41h
B	67 to 72	66 to 71	42h to 47h
C	73 to 78	72 to 77	48h to 4Dh
D	79 to 84	78 to 83	4Eh to 53h
E	85 to 90	84 to 89	54h to 59h
F	91 to 96	90 to 95	5Ah to 5Fh

Table 2: BANK SELECT TABLE

2.8 RS232 Termination (TERM) Switch

The RS232 termination switch must be used to correctly terminate any RS232 control connection as described in paragraphs 2.6.1 and 2.6.2.

2.9 HDMI Input ports

Standard HDMI input ports are provided for the purpose of connecting HDMI sources. They are labelled 1 to 6.

All Leaf systems accord with the HDMI 1.4 specification and includes support of 3D formats.

3 BREAKOUTS

A Breakout is the “receiving end” of the Leaf system and one is required for each connected “zone” of the Leaf system.

The LB1 is the breakout that is designed for use with L66.

3.1 Local Power

Each LB1 breakout is required to be powered by its own (local) power supply and to be connected via a Cat5e / Cat6 cable link from its HDBaseT port to the associated HDBaseT port on the L66. Use only the power supplies that are provided by Leaf Audio for this purpose.

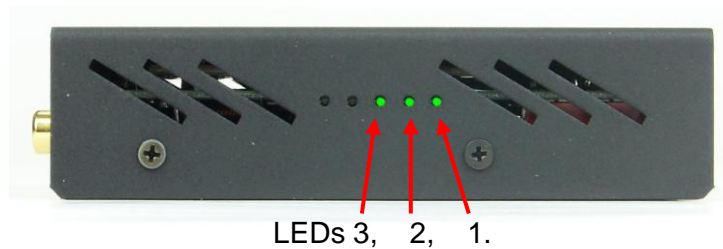
3.2 Mounting Bracket

Each LB1 is supplied with a mounting bracket which is designed to be attached to the mounting surface and have the breakout clipped to it.



3.3 Status LEDs

A set of 3 Status LEDs are visible through apertures in the right hand side of the LB1.



The Status LEDs operations are:

LED 1 FLASHING (heartbeat) = The local 12V DC power supply is connected and active.

LED 2 ON = The HDBaseT Cat5e / Cat6 cable link to the L66 has been made successfully and is ready for video.

LED 3 ON = Protected (HDCP) video content is being transferred on the HDBaseT link.

FLASHING = Non protected (no HDCP) video content is being transferred on the HDBaseT link. Irregular flashing may indicate an issue with the video link.

OFF = No video content is being transferred.
(Usually means that no source has been selected for that zone).

4 SYSTEM FEATURES

4.1 EDID Management

The Extended Display Identification Data (EDID) of all sinks (TVs, Display Panels, etc) attached to a zone are merged and presented to the source. This ensures that the source outputs the correct audio and video format to all sinks .

When a sink is switched to a source the L66 remembers its EDID. After a calibration, or each time new sinks are switched, the combination or merge of this sink EDID and previously switched sink EDIDs is calculated and stored for use thereafter until power off or recalibration.

This guarantees true repeater functionality while minimising interruption to active TVs or Display panels when selecting sources.

4.2 Calibration

This process effectively gathers all of the information from the source and sink devices (EDID and HDCP keys data) and pre-calculates the EDID merging and HDCP key list. This results in faster switching times and isolates the effect on one zone from another zone when new connections are routed. Refer to the Calibration description in the Operation section for more detail.

4.3 Exclusive Source Selection (Zone Lock mode)

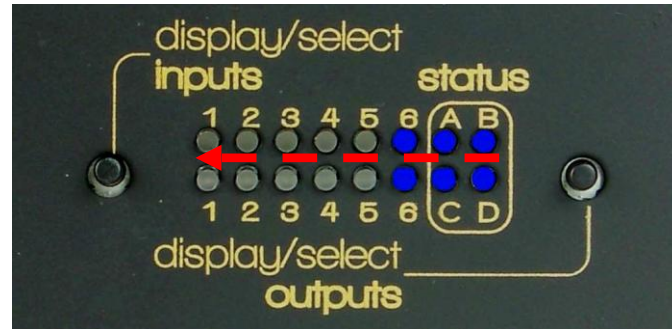
A source can be locked to a particular zone. The exclusive source selection feature enables enhanced features, such as multichannel audio, 3D etc, to become active in the locked zone (if supported by both the source and zone equipment) – even if other zones in the system do not support these features.

- This feature is activated by RS232 command.
- Any one zone can be locked to a desired source thus creating a so-called “locked connection”.
- Effectively this feature overrides the system merged EDID for this connection and allows the unique EDID for the zone to be passed through to the source. A typical example would be switching a 3D-capable zone to a 3D-capable source in instances where not all zones in the system can support 3D.
- No other zone can connect to a source that is locked.
- Multiple locked connections are allowed but locked sources cannot be shared.
- When the zone of a locked connection is disconnected the source is unlocked and available for selection by other sources.
- When the zone of a locked connection changes to a new source the existing source is unlocked.
- When a global command is sent then the existing source is unlocked
- Locking a zone to a source that is already switched to one or more other zones will cause that source to disconnect from those zones.

5 Operation

5.1 Apply Power

Once power is applied to the L66 it will go through a Power Up routine lasting a minute or two. The display LEDs will cycle blue in a Right to Left direction.



When this routine is completed the unit will reconnect the most recent state (Source – Zone selection or standby) Active (switched) source and zones are indicated by their corresponding LEDs glowing green

LEDs 1 to 6 on the upper row indicate selected sources 1 to 6.

LEDs 1 to 6 on the lower row indicate selected zones 1 to 6.

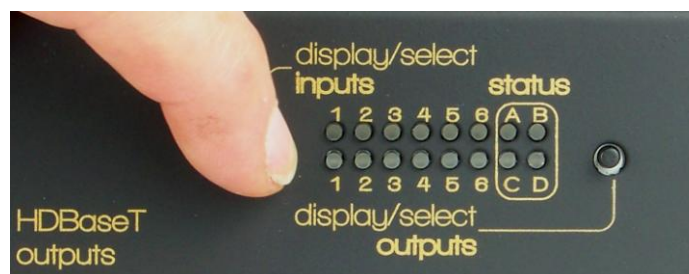
Standby will be indicated by the right hand lower LED (D) only, pulsing green/ blue.

5.2 Calibration

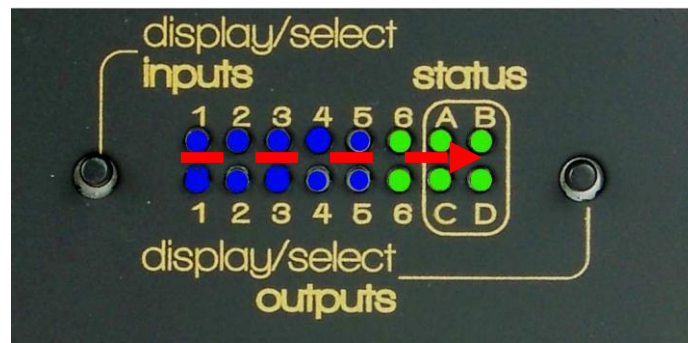
The system should be calibrated on first use, after any new devices (source or zone equipment) are added, port allocations changed or after power has been interrupted and reapplied. Failure to correctly calibrate a system may lead to interruption to audio and video at zones when other zones are switched to a source that is already in use.

The system may be calibrated under RS232 control or manually by following these steps.

1. Turn on all sources and zone equipment (receiver or TV). Ensure that zone equipment (TV's etc) are set to the correct HDMI input.
2. Press and hold operated the left hand press button switch on the front panel for 3 seconds to commence calibration.



The LEDs will “run” Left To Right alternatively Blue / Green



The calibration process may take up to a minute or two and when finished, the LEDs will display (green) any previously selected sources and zones or revert to standby (right hand LED only, pulsing green/blue) if that was the previous state.

5.3 Creating input to output switched selections

While this would typically be performed by RS232 commands from your control system, basic selections may also be performed manually by following these steps in sequence.

Manually select output zone

Press the right hand press button switch sequentially until one of the LEDs in the lower row corresponding to the desired output (zone) is blue, then release the switch and proceed to the next step.

The left hand six LEDs in the lower row indicate the output zones 1 to 6 left to right.

(Zone 2 is depicted in this picture)

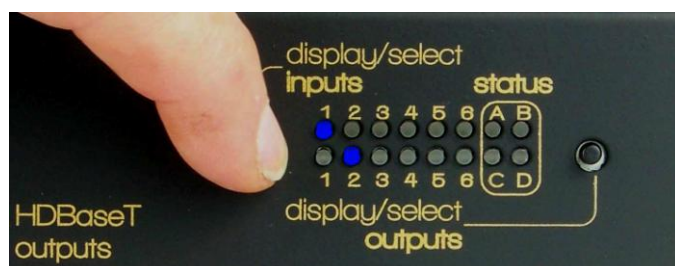


Manually select the input source for that zone

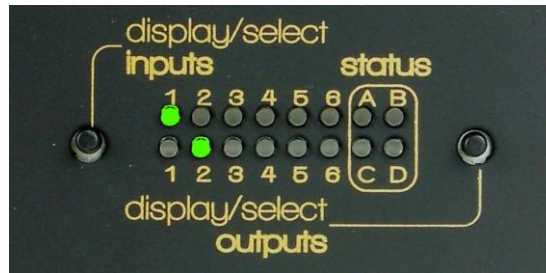
Press the left hand press button switch sequentially until one of the LEDs in the upper row corresponding to the desired input (source) is blue, then release the switch.

The left hand six LEDs in the upper row indicate the input sources 1 to 6 left to right.

(Source 1 is depicted in this picture)



After a few seconds the switched selection will be made, and these LEDs will change to Green.



Repeat this process for other input (source) to output (zone) selections as required.

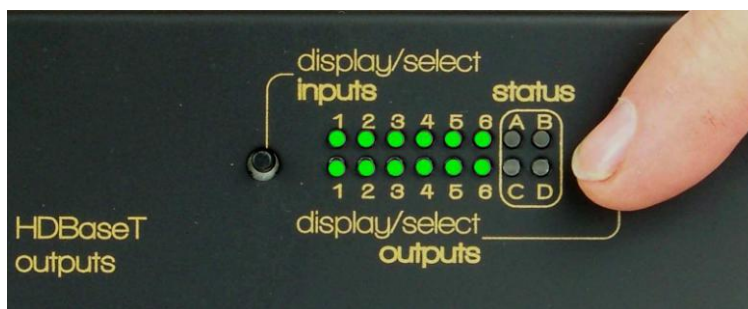
Notes:

1. If neither button is pressed for an extended time (approx 10sec), the display will revert back to display (green) mode, displaying the existing input/output connections.
2. If in the second step above the left hand press button switch is pressed until no Blue input LEDs are displayed, the connection will be cleared - i.e. the output will be disconnected from the input.

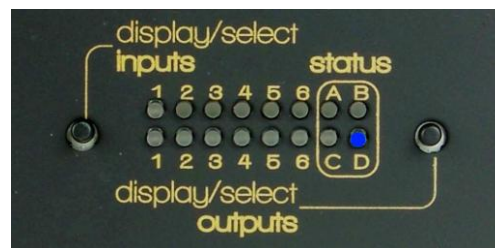
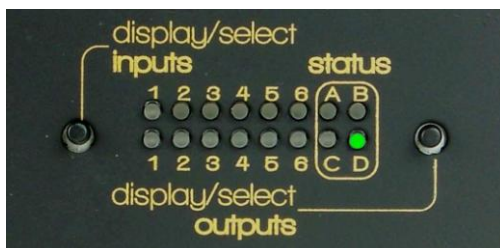
5.4 Clear all switched selections / Global OFF

While this would typically be performed by RS232 commands from your control system, it may also be performed manually by the following steps.

Press and hold the right hand press button switch for 3 seconds to clear all switched selections and set the unit to standby mode.



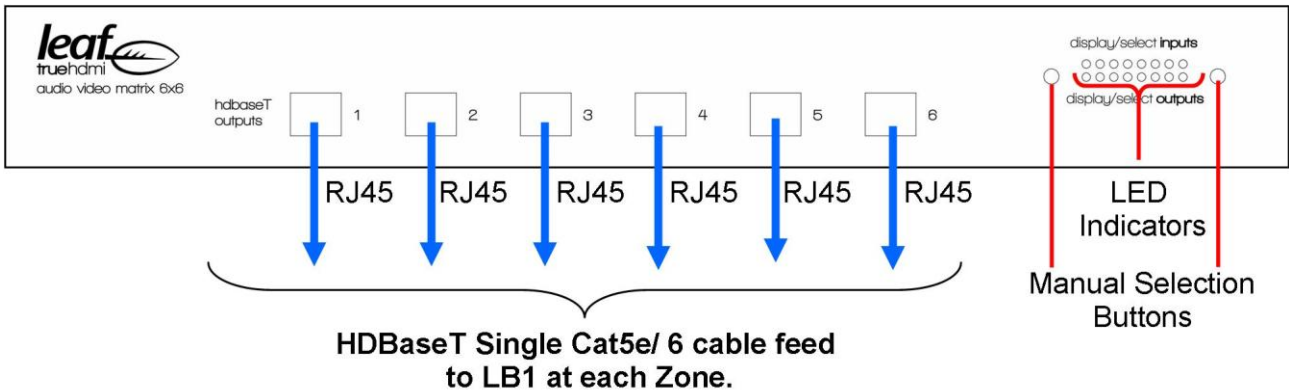
Standby mode will be indicated by the lower right hand LED (Status LED D) pulsing green / blue.



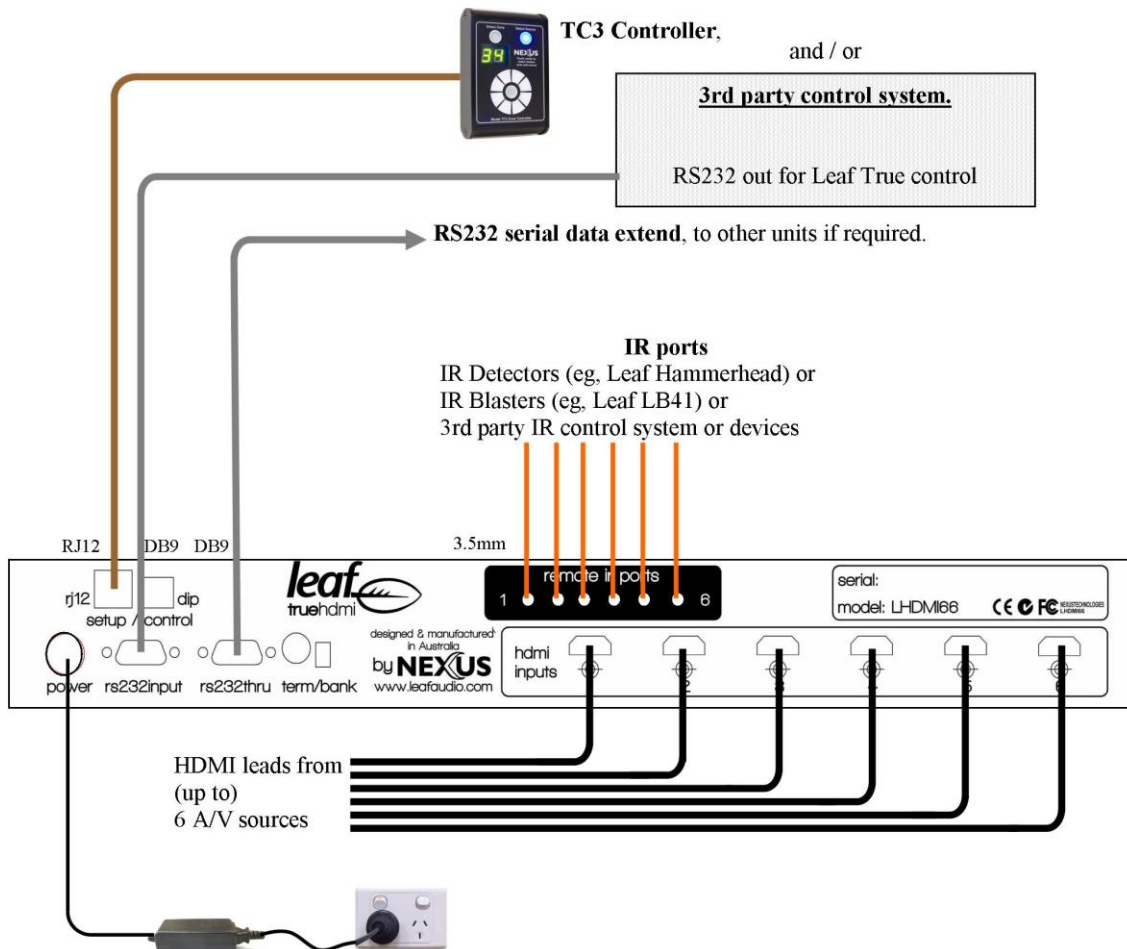
Status LEDs A, B and C are reserved for future features.

6 Interconnections

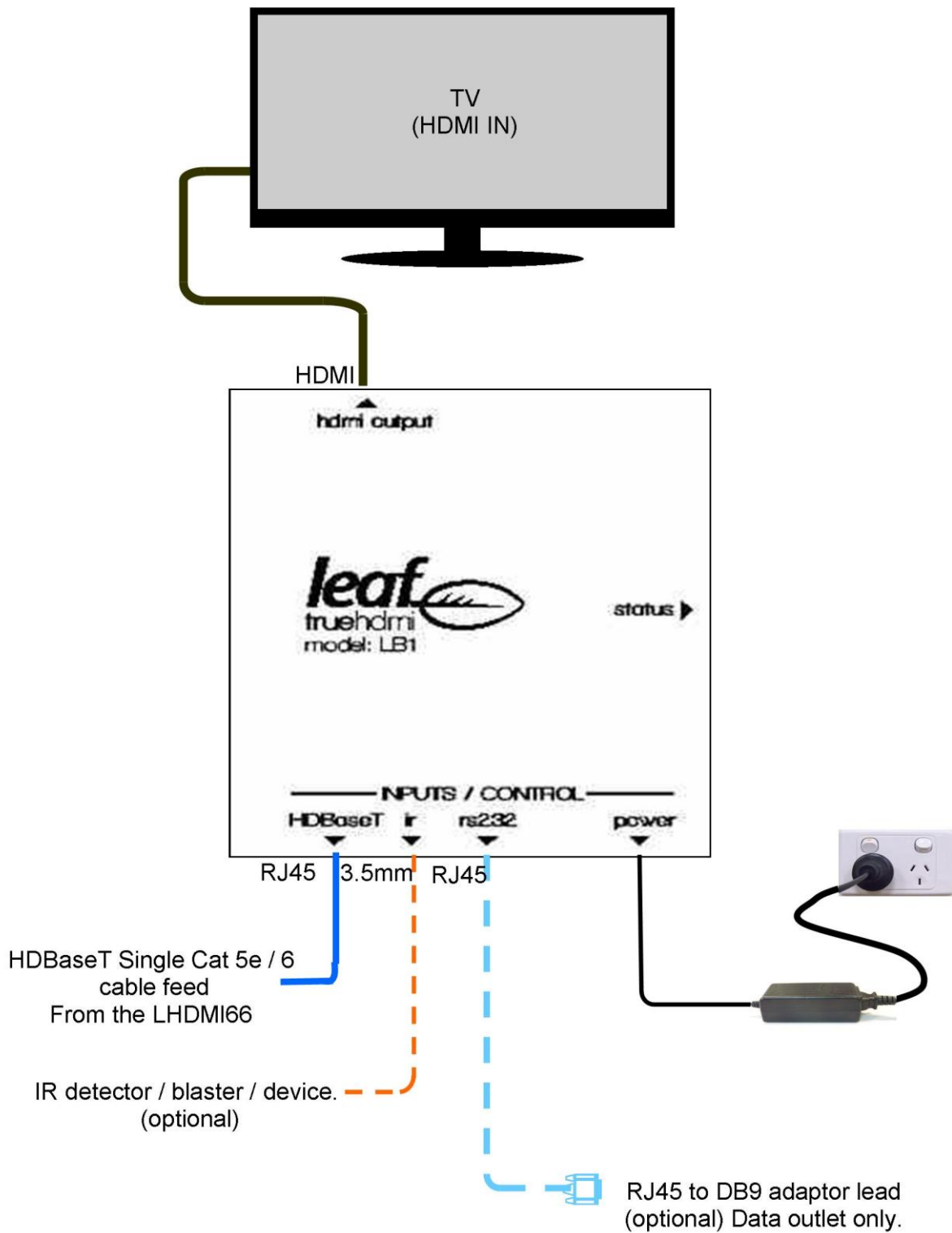
6.1 Interconnections at front panel



6.2 Possible interconnections at rear panel



6.3 Possible interconnections at LB1



L66: MAIN MATRIX UNIT

	FEATURE	SPECIFICATION
1	INPUTS: DIGITAL-AUDIO/VIDEO	(6x) HDMI inputs <u>VIDEO FORMATS:</u> 480p,576p,720p50/60,1080i50/60,1080p50/60,HDMI1.4 Mandatory 3D formats as a minimum.DVI formats. <u>AUDIO FORMATS:</u> LPCM,AC3,DTS,DD+,DTS-HD (in Multichannel mode)
2	OUTPUTS: HDBaseT	(6x) HDBase-T Outputs Uncompressed HD video - Supports all formats as in item 1. <u>One cable carries:</u> Video, Audio, IR, RS232.
3	SYSTEM CONTROL	(1x) RJ12 Leaf Proprietary Remote control (1x) RS232 DB9 IN (1x) RS232 DB9 LOOPOUT Bank select and termination selectors.
4	INFRA RED REMOTE CONTROL THROUGHPUT ONLY (No direct control by IR)	(6x) DIRECTIONAL IR INPUTs. Support for: Direct IR, IR TX Bug, IR RX Bug. Modulated 38Khz and Envelope.
5	DISPLAY/KEYS	Front Panel with 2 push switches and 16 LEDs enable basic selection and display of the connections within the matrix.
6	PHYSICAL LAYOUT	Rack mountable (1RU+). Remote HDBaseT RJ45s, and LEDs at front, all other connections at rear. RJ12 for connection to TC3 controller. User interface(basic): 2 buttons 16 LEDs. Standard rack ears and feet included.
7	RANGE (Cable Distance)	Expected achievable range between L66 and the connected Zone LB1's is up to approximately 60 metres for Cat5 /6 cable and up to approximately 70 metres for Cat6a cable.
7	NUMBER OF INPUTS/OUTPUT	6 /6
8	EXPANDABILITY	Bank Select Switch
9	POWER	45W 3.75A 12V DC. Consumption depends on resolution of distributed video and features enabled. 60W supply included – Use Leaf Audio supply only.
10	DIMENSIONS (W, D, H)	Approx 425mm x 290mm, x 55mm

LB1: BREAKOUT		
	FEATURE	SPECIFICATION
1	INPUTS: MAIN A/V	(1x) HDBase-T Input . See L66 for further specification.
2	OUTPUTS: AUDIO/VIDEO	(1x) HDMI output
4	OUTPUTS:RS232	(1x) RS-232 PORT (RJ45 CONNECTOR) Up to 115200 Baud.
5	OUTPUT: IR THROUGHPUT	IR LED DRIVER 38KHz... OR... IR INPUT. (Selected by main unit). 3.5mm TRS female connector
6	NUMBER OF INPUTS/OUTPUT	1/1
7	POWER	Local power required 12W (1A @ 12V).
8	DIMENSIONS (W,D,H)	116mmx121mmx31mm(36mm with wall plate fitted)



Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could void the user's authority to operated the equipment under FCC rules.