HANDBOOK

Leema Acoustics Tucana Integrated Amplifier

TUCANA II

LEEMA ACOUSTICS

Index

Introduction

Congratulations on your purchase of a Leema Tucana II amplifier. The Leema product range has been painstakingly engineered in the United Kingdom to offer genuine state-of-the-art performance. Users should read and follow this instruction manual, paying particular attention to the user installation and safety advice sections. This manual has been written to enable you to achieve the very best performance and maximum listening pleasure from your investment.

We wish you many years of pleasurable listening… Move Your World! With best regards, The Leema Team.

EC Declaration of Conformity

In accordance with EN ISO 17070-1:2004

We Leema Electro Acoustics Limited

of Llanfair Caereinion
Welshpool
Powys
UK

in accordance with the following Directive(s): 2006/95/EC The Low Voltage Directive 2004/108/EC The Electromagnetic Compatibility Directive

hereby declare that: Equipment HI-FI Integrated Amplifier Model Name Tucana II

is in conformity with the applicable requirements of the following standards

Standard. No.	Name	International Equivalents
BS EN60065; 2002	Electrical Safety Requirements	EN60065; 2002 / IEC60065; 2001
BS EN 55020; 2002	EMC Immunity	EN55020; 2002 / CISPR 20; 2002
BS EN 55013; 2001	EMC Emissions	EN55013; 2001 / CISPR 12; 2001
BS EN 61000-3-2; 2001	EMC Limits for Harmonic Emissions	EN61000-3-2; 2000 / IEC61000-3-2; 2000
BS EN 61000-3-3; 1995	EMC Limits for Voltage Fluctuations	EN61000-3-3; 1995 / IEC61000-3-3; 1994

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives and Standards.

Signed by: .....

Name: Mallory Nicholls
Position: Technical Director
Done at: Leema Electro Acoustics Ltd.
On: 6/11/2009

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Environmental Issues

Although Leema electronics operate in standby mode as opposed to being fully switched off, the power drain has been optimised to a negligible level. Contrary to popular audiophile practice, we do not recommend leaving our power amplifiers permanently powered. All Leema amplifiers have been designed to attain full operational specifications and sound quality within a few minutes of switch-on.

Leema operates a 100% recycling program. All waste materials generated as part of the manufacturing process at Leema's headquarters are recycled via a licensed specialist company.

WEEE Scheme

Disposal of Electronic Equipment in the European Union and other countries with collection procedures:

The wheelie bin symbol on this product indicates that it shall not be treated as household waste. It should be disposed of via a collection point for the recycling of electrical and electronic equipment.
Leema is fully registered under WEEE/HK 0757 ZX.

VERY IMPORTANT

Before connecting your new Leema Tucana II to the rest of your system, please ensure that the loudspeaker cables are correctly and firmly attached to the binding posts on the rear of the unit. All required sources should also be connected BEFORE inserting the mains power lead and powering for the first time. Tucana II has no output short circuit protection, therefore, shorting the speaker terminal with power applied may cause the internal fuses to fail and may be dangerous.

Made in the UK Tucana II was designed and is manufactured in Wales, UK.

User installation and safety advice

Please ensure that the mains voltage of your new Tucana II amplifier is correct for your region. The setting is displayed on a label next to the mains power inlet. The mains voltage setting is not user adjustable, therefore the amplifier must be returned to the manufacturer if any changes are required. Ensure the mains supply is switched off at the wall socket, or unplugged before installing or moving the amplifier.

Do not use near water, for example do not place a potted plant on top of the unit or allow drinks to be placed near the unit. If liquid is spilt in to the cabinet, remove the mains lead from the wall immediately. The amplifier should then be returned to your dealer for safety testing before re-use. Failure to do so may result in electric shock or even fire! Do not use the amplifier in damp conditions, for example, outside of the house. In the event of an electrical storm, remove the mains power lead from the wall outlet.

Keep away from direct sunlight and other heat sources and ensure adequate ventilation around the amplifier to maintain proper cooling. Units **MUST NOT** be stacked directly on top of each other.

Never attempt to open the cabinet. There are no user serviceable parts inside and doing so will invalidate the amplifier's warranty.

Avoid touching the amplifier cabinet after prolonged use at high output, as the case and heatsinks may become hot to the touch.

As with all high-powered amplifiers, high voltages can occur at the output binding posts. Loudspeaker connection should only be carried out with the unit switched off. Care should be taken to ensure there is no possibility of short circuit behind the unit when in use - for example, metal framed hi-fi units may be a hazard.

To ensure maximum audio quality and dynamics, Tucana II does not use output short circuit protection except for power supply fuses, so extreme care must be taken.

Tucana overview

The award-winning Leema Tucana II is a very high power output, microprocessor-controlled, stereo integrated amplifier. It is capable of class-leading performance as the heart of an audiophile stereo system and thanks to the LIPS (Leema intelligent protocol system) interface, can also be the centre of a stunning home cinema or surround music system. Each component in the system dynamically configures itself in real time, depending on the requirements of each input source. The microprocessor gives an unprecedented degree of sophistication, making the Leema 'Constellation' series easy to use for all the family. No longer will only one member of the family know how to play a CD or watch a movie - the built-in intelligence learns your preferences without menus and confusing options.

Connections

Input connections

BAL> The Balanced input may be used to connect any source having balanced outputs, for example, the Leema 'Agena' or 'Antila'. Balanced connection will be of particular benefit with interconnecting cables greater in length than 1M.

CD> The Tucana II's CD input should only be connected to the analogue outputs (usually marked left/right and colour coded white/red) of the CD player. **DO NOT** connect any available digital outputs from the CD player to the input terminals of the Tucana II, as damage to the speakers is likely to occur.

TUNER> The Tuner input should be connected directly to the analogue outputs (usually marked left/right and colour coded white/red) of a radio TUNER.

AUX> The AUX input can be connected directly to any line level analogue stereo outputs. Some devices such as MP3 or hard disk based portable players have a comparatively low output, which will require the input gain to be increased. Please see 'Gain' on page 10.

Loudspeaker Outputs

The speakers are connected here.
Ensure correct polarity:
Red terminal is +, Black terminal is -.

WARNING:
Do not make connections with unit connected to the mains supply.

SHORTING THE LOUDSPEAKER OUTPUTS WILL DAMAGE THE AMPLIFIER

'LIPS' bus connectors

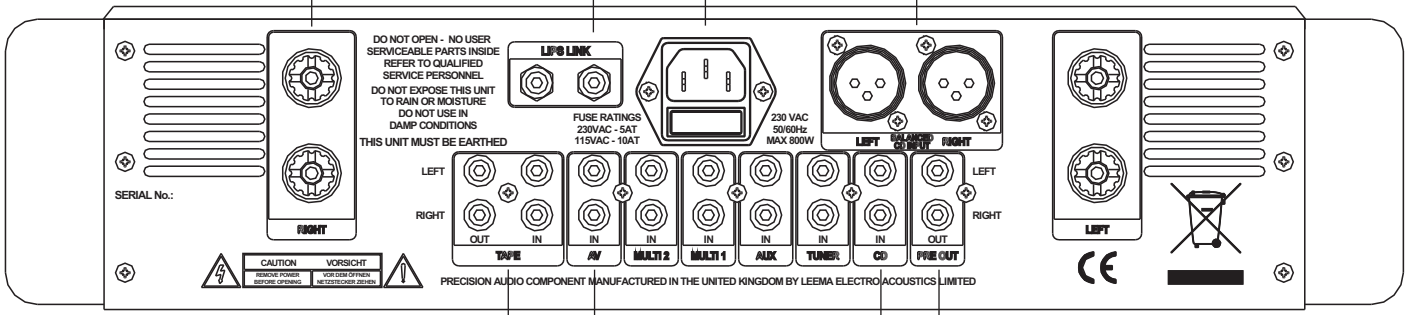
This allows communication between various Leema system components.

Power Inlet

Please ensure that the specification indicated adjacent to the connector is correct for your area. This will either be 230VAC or 115VAC.

Balanced Inputs

Source equipment having balanced outputs may be connected here.



TAPE Input and Output

A tape recorder or PC audio card may be connected here.

AV DIRECT

The AV Direct input is intended for connection of an AV processor or similar.

WARNING:
Any source connected here MUST have its own volume control. When the AV input is selected, the volume level is preset. If a fixed level source is connected here e.g. a CD player, the resulting volume level will be extremely high.

Inputs

When a Tucana II is used in a stereo system, all inputs CD to MULTI 2, may be used to connect stereo sources.

If the Tucana is part of a multi-channel system, CD, TUNER and AUX are used to connect stereo-only sources.

MULTI 1 and MULTI 2 are the left and right channels of multi-channel sources, e.g. DVD players etc.

PRE-AMP Output

This output may be used for subwoofers, bi-amping or for bass enhancement when used with a Leema Corvus.

MULTI 1> In a stereo system, the MULTI 1 input can be used as an additional stereo input. In a surround system consisting of a Tucana II, Hydra and Corvus, MULTI 1 is used to connect the front channels of multi-channel sources such as DVDA, SACD or DVD players equipped with internal multi-channel de-coding. In such a system, the left and right surround outputs of the source machine would then be connected to a Hydra's left and right MULTI 1 inputs. The remaining centre and subwoofer outputs from the source machine connect to the Corvus' MULTI 1 centre and subwoofer inputs. For a more details, please refer to the Corvus manual.

MULTI 2/MP3> The MULTI 2 input may be used as part of a multi-channel system (see Multi 1 above), or for connection of MP3 type devices. This input is repeated on the front panel using a 3.5mm jack socket. Do not connect the front and rear sockets simultaneously. Although no harm will be done, the audio quality will be severely degraded.

WARNING: The AV DIRECT input must not be used with sources that are not equipped with an independent volume control, e.g. most CD players and DVD players. This input is designed to be used only with an external surround sound processor that has its own volume control.

AV DIRECT> The AV DIRECT input is provided for those using a dedicated external multi-channel processor equipped with a volume control. When AV is selected, the volume setting defaults to a low level and then slowly rises to a pre-set gain point. The volume rise may be interrupted by turning the volume knob, or by pressing volume-down on the remote. If a Hydra and Corvus are connected via LIPS, the volume setting of all units will follow that of the Tucana. Great care should be taken when using the AV DIRECT input, since an excessive volume level could easily result. However, unlike other systems, the volume control on the Leema system is still active and can be adjusted away from the pre-set point as a safety feature. Selecting another input on the Tucana II and then re-selecting the AV DIRECT input, will reset the gain point.

In a surround system, the Tucana II inputs should be connected to the external processor's analogue left and right front outputs. The left and right surround outputs of the processor should be connected to the Hydra's left and right AV DIRECT inputs. The remaining centre and subwoofer outputs from the processor connect to the Corvus AV DIRECT centre and subwoofer inputs. For more details, please refer to the Corvus manual.

TAPE> The TAPE input should be connected directly to the analogue outputs (usually marked left/right and colour coded white/red) of a recording device such as a tape machine or PC audio card. DO NOT connect any available digital outputs from the source player to the input terminals of the Tucana II, as damage to the speakers is likely to occur.

Output connections

TAPE OUT> Any input selection other than TAPE will automatically be fed to the tape record output sockets. The volume control on Tucana has no effect on the record output level.

PRE OUT> These outputs are controlled by the Tucana's volume control and can be used for a variety of uses. Examples include feeding an active subwoofer and bi-amping, where a Tucana II is used to drive the tweeters in the loudspeakers and a Hydra is used to drive the woofers. The loudspeakers must be suitable for bi-amping. This is normally the case where there are two pairs of binding posts on the rear of the loudspeakers. It is **vital** to remove the links on the rear of the speakers, otherwise the amplifiers will be connected to each other, which will result in considerable damage. Please contact Leema Electro Acoustics Ltd. for advice.

Loudspeaker terminals

There are two pairs of shrouded loudspeaker terminals on the Tucana's rear panel, one pair for the left loudspeaker and one pair for the right loudspeaker. They accept 4mm banana type plugs. Pay close attention to polarity. The red terminal must connect to the red terminal on the loudspeaker and the black to the black. Leema recommend the use of high quality bi-wire cables with Tucana II to ensure optimum fidelity.

Cables

Never underestimate the importance of good quality speaker cables. Bell wire or lighting flex will not do. Speaker cables can be very synergistic. The higher the system resolution, the more easily the differences between cables can be discerned.

Front panel controls

Standby button

The blue light in the centre of the standby button is illuminated if the unit is in standby mode. Pushing the standby button once, or pressing the power button on the remote control will turn the unit on. The LED ring around the volume control will flash for a few seconds while Tucana II initialises. If mains power has not been removed from the unit, the previously used input is re-selected and the volume setting is slowly raised to a low level. This fade up can be interrupted at any time by turning the volume control on the front, or by pushing the volume-down button on the remote control. Unlike many electronic devices, the standby mode uses very little power and is essential for LIPS operation.

Source selection

Input sources are selected by pressing the appropriate button on the front panel, or by using Input Up/Down on the remote. The audio will mute for a fraction of a second while switching, to prevent any unwanted clicks, then restore to a low level to avoid speaker damage. When AV direct is selected, the volume initially returns to a low level then slowly fades up to a pre-set level for control via the AV processor. The volume can be manually overridden at any time by turning the volume knob or by pushing either of the volume buttons on the remote control.

Volume control

The ring of blue LED's around the control offer a high-resolution visual indication of the volume setting. This has the advantage of being clearly visible when viewed from a distance, or when using the remote control. The method of volume control used permanently ensures the highest fidelity without the gradual degeneration of conventional motorised volume controls. The volume control has no effect on the tape-output, but does control the pre-out volume.

Mute> This may be used to temporarily reduce the volume to zero. This is useful for taking phone calls etc., without losing your normal volume setting.

Gain> Pressing 'Gain' allows the gain of the currently selected input to be varied over a range of +/-10dB. This is ideal for boosting the level of quiet sources such as MP3 players and tuners, to better match that of CD players etc. When you have finished adjusting the gain, press the button again to leave the editor. The gain adjustment is memorised and applied whenever the current input is re-selected. To return the gain to a nominal level, re-adjust the gain to the two top LEDs. It is recommended that the CD gain is not adjusted, but used as a reference against which the other inputs are judged.

Balance> The balance editor allows the level of the loudspeakers to favour the left or right. This facility may be helpful if your listening position is not ideal or if your hearing is not perfectly balanced. As with Gain, press to enter the editor and press again when the adjustment is complete. Balance affects all inputs and the pre-amp output.

Front Panel LEDs

Various LEDs are provided on the front panel. The most obvious being the collection of thirty-two LEDs forming the volume display ring. This ring normally displays the volume level, however, during 'Gain' or 'Balance' editing, the ring is used as an indicator for those functions. In addition, each pushbutton is illuminated when active.

Warning LEDs

PROTECT> This LED indicates that the amplifier has entered protection mode to safeguard the loudspeakers. It is normal for this LED to illuminate when the amplifier is first turned on. If the LED continues to flash, it indicates a fault condition and the amplifier should be returned for service.

HEAT> This LED will flash and the unit will switch to standby if the heatsinks at the sides of the unit reach seventy degrees centigrade. The LED will continue to flash until the unit has cooled down. During this time, it is not possible to switch the unit back on. If this situation occurs, ensure the unit has enough ventilation and that the speakers do not have fault. The condition may also occur if very high volumes are used for long periods, such as during a party. **Warning:** Avoid touching the hot surfaces of the unit!

Remote control

Power> The red power button turns the unit on from standby, or reverts to standby from power on. When powered on, the volume ring will flash while the unit initialises then, if applicable, the previous input setting will be restored and the volume will slowly rise to a low level. The fade up sequence can be overridden at any time by using either the volume control or the remote control volume buttons.

Mute> Pressing the mute button once, while the system is playing, will cause the volume to rapidly fade to zero. A second push of the button will restore the volume level.

Input> The input up and down buttons cycle through the available input sources, one-button push at a time. The audio mutes for a fraction of a second between selections.

Volume> Two buttons, one for up and one for down, control the volume. If using a complete Leema system, the volume of the Hydra and Cygnus will also change in step with the Tucana.

Remote control codes

The remote control format is Sony 12 bit. The following codes may be used to program universal remotes:

IR DEVICE = 16 (Amplifier)

IR COMMANDS:
0=CD, 1=TUNER, 2=AUX, 3=MULTI1, 4=MULTI2/MP3, 5=AV DIRECT, 6=TAPE, 7=BALANCED, 16=Input Up, 17=Input Down
18=Volume Up, 19=Volume Down, 20=Mute

Technical Discussion

Topology

Starting with the pre-amp and control stage, input selection is performed by gold-over-silver contact relays under control of a microprocessor. The audio is then buffered by audiophile quality OP275 amplifiers in order to present the Burr Brown precision attenuators with a low impedance drive signal. Next, the controlled signal passes to the dual-mono class B power amplifiers and also to the buffered pre-amp outputs.

The left and right power amplifiers are totally separate and have their own power transformers, rectifiers and reservoir capacitors. A third transformer powers the control electronics, thus completely separating the microprocessor from the audio electronics.

The power amplifiers use a well established topology comprising differential input stage, class A voltage amplifier stage with constant current load and class B output stage. Each stage is highly optimised following the general teachings of design guru Doug Self, with notable additions drawn from our own design research. This is particularly evident in the ultra low-distortion printed circuit layout.

Each output stage uses a class A driver stage and has three pairs of very high performance, hand-matched Thermal Trak™ output transistors, resulting in total removal of thermal distortion. Recently, some reviewers have been critical of the use of multiple output devices. This is completely unfounded, as multiple devices offer many benefits over single pairs of devices:

Distortion is greatly reduced at lower load impedances due to reduced gain loss with increasing current.
Output impedance is reduced due to multiple parallel-connected emitter resistors.
Device electrical and thermal stresses are reduced offering increased reliability.
Output current capability is increased.
Safe operating area of the output stage is increased.

Contrary to another common misconception, 'timing' cannot be compromised.

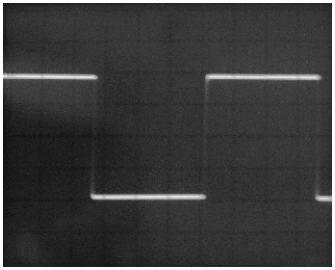
The square wave performance of an amplifier is the ultimate timing test. A look at the square wave performance of a Tucana II is testament to the time domain performance of the design. If multiple devices did cause errors in the time domain, the resultant square wave would be significantly degraded. This is simply not the case. Apart from the mild rounding of the corners caused by amplifier input bandwidth filtering, the square wave response is virtually perfect and has no overshoot or ringing.

On the subject of ringing, if the amplifier is tested in to a load including a capacitive element, inaccurately trying to simulate an electrostatic loudspeaker, ringing will be observed at the output in response to transient signals. In fact, this ringing is not caused by the amplifier. It is simply the resonant combination of the amplifier output inductor and load capacitance. No notice should be taken of any test reports including the level and makeup of this ringing, as the results are totally dependant upon load type and applied stimuli.

The power amplifiers incorporate no output stage protection circuits except for power supply fuses. Leema designers feel that even quite complicated protection schemes remain somewhat audible. If the output stage fails due to a short circuit or component failure, the fuses offer safety protection. An auto-detect and disconnect circuit protects the loudspeakers from damage.

The resulting amplifier has the following characteristics:

Low noise
Very low distortion, typically much better than leading class A designs
High output current delivery
Low output impedance
Fast and detailed, yet untiring audio presentation
Very robust and reliable



Tucana II 1KHz Square

The following section is intended for installers, system integrators and third-party manufacturers.

What is LIPS™?

LIPS, or Leema Intelligent Protocol System, facilitates communication between various items in a Leema audio system. It allows units such as Tucana, to control other items in a chain. Leema's 7.2 surround system is a good example, where a Tucana controls two Hydras and a Corvus. Key information including volume level, input selection and power control is passed through the bus, enabling other units to operate in synchronisation. Intelligence is added within each receiving unit, for example, a Hydra installed as part of a surround system 'knows' that it won't be required when listening to a stereo source such as CD. Therefore, when the Hydra 'sees' the CD input, it powers itself down.

Each Leema unit can be controlled via the LIPS bus. Controlling a Tucana II externally for example, enables it to be used within a home automation system. An interface between LIPS and RS232 is available for installers and system integrators.

LIPS Specifics

The LIPS bus is driven by an open-drain output. The communication standard follows the common RS232 format of no parity, 8 data bits and 1 stop bit. The baud rate is 38400.

LIPS Packets

Each communication on the LIPS bus contains a packet of four data bytes as follows:

First, a header is sent with a value of 255. This alerts the receivers to incoming data.
Next, a command header is sent. For a volume command, this would be 40. (see below for details).
Next, a value relating to the command is sent. For volume this would be 0 to 248.
Finally a tail byte is sent with a value of 0.

LIPS Protocol Headers For further information, please contact Leema Technical Support.

Value = 20 ID header. This header is private and must not be issued by any controlling software.
Value = 30 This is a general command header. The command values are as follows:

10 = Infra Red control OFF. These commands control the local IR receiver
20 = Infra Red control ON.
100 = Power ON.
101 = Power OFF.
099 = Select Input BAL
103 = Select Input CD
104 = Select Input TUNER
105 = Select Input AUX
106 = Select Input MULTI 1
107 = Select Input MULTI 2
108 = Select Input AV DIRECT
110 = LED ring ON
111 = LED ring OFF

Value = 40 Volume header. Valid command values are 0(mute) to 248(maximum volume)
Value = 50 Serial Pass Through. When a Tucana, Hydra or Corvus receives this header, the header and value are passed further up the bus. This enables future expansion options.
Value = 60 This is issued by Corvus. The command value contains the sub filter frequency.
Value = 70 As 60. The command value contains the sub filter slope.
Value = 80 As 60. The command value contains the extract status.
Value = 90 Spare header for future use.
Value = 100 Spare header for future use.

Connecting LIPS using the supplied LIPS lead.

LIPS leads are directional. The direction is governed by the plug colour. Remember - **'Black out, Red in'.**

Tucana II as LIPS slave: If you own a Leema CD player, it will normally be the master. In this case, connect the black plug to either LIPS socket on the player and the red plug to either socket on Tucana. Set The player to LIPS master, choosing 'Tucana II' in its menu. All functions will now be controlled from the player.

Tucana II as master or part of a chain: If you own other Leema units which will form a chain, such as Hydra and Corvus, connect the black plug to Tucana and the red plug to the next unit: Tucana=Black->Red=Hydra, Hydra=Black->Red= Corvus etc.

Audio Specifications

Power Output: 8 ohms: 150 Watts RMS per channel, 4 ohms: 290 Watts RMS per channel
Minimum load impedance: 2 ohms.
Output Current: greater than +/- 50 Amps
Frequency response +0/-3dB @ 1W: 5Hz - 100kHz
Noise (A weighted, volume control minimum): -100dBm
Signal to Noise ratio (A weighted, ref: 285 Watts RMS 4 ohms): -104dB
THD (10 Watts RMS 4 ohms, 1KHz): 0.004%
THD (Max output before clipping, 4 ohms, 1KHz): 0.004%
Maximum DC offset: +/- 15mV
Sensitivity for maximum output (CD input): 565mV RMS
Sensitivity for maximum output (other inputs): 311mV RMS
Output Impedance: 0.05 ohms Damping Factor (8 ohms): 160

Specifications subject to change without notice.

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