

LUNATEC V3

Owners Manual

Microphone Preamplifier and A/D Converter

Manual Rev E



GRACE
d e s i g n

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Thank you for purchasing the lunatec V3 portable microphone preamplifier and A/D converter. It is designed and built to be extremely reliable, flexible and easy to use. This owner's manual provides comprehensive setup and operational instructions, including directions for changing various preamplifier settings via the internal jumpers. Please take the time to familiarize yourself with these instructions, which will help you help you get the most from your lunatec V3.

Grace Design has been building professional audio products for the recording industry for over ten years. During this time the circuit technology embedded in the lunatec V3 has evolved through a process of extensive listening, testing and refinement. Regardless of what audio sources you plan to record, the lunatec V3 will faithfully serve as an invisible link between your microphone and recording device. We hope it helps you achieve a new level of excellence in your audio recordings.

FEATURES OF THE LUNATEC V3 PREAMPLIFIER

- High fidelity stereo preamplifier circuit with balanced inputs and outputs
- 11 position gain control with 5dB steps
- 10-70dB gain range
- 10dB continuously variable trim control
- 48 Volt phantom power for microphones
- 8 segment dot mode level meters
- Two position High Pass Filter with 6 or 12dB/octave slope
- Mid-Side recording matrix
- 24-bit A/D converter with 44.1, 48, 88.2, 96, 176.4 and 192kHz sample rates
- ANSR™ Analog Noise Shaped word length Reduction for 16-bit output
- Single and dual wire operation for 88.2-192kHz sample rates
- Professional and consumer digital signal formats
- Word clock output
- Input attenuator for line level input A/D operation

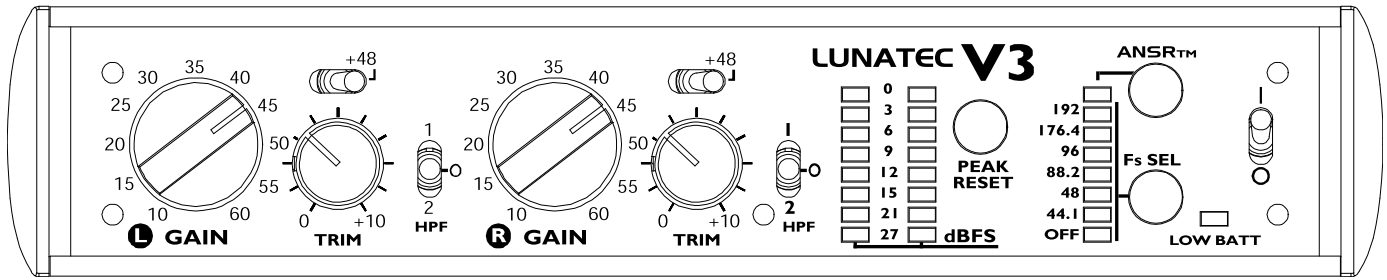


Figure 1. V3 Front Panel

FRONT PANEL CONTROLS

GAIN CONTROL Each gain control has 11 positions and adjusts the voltage gain from 10dB to 60dB in 5dB steps.

TRIM CONTROL The trim control provides 10dB of continuously variable gain trim. In the fully counter-clockwise position the trim is at unity. In the fully clockwise position the trim control adds 10dB of additional gain. The trim control can be used to adjust the record level smoothly during recording.

PHANTOM POWER (labeled +48) This switch provides 48 Volts to power condenser microphones. The phantom power switch connects the +48V power supply to pins 2 and 3 on the XLR input connector. Alternatively, the V3 can be configured to provide 12V Parallel power. Please contact the factory for information on this option.

HIGH PASS FILTER (labeled HPF) Sometimes referred to as a bass roll-off, the HPF uses a three position toggle switch to select two different low cut corner frequencies and an OFF position. Position 1 is the higher cutoff frequency and Position 2 is the lower cutoff frequency. Internal jumpers allow for selection of either 6dB/octave (passive) or 12dB/octave (active) slope. Also, internal jumpers select the cutoff frequencies at 50Hz/100Hz or 75Hz/125Hz. The 12dB/octave filter employs a *transitional Thompson-Butterworth* response for the best combination of pass-band flatness and time domain response. See jumper configuration section for detailed information.

POWER SWITCH (labeled 0-I) The power switch connects power from the DC input connector to the preamplifier circuitry. If the preamplifier is connected to a charged battery or other DC power supply, one of the sample rate LED's will illuminate.

LOW BATT For the 6 Volt V3, the low battery indicator flashes if the battery voltage drops below 5.75V. For the 12 Volt V3, the low battery indicator flashes if the battery drops below 11.5V.

ANSR™ SWITCH This switch activates the ANSR™ dither circuit which allows the V3 to output 16-bit data on its digital outputs. The amber ANSR™ LED will illuminate when this circuit is active. Use the ANSR™ circuit when recording to 16-bit digital devices such as DAT and CD-R recorders.

PEAK CLEAR SWITCH Pushing this switch clears the 0dBFS/OVER indicators.

SAMPLE RATE SELECT (labeled Fs SEL) Sample rates are selected by pushing and holding

this switch for 1/2 second. The 1/2 second delay before the sample rate changes is designed to help prevent accidental rate changes while recording. When the “OFF” position is selected, the AD converter module is powered down to reduce power consumption. The sample rate and ANSR™ state are saved when the V3 power is turned off.

LEVEL METERS The LED level meters operate in dot mode rather than bar mode. This saves a considerable amount of battery power while still providing useful peak signal level information. The meter scale is calibrated in dBFS to indicate the amount of headroom at the A/D converter. The “0” LEDS are dual purpose indicators: the “0” LED will illuminate when the signal presented at the A/D converter reaches 0dBFS but will “latch” on when an “OVER” has occurred. The LED will stay illuminated until the PEAK CLEAR button is pressed. 0dBFS also corresponds to an analog output level of +25dBu on the balanced output connectors. The following table indicates the analog output levels for each LED.

dBFS	ANALOG OUT BALANCED (dBu)	ANALOG OUT UNBALANCED (dBu)	LED COLOR
0	+25	+19	RED
-3	+22	+16	AMBER
-6	+19	+13	AMBER
-9	+16	+10	AMBER
-12	+13	+7	GREEN
-15	+10	+4	GREEN
-21	+4	-2	GREEN
-27	-2	-8	GREEN

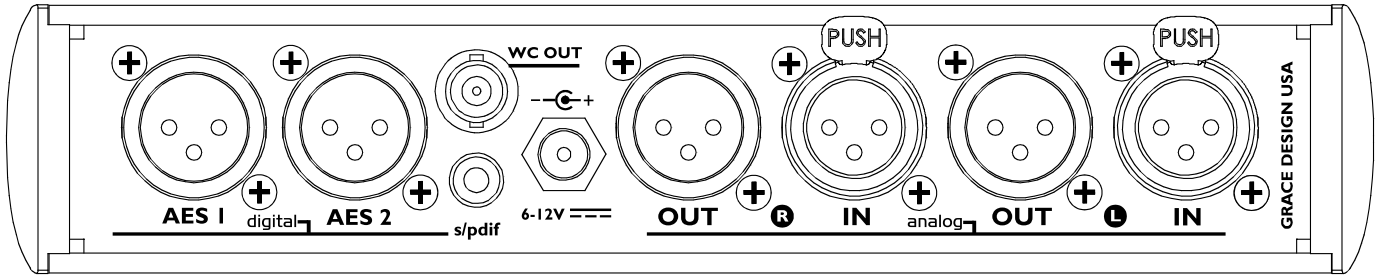


Figure 2. Rear panel

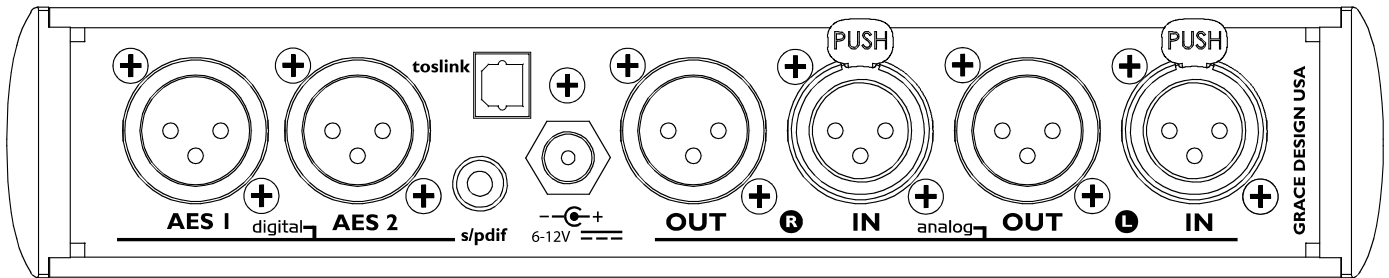


Figure 3. Rear panel with Toslink connector

REAR PANEL CONNECTIONS

DIGITAL OUTPUT CONNECTORS The V3 has a total of three digital output connectors: two balanced XLR 110Ω outputs and one coaxial 75Ω output. In addition, V3 preamplifiers with the optical out option have a standard Toslink optical output jack. All connectors are active whenever the A/D converter is on. The AES1 and S/PDIF outputs both transmit consumer or professional format data while the AES2 connector always transmits professional format data. See the jumper configuration section of this manual for details.

WORD CLOCK The word clock BNC connector is a 75Ω sample clock output for synchronizing external equipment to the V3. Note that V3 preamplifiers with the optical output option do not have the word clock output BNC connector.

ANALOG INPUTS The female XLR microphone input connectors can be used with dynamic or phantom powered condenser microphones. When on, 48V phantom power is fed to the microphone. The analog inputs can also be used as consumer line level inputs or, with an internal jumper change, as professional level line inputs. See the jumper configuration section of this manual for more details.

ANALOG OUTPUTS The balanced analog outputs are fed from the output of the microphone amplifier section and can be used simultaneously with the digital outputs.

DC POWER JACK DC power enters the V3 on a robust 2.1mm jack. If ordered, the supplied DC power cable features a locking plug that will prevent accidental disconnect of power while recording.

CONNECTING THE PREAMPLIFIER

ANALOG AUDIO CONNECTIONS

Input connections from a microphone are made using female XLR connectors. These are wired with pin 2 positive, pin 3 negative and pin 1 ground. 48V phantom power, if used, is supplied on pins 2 and 3.

The V3 can be used as a line level A/D converter. If input signal levels are not expected to exceed +15dBu (i.e. consumer unbalanced signal from a CD player, DAT recorder, home stereo receiver or cassette deck) then simply connect an unbalanced signal into the V3, set the input gain control to 10 and adjust the trim control for optimum recording levels. See the figure below for proper unbalanced input termination. If professional balanced signals are to be used, set the internal 20dB input attenuator jumpers. Remember to reset these before recording with a microphone again.

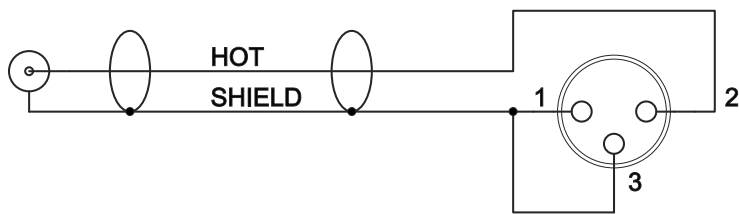


Figure 3. UNBALANCED INPUT CABLE TERMINATION

Analog output connections are made using male XLR connectors. The XLR connectors are wired with pin 2 positive, pin 3 negative and pin 1 ground. If the XLR outputs are to be used unbalanced, a modified cable is required and pin 3 should be left open. See figure 2 below.

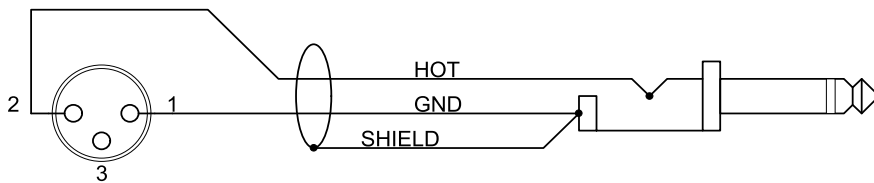


Figure 4. UNBALANCED OUTPUT CABLE TERMINATION

DIGITAL OUTPUT CONNECTIONS

The digital output connectors are all active whenever the A/D converter is on. The AES1 and S/PDIF connectors are derived from the same transmitter while the AES2 connector is derived from its own transmitter. Internal jumpers ADJ6 and ADJ7 on the AD converter module set the output data format configuration.

ADJ7 selects whether the data from AES1 and S/PDIF connectors is in Professional (AES3) or Consumer (S/PDIF) format. If the V3 is being used with a consumer type DAT, CD-R, or MINIDISK, it may be necessary to set the jumper in the CONS position. *Most professional equipment is not too picky about which data format is being used.*

ADJ6 selects single or dual wire mode for transmitting high sample rate data. If ADJ6 is set in single wire mode then stereo data will be transmitted on all output connectors at the sample rate indicated on the front panel of the V3. If ADJ6 is set for dual wire operation then the V3 will divide the stereo channels into two mono signals at ½ the sample rate for sample rates of 88.2-192kHz. For instance, if using the 96kHz sample rate in dual wire mode, the AES1 connector will transmit the left channel data at 48kHz and the AES2 connector will transmit right channel data at 48kHz. This allows for transmission of high sample rates over lower sample rate hardware. For example, 96kHz stereo audio could be recorded to a 4 channel 48kHz digital recorder. It is required that the equipment at the receiving end be able to process the mono signals properly and reconstruct the stereo signal. NOTE THAT ADJ7 MUST BE IN PROFESSIONAL MODE FOR PROPER DUAL WIRE OPERATION.

OPERATION

POWER SUPPLY CONNECTIONS

The V3 can be ordered to operate from either 6 or 12 Volt power sources. The V3 current draw ranges from .6A to .1A, depending on the microphones used (Phantom power usage) and if the A/D converter is on or off. For battery operation it is recommended to use the input power cable supplied by Grace Design or from a reputable battery system supplier. If you choose to supply your own cable, we would recommend the wire be 20 gauge or larger and the 2.1mm DC plug be a Switchcraft S760K locking type connector. +V is on the center pin and Ground is on the outside conductor.

For AC operation the V3 can be used with and AC adaptor. We recommend purchasing the proper adapter from your dealer. For 6V operation use a 7.5V, 1.0A power supply. For 12V operation use a 12V, 1.0A power supply.

SETTING THE GAIN

When preparing to record with the V3 it is recommended to make all of your connections with the power off. Turn the gain control fully counter-clockwise, turn the trim control fully counter-clockwise and check that the +48V phantom power is off on both channels. After input and output connections are made, turn on the V3 and then turn on the 48V phantom power (if using condenser microphones). (*Note: it is always good practice to have the 48V phantom power off when plugging or unplugging microphones.*) When using the internal A/D converter, simply increase the gain until the optimum recording level is reached. If necessary, use the trim control to fine tune the level.

When using the analog outputs and sending the signal to a recorder with a variable input, use the following procedure: turn the gain control fully counter-clockwise, turn the trim control fully counter-clockwise. Set the record level control on the recorder to 12 o'clock or midway between minimum and maximum. With the sound source present, adjust the preamplifier gain control clockwise until the signal peaks at -9dBFS (+16dBu) on the V3. Adjust the record level control on the recorder for the optimum recording level.

The trim control can be used for fine output level adjustment as well as for level riding during recording.

USING THE V3 IN M-S MODE

In M-S mode the V3 accepts the Mid signal in channel 1 (L) and the Side signal in channel 2 (R). The channel 1 output provides the “sum” of the inputs and the channel 2 output provides the “difference” of the inputs. In the M-S mode, the CH 1 GAIN control adjust the amount of Mid signal in the “sum” and “difference” outputs. The CH 2 GAIN control adjusts the amount of Side signal in the “sum” and “difference” outputs. Once a proper record level has been established for CH 1, CH 2 can be adjusted for the proper stereo field width. Equal signal strength on both channels will provide the widest stereo perspective while reducing the level of the Side channel will decrease the width of the stereo field.

Note: For more information on M-S recording we would highly recommend the AES paper written by Wes Dooley and Don Streicher called “M-S Stereo: A Powerful Technique for Working in Stereo”. This paper (No. 1792) is available from the Audio Engineering Society web page (www.aes.org)

BATTERY CONSIDERATIONS

With the AD converter on and a standard pair of 48V condenser microphones, the V3 draws roughly .75A. In our lab we have tested the V3 with a 6V 7.2A/h battery system. The V3 shuts down automatically after 8 hours with a pair of Countryman Isomax II microphones. *Note that this represents a complete discharge of a new and completely charged battery and if used in this fashion repeatedly the battery would degrade rapidly.* 6 hours would be a conservative estimate. A simple formula to determine useful battery life in hours is $\text{Hours} = (C \times 0.6) / A$ where C is the capacity of the battery in Amp-Hours and A is the current draw of the V3 in Amps. We have set the LOW BATTERY threshold so that the LED begins flashing after about 6 hours of run time (or about 1 hours before shutdown) to encourage the user to avoid deep discharges. However, no two batteries have the exact same discharge characteristics, so the low battery threshold may represent different levels of reserve for different batteries.

The V3 is set at the factory to run at 6 or 12V. The current drain is the same at either voltage, but the total power consumption will be twice as high for the 12V system. Also, it is normal for a 12 Volt V3 to run warm to the touch.

INTERNAL JUMPER SETTINGS

In addition to the front panel controls, the Lunatec V3 has several options that can be selected with internal jumpers. Before making any changes to the internal jumpers always disconnect any power source from the V3, switch both +48 switches to the on position and wait for 1 minute before removing the top cover. This is to assure that all power has been discharged from the capacitors used in the power supply circuit.

STEREO M-S MODE The V3 operates in a standard 2 channel stereo mode as well as M-S or Mid-Side mode. Jumpers J12 and J17 select the mode.

HIGH PASS FILTERS J7 and J10 select the filter slope for CH1. J19 and J22 select the filter slope for CH 2. J6 and J9 select the frequency range for CH 1. J20 and J21 select the frequency range for CH 2.

HIGH PASS FILTER JUMPER SETTINGS				
J6 J9 J20 J21	LOW		HIGH	
HPF SWITCH POSITION	1	2	1	2
CUTOFF FREQUENCY	100Hz	50Hz	125Hz	75Hz

Table 1. HPF Filter Frequency Selection

INPUT ATTENUATOR JUMPERS Jumpers J3 and J4 select the 20dB input attenuator for channel 1. Jumpers J14 and J15 select the 20dB input attenuator for channel 2. These should be set for -20dB when the V3 is to be used with professional line level input signals.

MICROPHONE POWER JUMPERS The V3 can supply +48V Phantom power as well as 12V Parallel power. Jumpers J1 and J5 select the mic power for channel 1. Jumpers J13 and J18 select the mic power for channel 2. The V3 ships from the factory with the jumpers in the +48V setting. To avoid possible microphone damage the V3 is shipped with the 12V setting disabled. The 12V setting must be enabled at the factory. Please contact us if you need 12V microphone power.

DC SUPPLY VOLTAGE JUMPERS Jumpers J26 and J27 select the operation Voltage to be 6 or 12 Volts DC. These jumpers should be moved ONLY by a qualified technician. Consult the factory for voltage change information.

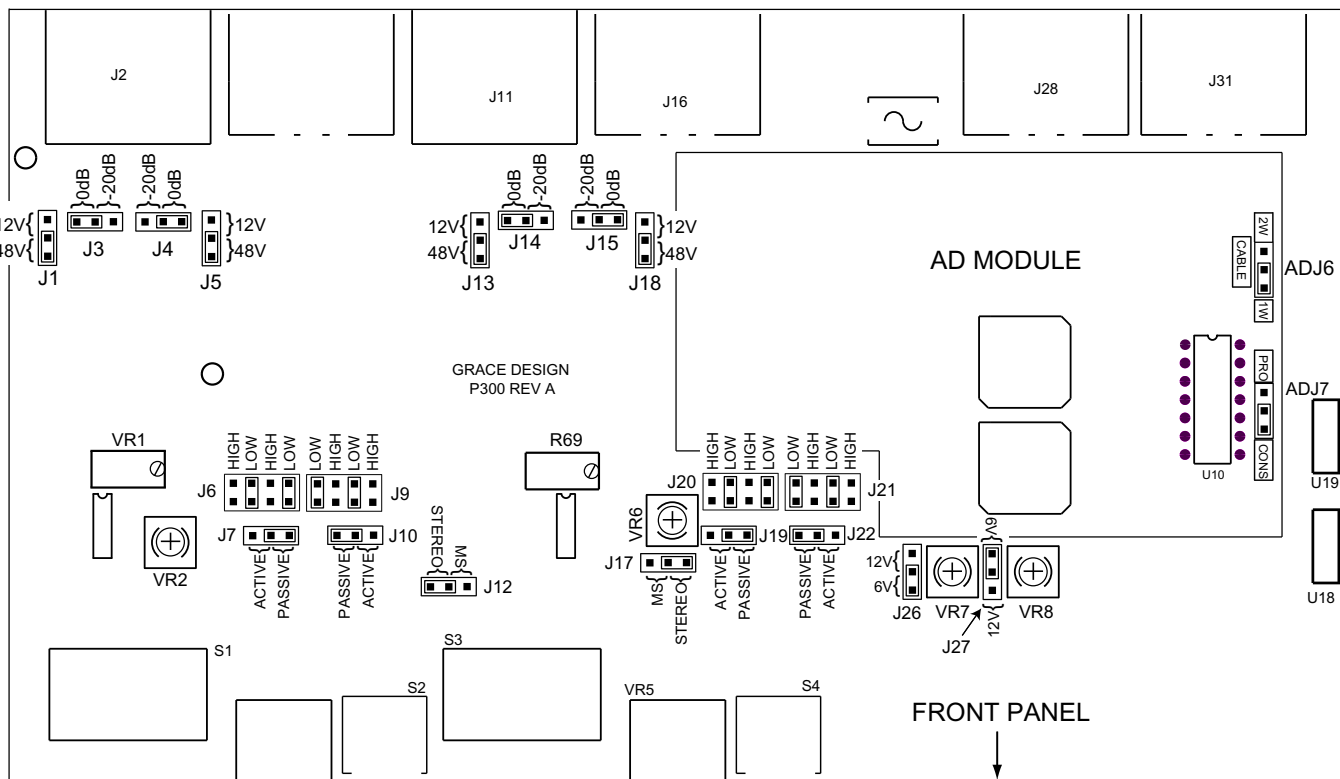


Figure 5. V3 INTERNAL JUMPER LOCATIONS

SPECIFICATIONS

MICROPHONE AMPLIFIER SECTION

Frequency Response

@ 60dB gain -3dB 6Hz-250kHz

THD+N

@ 20dB gain +20dBu out 0.0011%

@ 40dB gain +20dBu out 0.0011%

@ 60dB gain +20dBu out 0.0046%

Intermodulation Distortion

@ 40dB gain +20dBu out
SMPTE/DIN 4:1 50Hz,7k <.0045%

Noise - Referred To Input

@ 60dB gain 50 Ohm source <-130dB

Phase Deviation

50Hz-20kHz <8°

Crosstalk

Either Channel -109dB

CMRR

@ 60dB gain, 3.5Vcm, 1kHz 70dB

@ 60dB gain, 3.5Vcm, 10kHz 80dB

Output CMRR 60dB

Maximum Output Level

Balanced +25dBu

Unbalanced +19dBu

Impedance

Input 3k Ohms

Output 300 Ohms

Minimum Load Impedance 600 Ohms

A/D CONVERTER SECTION

Dynamic Range

44.1kHz-192kHz, 22Hz-20kHz bandwidth 107dB

44.1kHz-192kHz, A-weighted 110dB

THD+N

44.1kHz-192kHz, -3dBFS, 22Hz-20kHz bandwidth -96dB

Frequency Response

Fs 44.1kHz +0.1/-0.4dB 20Hz-21kHz

Fs 48kHz +0.1/-0.4dB 20Hz-22kHz

Fs 88.2kHz +0.1/-0.4dB 20Hz-42kHz

Fs 96kHz +0.1/-0.4dB 20Hz-45kHz

Fs 176.4kHz +0.1/-0.4dB 20Hz-75kHz

Fs 192kHz +0.1/-0.4dB 20Hz-82kHz

Power Consumption

6-12VDC 600-1000mA

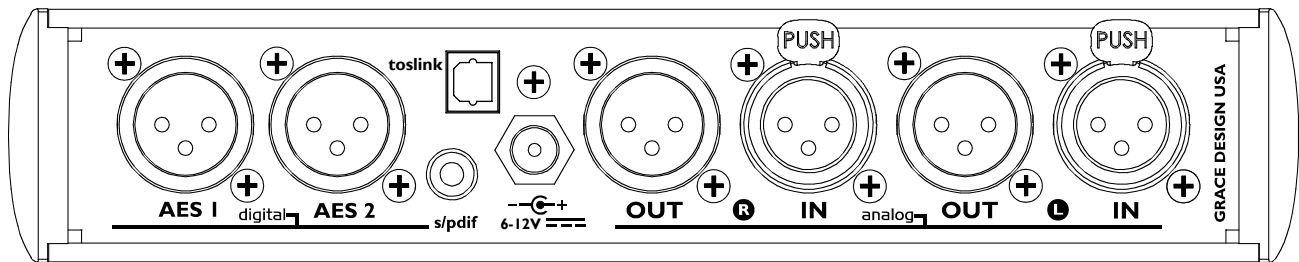
(depending on A/D settings and microphone type)

Weight and Dimensions

2.6 lbs / 1.2kg W8.25" x D5.5" x H1.7"

Lunatec V3 Owner's manual addendum 1

Optional Toslink / Optical Output Option



The Lunatec V3 Toslink / Optical option adds an additional digital output on the rear panel of the V3 in place of the Word Clock out BNC connector. The Toslink / Optical output is always live and available in conjunction with all of the other outputs on the V3.

This optical output is derived from the same transmitter as the S/PDIF output, so its consumer/ professional status is also determined by the same internal jumper setting which is used for the S/PDIF output. The Toslink output supports 44.1kHz, 48kHz, 88.2kHz, 96kHz.

Connections are made with a standard Toslink cable (not a Toslink mini plug)

Lunatec V3 Owner's manual addendum 2

V3 Battery Cable Considerations

There are several battery systems available on the market for the Lunatec V3. Recently a few batteries have been introduced which have caused some confusion with connectivity.

The ECO-CHARGE EC-90 series battery systems provide both a 12V output and either a regulated 7.5V or a 6V output via 4 pin XLR connector. When connecting the V3 to the 12V output, the cable should be the standard pin 4 hot (+12V) and pin 1 ground.

If you are connecting the V3 to either a 7.5V or a 6V output, a different 4-pin XLR wiring is required. For this connection, pin 3 is hot (+7.5V or +6V), pin 1 is ground and pins 2 and 4 need to be tied together using a jumper wire within the connector. Using a cable without this jumper for the regulated output will not work, as this battery output will be shutoff.

If you have any further questions, please contact us at 303-443-7454).

Have fun!

-The Grace Design Team

Warranty Information

Grace Design warrants all of our products to be free of defective parts and workmanship for a period of five years. This warranty period begins at the original date of purchase and is transferable to any person who may subsequently purchase the product during this time.

This warranty excludes the following conditions: normal wear and tear, misuse, customer negligence, accidental damage, unauthorized repair or modification, cosmetic damage and damage incurred during shipment.

During the time of this warranty, Grace Design will repair or replace, at its option, any defective parts or repair defective workmanship without charge, provided the customer has appropriate proof of purchase and that the product has its original factory serial number.

In order for Grace Design to provide efficient and timely warranty service, it is important that you mail the completed warranty registration card enclosed with all of our products within 10 days of the original date of purchase. You may also register your product directly with Grace Design by telephone (303-443-7454 Monday-Friday 9:00am to 5:00pm MST), or you can register your product online at www.gracedesign.com.

This warranty is in lieu of all other warranties whether written, expressed, or implied, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In no event will Grace Design be liable for lost profits or any other incidental, consequential or Exemplary damages, even if Grace Design is aware of the possibility of such damages. In no event will Grace Design's liability exceed the purchase price of the product

This warranty gives the customer specific legal rights. The customer may also have other rights, which vary from state to state. Some states do not allow limitations on implied warranties or consequential damages, so some of the limitations of the above may not apply to a particular customer.