APOLLO

Low Level Laser Therapy

Veterinary Laser Treatment

LTU-II User Manual

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Introduction

The LTU-II is a self contained, battery powered low level laser therapy machine, designed specially for veterinary applications and for use by trained clinicians. The LTU-II has been designed to be easy to use and transport for remote work. It incorporates a compact yet fully capable design comparable, and often superior, to more costly devices available in the sector.

Unlike many other competitors the LTU-II incorporates a removable and rechargeable battery which can be quickly swapped out for a replacement, ensuring you never lose power whilst on the move. We hope you enjoy using our product as much as we enjoyed designing, developing and making it.

Specifications

Pulse Rates	0Hz - 1000Hz (1kHz)
Treatment Time	Can be set in both minutes and seconds, 90 minutes maximum.
Battery Power	7.4V Lithium-ion, 1600mAh. Batteries are replaceable.
Battery Life	Approx 26 hours continuous running.

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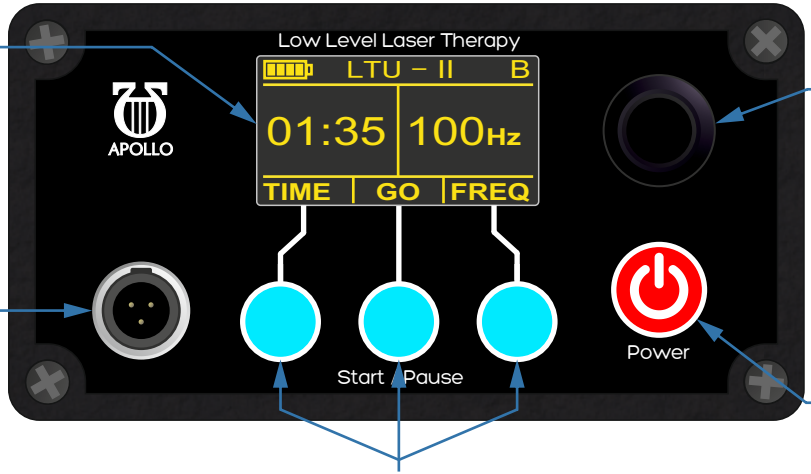
Introduction to the Interface

This page is a brief introduction to the LTU-II functions and features. A run through of all the different screens and in depth functions will be explained on subsequent pages.

Screen:
The screen is the main source of information. Battery status, treatment time, frequency and treatment progress can all be seen here.

Output Connector:
The output connector will allow for the connection of the connector cable. Which in turn will connect to any Apollo laser head.



Soft Keys:
The keys perform different functions depending on the screen currently displayed.

Selector Knob:
The selector knob allows the time and frequency to be set when the respective screen is displayed. a right hand turn will increase the selection and a left hand turn will decrease it. Depressing the knob will confirm the selection.

Power Button:
The power button will turn on the unit with a short press. A long press will turn off the unit. The unit will shut off after 10 minutes of inactivity.
The unit can be turned on again with a short press.

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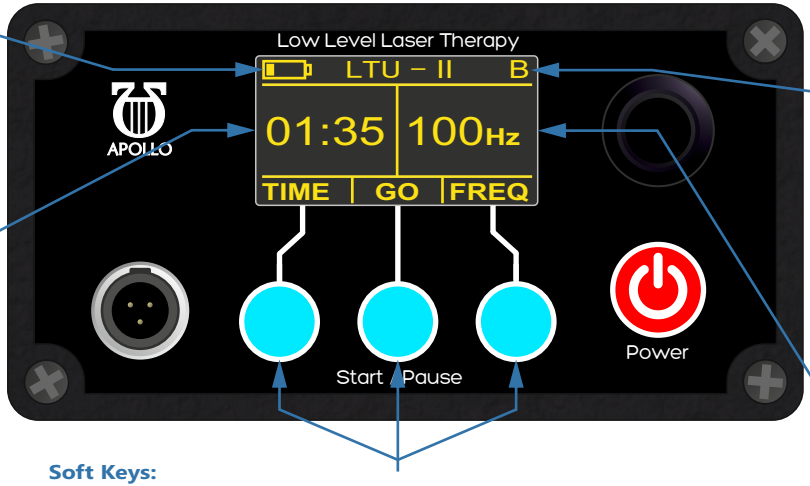
The Home Screen

This page is an introduction to the home screen, it will explain the icons, the information displayed, how the screen is divided and the function of the soft keys

Battery Icon:
The battery icon displays the battery charge level. The fewer illuminated segments present shows the lower the charge level of the battery.

Time:
The left hand section of the home screen displays the time selected for which the treatment will run. The time is stored in memory so will be present until it is changed even if the unit is powered off and back on.



Soft Keys:
For the home screen the left button initiates the set time screen. The middle button starts the therapy and the right button allows for the desired frequency to be set.

Buzzer Icon:
The buzzer icon displays if the buzzer is active; a 'B' icon will be displayed in the top right of the screen. The buzzer will sound when treatment finishes and can be activated and deactivated by holding down the right soft key on the home screen. The 'B' icon will not be displayed if the buzzer is deactivated.

Frequency:
The right hand section of the home screen displays the frequency selected for which the laser will pulse during treatment. The frequency is stored in memory so will be present until it is changed even if the unit is powered off and back on.

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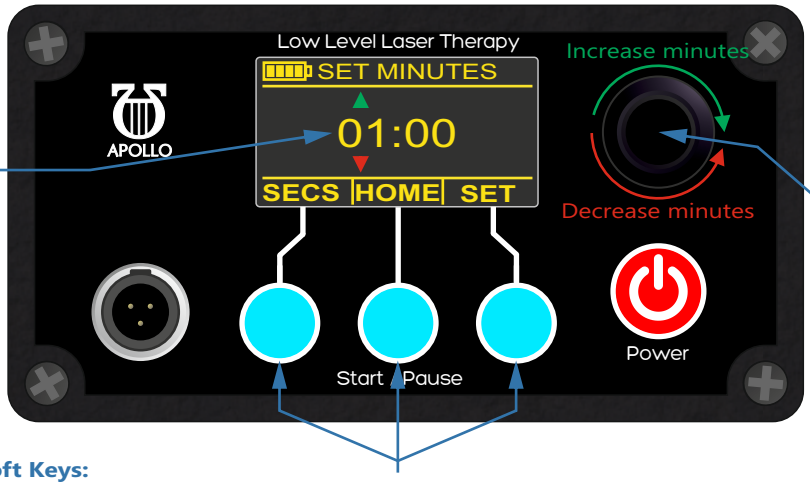
Set Time (Minutes)

This page is an introduction to the set minutes screen, it will explain the information displayed, the function of the soft keys and that of the selector knob. Pressing the 'TIME' soft key on the home screen will enable this screen.

Time:
The screen shows the current time selected for therapy treatment duration. The number of minutes will increase or decrease in accordance with the selector knob. The number of seconds can be set on the following screen.



Selector Knob:
The selector knob on this screen can be used to set the number of minutes the therapy will run for. Rotating the knob clockwise will increment the number of minutes by 1, up to a maximum of 90 minutes. Rotating the knob anti-clockwise will decrement the number of minutes by 1. Press the right hand soft key or depress the selector knob to confirm the selection.

Soft Keys:
The soft keys on this screen perform the following functions: The left soft key will cycle between set minutes screen and set seconds screen. The middle soft key will return the unit to the home screen. the right soft key will allow the desired time to be set and committed to memory.

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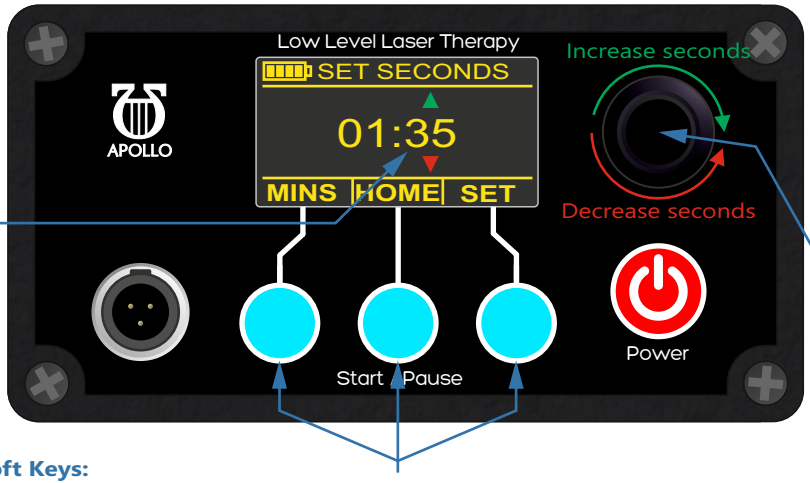
Set Time (Seconds)

This page is an introduction to the set seconds screen, it will explain the information displayed, the function of the soft keys and that of the selector knob. Pressing the 'SECS' soft key on the set minutes screen will enable this screen.

Time:
The screen shows the current time selected for therapy treatment duration. The number of seconds will increase or decrease in accordance with the selector knob. The number of minutes can be set on the preceeding screen.



Soft Keys:
The soft keys on this screen perform the following functions: The left soft key will cycle between set seconds screen and set minutes screen. The middle soft key will return the unit to the home screen. the right soft key will allow the desired time to be set and committed to memory.

Selector Knob:
The selector knob on this screen can be used to set the number of seconds the therapy will run for. Rotating the knob clockwise will increment the number of seconds by 1, up to 59. anti-clockwise will decrement the number of seconds by 1. Press the right hand soft key or depress the selector knob to confirm the selection. Above 59 seconds will cause the minute count to increase by 1 and the second count will reset to 0. Below 1 will decrease the minute count by 1 and set the second count to 59 seconds.

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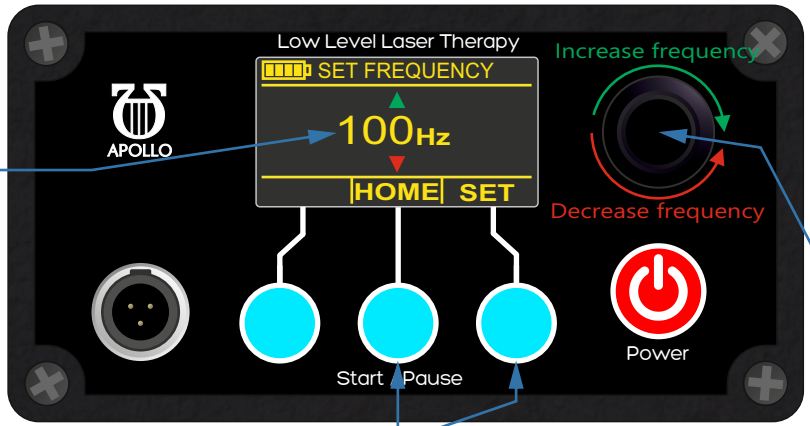
Set Frequency

This page is an introduction to the set frequency screen, it will explain the information displayed, the function of the soft keys and that of the selector knob. Pressing the 'FREQ' soft key on the home screen will enable this screen.

Frequency:
The screen shows the current frequency selected for therapy treatment. The frequency will increase or decrease in accordance with the selector knob.



Selector Knob:
The selector knob on this screen can be used to set the frequency at which the laser will pulse. Rotating the knob clockwise will increment the frequency by 1Hz, up to a maximum of 1000Hz. Rotating the knob anti-clockwise will decrement the frequency by 1Hz to a minimum of 0Hz. If the knob is turned at a higher speed, in either direction, the frequency will increase / decrease by increments of 10Hz to allow for quicker frequency setting. Press the right hand soft key or depress the selector knob to confirm the selection.

Soft Keys:
The soft keys on this screen perform the following functions: The left soft key is disabled and performs no function. The middle soft key will return the unit to the home screen. the right soft key will allow the desired frequency to be set and committed to memory.

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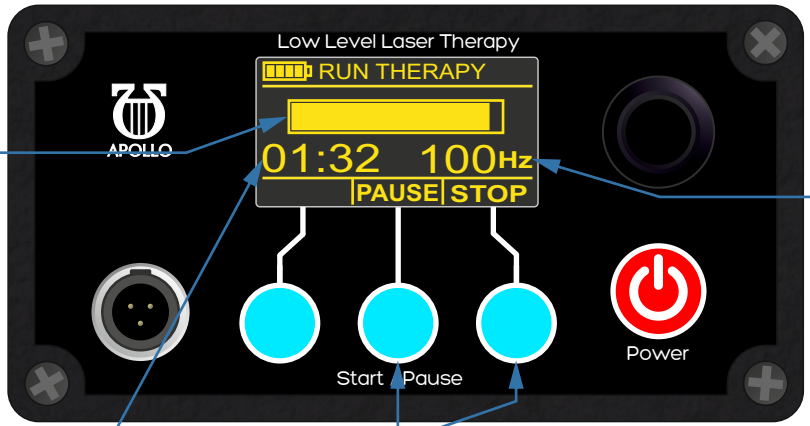
Run Therapy

This page is an introduction to the run therapy screen, it will explain the information displayed and the function of the soft keys. Pressing the 'START' soft key on the home screen will enable this screen.

Countdown Bar:
The countdown bar is a visual aid to the remaining treatment time. The bar will turn from coloured to un-coloured in conjunction with the treatment time decreasing. When the treatment finishes the unit will display the home screen.

Time:
The remaining duration time of the treatment is displayed on the left hand side of the screen, below the countdown bar. The time number will reduce in conjunction with the rate at which the countdownbar decreases.



Frequency:
The frequency at which the laser will pulse during treatment is displayed on the right hand side of the screen below the countdown bar.

Soft Keys:
The soft keys on this screen perform the following functions: The left soft key is disabled and performs no function. The middle soft key will pause the treatment and display the pause therapy screen. The right soft key will stop the treatment and return the unit to the home screen.

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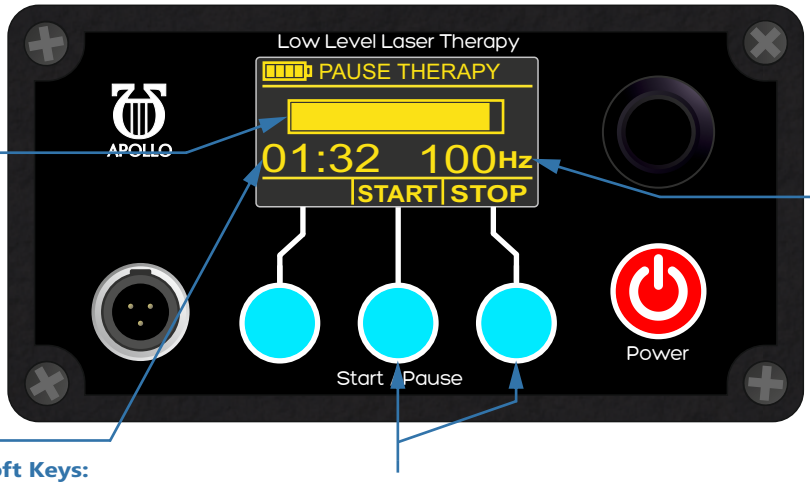
Pause Therapy

This page is an introduction to the pause therapy screen, it will explain the information displayed and the function of the soft keys. Pressing the 'PAUSE' soft key on the run therapy screen will enable this screen.

Countdown Bar:
The countdown bar coloured section will stop reducing in size when the pause therapy screen is active.

Time:
The remaining duration time of the treatment is displayed on the left hand side of the screen, below the countdown bar. The time number will not reduce when the pause therapy screen is active.



Frequency:
The frequency at which the laser will pulse during treatment is displayed on the right hand side of the screen below the countdown bar. Note that whilst the pause therapy screen is active the laser will not pulse and will not output laser light.

Soft Keys:
The soft keys on this screen perform the following functions: The left soft key is disabled and performs no function. The middle soft key will resume the treatment and display the run therapy screen. The right soft key will stop the treatment and return the unit to the home screen.

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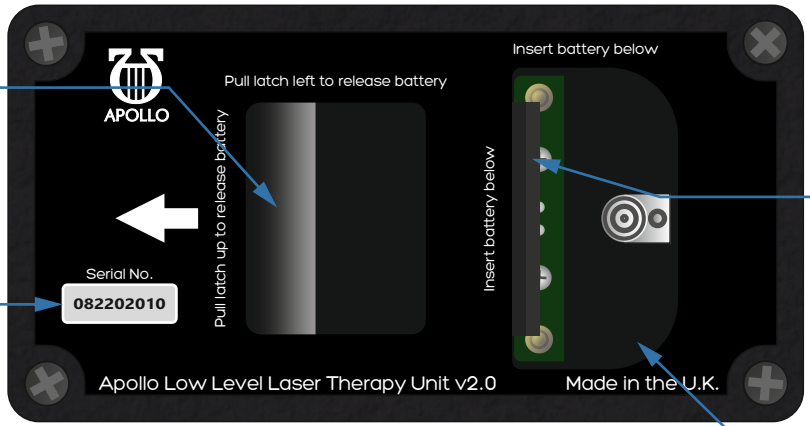
Battery Operation

This page is an introduction to the Battery Operation with the LTU-II, the operation of the battery latch and other features such as the serial number.

Release Latch:
The release latch will release the battery if pulled to the left. Angle the unit down in order to assist with battery release.

Serial Number:
The serial number is unique to the unit. It is used to track when the unit was made and the batch it came from. This aids with repairs if required.



Latch Retaining Lip:
The latch retaining lip. Holds the battery in position. When the latch is pulled to the lip is concealed and the battery is able to be removed. The spring behind the battery aids its removal.

Battery Compartment:
The Battery is inserted here and connects with two metal contacts at the base of the compartment to power the unit. The battery is of type: Sony NP-F550 and are widely available.

Important Note:
When inserting the battery into the compartment it is recommended that the latch is actuated before insertion as this will avoid unnecessary damage to both the latch and battery. Ensure the lip fully covers the base of the battery.
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Available Treatment Heads

A number of standard heads are available and custom heads can be manufactured to order upon request, cost and practicality permitting.

A breakdown of the available treatment heads can be found in the table below:

	Single Visible Red Diode	Single Infrared Diode	Cluster Visible Red Diode	Cluster Infrared Diode
Wavelength	660nm	808nm	660nm	808nm
Coherence	Laser	Laser	Laser	Laser
Power	1x200mW	1x200mW	3x200mW	3x200mW
Irradiation Zone	1cm	1cm	5cm	5cm

Operation and Use

Detailed instructions for giving treatment are beyond the scope of this manual. This equipment is intended for use by trained and qualified veterinary personnel. The pulse rate guidance and head applications have been collected from published sources but is offered as general guidance information.

Laser Safety

All heads supplied with this machine are classified as class 3B. Lasers within this category can cause serious eye damage and it is advised that protected eye wear is always used. The glasses provided are IPL protective eyewear. CE certified filter provides protection from 190-1200nm. These are suitable to be worn over most prescription eyewear if required, but equally comfortable when worn by themselves. Protective eyewear does not replace risk assessments and safe practice, every effort should still be made to avoid eye contact with the laser beam.

Maintenance and Servicing

No routine maintenance is required. The most likely long-term problems will be caused by deterioration of the battery charge capacity. Machine service or repair can be carried out at reasonable cost with a rapid turnaround by returning it to the manufacturer.

An Introduction to Lasers

Laser is an acronym for Light Amplification by Stimulated Emission of Radiation. Lasers are coherent, high intensity and collimated emission of light. The laser heads produced by Apollo Veterinary Laser are deemed as class 3b.

Health, Safety and Good Practice

Lasers are capable of causing serious injury, especially to the eyes. It is highly recommended you follow the steps detailed below when using or operating lasers:

1. Keep the treatment head off and disconnected until ready to start treatment.
2. NEVER point the beam towards the eyes of a patient or your own.
3. Avoid reflection of the laser beam from surfaces.
4. Wear protective glasses at all times during operation.
5. Always risk assess immediate area of operation.
6. Clean equipment thoroughly between patients to ensure good sanitation.
7. Ensure tissue and treatment area is clean prior to application.
8. Introduce the treatment heads in a slow and gentle manner to avoid patient distress.
9. Monitor reaction of the patient and assess.
10. Reassess reaction before every treatment, no two patients are alike!

Proposed Benefits of Low Level Laser Therapy (LLLT)

LLLT has many proposed benefits and ailment alleviation applications including:

- Analgesic
- Anti-inflammatory
- Faster healing
- Improved oxygen delivery
- Increased circulation
- Reduce inflammation and oedema
- Reduce trigger points and muscle spasms
- Earlier Rehabilitation
- Improved function
- Improved range of motion
- Increased synovial fluid
- Reduced pain

Inappropriate Applications and Contraindications

Not all ailments are appropriate for LLLT and in some instances can be detrimental:

- Cancerous tumours
- Eyes
- Active infection
- Over vagus nerve
- Areas recently treated with stem cell therapy
- Areas recently treated with cortisone
- Epileptics / photosensitive
- Haemorrhage
- Inflammatory skin conditions
- Pregnant abdomen
- Thoracic cavity if cardiac issues present

Supporting Theory (Dose)

Energy Density (ED) is the 'dose' that you wish to apply, measured in J/cm^2. Recommended EDs vary hugely across widespread sources, therefore it is vital you stay abreast of the latest research and recommendations if you would like to use phototherapy in your career.

There are no global dosages appropriate for every patient. If the dose is inadequate, there will not be a consistent clinical response (or no response at all!) = Ineffective. However, there is a very large margin of safety, therefore it would be difficult (but not impossible) to cause harm.

Recommended Dosages

Tissue Healing Applications	Companion Animal Species	Equine and Larger Farm Species
Superficial Tissue Conditions	1-5 J/cm²	1-5 J/cm²
Deep Tissue Conditions	8-10 J/cm²	8-20 J/cm²
Chronic Complex Conditions	15-25 J/cm²	15-35 J/cm²

Pain Management Applications	Companion Animal Species	Equine and Larger Farm Species
Superficial Wounds	1-4 J/cm²	1-4 J/cm²
Chronic Wounds	4-30 J/cm²	4-30 J/cm²
Acute Deep Pain	4-8 J/cm²	4-8 J/cm²
Chronic Deep Pain	6-20 J/cm²	6-20 J/cm²

Pulsed Laser Light Vs Constant Laser Light

The 'wave front' agitates and causes changes within tissue (energy transfer).
Time between fronts allows assimilation of stimulus photons.

Pulsing Frequency

Pulsing Frequencies are optional. Some studies claim accentuated responses when pulsating the light emitted at different rates within some tissues. Unfortunately there is no consensus on the very best pulsing parameters to use for specific diseases = Lacking in scientific evidence. It is suggested that acute injuries require low pulse rates whereas chronic injuries require high pulse rates. The following information is guidance only and each patients should be assessed on individual bases with sound clinical reasoning to deem appropriate treatment.

Low Pulse Rates (<20Hz)	Medium Pulse Rates (20-700Hz)	High Pulse Rates (700Hz+)
• Acute Injury • Growth Factor Response • Tissue Repair • General Ailments	• Pain Relief • Tissue Repair	• Chronic Injury • Infection Control

Calculating Treatment Times

The following is guidance on how to calculate accurate dosage required for laser application.

$$\text{Total Treatment Time (s)} = \frac{(\text{Energy Density (J/cm}^2\text{) x Treatment Area (cm}^2\text{))}}{\text{Power (W)}}$$

$$\text{Time per point (s)} = \frac{\text{Total Treatment Time (s)}}{\text{No. of Times Probe Fits into Treatment Area}}$$

Practical Example

You have a **5cm** lesion, a **200mW** probe and a **1cm** probe irradiation zone.
You select the energy density of **15 J/cm²**.

Step 1: Energy (j) = Energy Density x Treatment area
15 x 5 = **75j**

Step 2: Energy (j) / Power (W) = Total Time (s)
75 / 0.2 = **375** seconds or **6 minutes and 15 seconds**

Step 3: To work out treatment time per point:
As you have a **5cm** treatment area and a **1cm** probe:

5/ 1 = 5 (a 1cm probe fits into a 5cm zone 5 times)

375 secs / 5 points = **75 seconds or 1:15 per point**

Regulatory Compliance

The LTU-II is built to the highest standards using only the highest quality components.
All components are sourced from complying with RoHs quality standards.
The LTU-II is battery operated so is not subject to the low voltage directive.
The LTU-II complies with electromagnetic compatibility (E.M.C) regulations.
The LTU-II is designed primarily for veterinary applications and is not a medical device within the meaning of the medical devices directive.

Warranty

This product is guaranteed to be free from component or manufacturing faults for a period of 1 year from the date of purchase and will be repaired or replaced free of charge. This warranty excludes the replacement of batteries and damage by neglect or problems caused by any unauthorised work carried out on the machine including making any internal adjustments. Please note shipping of replacement parts or repairs is at buyer's expense.

Disclaimer

Detailed instructions for giving treatment are beyond the scope of this manual. This equipment is intended for use by trained and qualified veterinary personnel. Apollo Veterinary Laser does not accept any responsibility over the use of this equipment, or any condition arising out of its use or misuse. Its use is at the owner's own discretion and it is recommended that use should be supervised by a trained professional familiar with the equipment and it is supplied strictly on this understanding.

We accept no responsibility for personal injury or the damage of property from improper charging of the batteries. Use only the charging equipment provided. Lithium Ion batteries can cause serious injury when charged improperly or badly damaged. Exercise caution when operating and handling. Do not pierce the battery or expose the battery to extreme heat.

Further Information

Designed and manufactured in the U.K. by Apollo Veterinary Laser.
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