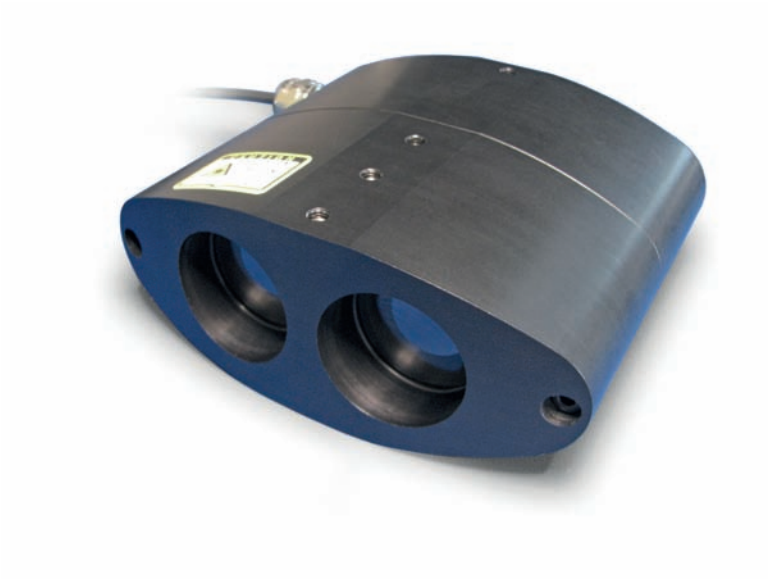

The SF00 is a long range laser altimeter for use by light aircraft, helicopters and large commercial UAVs.

The SF00 can take up to 286 readings per second and can be incorporated into data logging and display systems to provide accurate AGL readings for safety, photography, mapping and environmental monitoring applications.

The configurable features make the SF00 easy to connect with different types of data recorders and displays.

The SF00 uses a time-of-flight system to make fast and accurate distance measurements to natural or artificial surfaces.

Features:

- *Long measuring range of 250 meters.*
- *Accurate altitude measurements at 286 readings per second.*
- *0.1 meter accuracy.*
- *USB port as standard with serial port, analog voltage and alarm interfaces on request.*
- *Compact and lightweight - 500 grams.*
- *Easy to configure using the built-in menu and LightWare Terminal software.*
- *Fully calibrated and ready to run.*
- *Accurate, reliable measurements in sunlight or dark conditions.*
- *Not affected by: speed; wind; changes in barometric pressure; noise; ambient light; terrain or air temperature.*

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Disclaimer

1. Overview

The SF00 long range laser altimeter is designed to provide accurate above-ground-level measurements for light aircraft, helicopters and commercial UAVs. It works by measuring the time it takes for a very short flash of laser light to travel to a surface and back again. The accuracy of the measurement is not affected by the colour or texture of the surface, nor the angle of incidence of the laser beam. The SF00 is virtually immune to background light, wind and noise.

Operating from the USB port power supply, the SF00 can be easily connected to a data recorder, display or a standard processing platform. There are optional interfaces on the SF00 that can be configured using a simple software menu that is accessible through the USB port. These optional interfaces are as follows:

Serial port:	Provides distance readings to a display or embedded controller
Analog port:	An analog voltage proportional to the altitude reading
Alarms:	Two logic level signals that warns when the distance measured is below a preset value

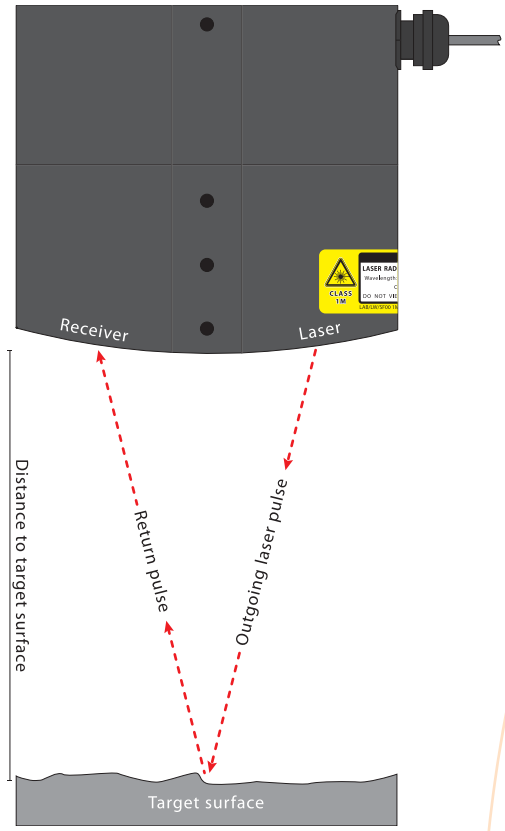

Figure 1 :: Time-of-flight measurement

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2. Quick start guide using the USB port

1. CAUTION - The SF00 laser rangefinder contains a laser and should never be aimed at a person or an animal during setup or testing. Do not look at the beam directly with optical instruments.

2. Download *LightWare Terminal* software from [www.lightware.co.za > Library > Documents > Software](www.lightware.co.za) onto your PC. Open the installer package and follow the installation instructions. Everything needed for communicating with SF00 will automatically be installed.

3. Plug the USB cable provided into your PC. This provides both power and communication to the unit.

4. Start the *LightWare Terminal* software and click the "Connect" icon to open a communications port.

5. If the connection isn't made automatically, click the "Laser" icon and select the correct USB port from the list shown.

6. Press the **<SPACE>** key to display the main menu. This menu includes a list of all the settings that can be changed in the SF00.

7. Press the **<SPACE>** key to start taking distance measurements. The results will be displayed in the Terminal window.

8. Information regarding the other menu items, and how to use them for your application, is contained in the body of this manual.

9. Press the "Disconnect" icon before unplugging the USB cable.

A summary of the settings available through the USB port is given in the table below:

Setting	Values	Description
1: Measuring units	Meters <-> Feet	Select the required measuring units for distance display.
2: USB port update rate	1 ... 286 / sec	Primary interface for connection to a data recorder or PC.
3: Serial port update rate	1 ... 286 / sec	Optional interface for connection to a display.
4: Serial port baud rate	9600 ... 921600	Sets the baud rate of the serial port to match the display.
5: Analog maximum range	512 m <-> 256 m <-> 128 m <-> 64 <-> 32 m <-> 16 m	Selects the maximum altitude that produces 2.56 V on the optional analog port. This value changes the scale of the analog output.
6: Alarm A	1 ... 250 m	Optional alarm A goes high when the altitude is below this value.
7: Alarm B	1 ... 250 m	Optional alarm B goes high when the altitude is below this value.
8: Multi-unit configuration	Single unit / Multiple unit	Select single or multiple unit configuration.

3. Powering up the SF00

The SF00 gets power from the USB port when it is connected to a PC or data recorder. Alternatively, there are a number of optional digital and analog interfaces depending upon which model is selected and the unit runs on an external +5V power supply when these are selected.

4. Communicating with the USB port

The SF00 has a USB port that can be used to communicate with a data recorder or PC. The *LightWare Terminal* software is available for Windows based devices. This connection also gives power to the unit providing a quick way to test and configure the SF00. The *LightWare Terminal* software will automatically detect the USB port that is connected to the SF00 and communications can be established by clicking on the "Connect" icon. If more than one compatible device is present, click the "Laser" icon to select which USB port should be active.

Once communication has been established, settings can be changed by pressing the **<SPACE>** key to access the menu and then selecting the menu item that needs changing. Pressing the **<SPACE>** key again restarts the measuring process. More details of the menu items are discussed in the sections that follow.

If you want to use a different serial emulation program then the USB serial protocol should be set to 115200 baud with 1 stop bit and no parity or handshaking. All communications are in standard ASCII format.

5. System settings

Setting	Values	Description
1: Measuring units	Meters <-> Feet	Select the required measuring units for distance display.
2: USB port update rate	1 ... 286 / sec	Primary interface for connection to a data recorder or PC.
3: Serial port update rate	1 ... 286 / sec	Optional interface for connection to a display.
4: Serial port baud rate	9600 ... 921600	Sets the baud rate of the serial port to match the display.
5: Analog maximum range	512 m <-> 256 m <-> 128 m <-> 64 <-> 32 m <-> 16 m	Selects the maximum altitude that produces 2.56 V on the optional analog port. This value changes the scale of the analog output.
6: Alarm A	1 ... 250 m	Optional alarm A goes high when the altitude is below this value.
7: Alarm B	1 ... 250 m	Optional alarm B goes high when the altitude is below this value.
8: Multi-unit configuration	Single unit / Multiple unit	Select single or multiple unit configuration.

The "1: Measuring units" setting determines whether the data is output in meters or feet, and is accessed by pressing the **<1>** key. Results are in an ASCII string with the meters format being "ddd.dd m <CR><LF>" and feet format being "ddd.d ft <CR><LF>" where <CR> is the ASCII code for a carriage return [0x0D] and <LF> is the ASCII code for a line feed [0x0A].

The "2: USB port update rate" selection determines how fast results are presented to the USB port, and is accessed by pressing the **<2>** key.. This can be set to any value from 1 to 286 readings per second but only certain whole number values are possible and these are displayed adjacent to the entered value.

Settings "3" to "7" relate to optional output ports and have no effect when the USB configuration has been ordered.

The "8: Multi-unit configuration" selects between single unit and multiple unit systems, and is accessed by pressing the **<8>** key. In multiple unit systems it is possible for the lasers to interfere with each other and produce false readings. Selecting the multiple unit option encodes the laser pulses so that each unit can only detect its own signals.

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6. Instructions for safe use

The SF00 is a laser rangefinder that emits ionizing laser radiation. The level of the laser emission is Class 1M which indicates that the laser beam is safe to look at with the unaided eye but must not be viewed using binoculars or other optical devices at a distance of less than 50 meters. Notwithstanding the safety rating, avoid looking into the beam and switch the unit off when working in the area.

CAUTION -- The use of optical instruments with this product will increase eye hazard.

The SF00 should not be disassembled or modified in any way. The laser eye safety rating depends on the mechanical integrity of the optics and electronics so if these are damaged do not continue using the SF00. There are no user serviceable parts and maintenance or repair must only be carried out by the manufacturer or a qualified service agent.

No regular maintenance is required for the SF00 but if the lenses start to collect dust then they may be wiped with suitable lens cleaning materials. Make sure that the SF00 is switched OFF before looking into the lenses.

Laser radiation information and labels

Specification	Value / AEL	Notes
Laser wavelength	905 nm	
Pulse width	< 20 ns	
Pulse frequency	9158 Hz	
Average power	< 10 mW	35 millimeter aperture
Average power	< 0.6 mW	7 millimeter aperture
Average energy per pulse	< 1.1 µj	
NOHD	45 m	Distance beyond which binoculars with may be used safely

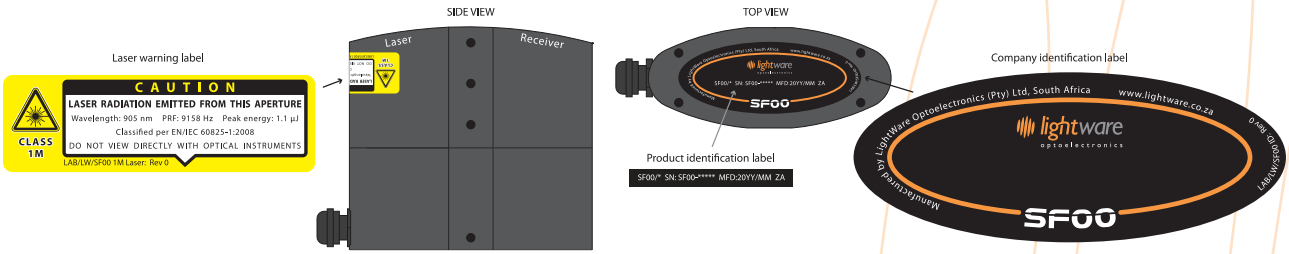

Figure 2 :: Labelling on the SF00

Appendix A :: Specifications

	SF00/USB (250 m)
Range	0 … 250 meters (natural targets)
Resolution	0.01 m
Update rate	1 … 286 readings per second
Accuracy	± 10 cm
Power supply voltage	USB
Power supply current	300 mA (maximum)
Outputs & interfaces	Standard: USB. Options: digital or analog
Dimensions	120 x 110 x 49 mm
Weight	535 grams (inclu cable)
Laser power	50 W (peak), 10 mW (average), Class 1M
Lens material	Glass
Operating temp.	0 … 40°C
Approvals	FDA: Pending

Appendix B :: Dimensions

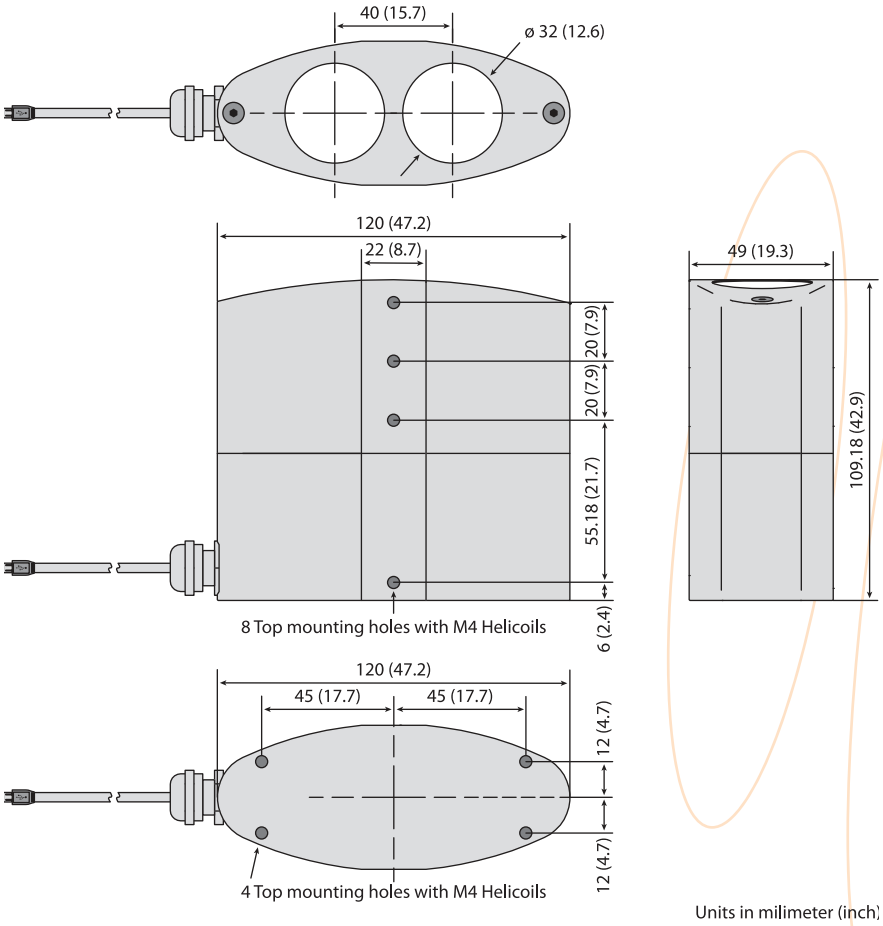

Figure 3 :: Dimension drawings of the SF00

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Revision history

Version	Date	Authors	Comments
Rev 0	2015/10/13	JEP	First edition

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