RangePRO Model LRF-3633 Laser Rangefinder Module
(Low Divergence)

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RangePRO Model LRF-3633 Laser Rangefinder Module

1 DESCRIPTION

The RangePRO Model LRF-3633 is a compact open-frame OEM laser rangefinder module providing an advanced digital rangefinding capability for military, paramilitary and commercial applications. All assemblies are integrated onto a precision bore-sighted open-frame platform.

It integrates with host systems such as weapon, sensing, or surveillance and tracking stations, and thermal imaging cameras. It requires power and control command input, and provides range-to-target and self-diagnostic data output.

The LRF-3633 ranges at low repetition rates over distances to >22km depending on target size, target reflectivity and atmospheric conditions (typically >10km for vehicle type targets).

The transmitter is a *low-divergence* collimated eye-safe laser system. It can provide ranging rates from single up to 12 shots per minute including a 5 second burst at one shot per second rate. Low and high divergence settings are available (specify at time of order) to suit different ranging applications – high divergence (standard configuration) suits airborne tracking applications and lower divergence suits land-based target acquisition.

Advanced digital signal processing techniques are employed to provide accurate, reliable ranging. Signals from the detector are digitally sampled. The samples are examined to determine all potential real target returns. If a valid target is detected within the user-set range gate it's range data is output, if more than one target is detected within the range gate, multiple may be selected for data output.

All signal and range computation is done "on the fly". Using this philosophy, the only task remaining after the sampling has expired is to transfer the range data through the serial port. Effectively the speed of the signal processing is limited only by the data output rate.

The system employs an adaptive range threshold to compensate for changing noise levels. The worst case for noise is when the system electronics are being operated at the high end of their temperature specification and when ranging is being performed in strong sunlight. The best case is the reverse situation. The adaptive range threshold feature results in more reliable ranging (fewer false alarms) when noise is elevated and higher sensitivity (further ranging) when noise is reduced, thus maximising the system capability under varying conditions. The threshold is calculated on a "shot-by-shot" basis.

RangePRO laser rangefinder software is easily upgradeable; upgrades can be downloaded in the field via a PC.

$$P_R = \frac{P_L \times \chi^2 \times \delta \times D_L^2 \times A_I \times \cos\beta}{4 \times R^2 \times A_L}$$

2 SYSTEM SPECIFICATIONS

Notation - use of brackets in tables: [*notes & qualifications*] (*units*).

2.1 System Performance

PARAMETER		SPECIFICATION
Control		
Control Functions		all control functions and range data via comms port
Ranging		
Laser Type		Nd:YAG/OPO
Wavelength (nm)		1,565 to 1,575 [1,570 nominal]
Output Energy [per pulse] (mJ)		nominally 8 [up to max. allowable for Class 1M]
Beam Diameter [at exit] (mm)		12
Receiver Aperture (mm)		26
Detector		APD with time variant gain
Range Read-out Limits (m)	**minimum**	50
[factory selectable]	**maximum**	25,000
Ranging Performance[1]	**man [0.45x1.8m]**	6,100
[Std. Clear[2]; max.] (m)	**vehicle [2.3x2.3m]**	10,100
	building [large]	22,000
Extinction Ratio[3] (dB)		>42
Range Accuracy [typical] (m)		± 2 [4 rms over 10 shots]
Target Dis-	**Lateral [1m² targets @ 5,000m]**	≤ 20
crimination (m)	**Axial [between 500 & 5,000m]**	≤ 20
Ranging Rate (per minute)	**typical**	5
	max.	12 ppm or intervals of 5 shots at 1 shot/sec rate with cool down period [total duration 30secs]

[1] Target albedo 0.4 @ 1,570nm.
[2] Standard clear atmosphere; extinction coefficient 0.0448 km^{-1} @ 1,570nm (Modtran3); sea level visibility = 23.5km.
[3] Target range 500m; target albedo 85%; target size large; standard clear atmosphere; probability of detection >50%.

$$P_R = \frac{P_L \times \chi^2 \times \delta \times D_L^2 \times A_I \times \cos\beta}{4 \times R^2 \times A_L}$$

PARAMETER	SPECIFICATION
Safety & Protection	
Laser Classification[4]	Class 1M
Visible Emission Filter	blocking
Visible Emission [@ ≥ 5m]	nil
Audible Emission [@ ≥ 5m]	nil
Support	
MTBF [ground mobile] (shots)	TBD
Operational Life (years)	10

2.2 Communications

PARAMETER	SPECIFICATION
Port(s)	one serial port
Type	RS-422
Default Data Rate (baud)	9600[5]

2.3 Physical Characteristics

PARAMETER		SPECIFICATION
Mass [approx.] (g)		325
Dimensions (mm)	**Length**	111
	Width	58.3
	Height	40.3
Mounting		3-point mount [M3 tapped holes]; bottom and side reference surfaces[6, 7]

[4] Australian/New Zealand Standard AS/NZS IEC 60825.1:2011 *Safety of Laser Products - Equipment classification and requirements.*
[5] Communications protocol as per PS-RP-T-3634-A_1. Other communications protocols and/or data rates can be supported at request.
[6] Some kinematic isolation is recommended to be provided by the installer.
[7] Tapped mounting holes and mechanical interface surfaces are electrically conductive

$$P_R = \frac{P_L \times \chi^2 \times \delta \times D_L^2 \times A_I \times \cos\beta}{4 \times R^2 \times A_L}$$

2.4 Electrical Requirements

PARAMETER			SPECIFICATION
Supply Voltage [external] (Vdc)			10 to 33
Current Drain @ 24Vdc (A) [average]	**standby mode**		< 0.1
	firing	**at 0.2Hz**	< 0.8
		at 1Hz	< 1.2
	low power mode		< 0.1
Frame Isolation @ +/-50Vdc (uA) [leakage current to frame from any connection]			< 5

2.5 Environmental

PARAMETER			SPECIFICATION
Temperature (°C)	**Operate**[8]	**min.**[9]	-40
		max.[10]	+63
	Survive	**min.**[9]	-45
		max.[10]	+71
Vibration and Shock[11]			MIL-STD-810F [ground mobile]
EMI/EMC			n/a [open frame]

[8] With some performance degradation at temperature extremes (TBD).
[9] Without wind chill.
[10] Without solar radiation.
[11] Refer to manufacturer for details.

$$P_R = \frac{P_L \times \bar{\chi}^2 \times \delta \times D_L^2 \times A_I \times \cos\beta}{4 \times R^2 \times A_L}$$

2.6 Connector/Pin Details

PARAMETER		SPECIFICATION	DESCRIPTION
Power Input & Comms Port Connection: micro D Panel connector, Female, 15 Way			
Pins	**1**	TX422-	TX- (transmitted from LRF)
	2	TX422+	TX+ (transmitted from LRF)
	3	GND_ISO	RS422 isolated GND
	4	RX422-	RX- (received into LRF)
	5	RX422+	RX+ (received into LRF)
	6	+VEXT	External Power (+)
	7	+VEXT	External Power (+)
	8	EXT_GND	External Power (return)
	9	EXT_GND	External Power (return)
	10	N/C	unused - reserved for video output
	11	GND	Ground
	12	PULSE-	RS422 laser pulse indicator
	13	PULSE+	RS422 laser pulse indicator
	14	CHS	Chassis
	15	N/C	unused

$$P_R = \frac{P_L \times \chi^2 \times \delta \times D_L^2 \times A_I \times \cos\beta}{4 \times R^2 \times A_L}$$

3 SET-UP

3.1 Mounts

The RangePRO mounting arrangement is located on the bottom surface of the unit:
three tapped M3 holes;
three bottom and two receiver-side surfaces used for mounting reference.

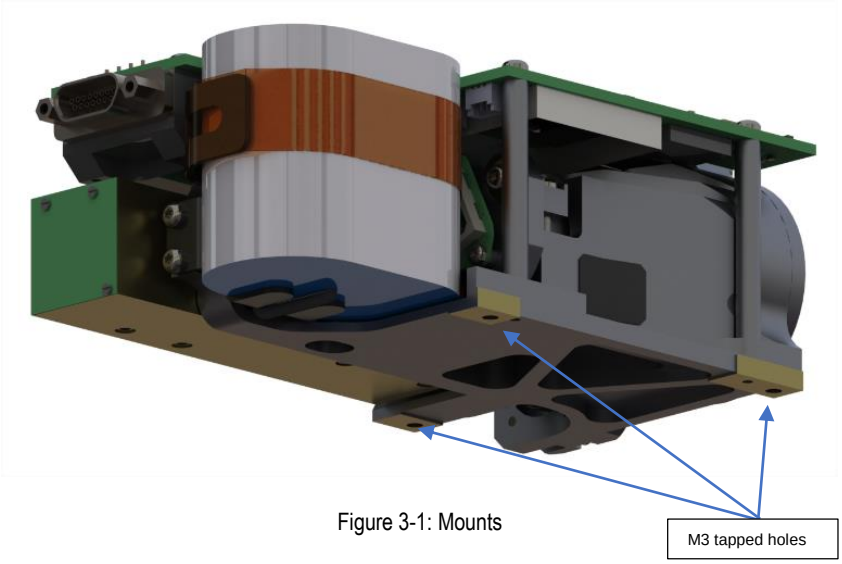

Figure 3-1: Mounts

3.2 Connections

CAUTION: do not connect or disconnect when external power is applied;
user-supplied connections must be correctly wired (see Connector/Pin Details).

The RangePRO has one connection point, being a 15 way (female) micro-D connector, located at the rear of the unit. Refer to section 2.6 for connection details.

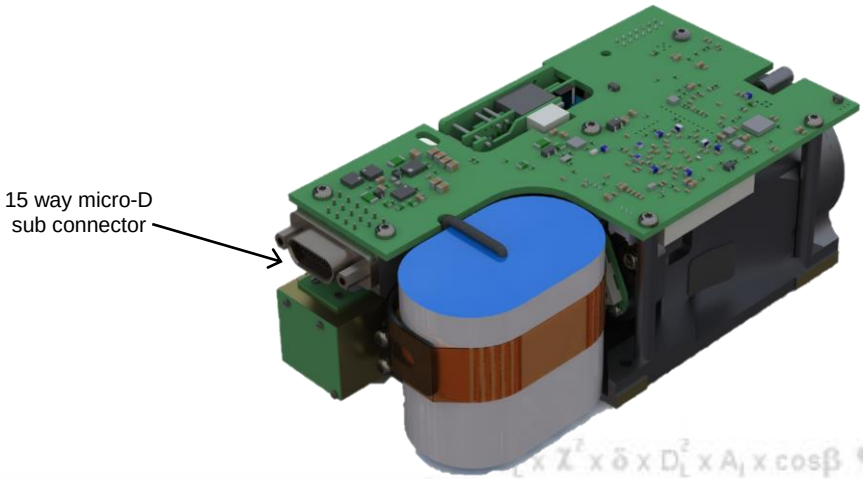

Figure 3-2: Connections

4 OUTLINE DRAWING

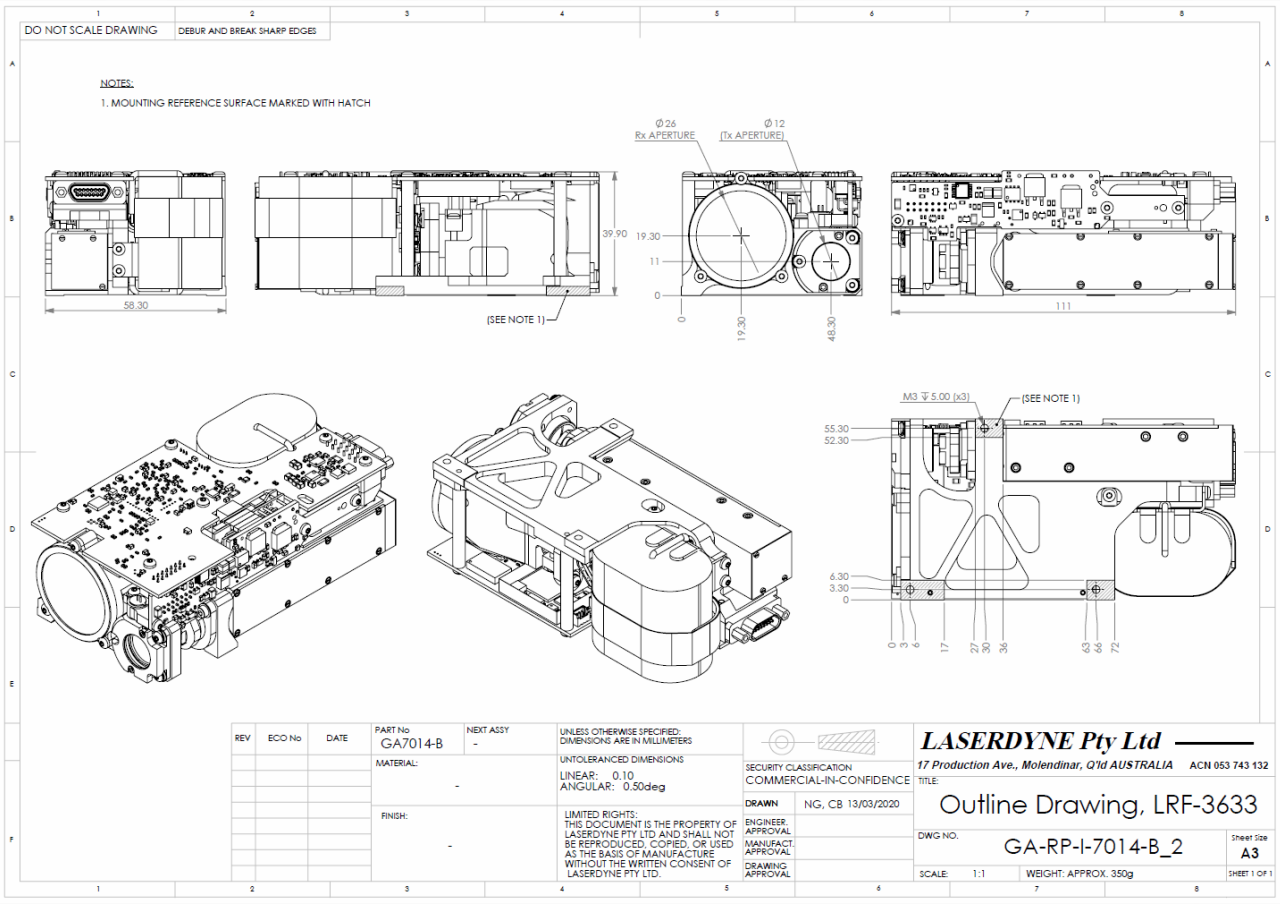

Figure 4-1: Outline Drawing

5 DOCUMENT REVISION INFORMATION

Rev	Date	Details	Author
A	27 May 2020	Initial release – based on 3633-E with updated performance figures for low divergence variant	MW
B	16 Jul 2020	Updated image	MW

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