SigmaSpace
EXCELLENCE IN AEROSPACE TECHNOLOGY

Micro Pulse Lidar System

MiniMPL-ENCL & MPL-ENCL

Enclosure Operations Manual

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Micro Pulse LiDAR Enclosure System: Record of Purchase

Thank you for your purchase of the Micro Pulse LiDAR Enclosure System from Sigma Space Corporation.

Please fill in the following system information for your records. This information may be requested by Sigma Space for obtaining service or for performing upgrades.

Customer Name	
Organization	
Date of Purchase	

	Model Number	**Serial Number**
Enclosure		
Enclosure A/C		
WebSwitch Plus™		
Router		
Configuration Notes		

Precautions

Electrical Safety

E1. Adhere to the specified operating voltage for the Micro Pulse LiDAR Enclosure System at all times. The Enclosure has a specified operating voltage that is determined at the time of purchase. The voltage specification on custom configured units is labeled accordingly.

E2. Use grounded plugs and receptacles for power. It is recommended to use receptacles or power strips equipped with surge suppressors to protect the electronics from damage.

E3. All electrical connections should be verified by qualified personnel prior to operating the instrument. Incorrect or poor connections may cause damage to the equipment.

E4. Ground straps are recommended for handling connection cables of the instruments inside the enclosure to avoid damage due to electrostatic discharge.

E5. Startup and shutdown procedures must be followed for the LiDAR as described in the MPL or MiniMPL Operations Manual. Do not attempt to open or move the LiDAR while the instrument is in operation.

E6. The user should review all procedures listed in the MPL or MiniMPL Operations Manual.

E7. Refer any service requirements directly to Sigma Space or an authorized representative.

Mechanical, Optical, and Environmental Safety

M1. The enclosure is rated for outdoor use.

M2. The surface of the enclosure aperture should not be touched by hand or cleaned in a manner that is outside of standard optical cleaning practices (gloves, acetone, lint free cotton wipes). The aperture must remain covered when not in use to protect against dust and accidental damage. Any dust accumulating on the aperture during normal operations should be periodically cleaned using filtered, pressurized air. Care should be taken to avoid contact with the optical surfaces.

M3. The enclosure and air conditioner must remain upright at all times. Care should be taken to ensure that the enclosure is properly anchored to the ground to prevent accidental tipping.

M4. The enclosure air conditioner must remain on at all times even if the LiDAR is not running, to ensure proper temperature inside the enclosure. The operating and storage temperature of the LiDAR should always be between 10°C (50°F) and 35°C (95°F).

M5. The doors on the enclosure must remain closed at all times, except when accessing the LiDAR or computer. This will help keep the temperature inside the enclosure stable.

Laser Safety

L1. ***Caution – Laser Radiation exposure may occur if the user modifies the controls or performance of the instrument with procedures other than those specified herein.***

L2. The LiDAR System inside the enclosure is a Class II Laser Product as defined by the US CDRH 21CFR1040.10/.11; Class II Laser Product as defined by EN60825-1/2; and ANSI Z136.1 2000.

L3. All operators of the LiDAR system should be trained in Laser Safety prior to operating the LiDAR. Laser warnings should be observed at all times and direct viewing of the beam should be avoided.

Scanner Safety (If applicable)

S1. While the scanner is operating, all people should be clear of the scanning area to avoid accidental exposure to the beam.

S2. Always use the provided red lens cap to cover the scanner window when initializing. The scanner initialization process could rotate the beam towards the user.

S3. Never point the scanner towards the user or other people.

S4. Proper warning and notification should be given to all people in the vicinity of the scanning system.

1. Introduction

The Micro Pulse LiDAR Enclosure System provides a comprehensive and robust housing for Sigma Space's Micro Pulse LiDAR products. The Micro Pulse LiDAR Enclosure System comes complete with a climate controlled, closed loop air conditioner to keep the inside of the enclosure at the proper temperature. The operating and storage temperature of the LiDAR should always be between 10°C (50°F) and 35°C (95°F). A WebSwitch Plus™ is utilized to turn the LiDAR On/Off automatically in the event that the temperature inside the enclosure exceeds the operating range of the LiDAR.

2. Micro Pulse LiDAR Enclosure System Installation

The Micro Pulse LiDAR Enclosure System comes with an outdoor rated enclosure and an electronics module (with purchase of Sensor Suite options).

2.1. Site Location

The Micro Pulse LiDAR Enclosure System site should be:

- Level and on solid ground. A concrete slab with anchor points is recommended
- Free of any overhead obstructions (Trees, power lines, buildings, etc.)
- Located away from any strong sources of EMI Radiation such as Radars
- Equipped with adequate power and Ethernet connections
- In a secure area to prevent any unauthorized access to the enclosure

2.2. Site Installation

Adhere to the following guidelines when installing the enclosure at the site.

- Install the enclosure so that the top surface is level. Use a level to verify.
- If possible, lift the enclosure up off of the wheels to prevent unwanted movement. If not possible, make sure the wheels are locked and use wheel chocks to keep the wheels from moving.

- Use tie down straps to secure the enclosure to the ground in 4 places using the supplied anchor points on the enclosure.
- Make sure none of the tie downs are interfering with access to the doors, connector panel, or air conditioner.

2.3. Site Power/Data

- The site should be equipped with the appropriate voltage for the enclosure using a dedicated circuit that is GFCI protected for 20A or greater (per enclosure). The enclosures are pre-configured for the standard operating voltage where it is to be installed. The enclosure operating voltage is listed on the outside of the enclosure.
- The site should also be equipped with an Ethernet LAN connection to the customer's network. Network access is required to stream data to servers or to remotely control the LiDAR and/or WebSwitch Plus™.

2.4. Instrument Installation

- The MPL or MiniMPL are to be placed on the shelf inside the enclosure. Refer to the MPL or MiniMPL Operations Manual for proper handling and installation requirements.
- Secure all cables to the LiDAR. Do not power on the enclosure until all cables are connected.
- If a WebSwitch Plus™ is installed, refer to the WebSwitch Plus™ section below for proper connections.

3. WebSwitch Plus™ Installation and Setup (Optional Item)

The Micro Pulse LiDAR Enclosure System comes preinstalled with a WebSwitch Plus™ on every new unit, if purchased. The WebSwitch Plus™ is already setup and pre-configured to run as soon as it's powered up. The WebSwitch Plus™ is a remotely controlled IP switch that is designed to turn off the LiDAR if the enclosure temperature is outside of the LiDAR operating limits. The operating temperature of the LiDAR should always be between 10°C (50°F) and 35°C (95°F). The switch will turn the LiDAR back on once the temperature is at a safe level.

For enclosure systems that do not already have a WebSwitch Plus™ installed, the user will need to mount the WebSwitch Plus™ to the racking rails inside the enclosure using the supplied rack mount brackets and screws as shown in Figure 1. Make sure the WebSwitch Plus™ and cables do not interfere with the LiDAR or the laser beam. The suggested position of temperature sensor is shown in Figure 2. Make sure that the temperature sensor is not in direct sunlight or in the direct airflow of the air conditioner. Secure the sensor using the supplied cable ties and mounts. Make sure the sensor (silver part) is not in direct contact with the enclosure walls or insulation. Attach the supplied router to the WebSwitch Plus™ using the supplied Velcro™ tabs.

Figure 1: WebSwitch Plus™ Suggested Enclosure Mounting Location

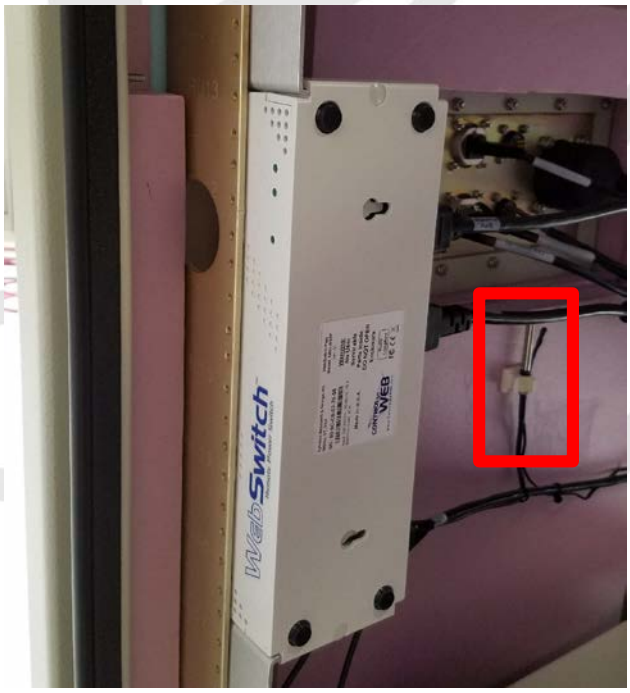


Figure 2: WebSwitch Plus™ Suggested Temperature Sensor Routing and Location

3.1. WebSwitch Plus™ Wiring Diagram

Figure 3 shows a diagram of how the LiDAR, WebSwitch Plus™, and computer are hooked up. Please make sure that the LiDAR is plugged into Outlet 1 on the WebSwitch Plus™. Outlet 2 is not used, but is still controlled by the same temperature limits as Outlet 1. If Outlet 1 is off, then Outlet 2 will be off. Make sure that whatever is plugged into Outlet 2 can tolerate being powered

off when the LiDAR turns off. ***Never plug the laptop or the Air Conditioner in to the WebSwitch Plus™.*** Damage to components inside the enclosure could result.

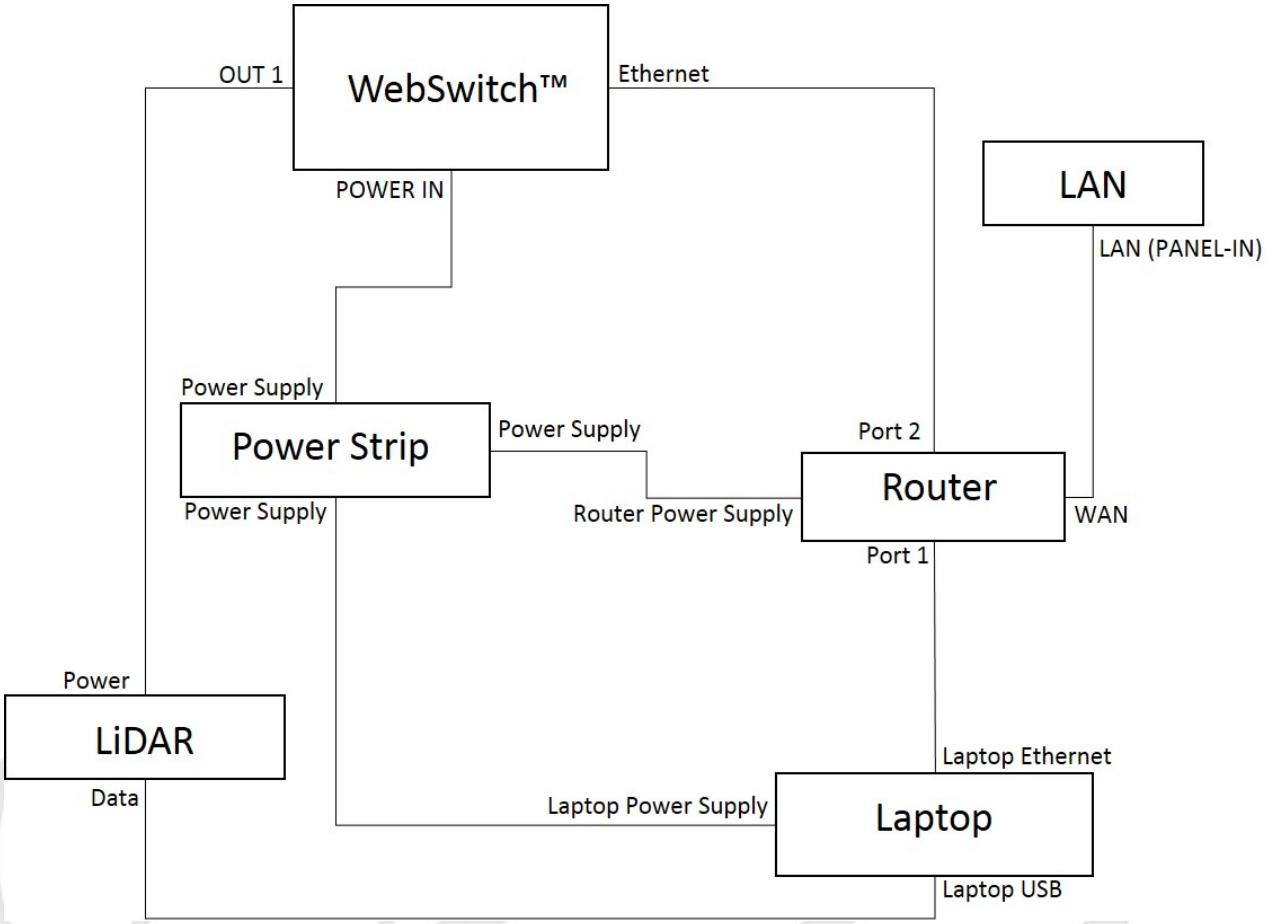


Figure 3: WebSwitch Plus™ Wiring Diagram

3.2. WebSwitch Plus™ Operation

The WebSwitch Plus™ uses a custom built script to turn the LiDAR on and off at the right temperatures. This script is pre-loaded into the memory of the WebSwitch Plus™ with any purchase. Do not remove or modify this script without permission from Sigma Space personnel. Tampering with the script without prior permission from Sigma Space personnel will void the warranty and can cause irreversible damage to the LiDAR.

Table 1 outlines the basic logic of the WebSwitch Plus™ temperature control script.

Table 1: WebSwitch Plus™ Temperature Control Logic

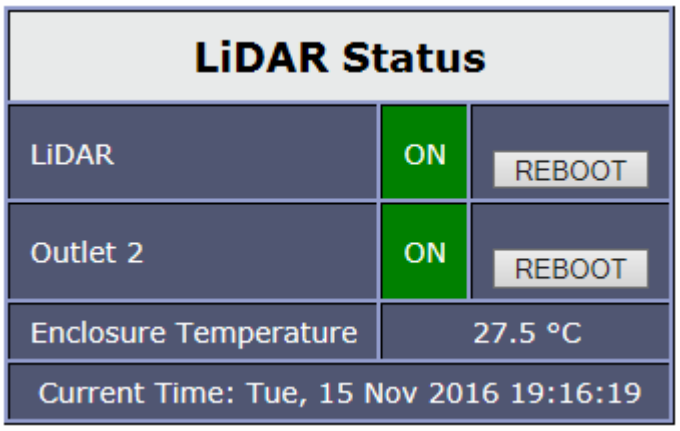
Temperature Range	Outlet State	Notes
15 °C – 25 °C	ON	Always ON within this range
> 30 °C	OFF	Always OFF when above 30 °C
< 10 °C	OFF	Always OFF when below 10 °C
25°C – 29 °C	ON	ON If, temperature is below 30 °C or if it's been within this range for > 10 minutes after being above 30 °C

	OFF	OFF if temperature is within this range for less than 10 minutes after being above 30 °C
11 °C – 15°C	ON	ON If, temperature is above 10 °C or if it's been within this range for > 10 minutes after being below 10 °C
	OFF	OFF if temperature is within this range for less than 10 minutes after being below 10 °C

3.3. WebSwitch Plus™/LiDAR Status Page

The status of the WebSwitch Plus™, Outlet State, and Enclosure Temperature can be viewed in real-time via the computer's LAN. To access the LiDAR Status page enter the information below into a browser on the instrument's computer.

- IP Address: 192.168.10.2
- Username: admin
- Password: webswitch



3.4. Advanced WebSwitch Plus™ Features

The WebSwitch Plus™ is a very powerful remote power switch. More advanced features including automatic email notifications, logging, etc. can be setup as needed. Please consult the WebSwitch Plus™ manual (http://www.controlbyweb.com/webswitch/manuals.html) for how to configure these options.

For all Micro Pulse LiDAR Enclosure service, please contact:

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