Lidar Engineering
Parakeet Zone Controller
For Parakeet Lidar

User Manual
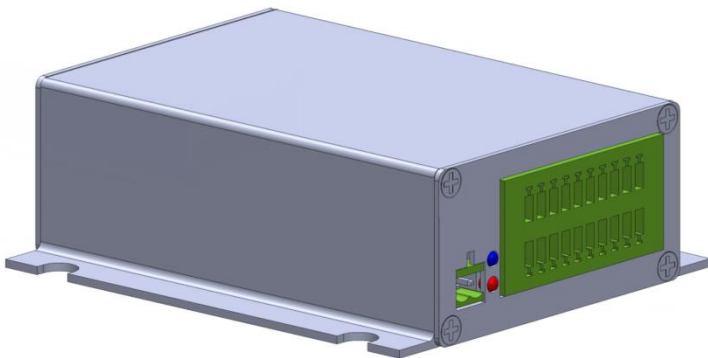
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1 Table of contents

2 Introduction

The PZC-16, Parakeet Zone Controller is designed to connect to two Parakeet LiDAR devices. The PZC-16 has two sets of inputs and outputs to monitor and control the operation of the box and LiDAR. The settings in the Parakeet Zone Controller can be configured with 16 zones, each with a number of defense areas. There are three levels of defense areas: Observed; Warning; Alarm. Each level of defense area can be associated with any of the four outputs.

The defense zones are configured using a Windows program called LidarViewer.

When configured the Parakeet Zone Controller will monitor the transmitted data of the connected Parakeet LiDAR and change selected outputs when an object is detected in that area. The inputs are used to select which of the zones are currently active.

NOTE: The box LIDAR 1 and 2 interfaces with Passive POE power supply function can only be connected to our LiDAR and must not be connected to other network devices, otherwise the switch/router may be damaged.

3 Parakeet Zone Controller Connections

The connectors of the Parakeet Zone Controller is as shown in the figures below. Please read it carefully and use care to wire correctly to avoid damage or failure of the Parakeet Zone Controller.
The communications end of the PZC-16 contains three ethernet ports and a USB-A connector.
The ethernet port LAN is used to send data and receive configuration commands either directly from a host computer or over a network. The two ethernet ports LIDAR1 and LIDAR2 should be connected to a Parakeet LiDAR device. The USB connector can be connected to a Lidar with a USB serial interface.

NOTE: Currently, the box only supports connecting to a single LiDAR, and does not support connecting LIDAR1 and LiDAR2 interfaces to two LiDARs at the same time. Future upgrades will remove this initial limitation.

NOTE: Lidar Engineering currently offers only Ethernet Connected LiDAR devices. USB connected LiDAR devices may be available in the future.
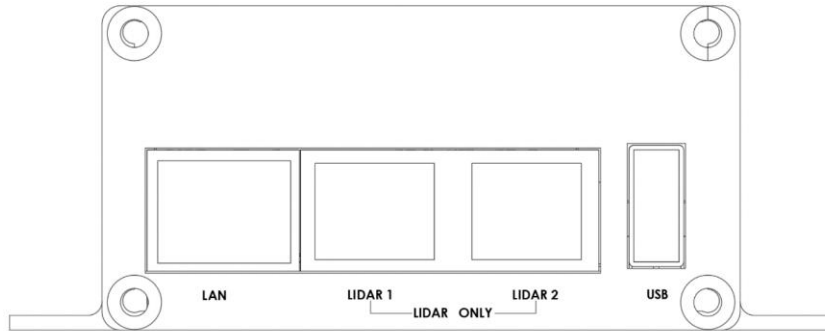
The other end of the PZC-16 has three connectors. The DC power supply connection can be between 12V ~24V. Current draw is ~150mA. This power is isolated from the power pins of the I/O connector.

The box I/O has two channels (See note above), which can be used alone or at the same time.

The I/O and +24VS and GNNS connections are optically isolated from the rest of the circuitry. Standard procedures for isolating connections between the PZC-16 and other industrial equipment should be followed. In a small well controlled system they may be powered from the same source, but that negates the advantages of the optical isolation.
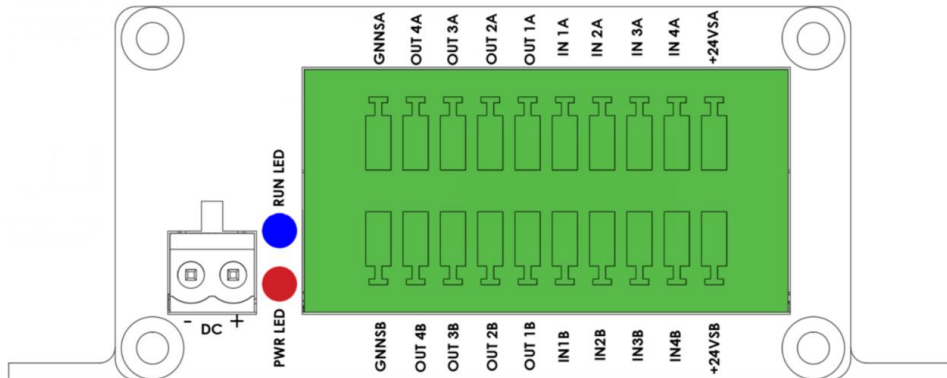
Each bank of outputs A or B, can be configured as either type PNP or NPN to support connections to various industrial control devices.

Each bank of inputs is configured with internal pull up resistors to +24VS. A switch to ground or NPN output can be used to choose which zone is currently being used to determine the outputs.

The inputs and outputs can be wired as shown below.
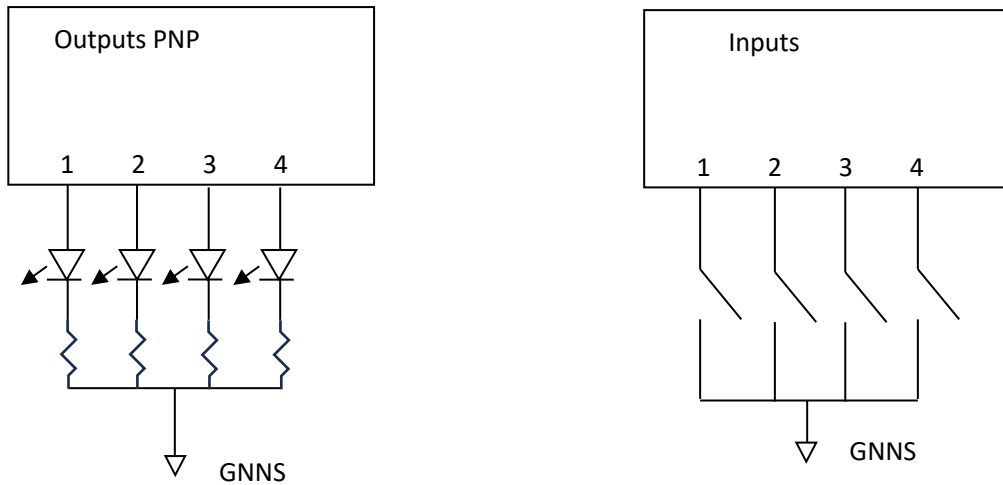
This example is with the Lidar Engineering test board.

The 4 input ports on the left are manual zone select switches. There are a total of 16 zones of defense areas 0~F. All inputs connected to ground selects zone 0.

The 4 outputs on the right are can be configured to be any of 12 possible outputs.

1. The output ports have two modes: PNP and NPN (selectable by the host computer I/O configuration)

2. Whether the corresponding output mapping is configured

3. Does the Lidar have a occupied defense area under this mapping?

Note: Please note that the connections must correspond to the Parakeet Zone Controller wiring.
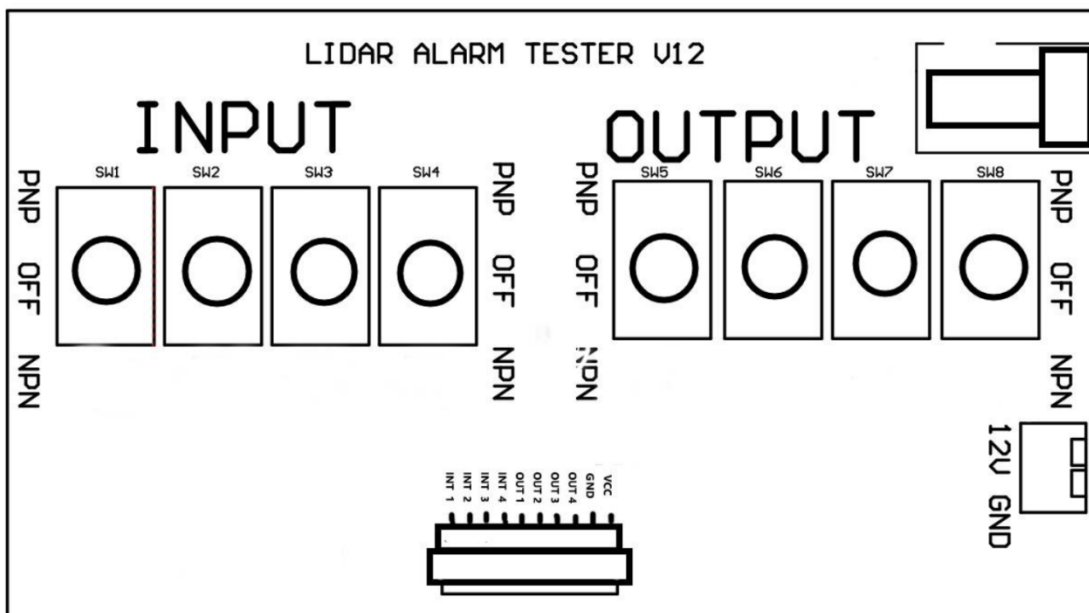

Lidar I/O external board example

The individual logic of each indicator light (4 groups) is as follows

	Lidar mapping trigger	Lidar mapping does not trigger
IO output opens output mapping check	Lights off	Light
IO output opens output mapping and is not checked	Light	Light
IO output close output mapping check	Light	Lights off
IO output closes output mapping and is not checked	Lights off	Lights off

Note: When there are multiple Lidars connected to the test board, it is necessary to ensure that the I/O output configuration is consistent, that is, if one Lidar is set to NPN, the other needs to be set to NPN by default. The reverse setting of the two is not allowed and can result in damage to the Lidar

This is a photo of the PZC-16 connected to the Lidar Engineering test board.
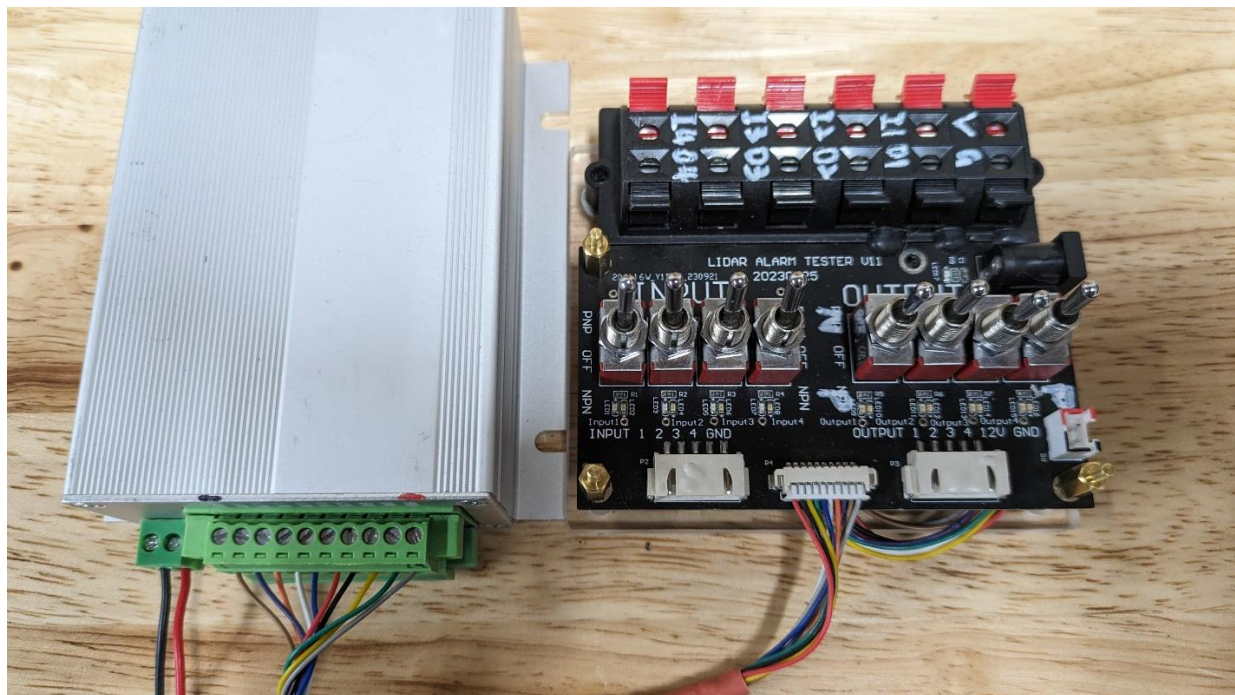
This is an example of the PZC-16 connected to a prototype breadboard circuit.
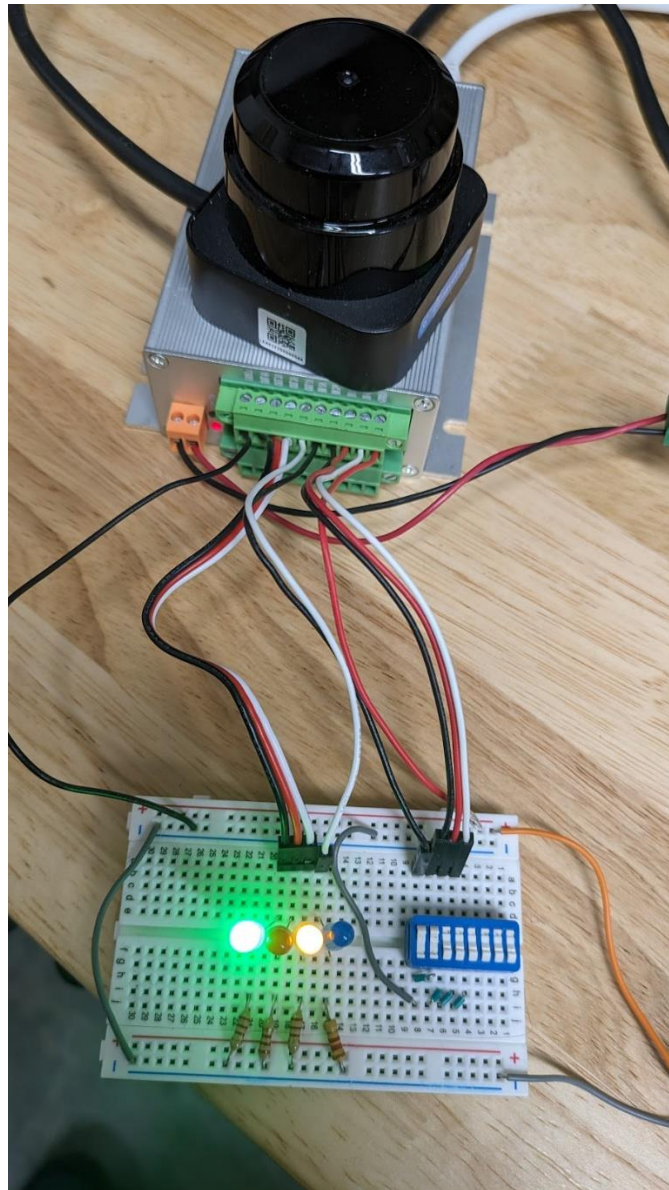
4 Lidar, Parakeet Zone Controller, and PC Configuration

Using the PZC-16 with a Parakeet LiDAR sensor requires two pieces of software:

1. Parakeet-1.2.2.5.exe
   a. This program is for viewing and adjusting the settings of a Parakeet Lidar sensor. The Parakeet must be configured properly to work with the PZC-16 Parakeet Zone Controller. This is the actual executable, place it in a work directory and run it from there.
2. LidarView.exe
   a. This program is for viewing and configuring the PZC-16 Parakeet Zone Controller. With a Parakeet connected, you can set defense zones, and areas to be monitored and optionally, outputs to be triggered. This is a Windows Installer program that will install the software.

To successfully get all of these devices set properly using this software you will need to understand and use the Windows Control Panel, Network Configuration dialogs, shown here.
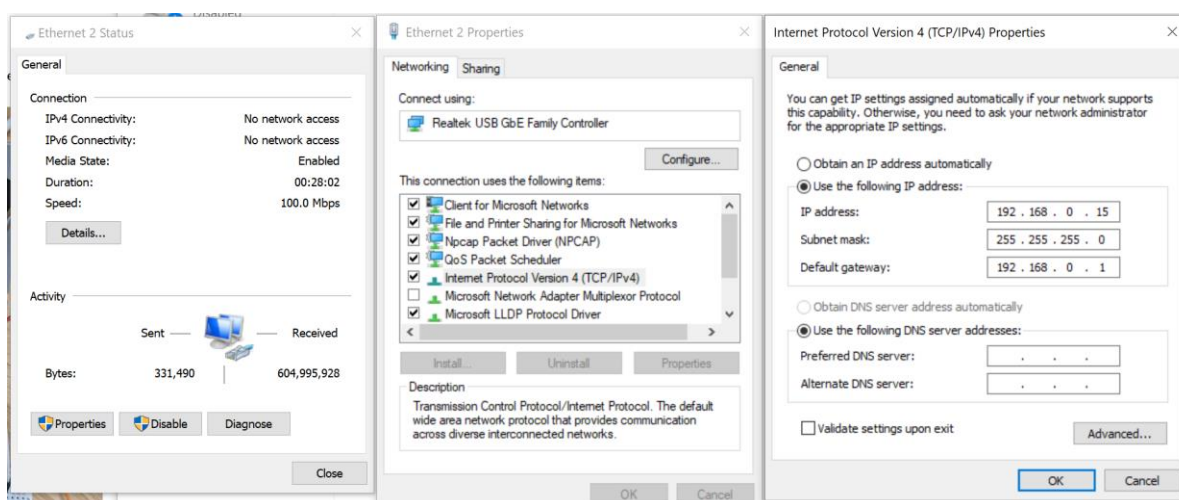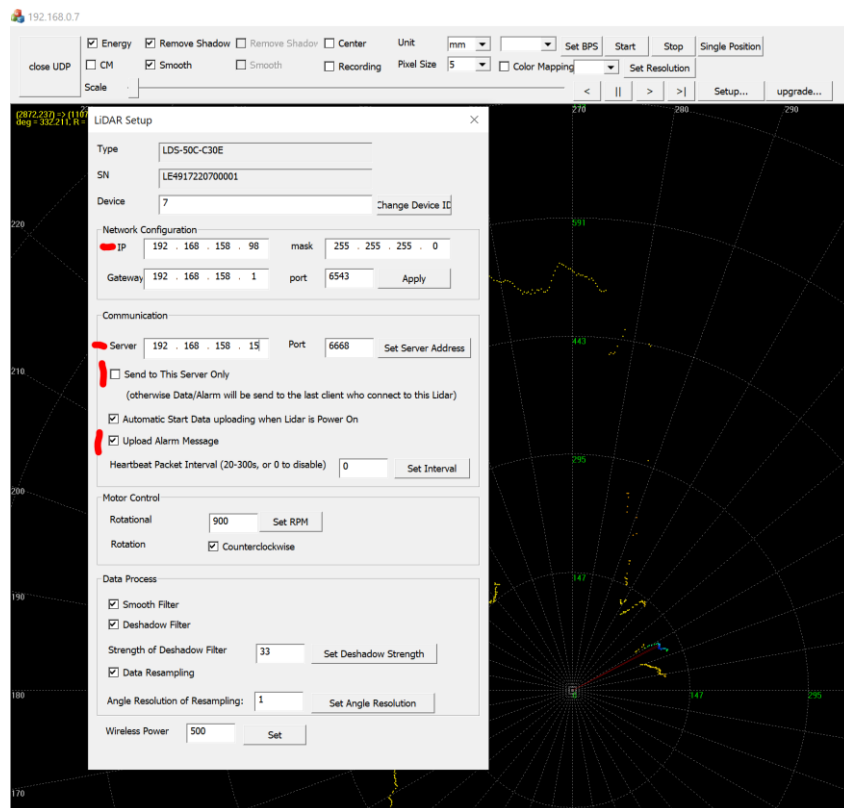

4.1 Parakeet Configuration and Viewing Software

The LiDAR ethernet inputs of the PZC-16 are configured to use subnet 192.168.158.xxx. Parakeet LiDAR that are going to be used with the PZC-16 must be configured to use the same subnet. The Parakeet LiDAR unit has a default factory setting of 192.168.158.98. The PZC-16 uses IP address 192.168.158.15 to connect with the Parakeet(s) so should not be used as an address for a Parakeet.

The picture below shows a Parakeet being configured to IP address 192.168.158.98, and configured to use host address 192.168.158.15. The check box "Send to This Server Only is OFF and the check box for "Upload Alarm Message" is ON. These two settings are required for proper operation with
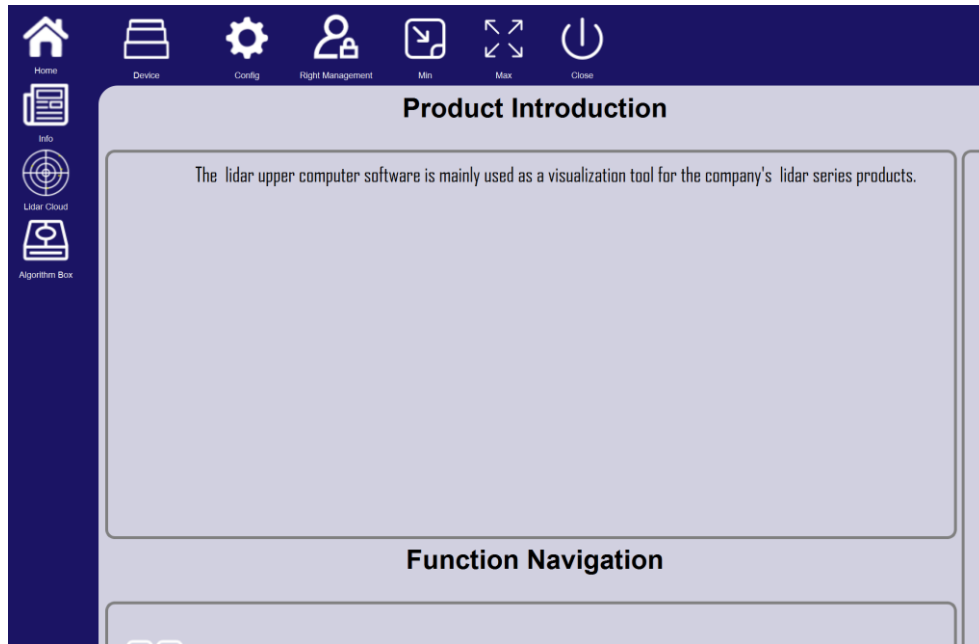
the PZC-16.

Full instructions on the use of this program are included in the document, "Parakeet-Test Software Documentation 4-5-23" or newer.

4.2 PZC-16 Configuration and Viewing Software

This picture shows the initial screen for the "LidarViewer" software. There are 10 icons around the upper left corner that provide access to the main features of the program.

 The home button brings you back to the initial screen.

 The Device button brings up a screen that allows you to select and connect to the PZC-16. It also provides information about a connected Parakeet.

 The Config button brings up a screen that lists general settings, Save and restore box settings, and upgrade the PZC-16 firmware via the USB serial port.

 The Right Management button causes a pop-up dialog box to appear allowing the user to log into the PZC-16 to enable editing the settings. The username is admin, and the default password is "lh123456"
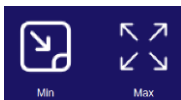
 The Minimize and Maximize buttons adjust the size of the program window.

 The close button causes the program to exit immediately. There is no prompt to save settings.

 The Info button brings up a screen that allows you to verify the current time, unit number, run settings of the Parakeet, and the I/O configuration of the PZC-16

 This Lidar Cloud button brings up a screen that allows you to view the point cloud data from the connected Parakeet Sensors, Draw and Configure Defense areas, and adjust Parakeet operation.

 The Parakeet Zone Controller button brings up a screen that lists the IP addresses of the PZC-16 and its attached LiDARs. It also has a section to update the firmware of the PZC-16. This icon will not be displayed if the software cannot communicate with an PZC-16 Parakeet Zone Controller.

4.2.1 Device Screen

This screen shot shows that the PZC-16 LiDAR connection is on IP Address 192.168.158.15. The Parakeet LiDAR should be configured to be in this subnet.

The connection from the PZC-16 to the Host PC is through IP address 192.168.0.158. The PC should be configured to be in this subnet. A typical IP to use for the PC would be 192.168.0.15.

Click on the device row in the table that you want to connect to, then click the connect button, in the middle.

Num	Link	Address	Upload	Heartbeat	RPM/HZ	CPU	MAC address	Volt	Alarm	State
1	UDP	192.168.0.158:6766	192.168.158.15:6766	13:20:36	908.9/15.11	67.7	cc-00-17-06-00-06	17.37	Box connect	Connected

After connecting, the user needs to confirm whether the LiDAR IP address needs to be modified. If multiple LiDARs are connected at the same time, it is necessary to ensure that the LiDARs are all in the same 192.168.158.xx subnet and there are no IP address conflicts.

NOTE: It is necessary to confirm that the LiDAR's data upload method ' is set to ' data + alarm ' and that the LiDAR configuration setting 'Send to this Server Only' is disabled.

4.2.2 Parakeet Zone Controller Screen

When the Lidar Viewer program detects the heartbeat packet of the Parakeet Zone Controller, the Parakeet Zone Controller icon will appear in the function bar on the left side of the host computer; Select 'Parakeet Zone Controller' to jump to the Parakeet Zone Controller setting screen. There are four main sections of this screen to manage connected Parakeets and the box.
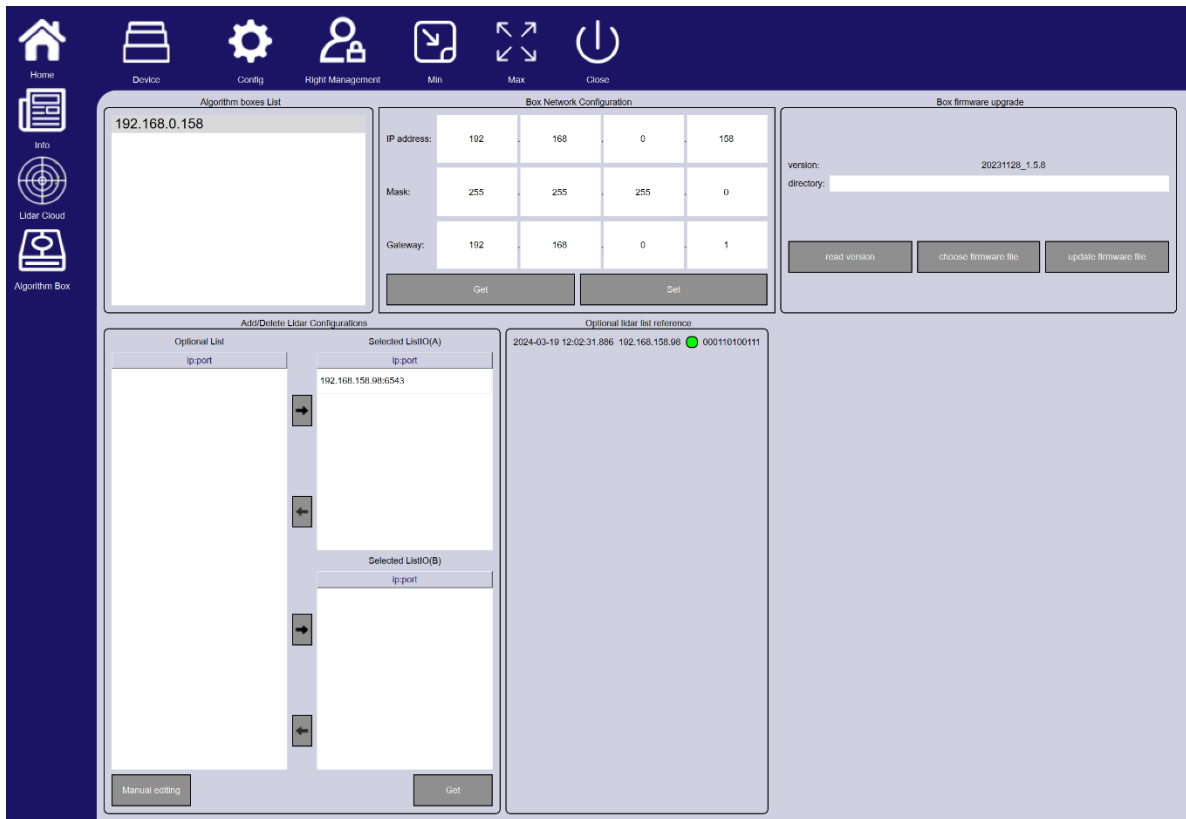
4.2.2.1 Box network configuration

The Parakeet Zone Controller allows users to modify external network parameters. You can modify the boxes network settings in the Box Network Configuration area. After modification, click the Set button and the Parakeet Zone Controller will restart for the settings to take effect.

4.2.2.2 Box firmware upgrade

The host computer supports upgrading the internal program of the Parakeet Zone Controller. The upgrade process is: ' **Select firmware** ' →' **Upgrade firmware** ' →' **Read version** '. After the upgrade is completed, the Parakeet Zone Controller will automatically restart to take effect. After the restart is completed, the read version will be refreshed to the new version.

4.2.2.3 Add or Delete Lidar Configuration

Up to two LiDAR can be connected to the Parakeet Zone Controller. (Current Firmware only allows one!) The selected Lidar for each are listed in the upper and lower boxes of this group. Other Lidars on the boxes network will be listed to the left. They can be selected or deselected by using the left and right arrows next two the IO(A) and IO(B) list.

The optional list to the right shows the LiDAR that are actively connected to the Parakeet Zone Controller, and has an indicator of current status.

Note: Only when the Lidar list indicator light turns green can it be connected and used normally.

Indicator status definition:

Gray: Disconnect/Connection timeout; Green : Communication is normal; Red : Communication failed.

The Parakeet Zone Controller supports IO output mapping of multiple Lidars (only by adding the

Lidar IP Address to the list can the host computer connect to the Lidar through the Parakeet Zone Controller)

To add a New Lidar: Manually edit the table edit bar and write ip:port →right arrow.

To Remove a Lidar: Select the address (ip:port) to be removed then ← and click the left arrow.

Note: IP:port is the Lidar IP address followed by port number separated with a colon. The default factory Lidar port number is 6543, which can be modified by the user.
   Users need to confirm in advance whether the I /O used by the Lidar is A or B , and accurately add the Lidar IP to the corresponding I /O list. (Parakeet Zone Controller currently only supports one LiDAR)
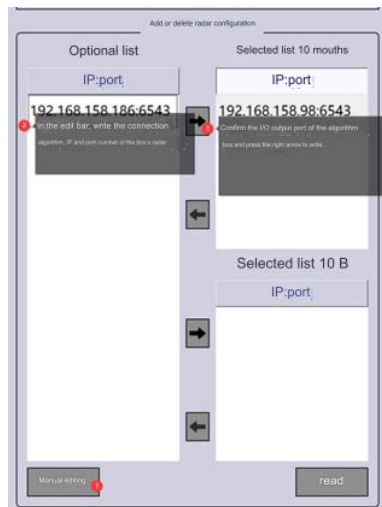
4.2.2.4   Update Box Firmware

In this area you can read the current box version information. Select a new firmware image stored on your computer and use that file to update the Parakeet Zone Controller with that version.
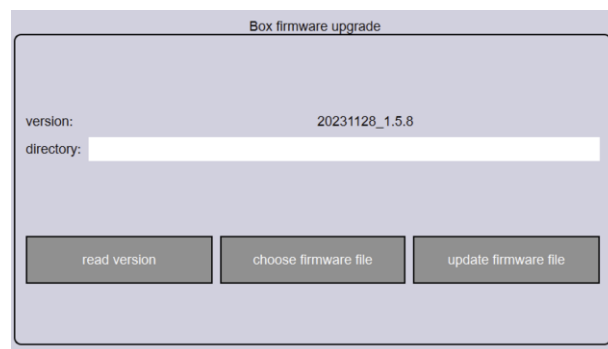
4.2.3 Optional Lidar list parameters

The optional Lidar list parameter displays the information of all Lidar heartbeat packets detected in the current network segment, as well as the network connection status of the Lidar, providing a reference for adding Lidar configurations.
The 12 one and zero digits behind the status indicator show the 12 internally defined alarm

triggering conditions, as listed below. These are the same conditions that can be selected for the outputs of the box.

Observe; Warning; Alarm; Camera Mask; No Data; Defense Zone Set; System Error; System OK; Network Connection OK; Defense Zone Updating; Zero Signal; Reserved.
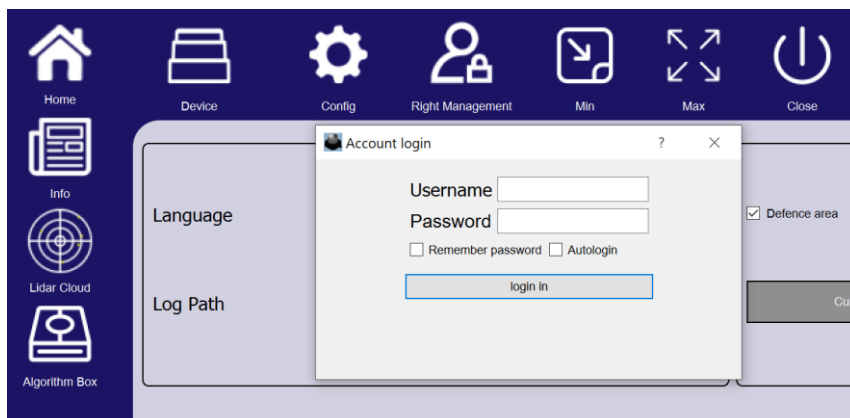
4.3 Connect Host computer to Lidar

Select 'Device' on the host computer screen, find the desired Parakeet Zone Controller IP address, select the Lidar to be updated, and click the connect button.
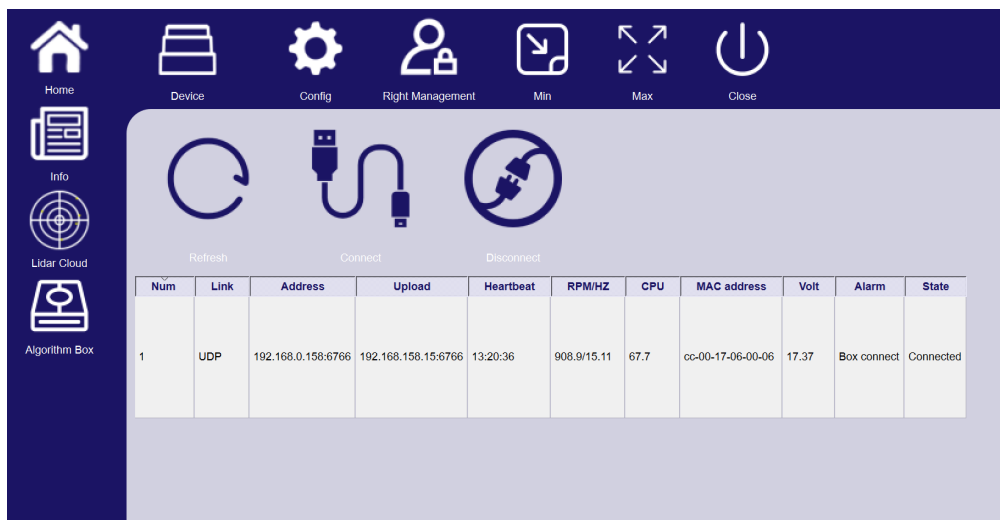

4.4 Login to Parakeet Zone Controller to allow configuration modifications

Click the Right Management button along the top of the screen. A popup dialog box will appear for Account login. Enter the user name and password to begin making settings changes. The default username is "admin", the default password is "lh123456". Click the Login button to continue. Changing of many settings is disabled without logging in.

4.5 Configure Basic Information of Box and Lidar.

After the Lidar is connected to the host computer, select the 'Info'; button.
This screen allows the user to set Lidar parameters, I /O configuration, and output mapping; the number of filter circles and filter points are used to filter the triggering of zone alarms. For example: the number of filter circles is 1 and the number of filter points is 3, which means that if the number of trigger points in the defense zone is less than 3 within 1 circle, the defense zone will not alarm. Filter circles are 360 degree scans or rotations of the lidar sensor.
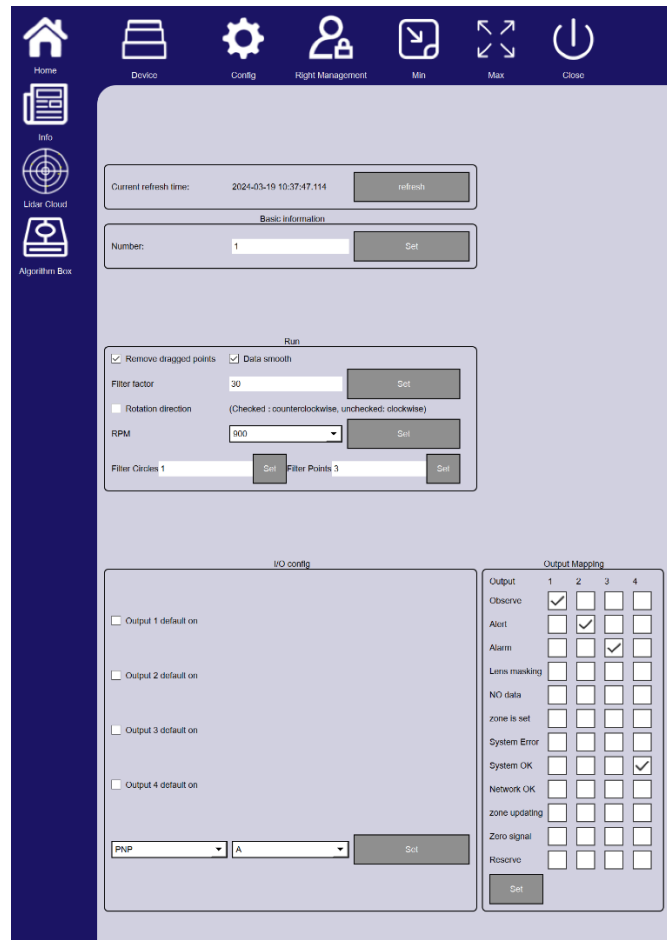
You can set the unit ID number of the Lidar here.
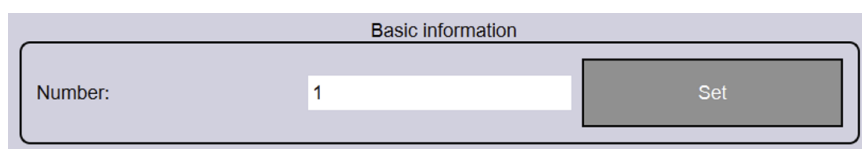
You can configure some of the Lidar's scan features here. Dragged points are where the Lidar scans across a near object and a far object and transition points are the average of the distance. Data smoothing averages sequential scans to filter variation in distance measurement.

I/O configuration and output mapping refer to the logical configuration as shown below. If you need to switch the I/O configuration output A /B , you can choose to switch directly in the I /O configuration, as shown in the figure, you can then select 'Parakeet Zone Controller', read The Lidar configuration, and see that the Lidar IP address has been switched from A to B.

Finally you can set the IO mapping of each of the 4 output bits, to any of the 12 alarm states transmitted by the Parakeet Zone Controller.
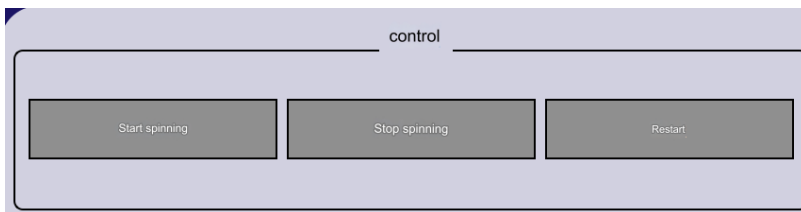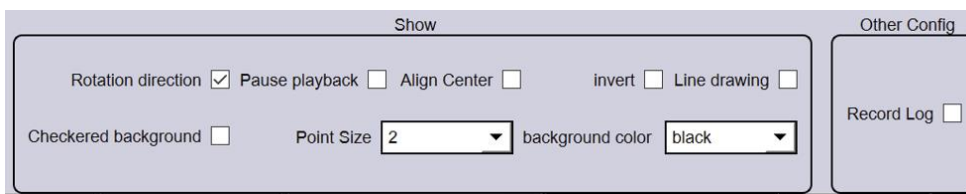
5 Display Point Cloud Data

On the main screen, click the Lidar Cloud button. The Current Connected Lidar point cloud data will be displayed graphically and in a table format.

The Control group at the top of the screen allow for starting, stopping and resetting the Lidar sensor.

The Show group at the top of the screen allows for adjusting some features of the display

6 Draw a defense zone

NOTE: Use caution when creating defense areas within zones while the lidar and Parakeet Zone Controller are actively operating. Changes to the inputs that select the current zone will override any changes made in the software.

NOTE: The software currently refers to all elements associated with detecting objects as zones. This document refers to the zones as what is selected by the inputs. The various rectangles, ovals, sectors, and polygons are referred to as areas. There are 16 zones and each zone can contain a

number of detection areas.
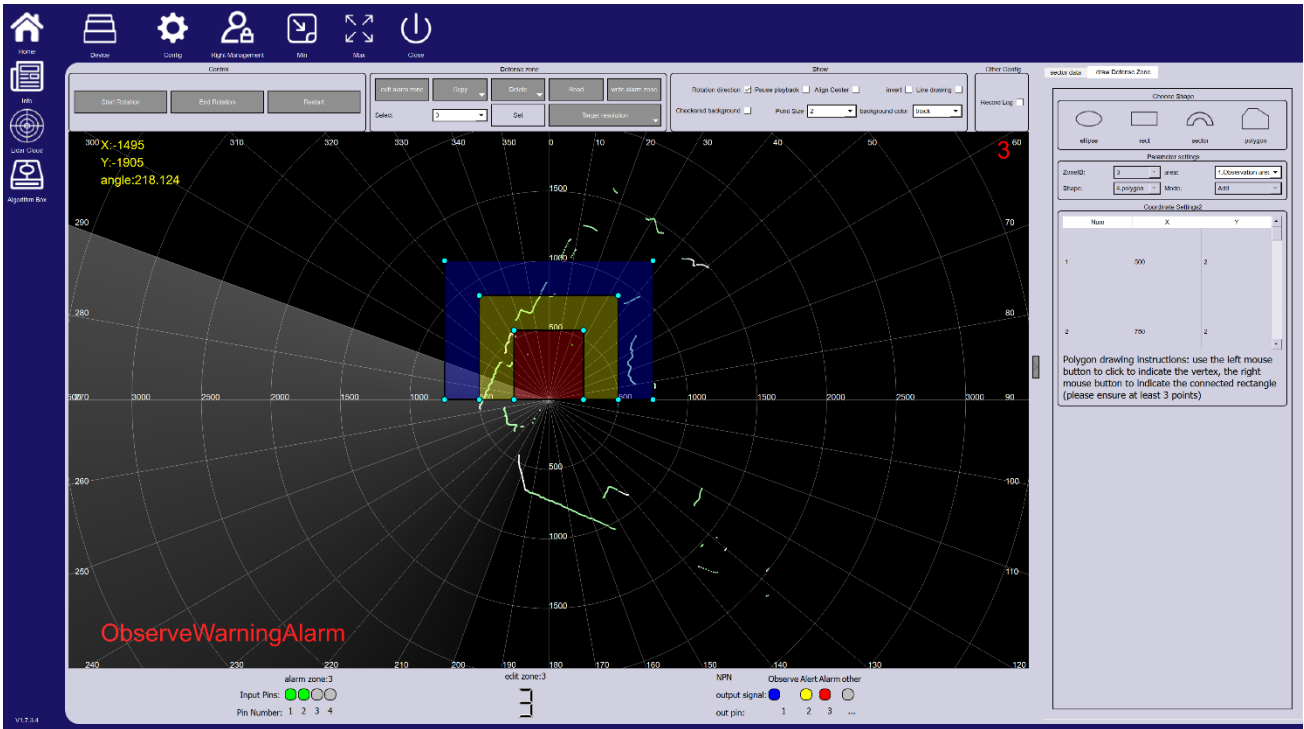
On the main screen select the 'Lidar Cloud' button.

At the upper right click on "draw Defense Zones" Users can view Lidar point cloud data (angle/distance/energy) and draw defense zones.

The "Defense Zone" control group provides the ability to select and modify defense zones are areas. There are 16 defense zones (0~9 & A~F) within each zone you can create a number of defense areas. The defense areas can be rectangles, circles (ellipses) Sectors. You select the zone you are working on by using the drop down box in the lower left of the control group.
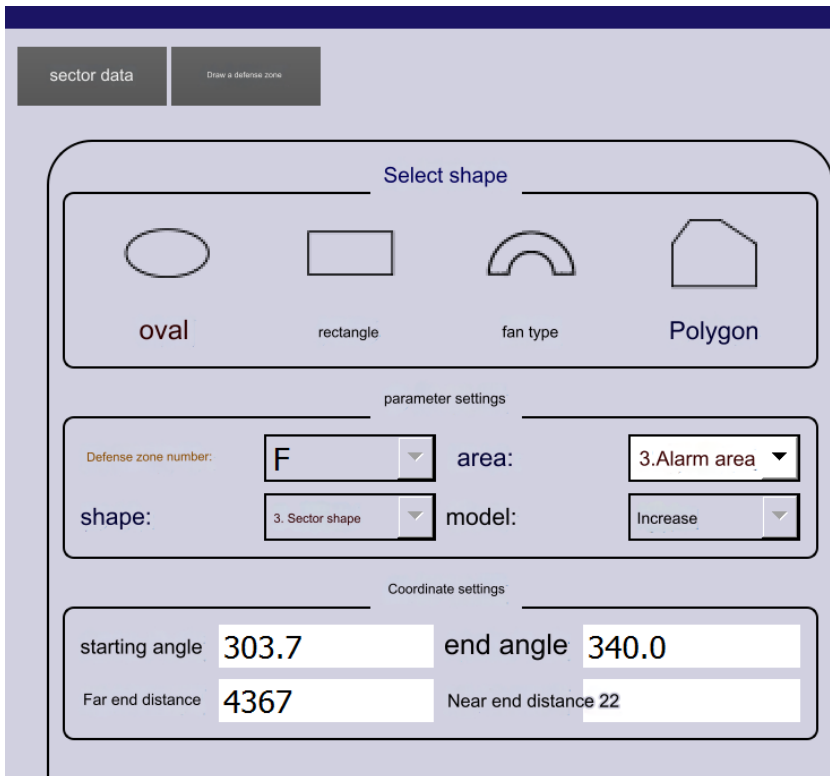

Here you can choose to edit the zone, copy the zone, delete the areas in a zone, read all of the zones or write (set) all of the zones back to the Parakeet Zone Controller.

Target resolution selects the size of an object that is required to determine that a defense area is occupied and the possible output is turned on.

Within a zone you can draw a number of areas of any of the four types: Oval (circle); Rectangle; Sector (fan); or Polygon. The defense areas can be assigned to any of the three alarm levels; Alarm; Warning; Observe. Those alarm levels can be assigned to any of the four outputs in the "Info Screen".

Defense areas can overlap. If they are configured as different alarm levels then more than one alarm may be active and any assigned outputs will be active.
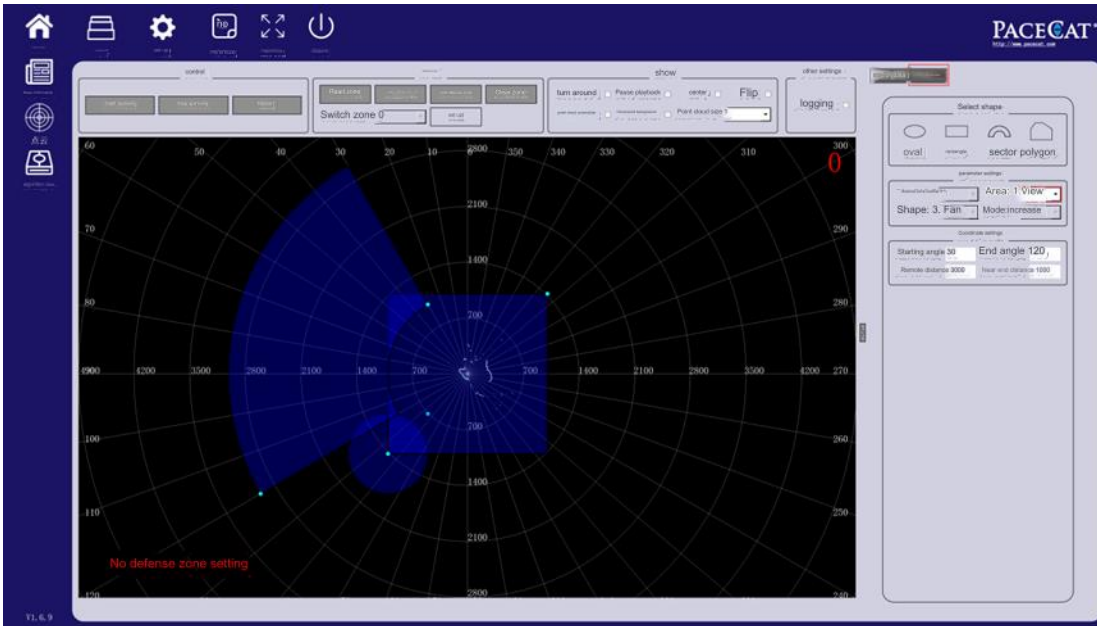
As shown in the picture, select ' **Draw Defense Zone** ' and select the required shape. With the exception of polygons, the software will automatically add that type area. The user can then move the position of the defense area with the left mouse button; the size of the defense area can be changed by selecting a blue dot corner, or by changing values in the 'Coordinate settings' text boxes. The defense area type is changed through the parameter setting area. Note that you must first select the shape and then set the defense area type.

When drawing a polygon, select the position of each vertex with the left button of the mouse. After the polygon is completed, the right button of the mouse can be used to automatically close the polygon. Polygons can also be edited by modifying their vertex information in the table of coordinate settings.

Finally, 'set defense zone' is required to save the new areas to the Parakeet Zone Controller. The host computer prompts that the setting is successful, indicating that the defense zones and their areas have been successfully written to the Parakeet Zone Controller.

The host computer provides a defense zone filtering function. Right-click the mouse to prepare the filtered defense zone. As shown in the figure, select filter, left-click to draw the vertex coordinates in the area, and right-click to complete the filtering. The filter position can be moved. Just select it with the left mouse button and drag it. Then refresh. The filter position will be refreshed again. If not needed, you can choose to delete the filter area/defense zone. After each change, you must select 'Set Defense Zone' before writing can be done. Lidar.

If you want to add the same defense area, you can right-click to select the defense area and select Add. The host computer will add a defense area of the same shape at the same position. The user can left-click and drag the defense area to another location.

Note that all changes to defense zones and areas require clicking ' **Set Defense Zone** ' to save the changes; ' **Clear Defense Zone** ' directly clears all defense zones in all zone groups of the current Lidar. If you do this by accident you can immediately click 'Read' to bring back the current zones and areas from the Parakeet Zone Controller. You must 'Set' the defense zone to actually clear the defense zones and areas.

Right clicking on a defense area will bring up a dialog box with: refresh; filter; add; and delete options.

Refresh – causes the defense areas to be redisplayed. This is useful when editing the shape of areas and filters.

Filter – starts the addition of a polygon, use the left mouse button to added verticies and the right button to complete the polygon. The newly created polygon causes a "Shadow" to be cut out of the defense areas behind it (away from the Lidar). Selecting and right clicking on the filter polygon will allow you to delete the filter.

Add – creates a duplicate of the current defense area.

Delete – removes the current defense area.
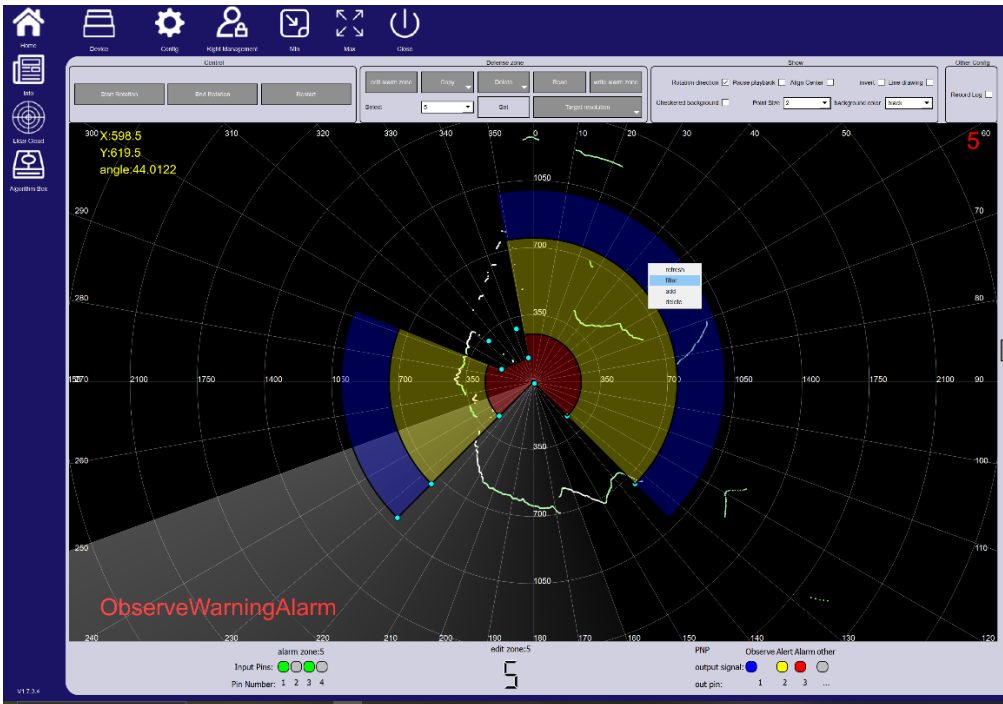
7 Config Screen Settings

Configuration settings include general settings/configuration parameter synchronization
You can select the language in the config settings. After changing the language, you need to restart the host computer;
The log file path determines where log files will be saved when the save log function is turned on.

Configuration parameter import and export is only for Lidars with defense zones and the PZC-16. They can be imported/exported. Exporting saves the settings to a file on the computer. Importing reads a file and writes the settings to the Parakeet Zone Controller. This is a method to clone the settings from one unit to another. Customers can choose the imported/exported modules themselves, including defense zone/IO/upload mode/operation parameters. Network settings are not saved and restored here.
This firmware update dialog is for units that have a USB based interface. The other upgrade dialog is for devices with ethernet based interfaces.