

# PSA

## Predictive Stop Arm™



## User Guide

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This guide will walk you through the Predictive Stop Arm™ configuration interface and the various sections used to set the relevant parameters necessary for the PSA system to work appropriately. But before configuring PSA, you will need to connect to the PSA system as explained below.

## Connecting to PSA

There are two ways to connect to the PSA system:

1. Through WiFi:
  - i. Power on PSA.
  - ii. Open wireless connection on your laptop and find the SSID that starts with "SAM:xx". Select that SSID.
  - iii. When prompted to enter a password, type **samsamsam**.
  - iv. Once connected, open the web browser and type 192.168.123.1 into your browser's address bar. You'll be taken to the login screen.

### TIP: Wi-Fi Connection



For security reasons, Wi-Fi Access Point will only be active for 5 minutes after boot for user to connect. Access Point will go off if there is no one connected during that period of time.

2. Through Ethernet port:
  - i. Update the static IP address in the user's PC to any 192.168.0.xxx different from 192.168.0.20.
  - ii. Connect the PC and the SAM with an Ethernet cable.
  - iii. Open the web browser and type 192.168.0.20 into your browser's address bar. You'll be taken to the login screen.



To access the Predictive Stop Arm configuration menus, login to the Safe Fleet Predictive Stop Arm URL by entering your user name and password (see previous image). By default, the username and the password are both **user**.

Once connected to the system, a new screen will prompt you to **select one GPS unit**. A second tool below also allows you to **connect with an external GPS source**. See the [GPS section](#) of the PSA configuration tools for more information.

## PSA Configuration

The PSA user interface displays two sectors that hold different fields, Settings and Advanced.

**Settings** allows access to:

- Alerts and warnings
- Diagnostics
- GPS
- Preferences
- System identification

**Advanced** permits:

- Change password
- Import and export Radar and Controller configuration
- View logging activity
- Radar configuration
- System upgrade.

## Settings

### Alerts & Warnings

The Alerts and Warnings section holds two different screens, one for **Predictive** mode and one for **Monitoring** mode. Both are accessible and configurable by clicking the corresponding tabs.

The screenshot displays the PSA Predictive Stop Arm configuration interface. The top navigation bar includes the 'SAFE FLEET' logo and the title 'Predictive Stop Arm'. A user profile section shows 'User' with a profile icon. The left sidebar contains a 'SETTINGS' menu with options: Alerts & Warnings (highlighted with a red arrow), Diagnostics, GPS, Preferences, and System Identification. Below this is an 'ADVANCED' section. The main content area is titled 'Alerts & Warnings' and features three tabs: 'PREDICTIVE' (highlighted with a red box), 'MONITORING', and 'DIGITAL GAIN'. An 'APPLY' button is located in the top right corner. The 'PREDICTIVE' tab is active, showing a 'Description' section with the text: 'Actively using radar events to provide warnings/alerts to the operator before the stop arm is activated. Visual warnings/alerts will be provided to the operator'. Below this is a 'Visual Notification' section with a green toggle switch and a 'TEST' button. The 'Audible Notification' section includes a sub-section for 'Warning' with a toggle switch and a 'TEST' button, and a sub-section for 'Alarm' with a toggle switch and a 'TEST' button. A small 'Add a sound' link is visible in the Audible Notification section.

When the system is on Predictive mode, it actively uses the radar to check traffic conditions surrounding the bus and informs the operator about potential safety concerns through visual and audible notifications.

If the stop arm is activated, the system enters the Monitoring mode and provides visual notifications to the operator and audible warnings and alerts to both the operator and the students.

Visual notifications are represented by a color-coded vehicle pattern on the vehicle's display module. Color code indications mean:

- Green = Normal situation
- Amber = Warning
- Red = Alarm

PSA also uses PCM-format files to provide audible warnings and alarms through sounds or spoken messages.

## TIP: Monitoring Mode



Monitoring and Predictive screens are identical. To move from one to the other click the corresponding tabs.

## Configuring Alerts and Warnings

### 1 Visual Notifications can be enabled, disabled and tested.

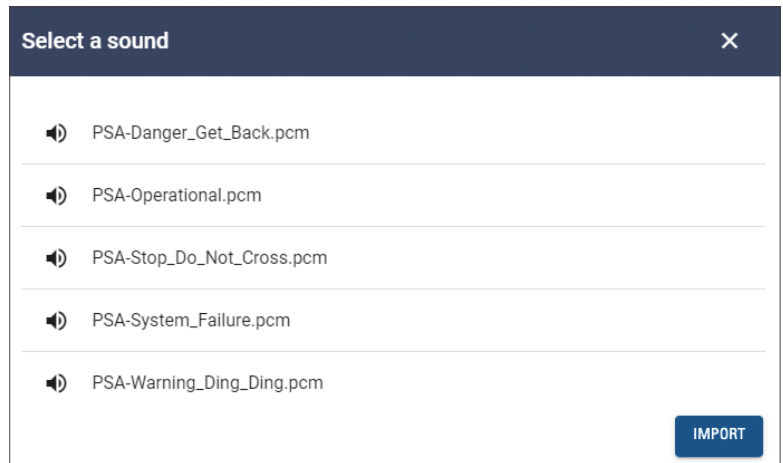
- To enable or disable Visual Notifications click the toggle switch on the left side of the panel.
- To test Visual Notifications click the **Test** button on the right. A pop-up message will indicate when the test is running and a second one will inform about the results.



### 2 Audible Notifications can be enabled, disabled, edited, imported and tested.

- i. To enable or disable **Warning** or **Alarm**, click the toggle switch on the left of the panel (see previous image).
- ii. To edit or import audible sound files, click the **Change the sound** button (pencil icon in the previous image) next to the audio file name. When the dialog opens:

- Click the appropriate file to select it from the available list.
- Click the **Import** button on the lower-right corner of the dialog if you want to import a different file from your computer.
- Once finished, close the dialog by clicking the **X** on the upper-right corner.



- Finally, click the **Apply** button (it turns blue after changing the sound) on the upper-right corner of the screen so the changes become operative.



- iii. To test Audible Notifications click the **Test** button on the right. A pop-up message will indicate when the test is running and a second one will inform about the results.



### TIP: Predictive Mode Default Settings

Audible Warning and Alarm Notifications are disabled on Predictive Mode by default but you can always enable them manually and alter the default behavior.

### WARNING: Notifications Disabled

If for any reason all notifications are disabled, a pop-up warning message will display to request your immediate attention. Click OK and activate the appropriate notifications (see following image).

**Description**

Actively using radar events to provide warnings/alerts to the operator before the stop arm is activated. Visual warnings/alerts will be provided to the operator

**Visual Notification** TEST

PSA uses a visual notification for warnings and red for alerts (danger).

**Audible Notification** Add a sound

PSA uses PCM-format sound files to provide audible warnings/alerts to the operator and students. Audible sound files can be in audible sounds or spoken messages.

Warning PSA-Warning\_Ding\_Ding.pcm ✎ TEST

Alarm PSA-Stop\_Do\_Not\_Cross.pcm ✎ TEST

All notifications are disabled. Your attention is immediately required.

OK

## Digital Gain

Control of volume and quality of Alerts and Warnings audio output requires the user to select the position of the adjustment knob as shown in the image.

**Alerts & Warnings**

PREDICTIVE    MONITORING    DIGITAL GAIN

**Description**

The digital gain level coupled with the volume adjustment knob on the amplifier control the overall volume and quality of the audio output. Too much gain may result in audio clipping which is undesirable. The user should play the selected sound clip to check the overall quality and volume.

**Digital Gain** Level 3 / -5 db

◀

3
▶

**TIP: Apply** 💡

Notice that there is no need to click the Apply button after the selection.

## Viewing PSA Diagnostics

Diagnostics provides information on many different parameters grouped in two different levels, System and PSA.

From a different screen, the Diagnostics module also allows users to Export SMA data.

### System Level

This level shows data relevant to:

1. Firmware version (This includes the controller and the application).
2. Used, free and total Memory.
3. CPU load and number of CPUs.
4. Temperature.
5. OS Distribution and Kernel.

The screenshot displays the 'Predictive Stop Arm' interface in 'SYSTEM LEVEL' view. The left sidebar shows 'Diagnosics' selected. The main content area is divided into five diagnostic cards:

- Firmware:** Controller Version 1:6, Application Version 0.1.2
- Memory:** Used 374.5 MB, Free 501.1 MB, Total 875.7 MB
- CPU:** Load 40.3%, CPUs 4
- Temperature:** 119 °F
- OS:** Distribution Raspbian GNU/Linux, Kernel 4.14.79-v7+



## PSA Level

This level shows data relevant to:

1. Visual Notifications (enabled or disabled), Digital Gain and Audible Warnings and Alarms (enabled or disabled and assigned sound file) on Predictive Mode.
2. Visual Notifications (enabled or disabled), Digital Gain and Audible Warnings and Alarms (enabled or disabled and assigned sound file) on Monitoring Mode.

The screenshot shows the 'Predictive Stop Arm' settings page. The 'PSA LEVEL' tab is selected. The interface is organized into three columns:

- Predictive Mode:** Contains settings for Visual (Enabled), Digital Gain (Level 3 / -5 db), Audible Warning (Disabled, Sound: PSA-Warning\_Ding\_Ding.pcm), and Audible Alarm (Disabled, Sound: PSA-Stop\_Do\_Not\_Cross.pcm).
- Monitoring Mode:** Contains settings for Visual (Enabled), Digital Gain (Level 3 / -5 db), Audible Warning (Enabled, Sound: PSA-Warning\_Ding\_Ding.pcm), and Audible Alarm (Enabled, Sound: PSA-Stop\_Do\_Not\_Cross.pcm).
- Radar:** Shows Front Radar Health and Rear Radar Health (both with green checkmarks). Below is a 'Parameters' table:

	Front	Rear
Version	V9.1	-
Low-Speed Reaction Time	3.0 sec	-
High-Speed Reaction Time	3.5 sec	-
Additional Warning Time	1.5 sec	-
Mounting Offset (MO)	10 ft	-
Safety Zone (SZ)	30 ft	-

### WARNING: Visual Tests



Be aware that vehicles should not be in operation when visual test are being conducted.

3. Front and Rear Radar Health and parameters including:

- Version
- Low-Speed Reaction Time
- High-Speed Reaction Time
- Additional Warning Time
- Mounting Offset (MO)
- Safety Zone (SZ)

## NOTE: Radar Connection



Radar checks can only be performed when the vehicle's ignition is on.

Notice that only one radar (front or rear) can be physically connected to the SAM for configuration. To connect and configure the second radar, disconnect the other unit first.

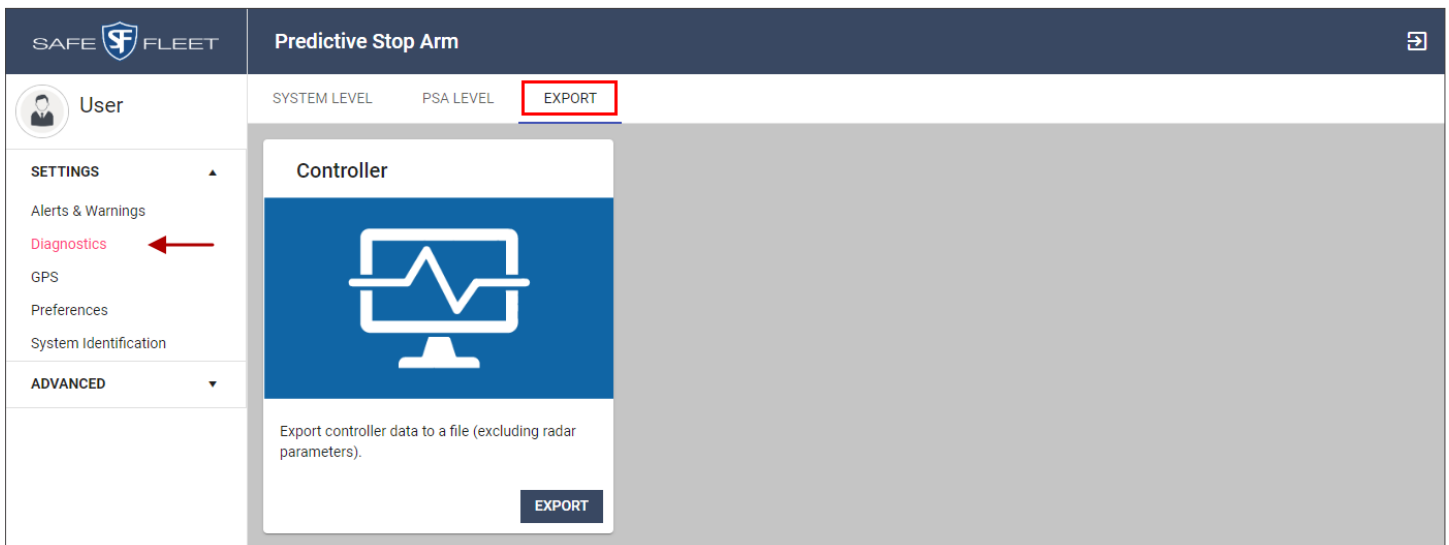
You can test **Visual** and **Audible Warnings** as well as **Audible Alarms**. To do so, click the **TEST** buttons next to each feature. A pop-up message will indicate when the test is running and a second one will inform about the results.



## Export

SAM data can be exported as .json files (JavaScript Object Notation) through the Export tool within the Diagnostics module. This file won't include radar parameters.

To do so, access the Export tool by clicking the corresponding tab and click **EXPORT** at the bottom of the **Controller** frame. The file will be downloaded to your computer.



## GPS Settings

This module includes different tools to configure both the GPS unit and the GPS Server. Each tool is accessed by clicking the corresponding panels.

The screenshot displays the 'Predictive Stop Arm' settings page for 'GPS'. The left sidebar shows 'GPS' selected under the 'SETTINGS' section. The main content area includes a 'Description' section stating: 'The system uses GPS information to determine when to de-activate to minimize added distraction to the bus operator.' Below this are three 'GPS Settings' panels: 'None' (Remove GPS Unit), 'GPS' (Global Positioning System Unit, currently active with a green dot), and 'GPS Server' (Connect with an external GPS source). An 'APPLY' button is located in the top right corner of the settings area.

### NOTE: GPS Default Settings

By default, a GPS Unit is configured and assigned to the vehicle.

### Removing a GPS

The first tool allows you to instantly remove a GPS Unit. To remove a GPS Unit from the system:

1. Click the **Remove GPS Unit** panel. A confirmation request displays below.
2. To execute the action, click the **APPLY** button on the upper-right corner of the screen.

This screenshot shows the 'GPS Settings' panel with the 'None' option selected. Below the settings panel, a confirmation dialog box is displayed with the text: 'Are you sure you want to remove the GPS?' and a 'None' icon.

## Setting the GPS Unit

To Configure the GPS Unit:

1. Click the **GPS** panel. Serial Port and Speed are shown.



**GPS**  
Global Positioning System Unit

Set as GPS provider/server

Serial Port  
/dev/ttyACM0

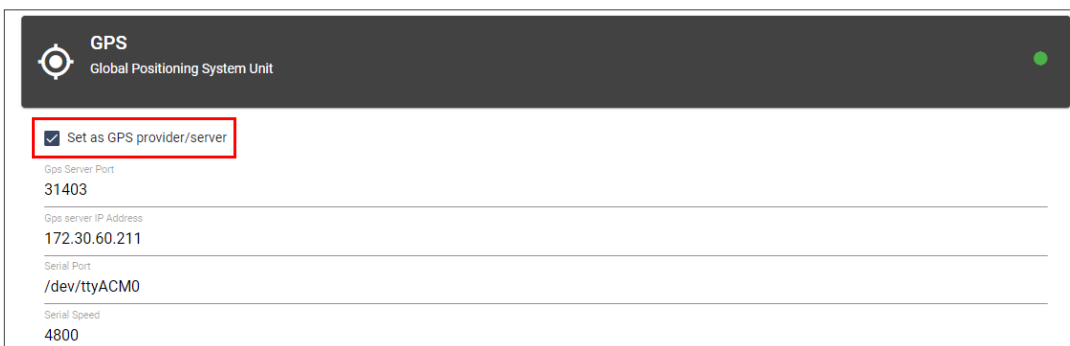
Serial Speed  
4800

2. If desired, select **Set as GPS provider/server**. The Menu expands and two more fields, GPS Server and GPS Server IP Address, become visible. These are read only fields.

### NOTE: Serial Port and Speed i

Generally, there is no need to modify Serial Port and Speed. Unless required, don't change these parameters.

3. If needed, enter the appropriate Serial Port and Speed.
4. Click the **APPLY** button on the upper-right corner of the screen.



**GPS**  
Global Positioning System Unit

Set as GPS provider/server

Gps Server Port  
31403

Gps server IP Address  
172.30.60.211

Serial Port  
/dev/ttyACM0

Serial Speed  
4800

## Connecting with an External GPS Source

To configure the connection with an external source, click the **GPS Server** panel. When the menu is displayed:

1. Enter TCP Port and TCP IP Address of the source in the corresponding text fields.
2. Click the **APPLY** button on the upper-right corner of the screen.



**GPS Server**  
Connect with an external GPS source

TCP Port  
31403

TCP IP Address  
192.168.0.10

## Setting General Preferences

The Preferences module allows the selection of Language, Temperature (Celsius or Fahrenheit) and Distance (meters or feet) units from their corresponding drop-down menus.

To change the default unit preferences:

1. Expand the menu by clicking on it and select the appropriate unit.
2. When finished, click **APPLY** on the upper-right corner of the screen.

The screenshot shows the 'Predictive Stop Arm' settings page. On the left, a sidebar lists 'SETTINGS' including Alerts & Warnings, Diagnostics, GPS, Preferences (highlighted with a red arrow), and System Identification. Below this is an 'ADVANCED' section. The main content area is titled 'Preferences' and contains three sections: 'Language' with a dropdown set to 'English', 'Temperature' with a dropdown set to 'Fahrenheit °F', and 'Distance' with a dropdown set to 'Feet'. Each dropdown has a red arrow pointing to it with the text 'Expand and select'. In the top right corner of the main content area, there is a red-bordered button labeled 'APPLY'.

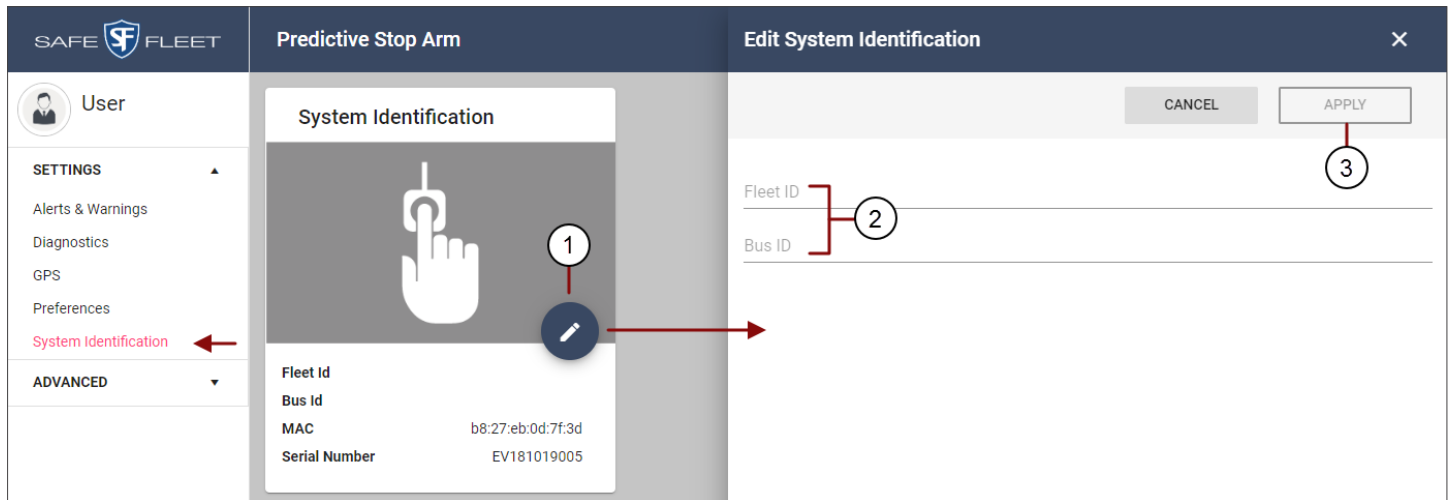
## System Identification

This module allows users to view Fleet ID, Bus ID, MAC and Serial Number. Fleet and Bus IDs can also be edited if required but MAC and Serial Number are presented as read-only information.

The screenshot shows the 'System Identification' settings page. On the left, a sidebar lists 'SETTINGS' including Alerts & Warnings, Diagnostics, GPS, Preferences, System Identification (highlighted with a red arrow), and ADVANCED. The main content area is titled 'System Identification' and features a large grey card with a white hand icon pointing to a keyhole. A dark blue pencil icon is in the bottom right corner of the card. Below the card, the following information is displayed: 'Fleet Id', 'Bus Id', 'MAC' with the value 'b8:27:eb:0d:7f:3d', and 'Serial Number' with the value 'EV181019005'.

To edit Fleet or Bus ID:

1. Click the **Edit** button, shown as a pencil icon. The **Edit System Identification** window opens on the right.
2. Type the correct **Fleet** and/or **Bus IDs**.
3. Click **APPLY** on the upper-right corner. Otherwise, click **CANCEL** to exit the tool.



# Advanced

## Changing the Password

Users with accounts can change their passwords following the standard procedure. To perform this task:

1. Enter your **Current Password**.
2. Type a **New Password**.
3. Type the New Password again to confirm the **New Password**.
4. Click **APPLY** on the upper-right corner of the screen.

The screenshot shows the 'Predictive Stop Arm' user settings page. On the left, a sidebar menu includes 'User', 'SETTINGS', and 'ADVANCED'. Under 'ADVANCED', 'Change Password' is highlighted with a red arrow. The main content area is titled 'Change password' and features three input fields: 'Current Password', 'New Password', and 'Confirm Password'. An 'APPLY' button is located in the top right corner of the form area.

## Importing and Exporting Controller, Radar and Geofence Configurations

Controller, Radar and Geofence configurations can be exported and imported as .json files.

The screenshot shows the 'Predictive Stop Arm' user settings page with three configuration cards: 'Controller', 'Radar', and 'Geofence'. Each card contains an icon, a title, and the text 'Export and import [category] configuration.' Below each card are 'EXPORT' and 'IMPORT' buttons. In the left sidebar, 'Import and Export' is highlighted with a red arrow.

## To Export:

1. Click the **EXPORT** button located within the corresponding tile (Controller, Radar or Geofence). A new dialog displays.
2. Enter an appropriate **File Name**.
3. Click the new **EXPORT** button presented in the dialog. The file will be downloaded to your computer.

## To Import:

1. Click the **IMPORT** button within the corresponding tile (Controller, Radar or Geofence). The **Select a file** dialog displays.
2. Click **Select SAM/radar/geofence file** (the button shows the corresponding term depending on whether you are importing Controller, Radar or Geofence configuration).
3. When the browser opens, locate the file in your computer, select it, and click **Open**.

## Logging

This feature allows users to:

- Enable the system to register logging activities detected by the Radar and/or the GPS.
- View logging activity. This can be presented in two different formats, **Critical** for the most relevant information only and **Info** for a more detailed information.

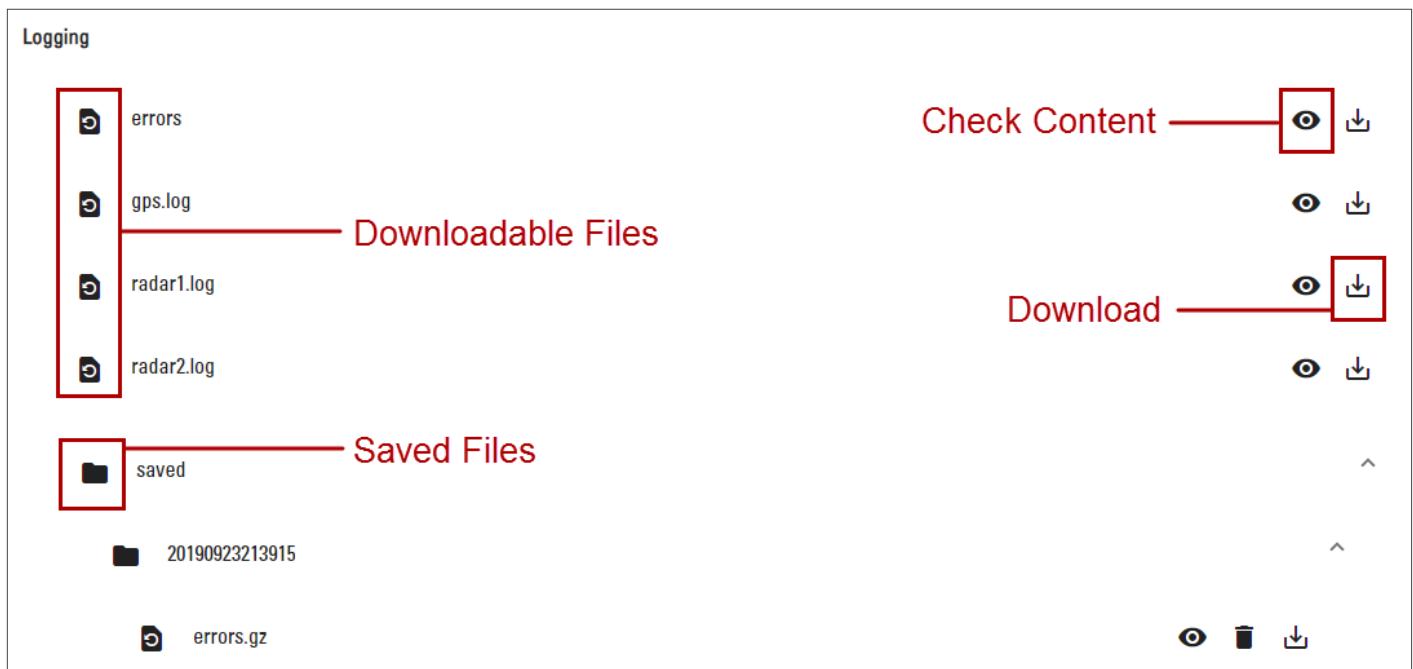


To configure Logging:

1. Enable Radar, GPS or both in the **Log Options** panel.
2. Select Critical or Info in the **System Error** panel, depending on the type of information you want to gather.

Once the appropriate selections have been made, you will be able to access logging activity by clicking the **ACCESS LOG** button below. Once accessed, the **Logging** menu displays:

- Downloadable Log files. Before downloading the files you can check their content by clicking **Check** button (shown as an eye icon) on the right of the screen. If desired, you can download the files by clicking the **Download** button on the far-right of the screen.
- Saved files. These are shown below and folders are organized by date.



## Setting the Radar Parameters

To configure the Radar units you need to understand the terminology associated with the process.

The relevant concepts are represented in two figures, **Zone Characteristics** and **Reaction Time Characteristics**, displayed in the Radar section.

Notice that the system triggers alarms based on both Zones and Reaction Times. The system will trigger an alarm when, according to its calculations:

- An approaching vehicle will enter a safe area that PSA calls **Violation Zone** (see Zone Characteristics figure).
- Students leaving the bus and intending to walk across the street won't have enough time to react to approaching vehicles safely, i.e., their **Reaction Time** will be insufficient (see Reaction Time Characteristics).

## WARNING: Important Safety Information



Before you proceed to modifying the Radar settings, it is essential that you understand this information:

The PSA system is preprogrammed to certain default settings that have been determined to be optimal for performance of the system. However, given the variety of potential conditions that can be encountered, the default settings cannot be guaranteed to be safe and appropriate for all situations. Accordingly, the purchaser/user of the PSA system is responsible for adjusting or modifying the settings to ensure that:

1. The settings are safe and appropriate for all circumstances encountered by the subject bus;
2. The settings comply with all state and/or local laws, rules, and regulations; and
3. The settings conform to all of Safe Fleet's current requirements and recommendations.

For information on Safe Fleet's current requirements and recommendations for the PSA system, please see PSA User Guide and PSA Installation Guide, currently located at:

<https://community.safefleet.net/sfpt/documents/>

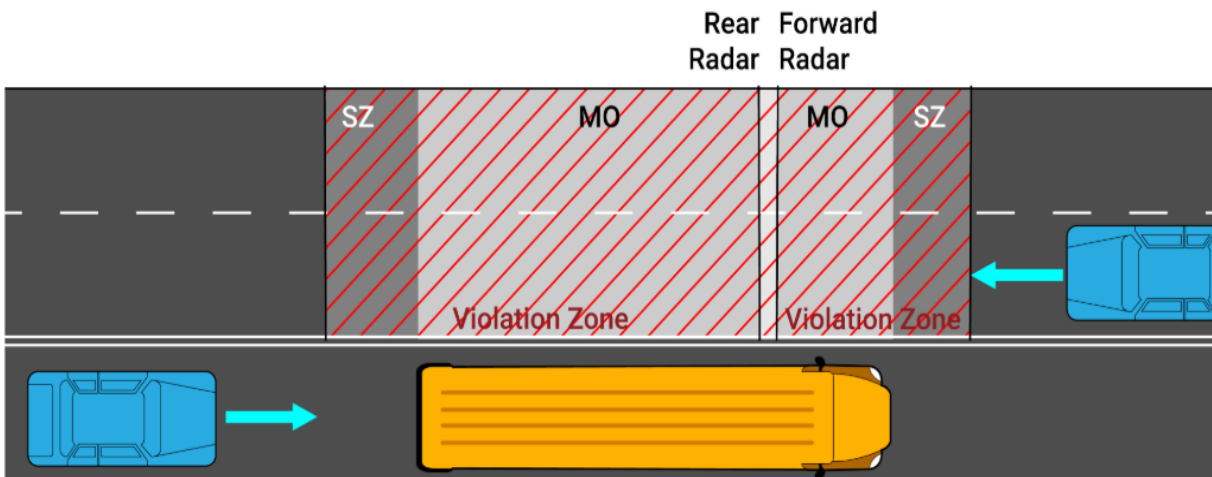
Notice that this information is also displayed in the Radar screen.

## Zone Characteristics

The Zone Characteristics figure illustrates the different zone descriptions that need to be taken into consideration when configuring the Radar.

The concepts represented and their descriptions are as follows:

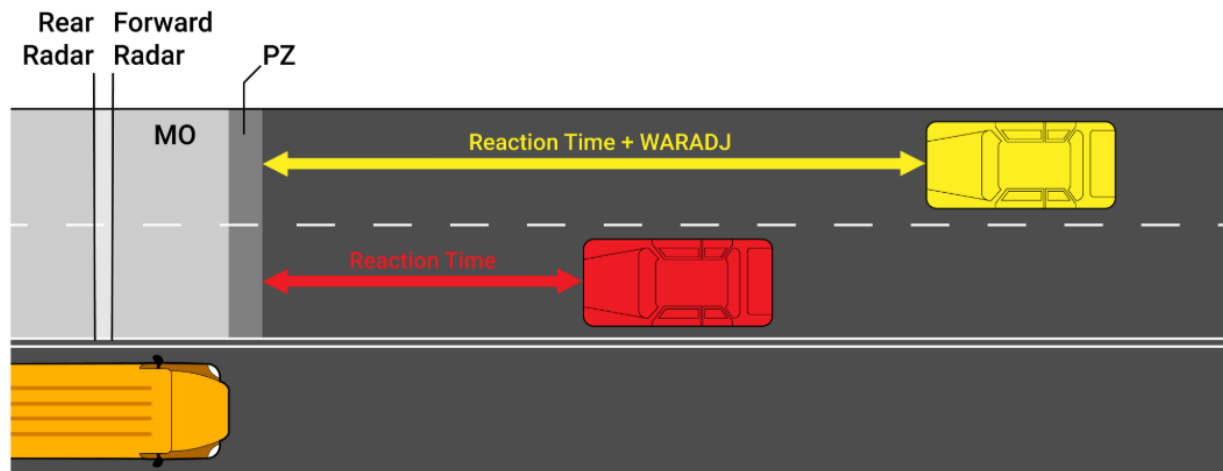
- **SZ (Safety Zone):** Area on the road side of the bus from the stop line of an approaching vehicle to the bus edge. Observe that there are two Safety Zones, one in the front of the bus and one in the rear.
- **MO (Mounting Offset):** Areas on the road side of the bus between the forward radar location and the bus front edge, and between the rear radar location and the bus rear edge.
- **Violation Zone:** The sum of the Safety Zone and the Mounting Offset areas (SZ+MO). There are also two Violation Zones, one in the front of the bus and one in the rear. Notice that no vehicle is allowed within the Violation Zones.



## Reaction Time Characteristics

The Reaction Time Characteristics figure illustrates the reaction time of a student intending to walk across the street under two different scenarios, when a vehicle is approaching at low speed and when a vehicle is approaching at high speed.

If a vehicle is approaching faster, the student will need more time to react. So, if the system detects a vehicle at high speed, additional warning time is allocated for the student to be safe.



Parameters relevant to Reaction Time Characteristics are:

- **Pedestrian Zone:** Area through which students walk across the street from the front of the bus. This has a fixed width of 2 meters, or 6.65 feet. This is referred to as **PZ** in the radar configuration menu.
- **Low-Speed Reaction Time:** Student's reaction time in seconds when the speed of the approaching vehicle is low. This is also referred to as Alarm for Low Speed Vehicles Time (**ALALST**) in the radar configuration menu.
- **High-Speed Reaction Time:** Student's reaction time in seconds when the speed of the approaching vehicle is high. This is also referred to as Alarm for High Speed Vehicles Time (**ALAHST**) in the radar configuration menu.
- **Additional Warning Time:** Additional time in seconds added to the reaction time (ALALST and ALAHST) to trigger a warning. This is also referred to as Warning Adjustment (**WARADJ**) in the radar configuration menu.

### NOTE: Alarm and Warning Calculations



Given a vehicle's velocity ( $v$ ), the effective Reaction Time (RT) varies linearly between ALALST and ALAHST.

The system calculates the distance between an approaching vehicle and the edge of the bus at which an alarm is triggered according to the equation:

- $\text{Distance} = \text{PZ} + \text{RT} * v$

Similarly, the distance between an approaching vehicle and the edge of the bus at which a warning is triggered is calculated according to the equation:

- $\text{Distance} = \text{PZ} + (\text{RT} + \text{WARADJ}) * v$

To configure the Radar units, make sure the correct unit, front (forward) or rear, is connected to the SAM. Notice that the image shows the front Radar.

### Radar - Front

Low-Speed Reaction Time (ALALST)  
1.8 sec

---

High-Speed Reaction Time (ALAHST)  
2.8 sec

---

Additional Warning Time (WARADJ)  
1.0 sec

---

Mounting Offset (MO)  
10 ft

---

Safety Zone (SZ)  
30 ft

---

**RESET VALUES**

Then, enter the appropriate values in the Radar fields as shown in the figure:

- Low-Speed Reaction Time (ALALST). Value must be between 1.5 and 4.0 seconds.
- High-Speed Reaction Time (ALAHST). Value must be between 1.5 and 4.0 seconds.
- Additional Warning Time (WARADJ). Value must be between 0.5 and 3.0 seconds
- Mounting Offset (MO). Distance values that determine the MOs must be at least 2 meters each, or 7 feet, but there is no upper bound.
- Safety Zone (SZ). Distance values that determine the SZs must be at least 6 meters, or 20 feet, but there is no upper bound.

If you need to reset the default values, click **RESET VALUES** below. Once finished, click **APPLY** on the upper-right corner of the screen.

## NOTE: Radar Connection i

Remember that only one radar unit (front or rear) can be physically connected to the SAM for configuration. To connect and configure the second radar, disconnect the other unit first.

## NOTE: Impact of Changing Time Parameters i

Increasing ALALST or ALAHST increases the distance between an approaching vehicle and the edge of the bus at which an alarm is triggered.

Decreasing ALALST or ALAHST decreases the distance between an approaching vehicle and the edge of the bus at which an alarm is triggered.

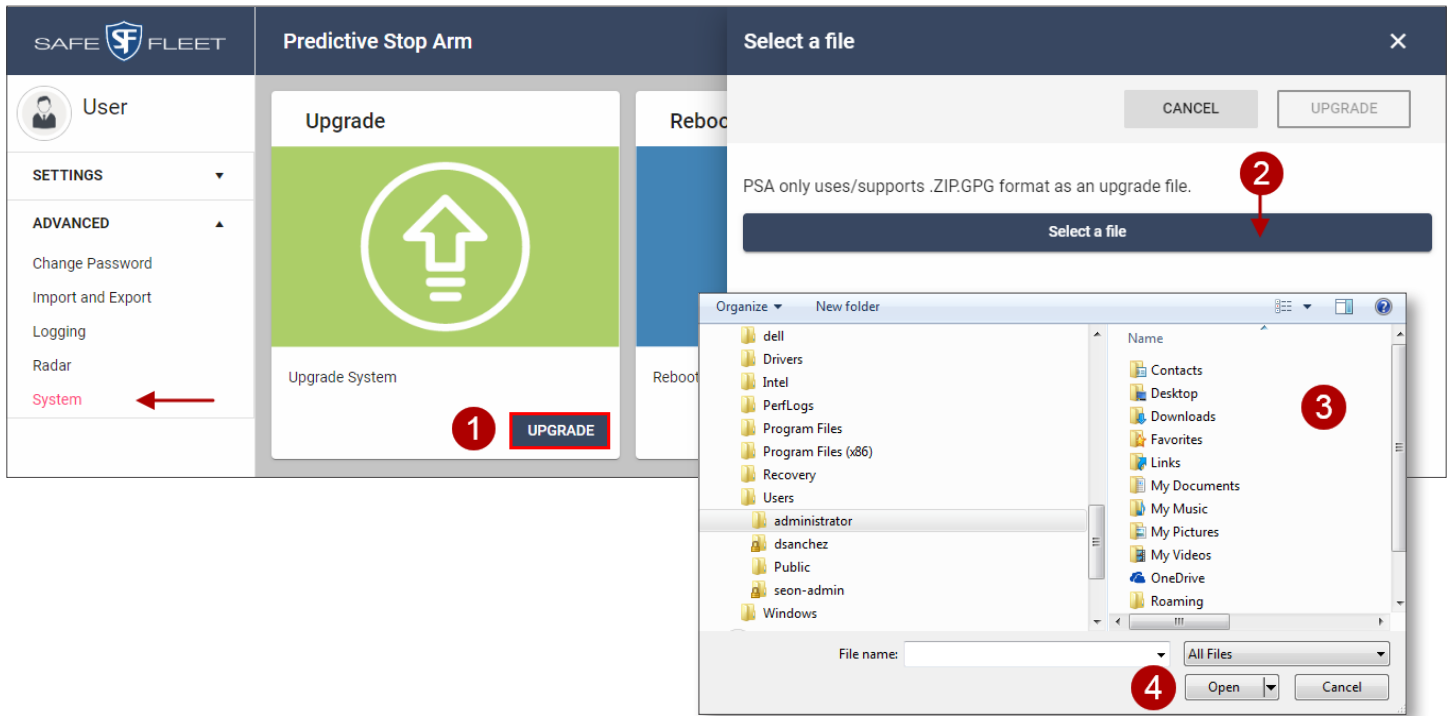
WARADJ is added to ALALST or ALAHST and changes in this parameter increases or decreases the same distances accordingly.

Notice that, since WARADJ is meant to improve awareness of potential danger, if its value is too low the warning and the alarms will be triggered very close in time to each other, and this could make the system less effective.

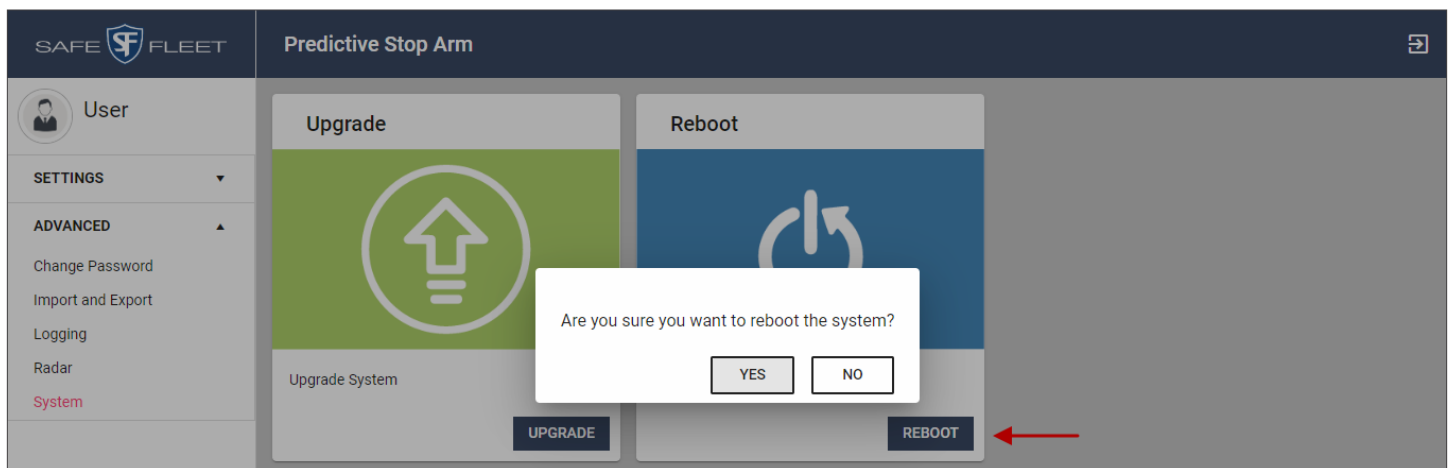
## Upgrading and Rebooting the System

Tools to Upgrade and Reboot the system are also included in the Advanced section. To Upgrade the System:

1. Click the **UPGRADE** button within the Upgrade frame. The **Select a file** dialog displays on the right.
2. Click the **Select a file** bar.
3. Once the browser opens, locate the file in your computer.
4. Select the appropriate file and click **Open**.



To Reboot the System, click **Reboot** within the Reboot frame on the right. When the confirmation message appears, click **Yes**. The System will be rebooted.



# Support

## Documentation

To read our User Guides and Release Notes, visit the Safe Fleet Community [Documentation Page](#).

## Training

To access a collection of Safe Fleet training tutorials, visit the [Product Training](#) page in our Safe Fleet Community Site.

## Technical Support

- Email: [PTsupport@safefleet.net](mailto:PTsupport@safefleet.net)
- Phone: 1.844.899.7366