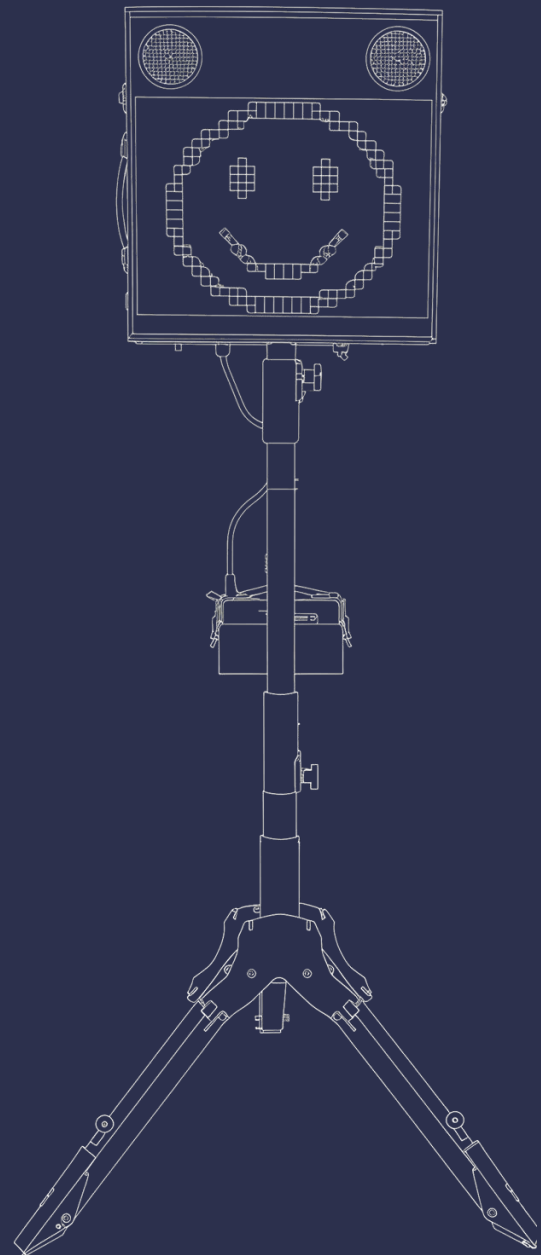


Electronic Speed Awareness System (eSAS) A & B User Guide

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Author: Alexander Profaca

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Table of Contents

Table of Contents	3
About This Document	5
Author/Custodianship	5
Document Details	5
Document Revision History.....	5
Key Terminology.....	5
Document Symbols	6
Purpose	6
Safe Work Procedures.....	6
Safety Warnings	6
General PPE Requirements.....	6
Safety Requirements	6
1. Specifications	8
1.1 eSAS Operation Features	8
1.2 System Specifications.....	9
1.3 Component Diagram.....	10
1.3.1 eSAS Unit.....	10
1.3.2 Battery and Charger	10
2. Unit Assembly and Deployment	11
3. Operational Procedures and Functionality	12
3.1 eSAS Controls	12
3.1.1 Adjusting the Speed Setpoint.....	12
3.1.2 Modifying eSAS Functions.....	12
3.2 Battery Status	13
3.2.1 Battery Level Indicators	13
3.3 Internal Switch Status	14
3.4 GPS.....	14
3.5 Critical Low Battery Alarm.....	14
3.6 Data Management	15
3.6.1 SD Card	15
3.6.2 Detection Zones	15
3.6.3 Local Storage and Accessing the Data	15
3.7 Wireless Data Collection (ASIST)	16
3.8 eSTOP and eSAS-B Integration.....	16



3.9	eLERT Integration.....	17
3.10	eSAS DVR Integration and Functionality	18
3.10.1	DVR Status Indicators	18
3.10.2	Accessing the SIM/SD Card	19
3.10.3	Modifying the Configuration	19
3.11	Transporting the eSAS	19
4.	Batteries.....	20
4.1	Charging the Batteries	20
4.2	Safe Handling of the Batteries	20
5.	Repairs, Servicing, and Warranty.....	21



About This Document

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Key Terminology

ASIST	Arrowes Smart Interactive Safety Technology
DVR	Digital Video Recorder
eSAS	Electronic Speed Awareness Sign
eSTOP	eSTOP Portable Traffic Signal System
HAWK	HAWK Gateway
PC	Personal Computer
SD Card	Secure Digital Card
TMA	Truck Mounted Attenuator



Document Symbols



Throughout this manual, this section will highlight information or provide additional detail to the operator of the equipment.

These are intended to be tips to aid in the adoption, usage, and maintenance of the system.



This is a warning box. Follow all warnings in this document. Failure to follow warnings may result in damage to property, the machine to malfunction, injury and possibly death.

Failure to comply to the warnings may also void manufacturer and supplier warranties.

Purpose

This manual is intended as a guide to the capabilities, uses and requirements of the Electronic Speed Awareness Sign (eSAS). Read and understand these instructions before use. Only competent, qualified, and familiarised individuals may operate the eSAS. If in doubt, contact Arrowes.

Safe Work Procedures

Prior to commencement of works and use of the eSAS, the operator has performed a risk assessment identifying potential hazards. Follow all additional safety requirements as provided in a SWMS or other document. Each company and jobsite are different.

Safety Warnings



Caution
Heavy Load



Caution
Electric Shock Risk



Warning
Danger of Falling Objects

General PPE Requirements				

Safety Requirements

- Ensure operator is competent and authorized as per site procedures.
- Operator has read and understood the eSAS User Guide.
- JSA/SWMS and/or risk assessments conducted for each use.
- Correct traffic management is in position prior to operating the eSAS.
- Ballast must be used where required to suit wind and environmental conditions.
- Battery must be fully charged prior to operation.





DO NOT deploy the eSAS in an unsuitable or unsafe area. Ensure the ground is stable and there is no incline.



DO NOT deploy the eSAS in areas with very high windspeed. In areas with moderate windspeed, the eSAS **MUST** be anchored with sandbags or similar weights. Ensure sandbags are properly positioned and situated such that there is minimal risk of the eSAS becoming unstable.



Batteries remain energised even when not connected to a device. Be careful when moving, connecting, or storing the battery.



The eSAS is 12V DC powered. Never work on the electrical systems without isolating the power source. If required to open the eSAS panel while the power source is connected, be careful to avoid contact with any circuitry within the device.



When not in use, store the eSAS in a cool and dry place. Keep the battery charged between uses to preserve the life of the battery.



DO NOT deploy the eSAS in an area with live traffic unless cones have been deployed and the operator is protected by a TMA or the other safety devices outlined in the site plan.



DO only use the battery supplied. If replacement batteries are required, please contact Arrowes for the correct battery.

DO store batteries in their original packing, in a dry place and at normal room temperature. Charge battery every 3 months if in storage.

DO keep all batteries in a safe place away from Children and pets.



1. SPECIFICATIONS

1.1 eSAS Operation Features

The **ARROWES Electronic Speed Awareness System (eSAS)** is a portable, radar-based safety device designed to provide real-time speed feedback to motorists and increase situational awareness for roadside workers.

The system is lightweight, compact, and designed for rapid deployment on short-term and mobile worksites. When mounted on the supplied tripod, the eSAS can be deployed in a wide range of site conditions with minimal setup time.

The eSAS communicates vehicle speed using a high-visibility LED display and may present the following information to approaching motorists:

- Numeric vehicle speed
- Graphical indicators (smiley or frown symbols)
- Text messages (“THANK YOU” or “SLOW DOWN”)

The displayed response is determined by the detected vehicle speed relative to the configured site speed limit.



There are two versions of the eSAS available for purchase: eSAS-A and eSAS-B. Some functionality may be present only in one version of the eSAS.

Confirm the model of your eSAS prior to reading this user guide.

Each eSAS unit is designed as a self-contained system and includes:

- Radar detection module
- LED display
- Internal controller
- Battery pack and charger
- Tripod and mounting hardware
- Internal data logging capability

Optional features include:

- Vehicle count and speed logging
- GPS-referenced event data
- Data export via SD card
- Optional wireless data transmission when paired with a HAWK Gateway
- Optional integration with eSTOP traffic control systems (eSAS-B only)
- Optional integration with the eLERT system



1.2 System Specifications

Specification	eSAS-A	eSAS-B
Total Mass (including Battery and Tripod)	~21 kg	~27 kg
Tripod Leg Footprint Radius	800mm Radius 1400mm Maximum Diameter	740mm Radius 1300mm Maximum Diameter
Maximum Working Height (Approximate)	2200mm	2400mm
Minimum Working Height (Approximate)	1900mm	2160mm
Maximum Wind Loading No Sandbag Base	~40km/h	
Maximum Wind Loading 3 Sandbags per Leg	~110km/h	
LED Colours	Red and Green LED	
Display Size	320mm x 320mm	420mm x 420mm
Speed Range	150m	
Detection Range	100m	
Operation Temperature	-20°C to +70°C	
Data Logging	Vehicle Count Vehicle Speed	Date, Time Set Speed Vehicle Speed Direction Moving GPS Longitude and Latitude Switch Positions
SD Card Capacity	Standard SD Card Size (16GB)	
Battery Type:	LiFePO4 12.8v 21Ah or 30Ah	
Power Consumption	~1.52A	
Operation Time (Approximate)	~32 hours / ~46 hours	



These values assume a standard eSAS model is produced. Custom specifications or requirements may result in slightly different results, especially power consumption and operation time.

If you have any concerns or requests for your eSAS, contact Arrowes.

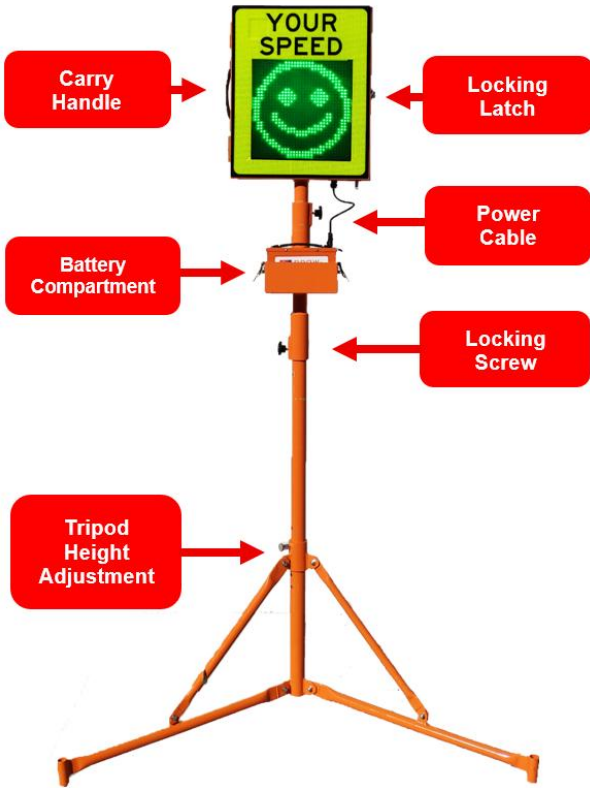


1.3 Component Diagram

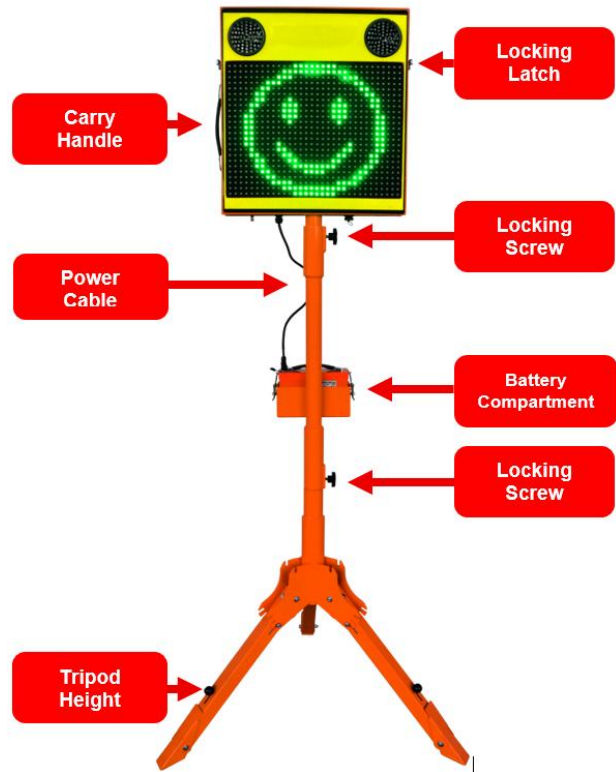


Below is the diagram for a standard eSAS-A and eSAS-B. Alternate versions or requested modifications may alter the specifications of your eSAS.

1.3.1 eSAS Unit



eSAS-A



eSAS-B

1.3.2 Battery and Charger



2. UNIT ASSEMBLY AND DEPLOYMENT



1. Pull the pin upwards to release the leg



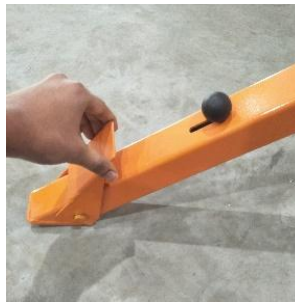
2. Extend the leg completely



3. Pull the Tripod Height mechanism, then select the notch suitable for the height required



4. Repeat the process for all three legs, ensuring the tripod is stable before continuing



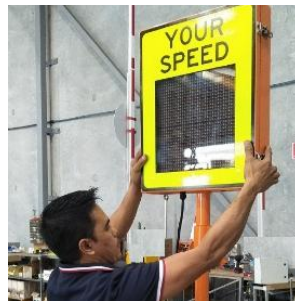
5. If sandbags are needed, open the holder and fasten the bags to each leg as required



6. Slide the Battery Compartment into the centre column of the tripod



7. Lock the Battery Compartment into place with the locking screw



8. Insert the eSAS display unit into the Battery Compartment column



9. Lock the unit into place with the locking screw



10. Mount the battery inside the Battery Compartment, then fasten into place with the latches



11. Connect the power cable to the battery



12. Once the battery is connected, the eSAS will power on and be ready for operation



3. OPERATIONAL PROCEDURES AND FUNCTIONALITY

3.1 eSAS Controls

The eSAS control panel is located inside the unit. To access it, ensure the eSAS is in a safe, stable location either laid down on a solid surface or mounted within an assembled tripod. Release the two latches located on the side of the unit, then open the eSAS.



If the battery is connected to the eSAS, the internal components of the eSAS will be live with low voltage DC power. Ensure there is no contact between the operator and the circuitry.

DO NOT open the eSAS when there are adverse weather conditions. Doing so may result in irreparable damage to the eSAS unit.

The following switches should be present inside the eSAS panel:



Internal eSAS Control Panel

3.1.1 Adjusting the Speed Setpoint

The **SPEED LIMIT** switch is a momentary up/down switch used to adjust the speed limit. The selected speed appears on the LED display while the switch is being pressed in either direction.

After a speed is set, it is stored in the unit's memory. When the eSAS is powered on again, it recalls the previously selected speed limit, so the speed does not need to be set again if the unit is being used at the same site.

3.1.2 Modifying eSAS Functions

The remaining three momentary switches alter the behaviour of the eSAS in the following ways:

SHOW SPEED

When the **SHOW SPEED** option is switched on, the unit displays the detected vehicle speed for 2 seconds. The LED display appears in green when the driver is below the speed limit, and red when the driver is over the limit.

If a detected vehicle is travelling 20 km/h over the limit, the speed is not shown. Instead, a critical warning message is displayed, with the words "**SLOW DOWN**" flashing on the screen.





SHOW SMILEY

When the **SHOW SMILEY** option is switched on, the unit displays a green smiling face when the detected vehicle speed is below the limit, or a red frowning face when the detected vehicle speed is above the limit.

If the **SHOW SPEED** option is also switched on, the detected speed appears first, followed by the smiley or frown face.



SHOW MESSAGE

When the **SHOW MESSAGE** option is switched on, the unit displays a green “THANK YOU” message when the detected vehicle speed is below the limit, or a red “SLOW DOWN” message when the detected speed is above the limit.

If **SHOW SPEED** and/or **SHOW SMILEY** are also switched on, the display sequence is as follows:

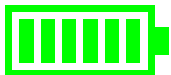
1. The detected speed appears first (if enabled).
2. The smiley or frown face appears second (if enabled).
3. The message appears last.

3.2 Battery Status

When the battery is first connected to the eSAS, the unit will turn on automatically. Within about 5 seconds, the battery level will appear on the screen for 2 seconds.

The eSAS shows 4 different battery-level indicators to display how full the battery is. With the standard 21Ah battery supplied by Arrowes, the unit can run for up to 20 hours on a full charge.

3.2.1 Battery Level Indicators



Fully Charged

Battery level between 75% and 100%

Recommended level to start operation of the eSAS.



Mostly Charged

Battery level between 50% and 75%

Acceptable to use the eSAS at this charge level for short periods of time. Recommended to charge if planning to use the system for longer than 8 hours.



Low Battery

Battery level between 25% and 50%

Avoid using the eSAS with a battery this low. Recommended to charge if planning to use the system for longer than 2 hours.



Critically Low Battery

Battery level between 25% and 50%

DO NOT use the eSAS with the battery this low. Replace the battery with another unit if possible and place this battery on charge.



3.3 Internal Switch Status

When the eSAS starts up and shows the battery level, there will also be three small toggle switch icons which light up under the battery gauge. These icons stay on for the same period as the battery indicator and shows the real-time position of the physical switches. If a switch is interacted with during this time, the display will update immediately. This startup screen is typically used to check for switch faults.

From the front of the eSAS:

- The left symbol shows whether the **SHOW SPEED** option is turned ON.
- The middle symbol shows whether the system will display a smiley face or sad face when a vehicle's speed is detected.
- The right symbol shows whether a preset message, such as "SLOW DOWN", "TOO FAST", or "THANK YOU" will be displayed.

3.4 GPS



The GPS is standard on every eSAS-A and eSAS-B model manufactured now. However, older eSAS-A units may not have a GPS. If a GPS upgrade is required for your older eSAS-A unit, contact Arrowes.

The eSAS uses a GPS module to get the unit's location and time when the radar detects a speeding vehicle. After powering on, if no SD card is detected, an icon (shown below) may appear. This means the eSAS has either lost its satellite connection or has not yet locked onto any satellites. Once the eSAS connects to the satellites, the icon will disappear.



No GPS Satellite Connection Icon

While this icon is showing, if the radar detects a vehicle, the GPS symbol will briefly disappear so the unit can operate normally. After the detection, if the eSAS still cannot lock onto satellites, it will return to showing the GPS warning icon during idle periods.

3.5 Critical Low Battery Alarm

If the battery becomes critically low during use, a small low-battery warning symbol will appear in the bottom-right corner of the eSAS screen. If a vehicle is detected, this warning will temporarily disappear to avoid distracting drivers.

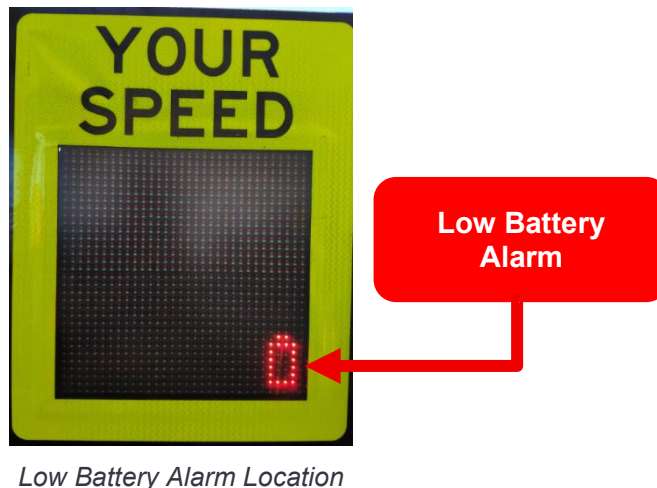
When the low-battery warning appears, the battery must be removed and recharged. If the unit keeps running with a low battery, it will shut off within one hour. It is a requirement of use to charge the eSAS battery prior to deploying the system.

If an eSAS is required to be installed for longer than 24 hours, Arrowes recommends replacing the battery with a second, fully charged unit at the end of each day. Additional batteries can be purchased from Arrowes.



As the eSAS is considered a critical piece of safety equipment on a worksite, it is a requirement of use to monitor the battery level to avoid the unit running out of charge on the site. Ensure the eSAS battery is fully charged prior to operation.



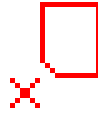


Low Battery Alarm Location

3.6 Data Management

3.6.1 SD Card

The eSAS saves each vehicle's data to an SD card. An SD card must be inserted for the eSAS to record vehicle information. If the SD card is removed or the unit cannot read it, an SD card fault icon will appear on the display.



No SD Card Detected Icon

When this SD card fault is showing, the eSAS will still work normally when a vehicle is detected. It will show the vehicle's speed and any enabled messages to the driver. After the vehicle passes, the display will return to showing the SD card fault icon.

Arrowes supplies a 16GB SD card with each eSAS purchase. Additional SD cards or ones with larger storage can be sourced from any local technology store.

3.6.2 Detection Zones

The eSAS is configured to detect:

- Approaching traffic within 20 metres of the eSAS unit.
- Receding traffic within 40 metres of the unit (eSAS-B only).

Studies of the eSAS accuracy have determined when in moderate and heavy traffic, it has an average accuracy of greater than 93%.



These detection ranges are configured at the factory prior to delivery and cannot be adjusted. If your application requires different settings, contact Arrowes to determine if your needs can be met.

3.6.3 Local Storage and Accessing the Data

Event data is stored locally on the internal SD card in CSV format. A new data file is created for each calendar day. Once a file has been written, it cannot be edited or overwritten by the operator.

Logged data can be accessed by removing the SD card and opening the CSV files using compatible software such as Microsoft Excel.



3.7 Wireless Data Collection (ASIST)

When the eSAS is used with a HAWK Gateway, the system can send event data wirelessly using long-range, low-power communication. Wireless data transmission is optional. It is important to note:

- All core safety functions still operate even if there is no wireless connection.
- Event data is sent to the HAWK Gateway, which collects the information and passes it on to the ASIST platform or another location.
- If the wireless connection drops out, the data stays saved on the eSAS and is sent later when the connection returns.
- Wireless communication does not change, delete, or overwrite any data stored on the eSAS.

For more information, consult the ASIST documentation available on the Arrowes website.

3.8 eSTOP and eSAS-B Integration

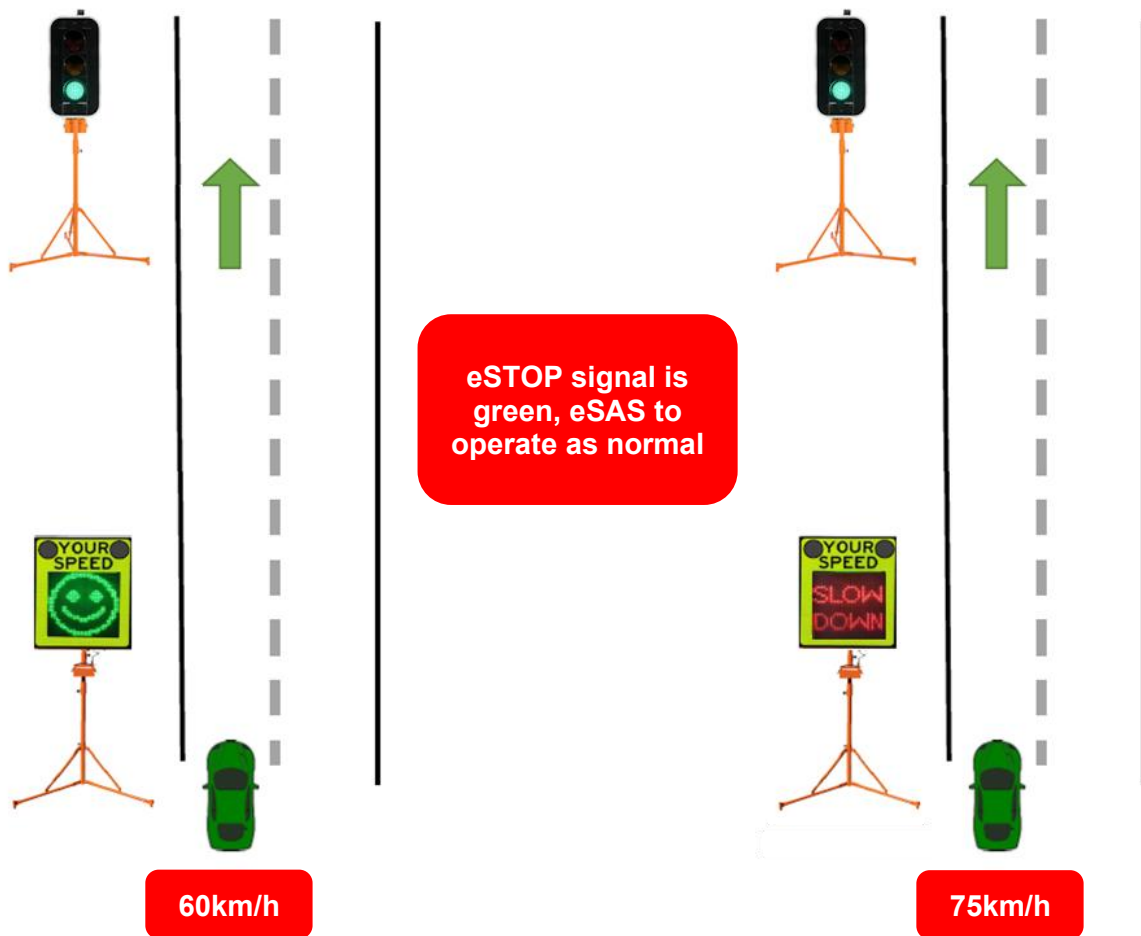


Integration with the eSTOP is only possible with the eSAS-B model. Contact Arrowes if assistance is required with the initial configuration.

The eSTOP works together with the eSAS using a wireless connection network. When the eSTOP light is red, the eSAS shows extra warning messages and flashes its Wigwag LEDs. This helps drivers notice the red signal ahead and understand that traffic may be stopping or building up.

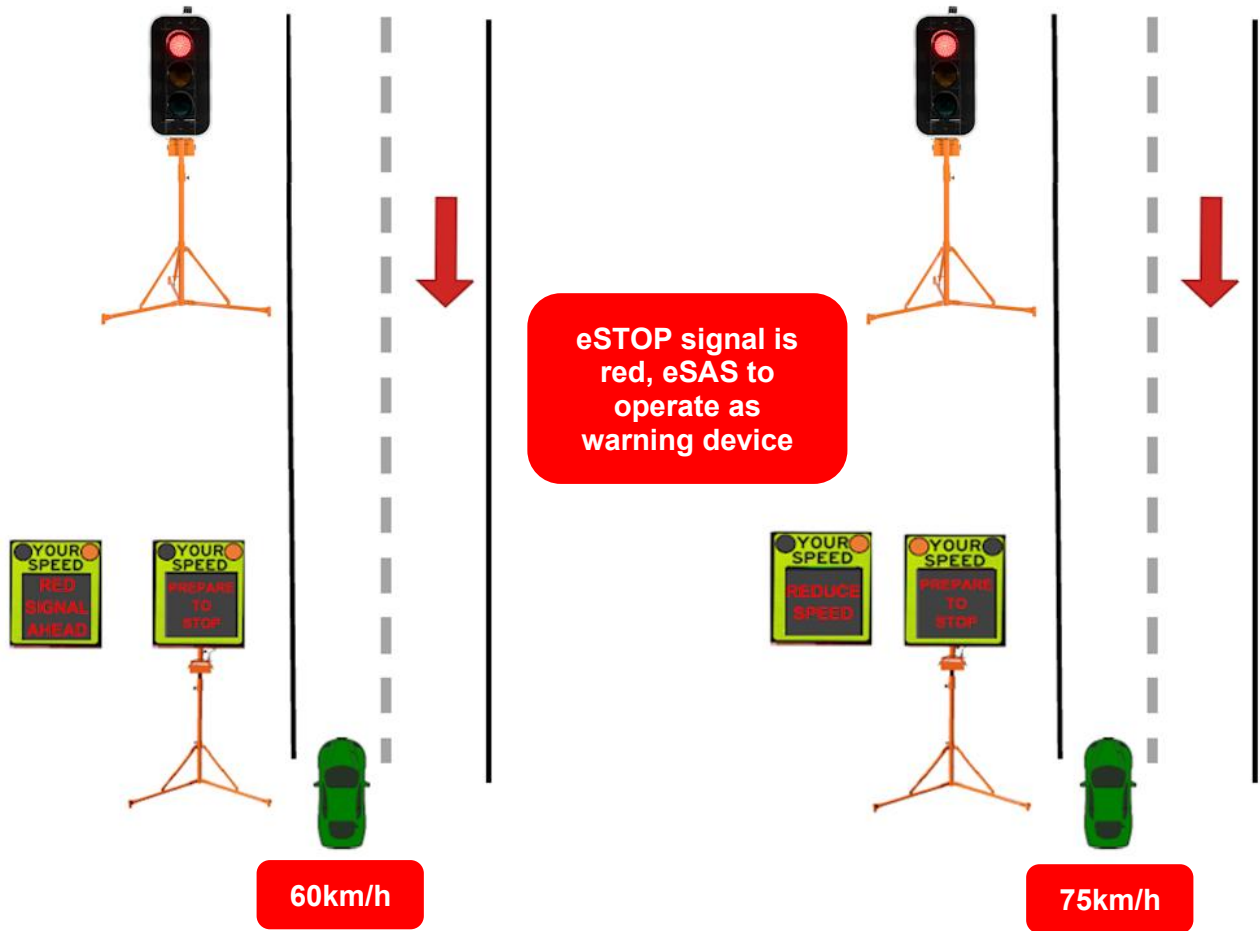
To use this setup, an eSTOP-M system must be paired with an eSAS. When the eSAS is paired and the eSTOP-M is activated, the eSAS will change how it behaves based on the eSTOP's signal.

When paired with an eSTOP-M, the eSAS will operate as described in the diagrams below.



eSTOP-M (green) paired with eSAS-B with speed limit set to 65km/h





eSTOP-M (red) paired with eSAS-B with speed limit set to 65km/h



Regardless of the eSAS setup and state, if an overspeed is detected, an audio and visual alarm is activated to alert workers of potential incoming danger.

- When the eSTOP-M is green, the eSAS operates as normal, changing the screen when detecting a vehicle overspeed.
- When the eSTOP-M is red, the eSAS switches to warning mode. In this mode, the eSAS will swap between “RED SIGNAL AHEAD” and “PREPARE TO STOP”.
- When detecting a vehicle overspeed, the eSAS will change the message between “REDUCE SPEED” and “PREPARE TO STOP”.

To return the eSAS to normal operation, use the remote currently paired with the unit and unpair it. For instructions on how to do this, see the eSTOP User Manual, in the section titled “Pairing the eSTOP Handheld Remote Controller (HRC) to lantern units.”

3.9 eLERT Integration



Integration with the eLERT system is only possible with the eSAS-B model. Contact Arrowes for more information.

The eSAS can connect with the eLERT system by alerting all nearby devices when a vehicle is detected going significantly overspeed. Additional connectivity and features are also available.

For more information, consult the ASIST documentation available on the Arrowes website.



3.10 eSAS DVR Integration and Functionality



Only some eSAS models are equipped with a DVR system. This optional upgrade can be requested upon purchasing the eSAS unit.

There are several DVR systems in use for various eSAS models to cater to a wide variety of client needs. The functionality described in this section may vary depending on your exact specification.



eSAS DVR Components

The eSAS is configured to record automatically when a connected eSTOP-M is powered on. There is a 1-minute delay between the eSTOP-M powering on and the DVR beginning recording to accommodate the DVR start up sequence.

Recording can be stopped via the switch inside the panel

3.10.1 DVR Status Indicators

The eSAS DVR illuminates the following lights:



RUN

Active when the device is recording



SD

Active when the SD card is incorrectly slotted



PWR

Active while the device has power



ALM

Active when the device reports an error
Configured by Arrowes in the factory



3.10.2 Accessing the SIM/SD Card

The SIM card and the SD card are hidden behind a protective cover to ensure they cannot be removed without proper authorisation. To access this slot, use the security key provided with the eSAS unit to unlock.

If the recordings are required to be viewed, remove the SD card and connect it to a PC.



Prior to returning to operation, ensure the DVR is correctly locked. The DVR will shut down if the electronic lock is unlocked.

3.10.3 Modifying the Configuration

The eSAS DVR configuration can be changed if required. To do so, a DVR monitor display and a USB mouse are required. Follow these steps to configure:

1. Connect the monitor display to the loom at the back of the eSAS DVR.
 2. Connect the mouse to the USB port in the front of the unit.
 3. Power the unit on, ensuring the electronic lock for the SD card is locked.
 4. For detailed information on each setting and the changes to the configuration which can be made, contact Arrowes for the user manual for the specific DVR unit for your application.
-



Arrowes recommends leaving the configuration to the specification provided at the factory. If changes need to be made, contact Arrowes for support.

3.11 Transporting the eSAS

While the eSAS is designed to be resilient to adverse road and weather conditions, care should be taken when storing and transporting the eSAS. To keep the eSAS in working order, ensure the eSAS is always fully secure and stable when transporting. It is recommended to keep the eSAS stored in a cool, dry place. Handle the eSAS with care and caution, always using the handle provided.



4. BATTERIES



DO only use the battery supplied. If replacement batteries are required, please contact Arrowes for the correct battery.

DO store batteries in their original packing, in a dry place and at normal room temperature. Charge battery every 3 months if in storage.

DO keep all batteries in a safe place away from Children and pets.

4.1 Charging the Batteries

Remove the connector cap on the top of the battery box, then plug the battery into the charger supplied by Arrowes.

The charger has an indicator light that shows the charging status:

- **Red.** The battery is charging
- **Green.** Charging is complete



Using any charger that is not a LiFePo4-approved charger can damage the battery and shorten its life. If the battery or charger ever becomes abnormally hot, gives an odour, changes colour, becomes misshapen, or looks unusual in any way, stop using them immediately and contact Arrowes.

4.2 Safe Handling of the Batteries

The eSAS battery **MUST** be handled according to the following criteria:

- Keep the battery dry and do not submerge in water. Store it in a cool, dry place.
- Do not use or leave the battery near heat sources such as fires or heaters.
- Do not throw the battery into a fire or heater.
- Only use the charger supplied with this battery when recharging it.
- Do not connect the battery with the positive and negative terminals reversed.
- Do not short-circuit the battery by touching the positive and negative terminals with metal objects.
- Do not hit, drop, step on, or throw the battery.
- Do not solder directly onto the battery or pierce it with nails or sharp objects.
- Do not use the battery in places with strong static electricity or magnetic fields, as this can damage its safety features.
- If the battery leaks and any fluid gets into the eyes, do not rub them. Rinse with clean water and seek medical help immediately.
- If the battery terminals are dirty, clean them with a clean, dry cloth. Dirty terminals can cause poor performance.
- Used batteries can catch fire or explode. Cover the battery terminals with tape before disposal.
- These lithium batteries must be recycled. Contact a battery recycling centre or a company that buys used batteries.



5. REPAIRS, SERVICING, AND WARRANTY

All repairs and servicing of the eSAS must be carried out by Arrowes or an authorised service centre. If any repairs, servicing, modifications, or replacement parts are used that are not approved by Arrowes, the warranty will be void. These unapproved changes may also affect the safe operation of the eSAS.

The mechanical parts and structure of the eSAS are made from steel and aluminium. These materials have a lifespan of at least 20 years. The unit is painted with Dulux X15 orange, which meets the AS2700 standard.

The eSAS comes with a limited factory warranty of 12 months.



Arrowes reserves the right to void warranty for misuse and/or mistreatment of the eSAS unit.

Repairs after the 12-month warranty period can be requested and may occur a fee.





Electronic Speed Awareness Sign (eSAS) A & B User Guide
Revision: R2.0

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