

BRIGADE[®]

**SSP-6000W
Sidescan[®]Predict
Ultrasonic Blind Spot
Warning System**

Installation & Operation Guide



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1 Introduction

The Sidescan®Predict system is designed to give warnings to the driver of dangerous scenarios involving objects in the blind spot, while ignoring objects that are not at risk from the vehicle. The system has a range of 2.5 metres from the side of the vehicle and covers the most dangerous area with no gaps. The system is active whether the indicator is on or off and shuts off above 30 km/h. The system uses a combination of ultrasound sensors, vehicle indicator/reverse triggers and vehicle motion monitoring to determine the level of danger before alerting the driver.

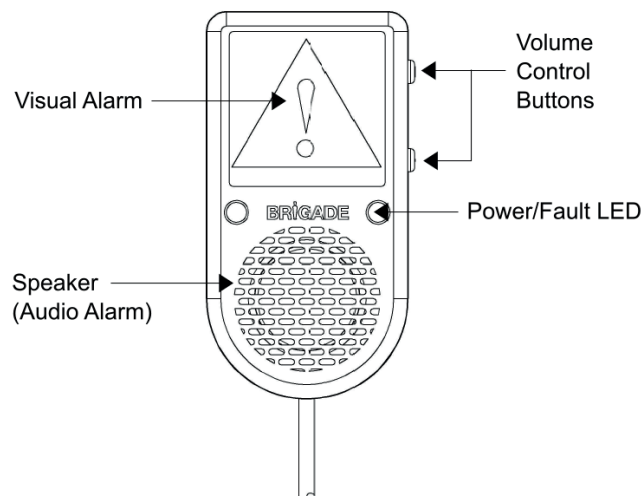
The installation process for the Sidescan®Predict should be followed carefully to ensure that the resulting system installation operates correctly. An incorrect installation will reduce the effectiveness of the system in preventing collisions and cause increased false alarms. Compliance with any standard is not guaranteed and will depend on the sensor configuration used.

Sidescan®Predict is designed to work on rigid vehicles with a length of 5.2 metres or greater. Vehicles must be fitted with a tachograph that uses a transmission speed sensor and provides a B7 output for the system to operate correctly.

The system is intended as an aid only. The operator must still concentrate on operating the vehicle, obeying traffic and local regulations and continuing to use their own training, senses, and other vehicle aids, such as mirrors, as if the system were not in place. Nothing removes the responsibility of the operator to operate the vehicle in a proper and lawful manner.

1.1 Alarm Outputs

The alarm output on the Sidescan®Predict buzzer display is designed to alert the driver to danger on the installed side and notify the driver of any system malfunction. The buzzer display has visual and audio indicators as shown:



Sidescan®Predict buzzer display

1.1.1 Alarm Outputs During Vehicle Operation









The system uses graduated alarm levels depending on the level of danger. Moving objects will activate a visual alarm but audio alarms will only be activated when the system detects a dangerous situation. The purpose is to minimise driver habituation and irritation while ensuring audio alarms are still given in dangerous scenarios. The different alarm levels are described below.

- **No alarm:** There will be no visual alarm when there is no danger detected on the installed side of the vehicle. The power/fault LED will be illuminated green to indicate that the system is running.
- **Moving object alarm (no audio):** When a moving object is detected on the installed side the visual alarm will show a solid yellow warning.
- **Close moving object alarm (no audio):** When a moving object is detected close to the vehicle whilst the vehicle is moving, the visual alarm will show a flashing yellow warning.
- **Danger of collision alarm:** When there is a danger of collision, a beeping audio alarm will be emitted and the visual alarm will flash yellow. “Danger of collision” is defined as situations where:
 - An object moves from the back to the front of the vehicle whilst the vehicle is moving and either indicating or turning to the installed side.
 - An object is detected within 0.5 metres of a sensor whilst the vehicle is turning.
 - A collision is predicted within 1.5 – 2.5 seconds.
 - The vehicle is reversing in a turn and a collision is predicted within 1.5 seconds.
- **Collision predicted alarm:** When a collision is predicted within 1.5 seconds and the vehicle is not reversing, a high-pitched beeping audio alarm will be emitted and the visual alarm will flash red.
- **System off:** When the vehicle is running at a speed above 30 kph/18.6 mph the system will shut down and no visual or audio output is given.

There are two additional states when the vehicle is stationary in which the system will give specific warnings.

- **Stationary awareness alarm (no audio):** If there are any objects, stationary or moving, within 1 metre of a sensor within the front 6 metres while the vehicle is stationary and indicating to the installed side, the visual alarm will show a solid yellow warning.
- **Stationary warning alarm:** If an object moves up the installed side within 1 metre of the vehicle whilst the vehicle is stationary and indicating to the installed side, the system will emit a single “beep” and the visual alarm will show as solid yellow.

1 Introduction




System state	Vehicle state	Power/ fault LED	Visual alarm	Audio alarm	Image
No alarm	Any	Green light	No light	None	
Moving object alarm	Any	No light	Yellow light	None	
Close moving object alarm	Driving	No light	Flashing yellow light (2 Hz)	None	
Danger of collision	Driving and EITHER turning or indicating	No light	Flashing yellow light (2 Hz)	2 beeps/sec	
Collision predicted	Driving and turning	No light	Flashing red light (8 Hz)	8 beeps/sec	
System off	Driving faster than 30 km/h	No light	No light	None	
Stationary awareness alarm	Stationary and indicating	No light	Yellow light	None	
Stationary warning alarm	Stationary and indicating	No light	Yellow light	Single beep	

1.1.2 Alarm Outputs for Installation and Maintenance





There are also several alarm states to show the status of the system during start-up, fault, or configuration.

- At system start-up the buzzer display will perform the following start-up sequence: Red visual warning -> Yellow visual warning -> On (green LED). Each visual warning is accompanied by a beep. This confirms the visual and audio functions of the buzzer display are working correctly.
- If the system is not configured, the power/fault LED will illuminate red.
- When the system self-diagnoses a fault with a sensor or vehicle data input, the power/fault LED will illuminate amber.
- When the buzzer display is powered but receiving no data, the power/fault LED will flash alternately green and amber.
- When the system is connected to the configuration software there will be a flashing green light on the power/fault LED.

See the troubleshooting guide in Section 7.3 for dealing with these faults.

System state	Power/fault LED	Visual alarm	Audio alarm	Image
System start-up (buzzer display self-test)	None -> None -> Green	Red -> Green -> None	Beep -> Beep -> None	
System not configured	Solid red light	No light	None	
System fault	Solid amber light	No light	None	

1 Introduction

System state	Power/fault LED	Visual alarm	Audio alarm	Image
No firmware/ no buzzer message	Alternate green and amber light	No light	None	 >  <
Connected to configuration software	Flashing green light	No light	None	 >  <

1.2 Detection Range and Capability

Sidescan®Predict takes measurements from all sensors 10 times per second and will detect objects that appear in the detection area up to 2.5 metres from the installed side of the vehicle.

There are some situations in which objects may not be detected. These are described below.

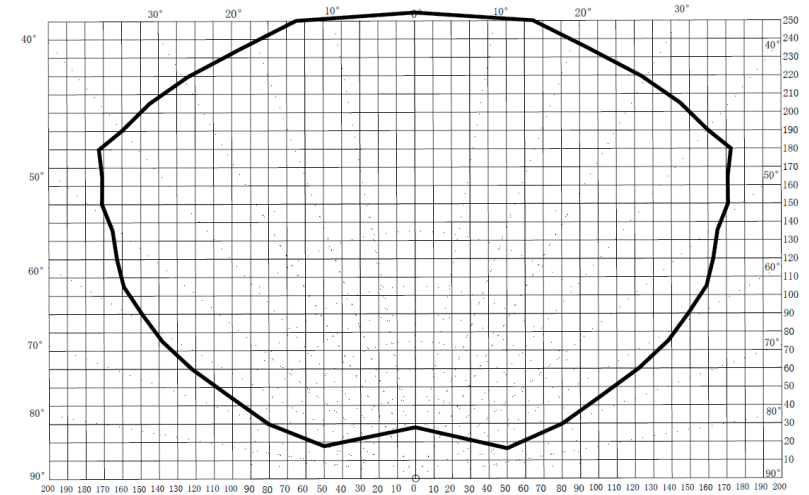
- **Size and shape:** The system reliably detects pedestrians, cyclists, motorcyclists and other roadgoing vehicles. Very small or thin objects however may not generate sufficient reflection from the ultrasound pulse to be detected consistently.
- **Material and surface:** Ultrasonic pulses are sufficiently reflected from humans, vehicles, and roadside furniture. However, sound-absorbent materials or surface finish (e.g. cardboard) will reflect less energy and may not be detected at the full range.
- **Distance:** Objects which fall outside of the sensor detection pattern will not be detected. The height of objects detected will depend on the mounting height and angle of the sensors. Detection patterns are given in Section 1.3.
- **Temperature:** The operating temperature for Sidescan®Predict is -30 to +70 °C.

There are also situations in which background noise can cause false detections on the sensors. This is typically caused by vehicle pneumatics, jet washing and street sweepers. In most cases this noise is filtered out and will not cause a visible or audible alarm to the driver.

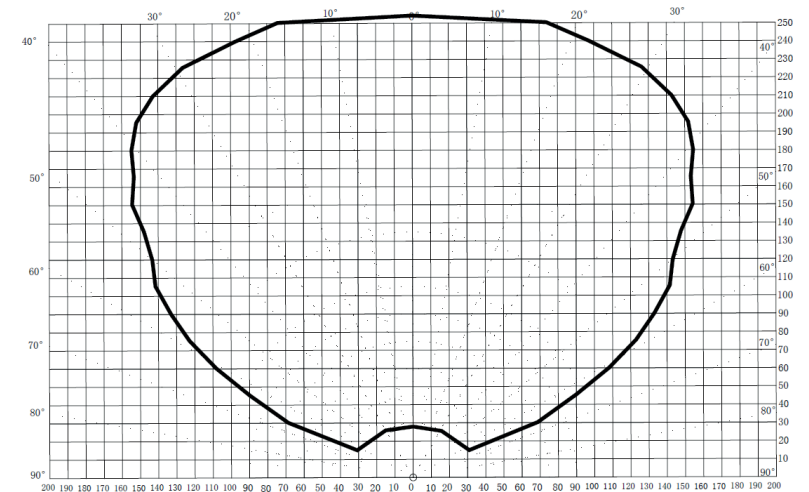
1.3 Detection Pattern

This section shows the detection pattern measured with a 110 mm pole as the target. The actual detection pattern will vary depending on the target used.

1.3.1 Horizontal Detection Pattern



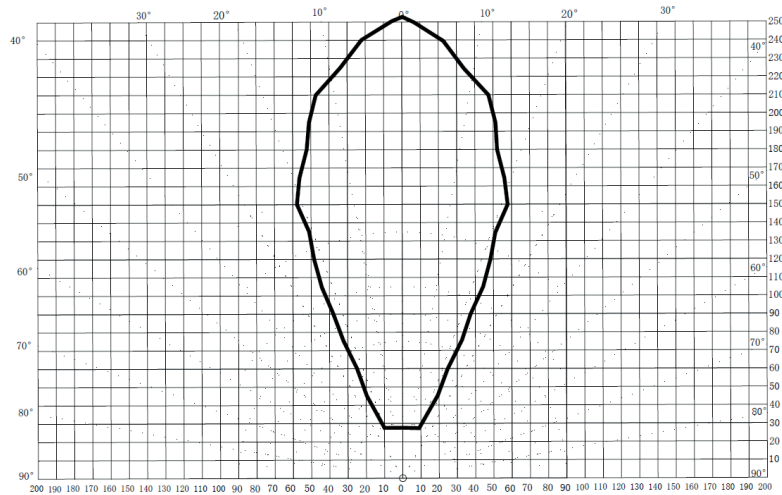
SSP-00HSS-B (black sensor) horizontal detection pattern (cm).



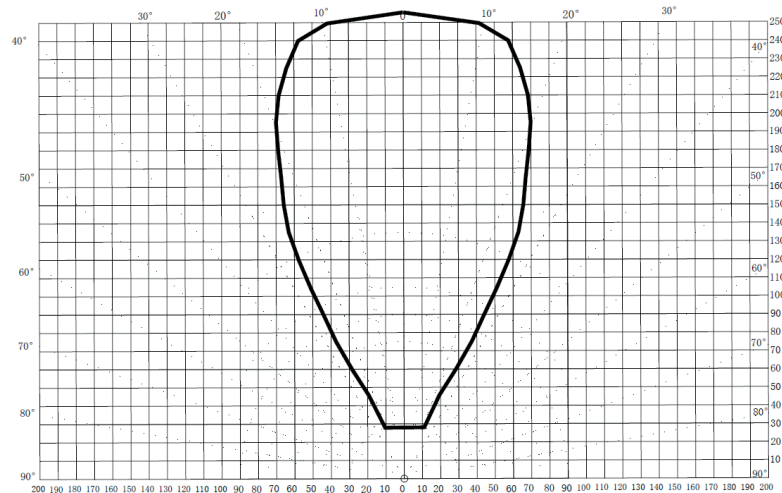
SSP-00HSS-W (white sensor) horizontal detection pattern (cm).

1 Introduction

1.3.2 Vertical Detection Pattern



SSP-00HSS-B (black sensor) vertical detection pattern (cm).



SSP-00HSS-W (white sensor) vertical detection pattern (cm).

1.4 Classification as Moving or Stationary

The classification of moving and stationary objects alongside the vehicle is dependent on relative movement between the vehicle and object. Classification as stationary or moving will affect the alarm state as described in Section 1.1.

To ensure visual and/or audio alarms to the driver are useful, the system will not classify as moving objects pedestrians or other vulnerable road users when they are being overtaken at a significantly greater speed. If the speed differential changes (by the vehicle slowing, or the vulnerable road user speeding up) the object will be reclassified as moving. Alarms for predicted collisions will still be given in either case.

1.5 Reduced Functionality Mode

If a fault is detected but sufficient elements of the system are still operational, Sidescan®Predict will revert to the behaviour of an indicator-activated, non-predictive Sidescan system with 1.0 metre range. Audio alarms will be emitted for any object within 1.0 metre of any working sensor. Reduced functionality mode will remain active until the error/s is/are resolved, offering some functionality to prevent collisions. The error/s must be resolved to return the system to full functionality.

There are several possible causes for this as discussed in “Testing and Maintenance” (Section 7) but if this is due to a faulty or disconnected sensor/s this will be indicated by beeps at start-up. The number of beeps indicate the number of faulty or disconnected sensors.

The power/fault LED will illuminate amber to indicate an error state. The output triggers 3 and 4 will be activated and output trigger 2 will be deactivated at all times. The output trigger 1 will continue activating as normal based on indicator signals.

When reduced functionality mode is active, the vehicle’s installed side indicator is on and speed is below 30 kph/18.6 mph a constant audio warning will be emitted and a solid yellow visual warning displayed for any object detected within 0.6 metres of a working sensor. A 4 bps audio warning will be emitted and 4 fps flashing yellow visual warning displayed for any object within 0.6 to 1.0 metres of a working sensor. This will happen irrespective of the number of sensors that are broken.

1.6 System Fault Mode

If a fault is detected with the system, where there is insufficient confidence to activate reduced functionality mode, the system fault mode is activated. There are several possible causes for this as discussed in “Testing and Maintenance” (Section 7).


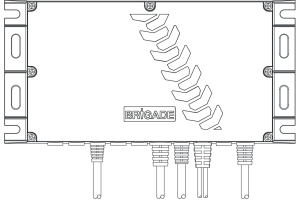
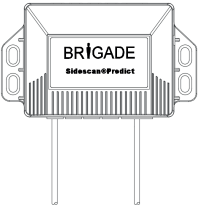
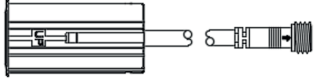
The power/fault LED will illuminate amber to indicate an error state and no alarms will be given. The output triggers 2, 3 and 4 will be activated at all times. The output trigger 1 will continue activating as normal based on indicator signals.

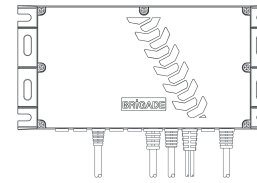
2 Contents

2.2 Full List of Contents (In 6 Sensor Kit)

This section covers the components of the Sidescan®Predict system.

2.1 Main System Components

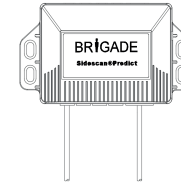
Part	Image	Mounting location
Sidescan®Predict Buzzer Display		<ul style="list-style-type: none"> • IP30. • Mounted inside the vehicle cab only. • Must be clearly visible for the driver, but not interfere with the driver's view. • Mounted in a location that reflects that the system is for side detection only.
Sidescan®Predict Algorithm ECU		<ul style="list-style-type: none"> • IP30. • Must be mounted onto a flat surface inside the vehicle cab only. • Must be mounted in correct orientation. • Ensure there is access to the USB connector.
Sidescan®Predict UDS ECU		<ul style="list-style-type: none"> • IP69K. • Can be mounted in the vehicle cab or on the body.
Sidescan®Predict Ultrasonic Sensor		<ul style="list-style-type: none"> • IP69K. • Mounted on the side of the vehicle to monitor the blind spot. • Use configuration software and pre-installation survey to find suitable locations



SSP-1000-AI-ECU
Sidescan®Predict Algorithm ECU



SSP-1000-DPW
Sidescan®Predict Buzzer Display



SSP-1000-ECU
Sidescan®Predict UDS ECU

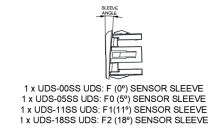
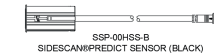


SSP-00HSS-W
SIDESCAN®PREDICT SENSOR (WHITE)

1 x UDS-05SS UDS: F0 (5") SENSOR SLEEVE
1 x UDS-11SS UDS: F1 (11") SENSOR SLEEVE
1 x UDS-18SS UDS: F2 (18") SENSOR SLEEVE
1 x UDS-26SS UDS: F3 (26") SENSOR SLEEVE

SSP-00SM-KT
SIDESCAN®PREDICT SENSOR MOUNT ASSEMBLY KIT

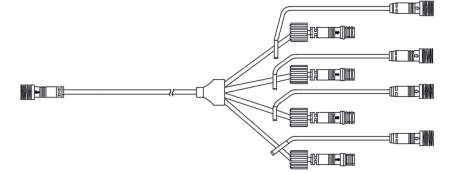
SSP-HSSW-KT (x 4)
Sidescan®Predict Sensor Kit (White)



1 x UDS-00SS UDS: F (0") SENSOR SLEEVE
1 x UDS-05SS UDS: F0 (5") SENSOR SLEEVE
1 x UDS-11SS UDS: F1 (11") SENSOR SLEEVE
1 x UDS-18SS UDS: F2 (18") SENSOR SLEEVE

SSP-00SM-KT
SIDESCAN®PREDICT SENSOR MOUNT ASSEMBLY KIT

SSP-HSSB-KT (x 2)
Sidescan®Predict Sensor Kit (Black)



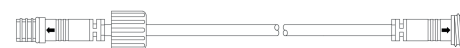
SSP-0.4-SP (x 2)
Sidescan®Predict Splitter Cable - 40cm



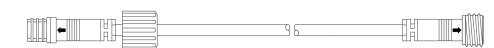
SSP-0.3-AC1
Sidescan®Predict Adapter Cable -
3 to 4 pins - 30cm



SSP-0.3-AC2
Sidescan®Predict Adapter Cable -
UDS ECU to ALGO ECU - 30cm



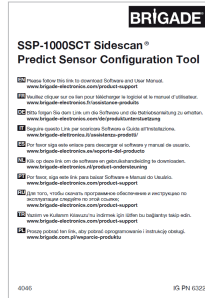
SSP-10-SC
Sidescan®Predict Extension Cable - 10m



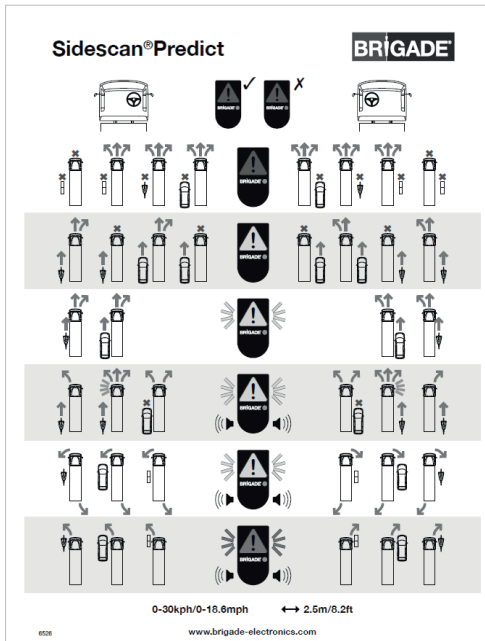
UDS-2.5BC (x 8)
3-Pin UDS Extension Cable 2.5m



UDS-4.5BC (x 7)
3-Pin UDS Extension Cable 4.5m



GENERIC-UG-SW-QG
Sidescan®Predict Configuration Software Link Card



SSP-1000-AI-ECU-CAL-LBL
Calibration Warning Label for SSP-1000-AI-ECU

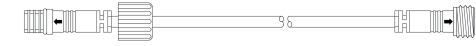
SSP-6000W-DI-QG
Sidescan®Predict SSP-6000W Driver Information Sheet

2.3 Optional Items and Configurator (Not Included in 6 Sensor Kit)

2.3.1 Extension Cables



UDS-15BC: 3-Pin UDS Extension Cable - 15m
UDS-30BC: 3-Pin UDS Extension Cable - 30m



SSP-2.5-SC: Sidescan®Predict Extension Cable - 2.5m
SSP-4.5-SC: Sidescan®Predict Extension Cable - 4.5m
SSP-15-SC: Sidescan®Predict Extension Cable - 15m
SSP-30-SC: Sidescan®Predict Extension Cable - 30m

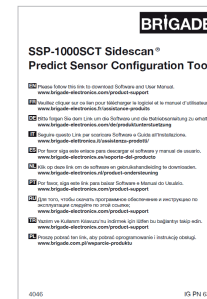
2.3.2 SSP-1000-CT-01: Sidescan®Predict Configurator Kit



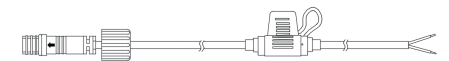
SSP-1000SCT
Sidescan®Predict Sensor Configuration Tool



USBA-CBL-2
USB Extension Cable - Type A - 2m

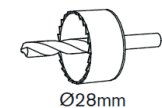


SSP-1000SCT-QS
Sidescan®Predict Configuration Software Link Card



SSP-01PIC
Sidescan®Predict Sensor Programmer Power Cable

2.3.3 28 mm Diameter Hole Cutter



UDS sensor hole cutter
Part number 3732

3 Before Installing

3.1 Important Notes

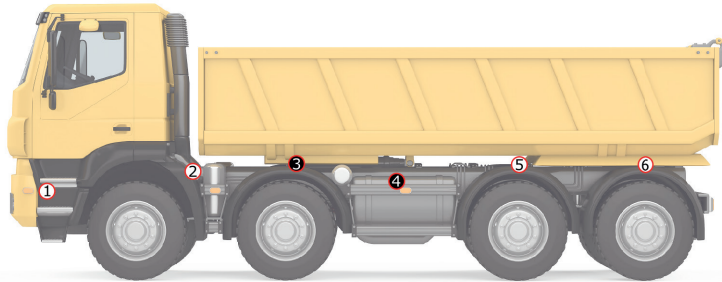
B7 CONNECTION
PLEASE ENSURE THE SPEED PULSE INPUT WIRE IS CONNECTED TO THE B7 OUTPUT OF THE TACHOGRAPH (NOT B8)

PRE-INSTALLATION SURVEY
A PRE-INSTALLATION SURVEY IS STRONGLY RECOMMENDED TO ENSURE THE VEHICLE IS SUITABLE FOR FITMENT OF THE SIDESCAN®PREDICT SYSTEM AND TO DETERMINE THE MOST APPROPRIATE SENSOR MOUNTING LOCATIONS

SENSOR MOUNTING
PLEASE DO NOT DRILL ANY HOLES TO MOUNT THE SENSORS UNTIL THE POSITIONS HAVE BEEN VERIFIED BY THE CONFIGURATION SOFTWARE

3.2 Example Installations

This example installation shows the Sidescan®Predict sensor configuration on a tipper vehicle.



SSP-00HSS-B (black sensor) horizontal detection pattern (cm).

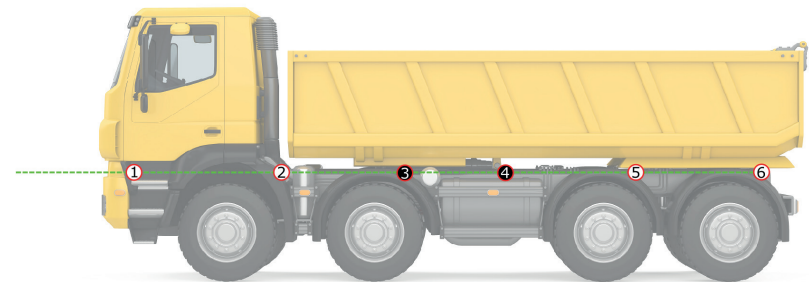
This installation has the dimensions given in the table below.

Vehicle length (m)	9.0
Vehicle width (m)	2.36
Installation side	Left
Number of sensors	6
Sensor horizontal distance from front of vehicle (m)	0.36, 1.95, 3.42, 5.11, 6.55, 7.93
Sensor height above ground (m)	0.96, 1.13, 1.17, 0.99, 1.19, 1.2

This is provided as an example only and the best sensor locations will vary from vehicle to vehicle. Sensor configuration will affect the performance of the system. Please read the following important guidance regarding best sensor locations.

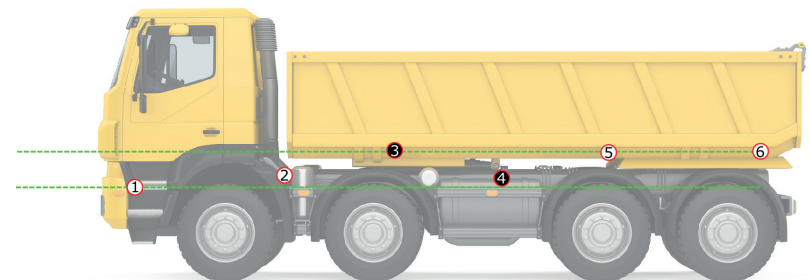
3.3 Sensor Positioning for Best System Performance

It is crucial to minimise the variation in sensor heights. This is the difference in height between the highest sensor and the lowest sensor. The less variation in sensor height, the fewer false alarms will be generated by the system. The maximum variation is 0.4 m, but the ideal installation has all sensors at the same heights.



Ideal installation. All sensors at the same heights.

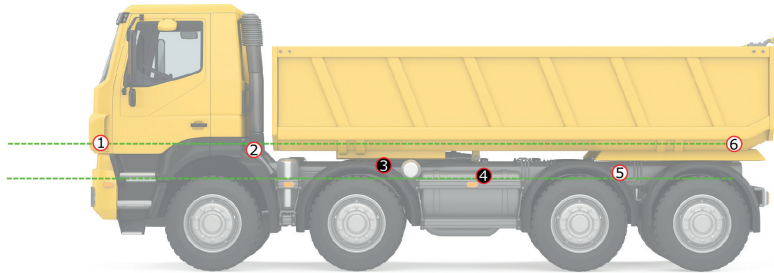
Where it is not possible to install sensors at the same height performance degradation can be mitigated by positioning sensors 1, 2 and 4 lower in the array. This configuration may be used for installations where sensors 3, 5 and/or 6 must be mounted in or on a high wheel arch.



Acceptable installation. Height variation between sensors but sensors 1, 2 and 4 are low in the array.

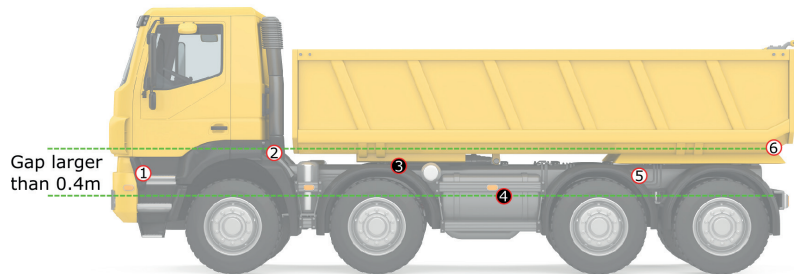
3 Before Installing

A configuration where sensors 1, 2 or 4 are higher in the sensor array is valid but will not perform as well and false alarms will be higher.



Ideal installation. Avoid having sensors 1, 2 or 4 high in the array.

A configuration where the variation in sensor heights is greater than 0.4 metres is not valid. If this condition cannot be met the system should not be fitted to the vehicle.



Acceptable installation. Height variation between lowest and highest sensor is greater than 0.4 m.

Note that any changes to the height of parts of the vehicle will also affect operation. Fit the system with the vehicle body at the normal ride height. If the ride height varies during operation fit the system in the worst-case scenario so that any height variation does not invalidate the sensor configuration.

IMPORTANT: The configuration software will permit sensors to be fitted with a horizontal spacing of up to 2 metres, but the horizontal spacing should be kept at a maximum of 1.7 metres where possible.

IMPORTANT: Sensors should be mounted flush with the side of the vehicle where possible to minimise the chance of vehicle self-detections.

IMPORTANT: Sensors should not be fitted horizontally adjacent to a steering axle where the wheel might be detected. Mounting higher than the top of the wheel at a steering axle will not usually cause a problem.

IMPORTANT: Use the software to confirm sensor positions before doing any physical installation. Pre-installation survey is strongly recommended to ensure the system can be fitted.

4 Configuration Software

This section covers the Sidescan®Predict configuration software.

4.1 PC System Requirements

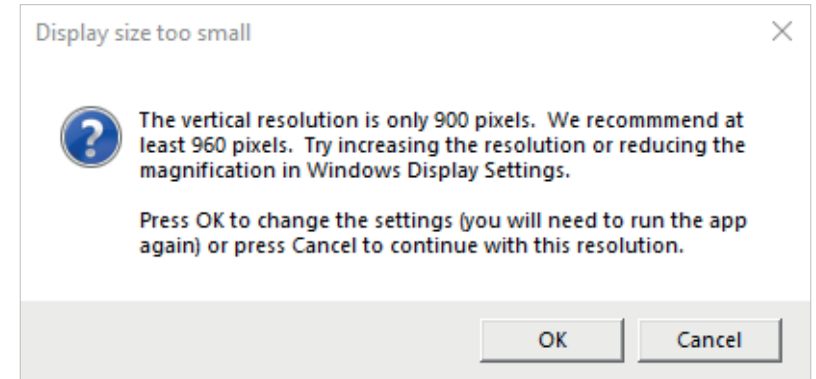
The configuration software is designed to work with a Windows 10 PC or laptop. Operation with older versions cannot be guaranteed. The PC or laptop must have a USB port to connect to the algorithm ECU. Administrator rights are required to use the software.

Minimum screen resolution is at least 1280 pixels in the horizontal and 960 in the vertical. A list of some compatible screen resolutions is given below:

1920 x 1080, 1680 x 1050, 1400 x 1050, 1280 x 1024, 1280 x 960

IMPORTANT: The Windows “Scale and Layout” setting should be set to 100% magnification. Some features may not be usable at higher magnifications. These settings are accessible from the Windows Display Settings page.

A warning will be given if operating below the optimum resolution or screen magnification. Pressing OK will exit the program and show the Windows Display Settings screen to adjust the settings. Pressing Cancel will continue at the lower resolution.



Screen resolution warning.

4.2 Getting the Software

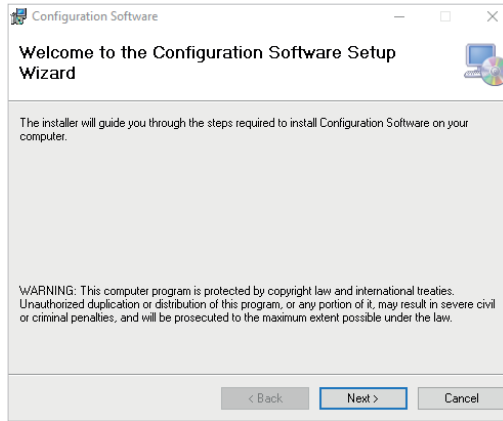
The configuration software is available for download from the Brigade website, <https://brigade-electronics.com/>.

It can be found by clicking Product Support >> Software >> Sidescan®Predict.

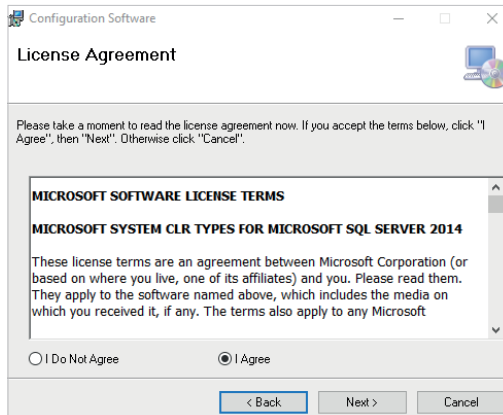
4 Configuration Software

4.3 Configuration Tool Software Installation

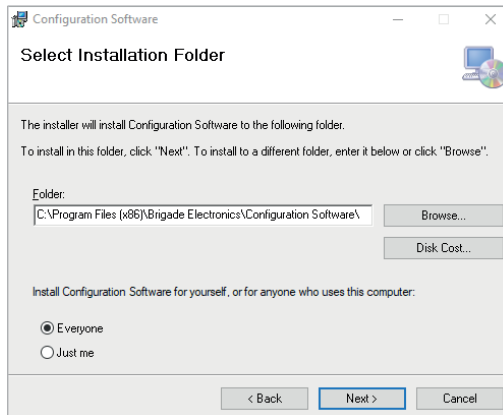
Download the installer file from our website. Run the downloaded installer file on the device that will be used for the installation. The setup wizard will appear. Select “Next”.



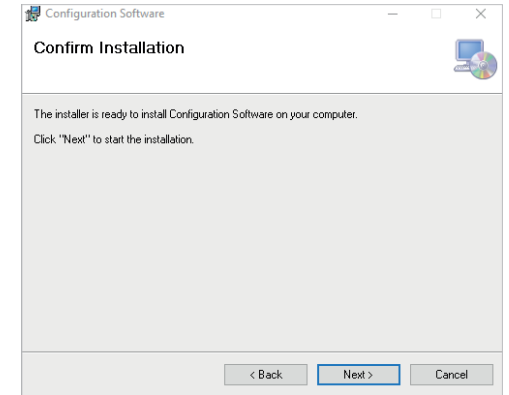
Agree to the license agreement and click “Next”.



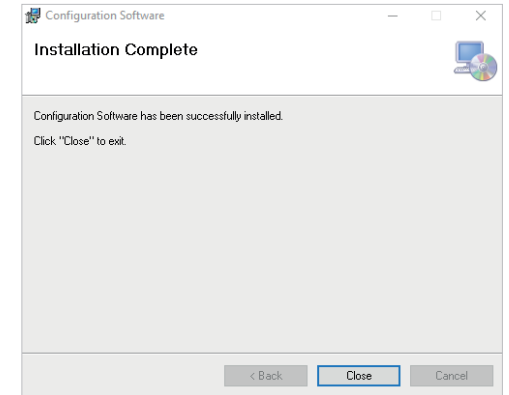
Select the installation folder and click “Next”.



Confirm installation then click “Next”.



Installation complete - click “Close”.



A shortcut will appear on the desktop.



4.4 Using the Configuration Tool Software

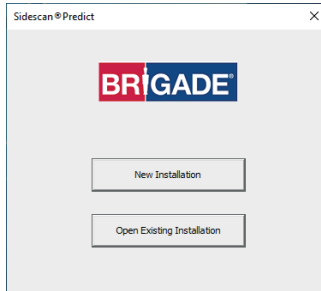
4.4.1 Installation File, Vehicle Configuration File and Sensor Configuration File

The Sidescan®Predict configuration software uses an individual installation file (.bif) for each installation. This is linked to the unique serial number of the algorithm ECU. A different *installation file must be used for each installation. This file will save automatically as the installation progresses.*

When you open the software the first window will provide the options to create new or use existing installation. To create a new installation file, click “New Installation”.

To return to an existing installation, click “Open an Existing Installation”.

4 Configuration Software

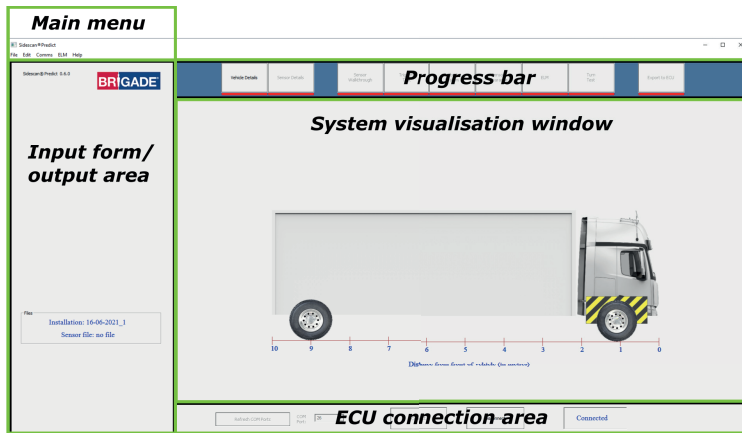


First window that appears allows selection of an existing or new installation.

To save and reuse vehicle configuration files (.bvc) or sensor configuration files (.bsc) on other vehicles, where the installation is identical, use the “File -> Open” and “File -> Save as” menu items when the vehicle details or sensor details input forms are open.

4.4.2 User Interface Overview

The components of the user interface are defined in the image below.



Components of the configuration software user interface.

4.4.2.1 Main Menu

File: “Open”, “Save as” and “Reset form” are used for vehicle details and sensor details input forms. “Last configuration” will load the most recent configuration. “Exit” will close the program.

Edit: “Edit data” will unlock a locked vehicle details or sensor details input form.

Comms: Use this menu to get the configuration, fitting log or error log from a connected algorithm ECU. Firmware update is also accessible from this menu (see 4.4.3). The algorithm ECU must be connected to the configuration software to use these functions.

ELM: “Run ELM” will activate ELM (Environmental Learning Mode) on any connected sensors. “Check ELM” will check the current state of ELM on any connected sensors. The algorithm ECU must be connected to the configuration software to use these functions.

Help: “Diagnostic mode” can be accessed to monitor and record the current output of the system. “Get ECU details” will display the firmware version, boot count and serial number of the algorithm ECU. The algorithm ECU must be connected to the configuration software to use these functions. “About” will display the configuration software version.

4.4.2.2 Progress bar

Follow the forms and tests in this bar from left to right to complete a vehicle installation.

4.4.2.3 Input form/output area

Used for input of vehicle details and sensor details. Used for output display during system tests.

4.4.2.4 System visualisation window

Displays a graphical representation of the current setup showing length of the vehicle, wheel positions and sizes, and sensor positions.

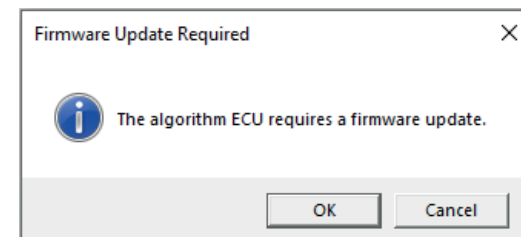
4.4.2.5 ECU connection area

Interface to connect to/disconnect from the algorithm ECU and COM port selection controls.

4.4.3 Firmware Update

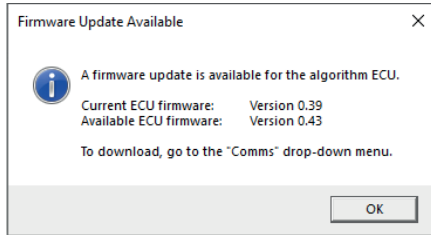
When the configuration software connects to the algorithm ECU it will check the current firmware version. The configuration software available on the Brigade website will have the most up-to-date firmware bundled.

If there is no valid firmware on the algorithm ECU the configuration software will show a “Firmware Needs Updating” dialog box to inform the user that the firmware needs to be updated:

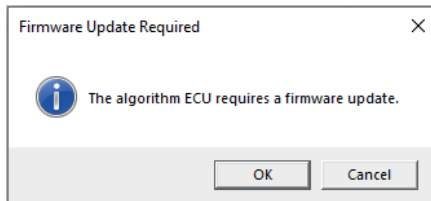


4 Configuration Software

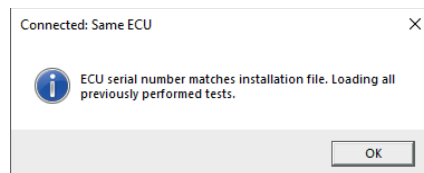
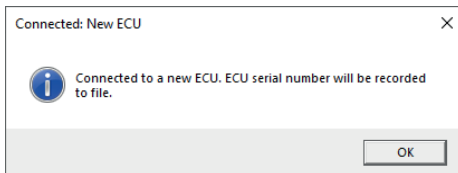
If there is valid firmware on the algorithm ECU but the configuration software has a later version the firmware update menu item (Comms->Send Firmware) will become active and the following dialog box will be shown:



To upload the firmware to the algorithm ECU, select Comms->Send Firmware from the drop-down menu. The same "Firmware Needs Updating" dialog box will then be shown:



From this dialog box click "OK" to begin the firmware upload. A progress counter will run from 0 to 100%. After several seconds the algorithm ECU will restart and the configuration software will reconnect. Either of the below messages means the configuration software has reconnected to the algorithm ECU. The current firmware version can be checked by clicking Help->Get ECU Details from the dropdown menu.



5 System Configuration Tutorial

This section goes step by step through the software installation process. Follow the buttons in the progress bar from left to right, starting at "Vehicle Details", and finishing at "Export to ECU".



Progress bar at the start of an installation.

The overall process is as follows:

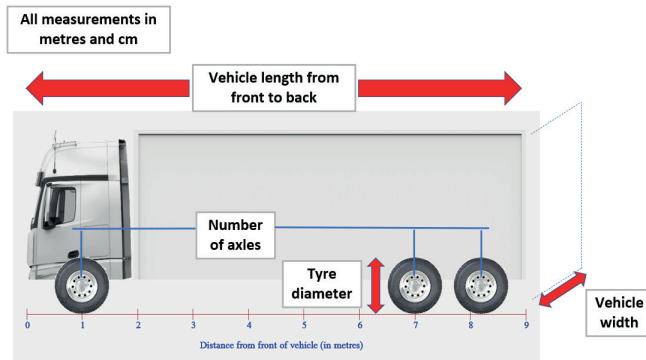
1. Input the vehicle and sensor details using the input forms to confirm valid sensor positions. This can be performed without any Sidescan®Predict hardware.
2. Install the hardware to the vehicle and connect to the algorithm ECU.
3. Run the tests to ensure the system is installed correctly and activate ELM.
4. Export the configuration to the algorithm ECU.
5. Save the configuration files from the algorithm ECU to verify the installation.
6. Disconnect from the system.
7. Restart the system.

5.1 Vehicle Details Input Form

Click the Vehicle Details button at the far left of the progress bar. This will open the vehicle details input form. This step involves inputting the details about the vehicle into the configuration software. The required measurements are as follows:

1. Measure the vehicle length from the front to the back of the vehicle. The length must be between 5.20 and 20.0 metres.
2. Measure the width of the vehicle at the cab (excluding wing mirrors). The width must be between 2.00 and 5.00 metres.
3. Measure the outer tyre diameter of front steering axles. The diameter must be between 0.50 and 2.00 metres.
4. Select whether the system is being installed on the left- or right-hand side.
5. Count the number of axles and measure the distance from the front of the vehicle to the centre of the wheel for each. The number of axles must be between 2 and 7 inclusive. Specify which are steering axles and which are fixed. Rear steer axles should be marked as steering.

5 System Configuration Tutorial



Vehicle dimensions for the vehicle details input form.

Input all the details to the vehicle details input form to 2 decimal places (i.e. 2.00 rather than 2 or 2.0). Accuracy of +/- 5 cm is sufficient for all measurements. The diagram will update as the dimensions are added. The vehicle diagram will flip horizontally depending on whether a right-hand side or left-hand side installation is selected.

Axle	Distance, m	Type
1	1.00	Steering
2	7.00	Fixed
3	8.20	
4		
5		
6		
7		

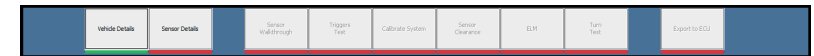
Vehicle details input form.

IMPORTANT: Make sure the installation side (left or right) is correctly selected before proceeding. The system will not operate correctly if the installation side is incorrect.

The vehicle diagram will flip horizontally depending on whether a right-hand side or left-hand side installation is selected, showing the correct side of the vehicle for this installation.

When the form has been checked and is complete, save the vehicle configuration to a file by selecting “Save As” in the file menu. The file extension should be left as .bvc. Previously saved vehicle configurations can be used by clicking “Open” in the file menu.

When the vehicle data has been saved, the Vehicle Details button will have a green line below it to indicate it has been completed. The Sensor Details button should become available. Click on it to move to the next form.



Progress bar with vehicle details complete.

5.2 Sensor Placement and Measurement

The sensors are mounted on the installed side of the vehicle from the front to the back. If it is not possible to install enough sensors to cover the entire length of the vehicle then it is important to at least cover the front portion of the vehicle, as this is where collisions are likely to occur.

IMPORTANT: The configuration software will permit sensors to be fitted with a horizontal spacing of up to 2 metres, but the horizontal spacing should be kept at a maximum of 1.7 metres where possible.

IMPORTANT: Sensors should be mounted flush with the side of the vehicle where possible to minimise the chance of vehicle self-detections.

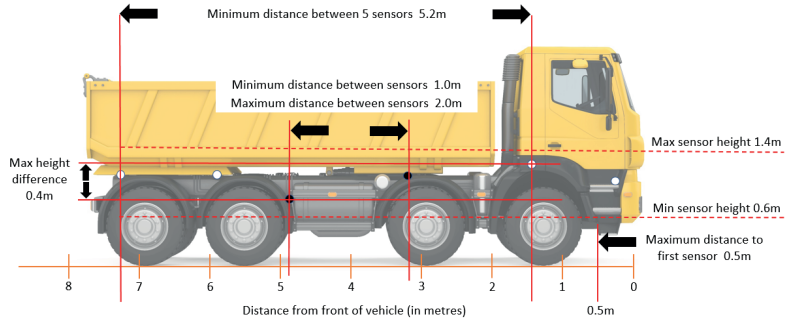
IMPORTANT: Sensors should not be fitted horizontally adjacent to a steering axle where the wheel might be detected. Mounting higher than the top of the wheel at a steering axle will not usually cause a problem.

IMPORTANT: Use the software to confirm sensor positions before doing any physical installation. Pre-installation survey is strongly recommended to ensure the system can be fitted.

There are several position rules to follow to ensure the system operates correctly. The sensors must be positioned according to the following rules:

Sensor Installation Rules	
Maximum distance from front of vehicle to first sensor	0.5 m
Minimum horizontal spacing between sensors	1.0 m
Maximum horizontal spacing between sensors	2.0 m (1.7 m recommended)
Minimum sensor height	0.6 m
Maximum sensor height	1.4 m
Maximum height variation (lowest to highest sensor)	0.4 m
Maximum distance between 5 sensors	5.2 m

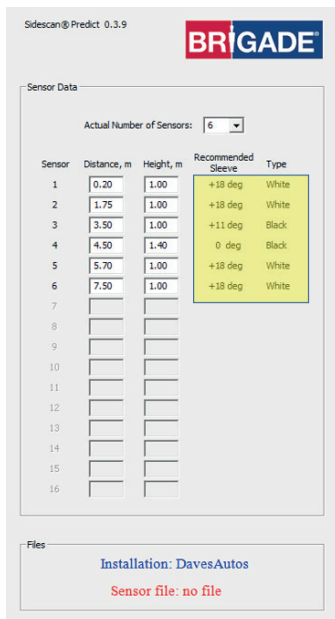
5 System Configuration Tutorial



Sensor position rules

5.3 Sensor Details Input Form

Click the Sensor Details button at the far left of the progress bar. This will open the sensor details input form. First select the number of sensors used in the installation. Sensor distance (from the front of the vehicle) and height (above the ground) should then be entered into the sensor details input form. Input all the details to 2 decimal places (i.e. 2.00 rather than 2 or 2.0). Accuracy of +/- 5 cm is sufficient for all measurements. Once valid sensor positions have been inputted, the configuration software will indicate the required sleeve angle and sensor type. A positive sleeve angle (+) indicates the sleeve pointing upwards to prevent ground detections. “Black” and “White” sensor types can be distinguished by the colour of the back of the sensor.



28 Sensor details input form with sensor types and recommended sleeve angles highlighted.

When the sensor positions have been confirmed as valid by the configuration software, save the sensor configuration. Leave the file extension as .bsc. Previously saved sensor configurations can be used by clicking “Open” in the file menu.

The Sensor Details button will show a green line below it, indicating completion of that stage.



Progress bar with vehicle details and sensor details complete.

5.4 Installing the Hardware

At this point the vehicle and sensor details input forms have been completed. The system will now require some tests to be passed to confirm correct installation. Some of these tests are mandatory and others can be skipped, however Brigade strongly recommends running all tests to confirm the system is installed correctly.

To run these tests, the hardware must be installed to the vehicle and the sensors programmed with their correct numbers. For more details on hardware installation see Section 6. For specific information about programming the sensor, go to Section 6.8.

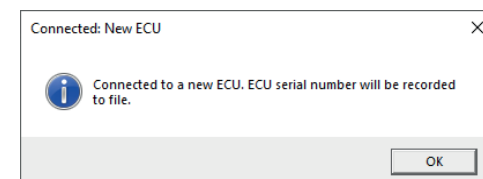
5.5 Connecting to the Algorithm ECU

Connect the PC to the USB connector located on the algorithm ECU. A USB extender cable may be needed to enable comfortable use of the PC. Once the algorithm ECU is connected to the configuration software it moves into configuration mode, indicated by a flashing green light on the buzzer. The ECU will remain in configuration mode until the system is restarted. When the ECU is powered and connected to the PC via the USB connection, the port number should appear in the “COM Port” drop-down list. If the port number does not appear, click the “Refresh COM Ports” button. Note that port numbers for other unrelated connected devices may also appear in the “COM Port” drop-down list. If unsure, disconnect any other devices before connecting to the ECU and click the “Refresh COM Ports” button again.



ECU connection area with algorithm ECU ready to be connected. COM port can be any number.

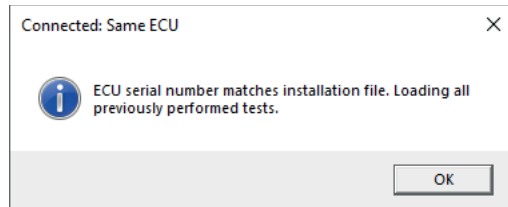
Select this port number and click “Connect”. When the ECU is powered the buzzer display should show a flashing green light on the power/fault LED. When connection is successful and no tests have previously been performed, the following message will appear:



Successfully connected to a new algorithm ECU.

5 System Configuration Tutorial

When connection is successful and some tests have been previously performed in this installation, the serial number will be recognised, and the following message will be displayed instead.



Successfully connected to a recognised algorithm ECU.

When connection is successful, the “Connect” and “Refresh COM Port” buttons will be greyed out and the “Disconnect” button will become available. This shows the system has connected to the ECU and that it is a new connection. The status box on the right-hand side of the ECU connection area will display “Connected”.



Successfully connected to the algorithm ECU.

If there is a problem connecting, an error message will appear towards the top of the screen stating “Could not connect. Please reset ECU.”. If the error message appears, close the program, disconnect the USB cable, power cycle the algorithm ECU and re-connect the USB cable.

IMPORTANT: Each installation requires a new installation file. It is not possible to reuse an installation file for multiple installations. The tests confirm that the physical installation is correct and must be performed again for each installation. Consequently, each new algorithm ECU requires a new installation file. The algorithm ECU serial number is recorded in the installation file after connecting.

In addition to the “Connected” message appearing, the Sensor Walkthrough button in the progress bar will also become available



Progress bar after algorithm ECU connected with vehicle details and sensor details complete.

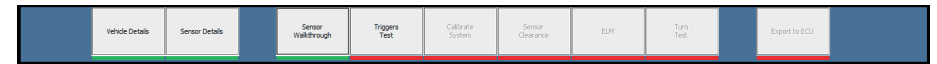
5.6 Sensor Walkthrough (Mandatory)

Once the sensors have been mounted and connected, this test checks they are in the correct numerical order. The system needs to have the sensors installed in the correct order to operate correctly. This test must be performed to configure the system. Click the Sensor Walkthrough button on the progress bar to start the test.

Starting from the front of the vehicle, the user should walk up to each sensor and place their hand over the sensor about 5-10 cm away to block it for one or two seconds. It is not necessary to touch the sensor. Then move to the next sensor and repeat until you have put your hand over to the last sensor. An audible indicator will be played through the PC when each sensor has been triggered.

Return to the configuration software and it will show the order of the sensors. The order should be numerically correct, e.g. 1, 2, 3, 4, 5, 6 for a 6 sensor installation. If the sensors are not in the correct order, they can either be swapped or re-programmed using the hand-held tool.

If the sensors are in the correct order, the test will state that it has passed. The Sensor Walkthrough button will display a green line below it and the Triggers Test button will become available on the progress bar.



Progress bar after sensor walkthrough complete.

5.7 Triggers Test (Mandatory)

This tests that the left, right and reverse gear indicators are correctly connected. These triggers must be correctly connected for the system to operate correctly. This test must be performed to configure the system. Click the Triggers Test button on the progress bar to start the test.

When prompted, the user will need to activate the left then right indicators, then put the vehicle into reverse. It is not necessary to move the vehicle.

If the triggers are connected correctly and activated in the stated order, the test will state that it has passed. The Triggers Test button will display a green line below it and the Calibrate System button will become available on the progress bar.



Progress bar after triggers test complete.

5.8 Calibrate System (Mandatory)

This will check that the algorithm ECU is mounted correctly. You must ensure that the vehicle is stationary and on reasonably level ground before commencing the test. This test must be performed to configure the system. Click the Calibrate System button on the progress bar to start the test.

The algorithm ECU will need to be mounted within 10 degrees of upright. It does not matter which one of the 6 faces of the algorithm ECU is mounted upwards within 10 degrees of vertical. See Section 6.6 for more information on acceptable mounting orientations.

5 System Configuration Tutorial

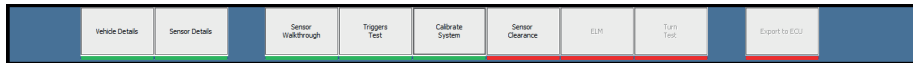
When the algorithm ECU is within 10 degrees of vertical, a green arrow will be displayed in the panel on the left-hand side.



If the algorithm ECU is tilted too much (greater than 10 degrees), a red arrow will be displayed.



Perform the test once the ECU is fixed in its final position. The test will continue for a few seconds once the mounting orientation is acceptable. If the orientation is correct, the test will pass, the Calibrate System button will have a green line below it and the Sensor Clearance button will become available.



Progress bar after calibrate system complete.

The “This Way Up” warning sticker should be attached to the ECU once calibration is complete so that the ECU is not moved at a later date.

5.9 Sensor Clearance (Recommended)

This checks for any obstructions or ground detections for any of the sensors. For example, a sensor mounted in a low position could be detecting the ground if it is not angled up high enough.

During the test, the user will be asked to turn the steering wheel to full lock one side and then to the other side. This is to ensure the sensors mounted near to a wheel that steers do not detect any part of the wheel while the vehicle is turning.

The system needs a clear, unobstructed gap of 3 metres between the side of the vehicle and any other objects to pass this test. This should extend 2 metres forward of the front sensor and 2 metres backwards from the back sensor. It might not be possible to pass this test if there is not 3 metre clearance at the side of the vehicle. If it is safe to do so, the vehicle can be moved to a position where there is enough space. The test can be run parked at this new location.

Click the Sensor Clearance button to start the test. This test will run for approximately 40 seconds and report back if there are any detections found. If the sensors do not detect anything the test will pass.

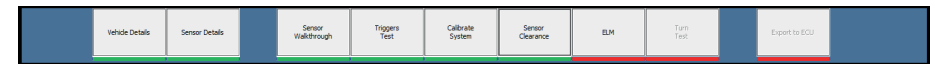
The sensor clearance test shows the number of detections on each sensor. If something is detected the test will fail and indicate which sensor is causing the fault. If the source of the detection can be determined, remove the obstruction or move the sensor then run the test again.

To diagnose the source of a failure diagnostic mode (see Section 7.2.4) can be used to record the output from the system. Guidance around sensor positioning and mounting (see Section 6.7) should be followed to prevent vehicle self-detections. Ensuring sensors are flush to the side of the vehicle and not in-board is the most important for preventing vehicle self-detections. If there are no obvious obstructions but the test still fails, skip the test and perform ELM. After ELM has been performed return to the sensor clearance test which should now give improved results.

The test may also fail with detections due to high frequency background noise, e.g. pneumatics or jet washing. If so, run the test again at a new location or with the noise source removed.

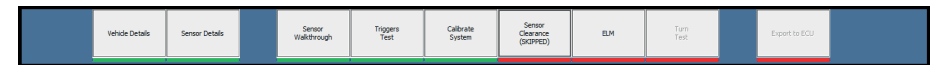
IMPORTANT: The test can be skipped, but correct operation then cannot be guaranteed. We strongly recommend running this test. Skipping the test will be recorded to the installation log file.

If successful, the Sensor Clearance button will have a green line below it and the ELM button will become available.



Progress bar after sensor clearance test complete.

If the test is skipped, this will be noted on the progress bar and in the installation log written to the algorithm ECU. The ELM button will become available.



Progress bar after calibrate system complete.

5.10 ELM (Recommended)

This will activate environmental learning mode (ELM) to ignore any vehicle self-detections. In some circumstances sensors can detect parts of the side of the installed vehicle and activating ELM checks for any such detection and configures the individual sensor to ignore this detection. ELM will ignore vehicle self detections at distances up to 130 cm.

ELM should always be performed irrespective, of whether the sensor clearance test has passed or failed. Intermittent vehicle self detections may occur only when the vehicle is moving and ELM will allow the system to ignore such detections.

The system needs a clear, unobstructed gap of 3 metres between the side of the vehicle and any other objects for the duration of this test. This should extend 2 metres forward of the front sensor and 2 metres backwards from the back sensor. It will not be possible to pass this test if there is not 3 metre clearance at the side of the vehicle. If it is safe to do so, the vehicle can be moved to a position where there is enough space. The test can be run parked at this new location.

5 System Configuration Tutorial

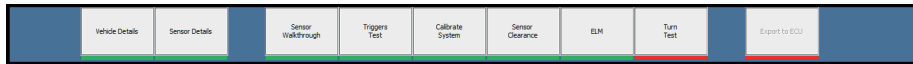
Click the ELM button to activate the test, which will take about 60 seconds. After the test is complete any activated ELM positions will be reported, noting the distance of any ignored object for each sensor. If any positions are activated, please check the area around the sensor and ensure the detection is not caused by a foreign object (e.g. a toolbox).

The test will fail if:

- Sensors are connected or disconnected during the test.
- The objects around the sensor are moved or changed.

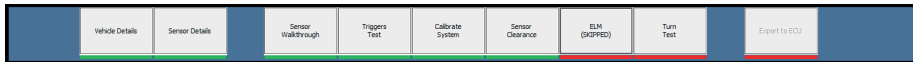
IMPORTANT: The test can be skipped, but correct operation then cannot be guaranteed. We strongly recommend running this test. Skipping the test will be recorded to the installation log file.

If successful, the ELM button will have a green line below it and the Turn Test button will become available.



Progress bar after sensor clearance test complete.

If the test is skipped, this will be noted on the progress bar and in the installation log written to the algorithm ECU. The ELM button will become available.



Progress bar after calibrate system complete.

5.11 Turn Test (Recommended)

This test will involve driving the vehicle slowly. It can be performed in a very short space of a few metres. This should not be performed on a public road and the PC should not be operated by the driver. It needs only a few metres slowly forward, slight turn to the left at full lock, slight turn to the right at full lock and then to reverse slowly a few metres.

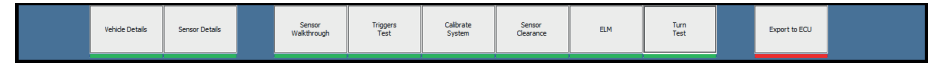
IMPORTANT: Please ensure it is safe to perform the manoeuvres before running the test. The configuration software will ask the driver to do the following:

- 1 Drive the lorry forwards a few metres. A beep will sound on the PC. **Stop the vehicle.**
- 2 Turn the steering wheel full lock to the left and drive for ~1 second. A beep will sound on the PC. **Stop the vehicle.**
- 3 Turn the steering wheel full lock to the right and drive for ~1 second. A beep will sound on the PC. **Stop the vehicle.**
- 4 Straighten up and reverse the vehicle a few metres. A beep will sound on the PC. **Stop the vehicle.**

The software will inform the user of the progress. It will provide an audible indicator on the PC after each stage passed, or if a failure occurs at any time.

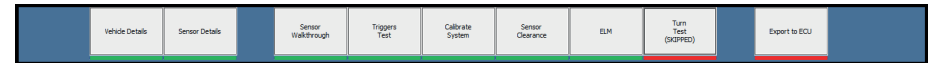
IMPORTANT: The test can be skipped, but correct operation then cannot be guaranteed. We strongly recommend running this test. Skipping the test will be recorded to the log file.

Once this test is complete, the Turn Test button will have a green line below it and the Export to ECU button will become available.



Progress bar after turn test complete.

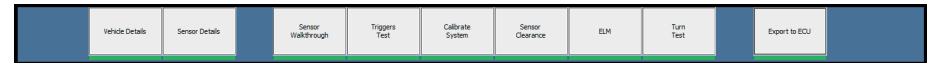
If the test is skipped, this will be noted on the progress bar and in the installation log written to the algorithm ECU. The Export to ECU button will become available.



Progress bar after turn test skipped.

5.12 Export to ECU

When the final test is complete, click the Export to ECU button. This is necessary to export the vehicle configuration, sensor configuration, and test results to the algorithm ECU before exiting the configuration software to finish the installation. The software will take a few seconds to send the data. When complete, the configuration software will report that the files were sent successfully then restart the system. Once complete the Export to ECU button will have a green line below it.



Progress bar after configuration complete.

Before disconnecting, save the programmed configuration file, fitting log and error logs from the COMMS menu for later reference. Once finished, disconnect from the algorithm ECU using the button in the ECU connection area, close the configuration software and disconnect the USB cable.

Restart the vehicle's electrical system with the system disconnected from the PC. The system will reboot into normal standalone mode. If configuration was completed the alarm will display a self-test on start-up. The system will now detect moving objects in the detection area.

The Sidescan®Predict driver information sheet should be left in the cab for the driver.

5.13 Confirming Correct Installation

To confirm the system is working with a parked vehicle do one or more of the following:

- Place an object within 1m of the front sensor. When the nearside indicator is activated, a solid yellow visual alarm will be given.
- Move quickly in from the back of the vehicle towards the front on the installation side, which will result in a solid yellow visual alarm.
- Move quickly in from the back of the vehicle towards the front on the installation side within 1 metre of the sensor array, with the nearside indicator active.

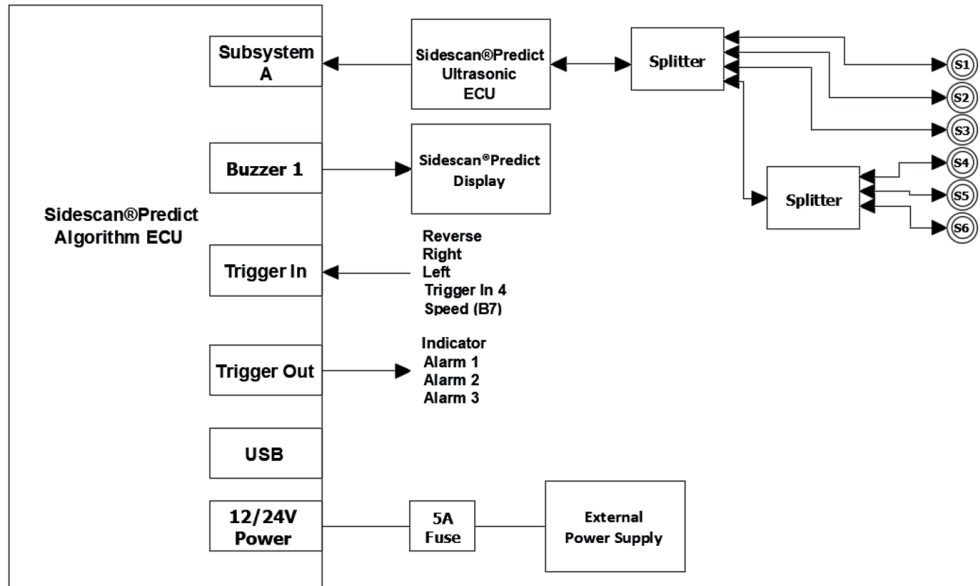
This will provide a single audible beep in addition to the solid yellow visual alarm.

6 Hardware Installation

6.1 Installation Site

The installation site should have enough space to verify correct operation of the system. There should be 3 metres of space on the installed side of the vehicle to verify correct sensor operation. There should be space to safely manoeuvre the vehicle at low speeds to verify vehicle motion monitoring is operating correctly. The installation should be performed on a flat surface with less than 5 degree gradient.

6.2 System Diagram



Block diagram showing all components of the Sidescan®Predict system.

6.3 System Setup

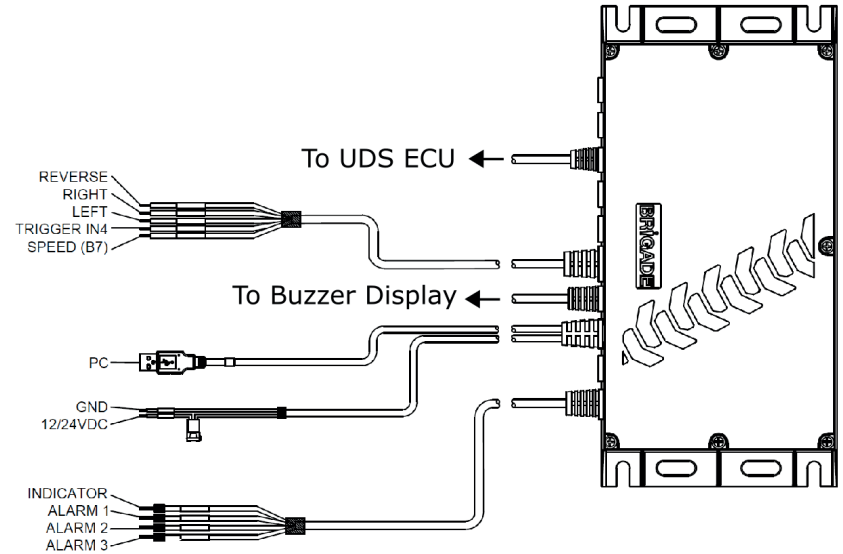
To set up, the user must configure the system across USB using a PC or laptop.

The configuration software takes details about the dimensions of the vehicle and positions of sensors.

IMPORTANT: It is recommended that the proposed configuration is run through the configuration software before any physical installation, to make sure that the proposed configuration is valid.

6.4 Electrical Connections to Vehicle

Electrical connections to the vehicle all come from the algorithm ECU. The algorithm ECU then powers and communicates with the sensor subsystem and buzzer display. The connections between the algorithm ECU and vehicle are described here. Connections between the system components are described in Section 6.5.



Block diagram showing all components of the Sidescan®Predict system.

6.4.1 Algorithm ECU Power

The algorithm ECU power tail cables are marked “12/24VDC” and “GND” and should be connected to the vehicle ignition circuit. All other components are powered from the algorithm ECU. The system is supplied with a 5A automotive blade fuse.

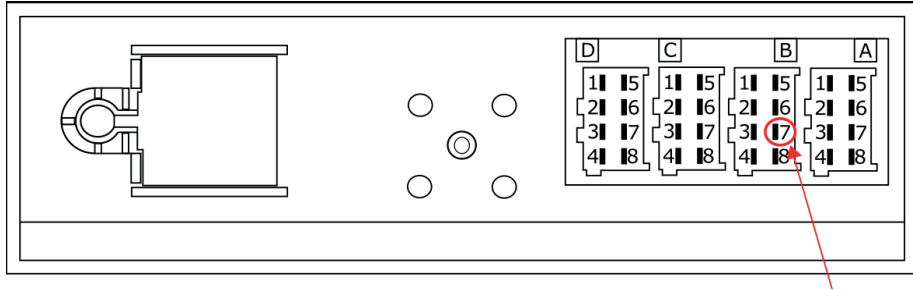
6.4.2 Input Triggers and Speed Input

There are four input trigger cables on the algorithm ECU and one cable for the speed input. The left, right and reverse input trigger cables should be connected to the respective vehicle triggers. The speed input cable should be connected to a tachograph B7 output. The “trigger in 4” cable is not used in this system and should be safely terminated and robustly constrained.

No intermediate relays or hardware components are required.

IMPORTANT: The speed input cable must be connected to the B7 output of the vehicle tachograph. If the speed cable is connected to any other output, the system will not operate correctly. The location of the tachograph B7 for a typical tachograph is shown below, but this may vary with tachograph models.

6 Hardware Installation



Location of B7 on a typical tachograph. May vary dependent on tachograph model.

IMPORTANT: The system assumes the speed signal is taken from the rear wheels of the vehicle. Performance at high turn rates may vary on vehicles where speed is taken from the front wheels.

IMPORTANT: The system assumes the tachograph speed signal input is taken from a motion sensor. Performance at low speeds may vary where the tachograph speed signal input is taken from the CAN.

6.4.3 Output Triggers and Integration of External Alarm

There are four switched ground output triggers on the Sidescan®Predict system. These function as described in the table below:

Trigger number:	Trigger name:	Activated when:
1	Indicator	Left trigger is active on left hand side installations. Right hand trigger is active on right hand side installations. Speed must be below system shutdown speed (30 kph/18.6 mph). Used to integrate external alarm.
2	Alarm 1	Moving object is detected. Speed must be below system shutdown speed.
3	Alarm 2	“Danger of collision” alarm is active. Speed must be below system shutdown speed
4	Alarm 3	“Collision predicted” alarm is active. Speed must be below system shutdown speed.

To integrate an external alarm, connect the positive of the alarm to the vehicle ignition circuit and the ground of the alarm output trigger 1. When the indicator is activated and the speed is below the system shutdown speed (30 kph/18.6 mph), the switched ground will activate, and the alarm will be powered.

Each output trigger can provide a switched ground for up to 750 mA at 32 V. Any unconnected output trigger should be safely terminated and robustly constrained.

6.4.4 USB Connector

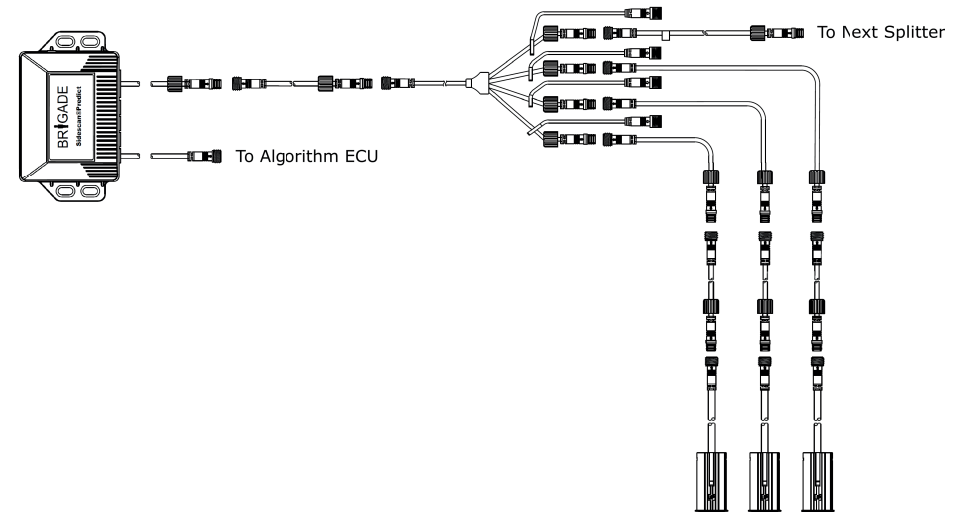
The algorithm ECU has a USB connector used during configuration and fault diagnosis. The cable and plug should be protected after configuration so that no debris can enter and it cannot become damaged during vehicle operation. After installation ensure the USB cable is robustly constrained to prevent contact with other tail cables or other equipment during the vehicle’s operation.

6.5 Electrical Connections between Sidescan®Predict Components

This section describes the connection between the main Sidescan®Predict components. It describes separately connection between the buzzer display and algorithm ECU, connection between the algorithm ECU and UDS ECU, and connection between the UDS ECU and the sensors. Different lengths of extension cables can be used between each connection depending on the requirements of a given installation.

6.5.1 Connecting UDS ECU to Sensors

The UDS ECU is connected to the sensors via a sensor bus configuration. 4-way splitter cables are used to connect multiple sensors, extension cables, and other splitters to the bus. 3-pin extension cables can be inserted at any point in the bus as required by the installation. The maximum cabling length between the UDS ECU and any sensor is 30 metres. Any unused connectors on the splitters should be closed off using the attached end caps to maintain ingress protection.

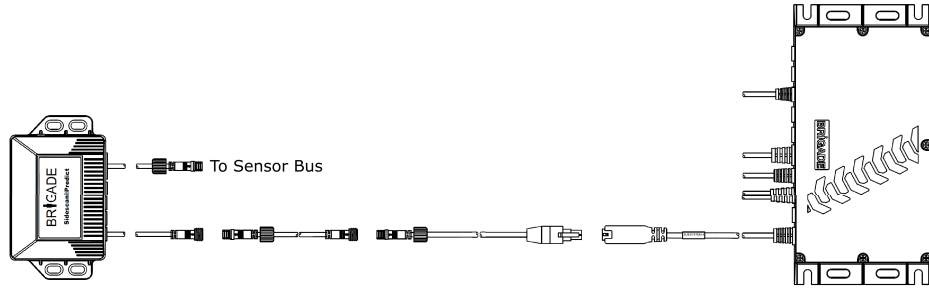


Sensor bus connections between UDS ECU and sensors.

6 Hardware Installation

6.5.2 Connecting Algorithm ECU to UDS ECU

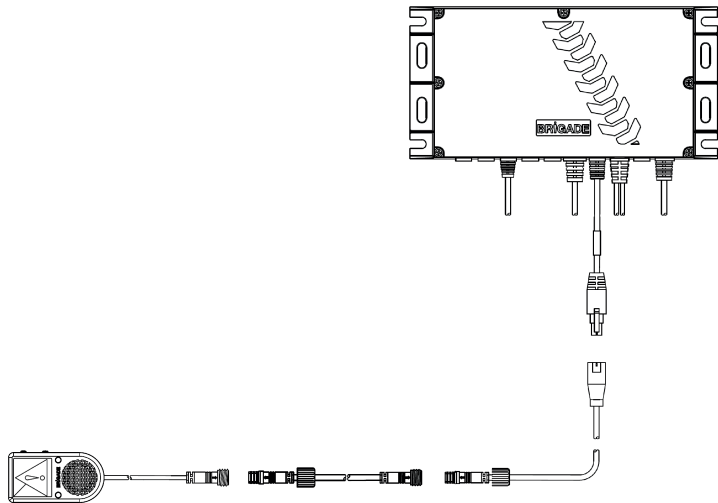
The algorithm ECU is connected to the UDS ECU with an adapter cable (SSP-0.3-AC2) and optional 4-pin extension cable. The maximum extension length is 30 metres.



Adapter cable and optional 4-pin extension cable between algorithm ECU and UDS ECU.

6.5.3 Connecting Algorithm ECU to Buzzer Display

The algorithm ECU is connected to the buzzer display with an adapter cable (SSP-0.3-AC1) and optional 3-pin extension cable. The maximum extension length is 15 metres.

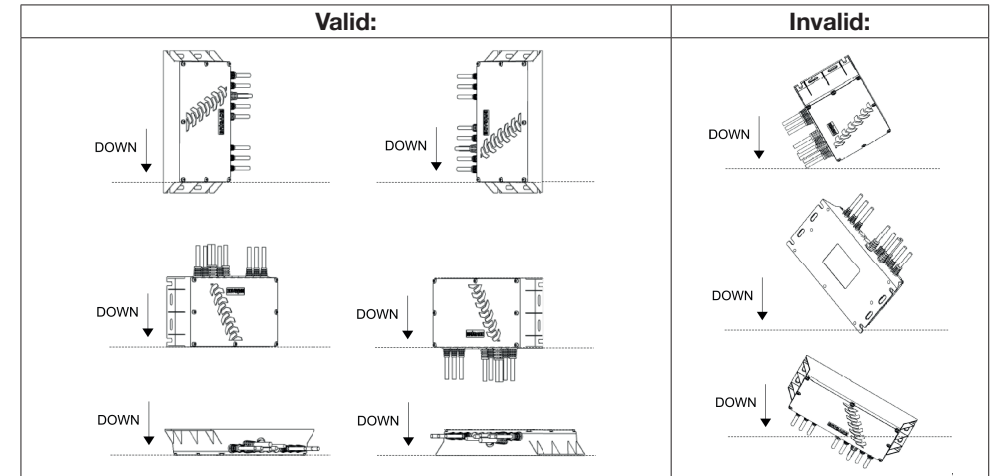


Adapter cable and optional 3-pin extension cable between algorithm ECU and buzzer display.

6.6 ECU Mounting

The algorithm ECU should be mounted in the cab and is not suitable for mounting on the vehicle frame due to its IP rating. The UDS ECU can be mounted in the cab or on the vehicle frame at the installer's discretion.

The algorithm ECU must be mounted with at least one flat side facing down. There are 6 valid mounting orientations. The diagrams below show valid and invalid algorithm ECU mounting positions. The validity of an ECU mounting orientation will be confirmed by the configuration software during the installation process. This should be fixed securely with screws and not moved after installation.



Valid and invalid algorithm ECU mounting orientations.

6.7 Sensor Mounting and Location

The sensor positions must be verified with the configuration software. Invalid sensor positions will cause the system to malfunction. The configuration software will not permit a user to set up the system unless the input positions are valid.

There are “black” and “white” type sensors, which must be programmed with the correct IDs and mounted in accordance with the recommendations from the configuration software.

Please ensure the sensor coating is not damaged during installation as this may cause corrosion issues.

IMPORTANT: The configuration software will permit sensors to be fitted with a horizontal spacing of up to 2 metres, but the horizontal spacing should be kept at a maximum of 1.7 metres where possible.

IMPORTANT: Sensors should be mounted flush with the side of the vehicle where possible to minimise the chance of vehicle self-detections.

IMPORTANT: Sensors should not be fitted horizontally adjacent to a steering axle where the wheel might be detected. Mounting higher than the top of the wheel at a steering axle will not usually cause a problem.

IMPORTANT: Use the software to confirm sensor positions before doing any physical installation. Pre-installation survey is strongly recommended to ensure the system can be fitted.

6 Hardware Installation

6.7.1 Sensor Positions

The correct position of the sensors is important to ensure the system operates correctly. These should be verified using the installation software. The sensor position rules must be followed:

- To cover the blind spot without any gaps.
- To ensure detection of vulnerable road users.
- To prevent interference between sensors.
- To prevent ground, curb, or vehicle self-detections.

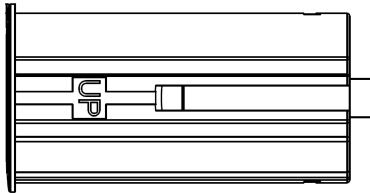
Please adhere to the sensor position rules defined in Section 5.2 and the sensor sleeve rules defined in Section 5.3 when setting up the system. If the height of parts of the vehicle body vary during use, the system must be fitted at the normal running height.

Sensors should be mounted flush with the side of the vehicle. Inboard sensors may be subject to reflections from the vehicle body, resulting in false alarms from vehicle self-detection. Diagnostic mode (see Section 7.2.4) can be used to check sensors are not giving false detections.

Some sensors and cables may need to be mounted in positions where they might be exposed to flying debris. If this is the case sensors should be suitably protected with bracketry and cables should be protected with conduits.

6.7.2 Sensor Rotations

The sensors are marked with an “UP” marking which shows which way up the sensor should go.



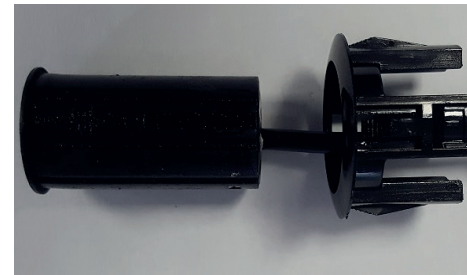
“UP” marking on a sensor.

IMPORTANT: The “UP” marking must be pointing straight up relative to the ground and not relative to any mounting surface on the vehicle. The Sidescan®Predict sensors have multiple grooves spaced at 45 degrees to allow flexible sensor mounting. These cannot be used as guides to determine correct rotation. The installer must check the “UP” marking on the sensor.

6.7.3 Sensor Sleeves and Underslung Housings

The sensors can be mounted on a horizontal surface using an underslung sensor housing with a sensor sleeve, or flush to a surface by inserting a sensor sleeve directly. The sleeves are used to angle the sensor upwards where required. The selection of sleeves should be performed with the configuration software.

Flush mounting through a vertical surface is achieved using a sensor and sleeve. A 28 mm diameter hole will be required to flush mount the sleeve into a surface.



Flush mounting of a sensor/sleeve assembly to a vertical surface.

Mounting to a horizontal surface requires a sensor, a sleeve and an underslung housing.



Underslung mount assembly for mounting a sensor to a horizontal surface.

6.7.4 Mounting to Uneven Surfaces

Mounting to uneven surfaces is not recommended. Deviating from recommended mounting angles will degrade the performance of the system.

If a sensor sleeve must be mounted to a surface which is not vertical, or an underslung housing mounted to a surface which is not horizontal, the installer should measure the angle of the surface using a digital spirit level (e.g. a smartphone app) and adjust the sleeve angle accordingly. Examples are given below.

Example 1: A sensor sleeve of +11° is recommended, but the vertical surface for flush mounting is measured 80° off horizontal. In this case the sensor will already be angled upwards 10° before the sleeve is added. Subtract 10° from the recommended angle to get the ideal sleeve (+1°).

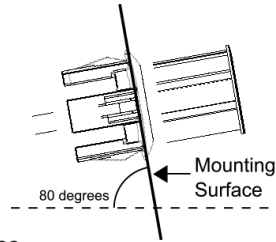
If available a sensor sleeve of 0° should be used as the result is the closest to the recommended.

6 Hardware Installation

Recommended sleeve = +11°.

Recommended minus "surface bias" = +11° - 10° = +1°.

Closest available = 0°. Use a 0° sleeve.



Flush mounting to an uneven vertical surface.

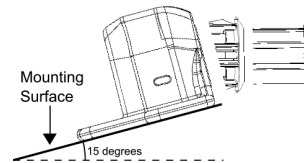
Example 2: A sensor sleeve of +5° is recommended, but the mounting surface is angled 15° upwards from horizontal. In this case the sensor will already be angled up 15° before the sleeve is added. Subtract 15° from the recommended angle to get the ideal sleeve (-10°).

A sensor sleeve of -11° should be used as the result is closest to the recommended.

Recommended sleeve = +5°.

Recommended minus "surface bias" = +5° - 15° = -10°.

Closest available = -11°. Use 11° sleeve angled downwards.



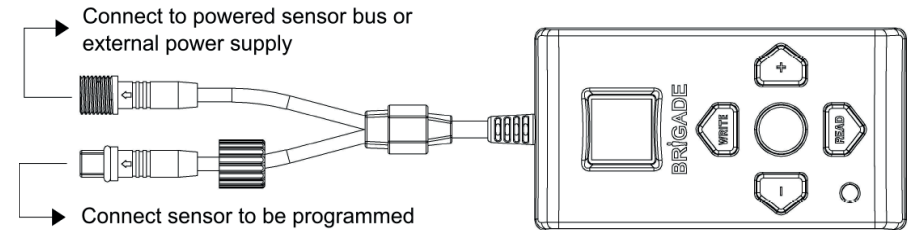
Surface mounting on an uneven horizontal surface.

6.7.5 Vehicle Overhang into Detection Area

Placing sensors near overhanging objects should be avoided. Where there is no alternative, it is recommended to place sensors above or below overhanging objects rather than to the side of them, as the vertical detection beam is smaller than the horizontal. Consequently, objects above or below are less likely to be detected than objects to the side. Check the detection patterns in Section 1.3 to see whether an object is likely to be detected.

6.8 Sensor Programming

The sensor programmer has four buttons and a 2-digit seven segment display. It can be used to read the current ID of a sensor or to program a new ID. It should be connected to a power source (the sensor bus or an external 12/24V supply can be used) and to a single sensor as shown below.



Sensor programmer connections.

To read the current ID of a sensor press READ and the ID will be shown on the display. To program the sensor, select the required sensor ID using the + and - buttons and press the WRITE button. If the ID is valid the LED will flash green and an audible alarm will sound. This indicates the sensor is correctly programmed. If the ID is not valid the LED will flash red. This indicates the sensor ID is unchanged.

6.9 Cabling

Cables should be run in conduit and along suitable cable runs throughout the vehicle. Avoid running cables with vehicle power cables to prevent possible interference. Ensure cabling and connectors are fitted away from sources of excess heat, vibration, movement, and water.

To prevent cable damage always allow a reasonable radius when folding excess cable and do not over tighten cable ties. Avoid pulling on the connector or tight bends close to the connector.

6.10 Buzzer Display

The buzzer display should be mounted so the vehicle operator has good visibility in all environments and situations. It should not obstruct the driver's view of windows or mirrors. The display should be fixed in a suitable location in line with any current legislation/regulations. The mounting location should reflect that the system is for side detection only.

If mounting with an adhesive or adhesive pad, use rubbing alcohol (70% isopropyl alcohol) to clean the surface. Make sure the surface is dry and cleared of any dirt. If using the adhesive or adhesive pad on surfaces which contain plasticizer, for example EPDM or PVC, please check the plasticizer-resistance of the material to ensure that this mounting method is suitable.

7 Testing and Maintenance

7.1 Information

This information is addressed to the installer and operator of the vehicle where a Brigade Sidescan®Predict system is installed:

- 1) The Brigade Sidescan®Predict is intended as a driver assistance system and should not be relied upon as your primary defence for the safe operation of the vehicle. It is an aid to contribute, in conjunction with other established safety programs and procedures, to ensure safe operation of the vehicle in relation to surrounding persons and objects.
- 2) Testing and inspection of the system should be carried out in accordance with this manual. The driver or operator is responsible for ensuring the Sidescan®Predict system is working as intended.
- 3) Operators using this equipment are strongly recommended to check the system's proper operation at the beginning of every shift.
- 4) Improved safety depends on the proper function of this product in conformance with these instructions. It is necessary to read, understand and follow all instructions received with the Sidescan®Predict system.
- 5) The Sidescan®Predict is intended for use on commercial vehicles and machinery equipment. Correct installation of the system requires a good understanding of vehicle electrical systems and procedures along with proficiency in installation.
- 6) Store these instructions in a safe place and refer to them when maintaining and/or reinstalling the product.

7.2 System Diagnostics

The system diagnostics here describe methods to determine the configuration and any errors that have occurred. If you do not have access to the installation file for this vehicle, a new installation can be used to run any diagnostics (select "New Installation" when the configuration software is opened). The configuration of the system will not be affected unless "Export to ECU" is clicked.

7.2.1 Configuration File

The ECU configuration file can be obtained by selecting "Get Config" from the "Comms" drop-down menu. This will save the ECU configuration as a text file and a csv file. Both contain the same information.

Once downloaded the files can be found in the user's documents folder:

Documents\Sidescan Predict\ECU Configurations\

This file will provide the current configuration of the algorithm ECU, with content from the vehicle details input form and the sensor details input form.

7.2.2 Installation Log

The ECU installation log can be obtained by selecting "Get Installation Log" from the "Comms" drop-down menu. This will save the fitting log as a text file and a csv file. Both contain the same information.

Once downloaded the files can be found in the user's documents folder:

Documents\Sidescan Predict\ECU Installation Logs\

The file will give all the important installation information, such as the time of installation, the test results, any tests skipped, and the names of the vehicle details and sensor details files used.

7.2.3 Error Logs

The ECU error log can be obtained by selecting "Get Error Log" from the "Comms" drop-down menu. This will save the error logs as a text file and a csv file. Both contain the same information.

Once downloaded the files can be found in the user's documents folder:

Documents\Sidescan Predict\ECU Error Logs\

This will provide a list of all errors logged, with each error showing the system state at the time of the log and an error code.

7.2.4 Diagnostic Mode

This is accessible by selecting "Diagnostic Mode" from the "Help" drop-down menu. It will display the readings from all UDS sensors and other outputs from the system in real time. It will save all these results into a txt file and a csv file located in:

Documents\Sidescan Predict\Diagnostic Data

IMPORTANT: Under no circumstances attempt to read diagnostic data while operating the vehicle.

7.2.5 Environmental Learning Mode (ELM)

This is accessible from the "ELM" drop-down menu. The user can run ELM on currently activated sensors or check the current state of ELM on the sensors.

ELM settings are stored on the sensors, not on the ECU. Changing the sensors will mean the ELM settings are lost and likewise changing the ECU components will not change the ELM settings. ELM settings can only be changed by running ELM again.

Activating ELM requires a clear space on the installed side of the vehicle as described in Section 5.10.

7 Testing and Maintenance

7.3 Troubleshooting

Errors due to loose connections, damage to components or incorrect installation may cause the system to shut down or otherwise present an error state. The table below describes specific errors that can be observed and their causes and fixes.

Observation	Cause	Fix
Power/fault LED is showing a constant red light	System is not configured	Configure the system with the configuration software
Power/fault LED is showing a flashing green light	System is in configuration mode	Disconnect the configuration software and restart the system.
No light on the buzzer display	Buzzer display is not powered or broken	Check the connection to the buzzer display. If the connection is OK, it may be necessary to replace the cables or the buzzer display
After restart power/fault LED is showing an alternating amber and green light, which continues indefinitely.	No valid firmware, or connection between algorithm ECU and buzzer display is faulty	Check valid firmware is loaded on to the algorithm ECU ("Help" -> "Get ECU Details"). Check connection between algorithm ECU and buzzer display
After restart the power/fault LED shows an alternating amber and green light for 10 seconds . Then the buzzer display does a self-test and the power/fault LED shows a solid amber light.	No data is being received from the UDS ECU	Use diagnostic mode to check whether any UDS data is being received. Check connection between algorithm ECU and UDS ECU. If this does not work, it may be necessary to replace the cables between the two ECUs or the UDS ECU itself
After restart the buzzer display does a self-test and the power/fault LED shows a solid green light for one second . Then the power/fault LED shows a solid amber light, but the buzzer display does not beep.	Algorithm ECU orientation does not match configuration. Algorithm ECU may have been moved after installation	Check the algorithm ECU has not moved since the installation. If it has, either return the algorithm ECU to its original mounting position or reconfigure the system
After restart the buzzer display does a self-test and the power/fault LED shows a solid green light for three seconds . Then the power/fault LED shows a solid amber light and the buzzer display beeps one or more times	One or more sensors are missing, disconnected, or broken	At start-up, the system will give one beep for each sensor that the UDS ECU cannot see. Use diagnostic mode to determine which sensors are missing. Check the connections to these sensors and replace them if necessary
System does not turn off at 30km/h, turning off at lower, higher, or random speeds	Incorrect speed signal connected	Check the speed signal connection to the algorithm ECU. Check the speed signal is connected to the tachograph B7 output

7.4 System Performance

If there is no fault displayed but the system gives excessive false positives there are several possible causes.

- Vehicle self-detection by one or more sensors. Use diagnostic mode to check for self-detections. Activate ELM (environmental learning mode). Ensure the sensor is flush to the side of the vehicle and other sensor positioning and mounting guidelines have been followed.
- Sensor positions are incorrect or do not match the configuration on the ECU. Check with the configuration software
- Sensor sleeves are not correct for the sensor positions given. Check with the configuration software.
- Sensor positions are correct and valid but not optimal. See the guidance in Section 3.3.

8 Specifications

8.1 System Operation Characteristics

Detection range	2.5 m
Detection pattern	See Section 1.3
Detection resolution	2 cm
Detection accuracy	+/- 2 cm
Detection sampling rate	10 Hz
Response time after detection	<100 ms
Start-up time	<3 seconds

8.2 System Electrical Specification

Operating voltage	10-32 V
Input current (with 16 sensors)	Typical: 200 mA @ 12 V / 140 mA @ 24 V Maximum: 470 mA @ 12 V / 380 mA @ 24 V
Fuse	5A Automotive Blade Fuse
Polarity	Negative Ground
Trigger input voltage	Active High / 9 V
Speed signal	Tachograph B7 0-5 V
Trigger output characteristics	Active State: switched to ground up to 750 mA @ 32 V Inactive State: High impedance (> 1 MOhm)

8.3 Maximum Connection Lengths

Cable between UDS ECU and any sensor	30 m
Cable between algorithm ECU and UDS ECU	30 m
Cable between algorithm ECU and buzzer display	15 m

8.4 Buzzer Display Specification

Weight	72 g
Mounting	In cab with adhesive pad or AMPS mount, see Section 9.5
IP protection	IP30
Operating temperature	-30 to +80 °C
Volume	Adjustable 5 levels
Sound levels	200Hz 64.3 to 83.5 dB ±5 @ 10cm (adjustable 5 levels) 800Hz 68.0 to 82.7dB ±5 @ 10cm (adjustable 5 levels) 2450Hz 68.5 to 89.0dB ±5 @ 10cm (adjustable 5 levels)
Colours (visual warning)	Yellow, Red
Colours (power/fault LED)	Green, Amber, Red

8.5 Algorithm ECU Specification

Weight	412g
Mounting	Specified orientation in cab, M5 screws, see Sections 6.6 and 9.4
IP protection	IP30
Operating temperature	-30 to +80 °C

8.6 Sensor Subsystem Specification

Weight (ECU)	158g
Mounting (ECU)	Cab or body, M5 screws, see Section 9.3
IP protection (ECU)	IP69K
Weight (Sensor)	30g
Mounting (Sensor)	Body, through hole mount or M5 screws, See Sections 9.1 and 9.2
IP protection (Sensor)	IP69K
Operating temperature	-30 to +70 °C

8.7 Configuration Software Specification

Operating system	Windows 10
Minimum resolution	1280 x 960
Recommended screen magnification	100%

8.8 Sensor Programmer Specification

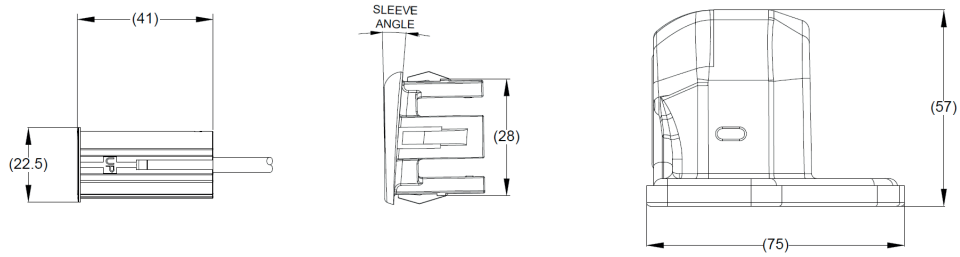
Weight	106g
IP protection	IP40
Operating temperature	-40 to +85 °C
Operating voltage	10-32 V
Power consumption	<3 W

8.9 Approvals

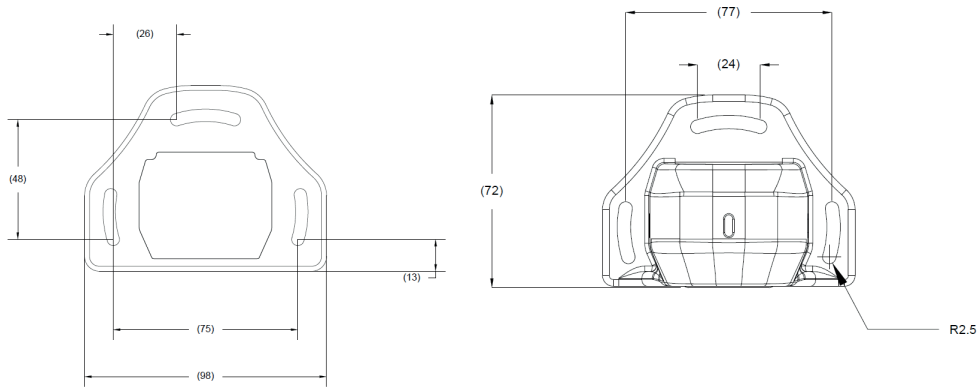
CE
ISO 16750
FCC
IC
ECE Regulation No. 10

9 Mounting Dimensions

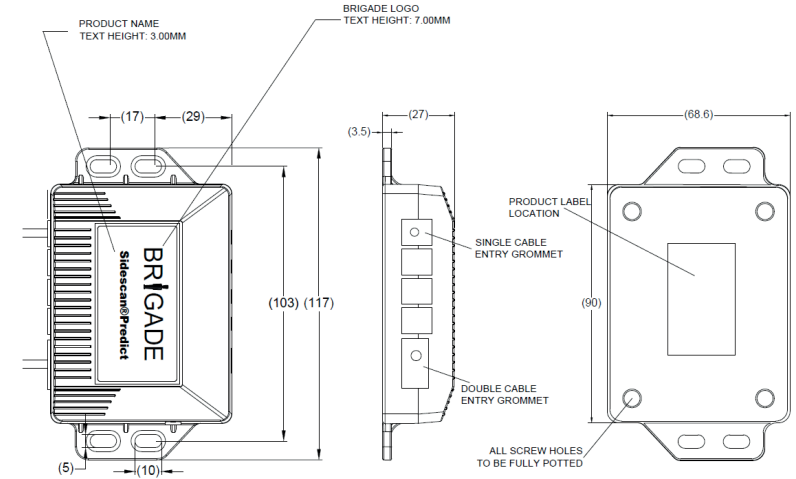
9.1 Sensors, Sleeves and Underslung Housings



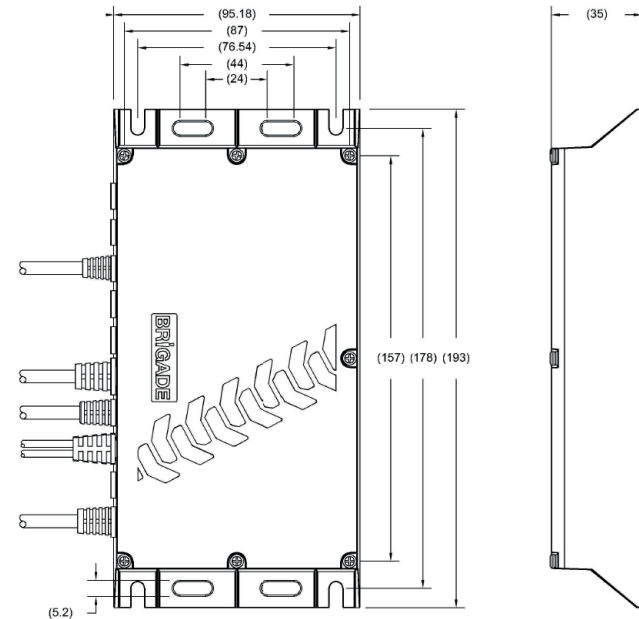
9.2 Underslung Housing Mounting Holes



9.3 UDS ECU

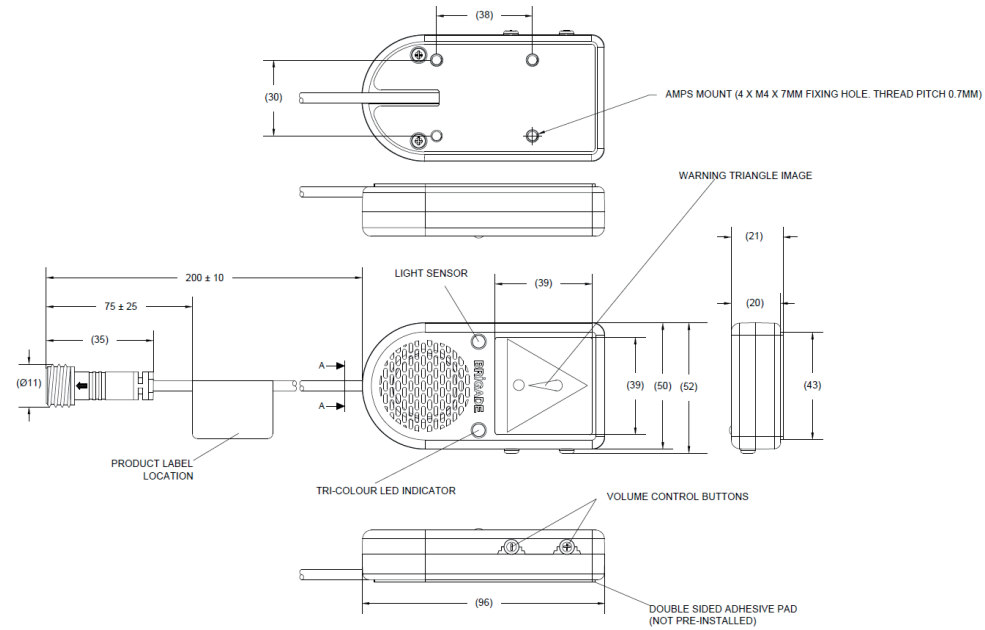


9.4 Algorithm ECU



9 Mounting Dimensions

9.5 Buzzer Display



10 Disclaimer

Ultrasound obstacle detection systems are an invaluable driver aid but do not exempt the driver from taking every normal precaution, when conducting a manoeuvre. No liability, arising out of the use or failure of the product, can in any way be attached to Brigade or to the distributor.



www.brigade-electronics.com

