Brigade

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BN360-4000AI
AHD 360° Camera System with AI

Please read this manual thoroughly before operating the device and keep it for future reference.
V1



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1 General Information, Precautions & Maintenance

1.1. Software/ Firmware Updates

The BN360-4000AI system is supplied with firmware installed in the ECU. Over time, changes will be made to these firmware versions to improve either functionality or the AI algorithm.

1.2. General Information

Due to continuous further development, the manufacturer reserves the right to change the system components without prior notice.

This manual is for use with the BN360-4000AI AHD 360° Camera System with AI. This manual is subject to change due to technical developments.

The operator must ensure that the instructions are read and understood by all relevant persons before work.

The manufacturer is not liable for any damage resulting from non-compliance with these instructions.

1.3. Important Safety Information

Brigade AI camera systems and solutions are designed to assist vehicle and machine operators by enhancing visibility and aiding the detection of people in the surrounding environment by alerting operators to the potential presence of Vulnerable Road Users (VRUs). These systems are driver aids only and do not replace the operator's own judgment, attention, or responsibility to safely operate and control the vehicle or machine.

This AI camera system is intended solely for informational and monitoring purposes. It is not designed, tested, or certified for use in any safety-critical control functions of a vehicle.

1.4. Important information for EU customers

This AI camera system is classified under the EU AI Act as a non-high risk AI system.

This system must not be used or relied upon as a safety component as defined in the EU AI Act.

1 General Information, Precautions & Maintenance

Continued

1.5. System Capabilities and Limitations

AI human form recognition systems assist in identifying people and VRUs within a defined detection range. While these systems provide enhanced visibility, they should not be solely relied upon to detect every person or VRU in every situation.

System performance may be affected by:

1. Environmental conditions (weather, lighting, visibility)
2. Physical obstructions or camera blockages
3. Camera positioning and field of view
4. Complex backgrounds, crowded environments, or ambiguous objects
5. Relative speed and motion between the vehicle and VRUs
6. Clothing, posture, or physical characteristics of individuals
7. Variability across the population of individuals encountered

You are responsible for ensuring that system configurations (reaction times, detection areas etc) meet with your operational and safety requirements.

This product is compatible with CVBS and AHD systems. Depending on the type of system, the camera field of view may be reduced. For more information see the full technical specification. You are responsible for ensuring that the product is suitable and appropriate for your or any third party's specific needs and/or is compatible with all other systems and components that make up a relevant vehicle or machine.

1.6. Storage and General Advice

Do not expose the system to excessive heat or cold. The storage temperature of this device is -40°C ~ +85°C, and the operating temperature is -30°C ~ +70°C.

- Never use this device in environments with excessive moisture, dust or smoke.
- Avoid dropping or striking this device.
- Avoid using this device in enclosed spaces, areas with excessive vibration or subject to severe impacts.
- Never puncture, scratch, or use abrasive cleaning materials on this device.
- Do not place cables where they may be pinched or stepped on.
- The ECU is not designed to be waterproof.

1.7. Operating Precautions

The device may be powered by a 12 or 24 Volt automotive battery or vehicle electrical system.

Make sure all cables are connected properly. Observe polarity. Improper cable connections may damage the system. Remove the power cable connections when you do not intend to use the unit.

⚠ Warning

- Excessive working voltage will damage the equipment.
- If a monitor is used, please only use when necessary to minimise distraction while driving.
- Never try to disassemble this device without professional assistance.

⚠ Caution

- Never try to repair this device by yourself. In case of any problems, please turn off the device at once and notify our company or authorised dealer.
- The device is a complex device. Any disassembly or modification may lead to damage and void the warranty.

1.8. Maintenance

Clean the camera lenses regularly with a soft dry cloth. Do not use solvents or abrasive cleaners. Ensure camera lenses are free from dirt, water spots, and obstructions for optimum AI detection performance.

⚠ Caution — Risk of Electric Shock

- Do not open. To reduce the risk of electric shock:
- Do not remove the cover (or back).
- No user-serviceable parts inside.
- Refer servicing to qualified service personnel.

1.9. Safety Instructions

⚠ Warning

- The case should only be opened by a trained technician.
- Do not watch the video while driving unless you are monitoring the camera image to ensure the vehicle or machine is operating safely.
- This system is a driving aid and does not replace safe driving practices.
- Always observe all road users and surroundings directly.
- Installation must be carried out by a qualified technician in accordance with local regulations.

CAUTION

Any changes or modifications not expressly approved in this manual could void your warranty and necessitate expensive repairs.

1.10. System and Function Description

The BN360-4000AI is an AHD 360° surround view camera system with integrated AI detection capabilities. The system combines four wide-angle cameras to produce a bird's-eye view of the vehicle and its surroundings, while the embedded AI engine performs real-time detection of vulnerable road users (VRUs) including pedestrians, cyclists, and other road users.

The system operates continuously whenever the vehicle ignition is on and provides both visual and audible alerts when VRUs are detected within configurable warning zones.

1.11. Areas of Application and Conditions of Use

The BN360-4000AI surround view system is designed for use on commercial vehicles including trucks, buses, construction equipment, agricultural machinery, and other large vehicles requiring enhanced situational awareness.

- Suitable for vehicles operating in low-speed manoeuvring environments such as loading docks, construction sites, urban delivery, and reversing operations.
- Not intended as a primary collision avoidance system.
- Must be used in conjunction with standard mirror systems and safe driving practices.

1.12. AI Usage Information

System Capabilities and Limitations

AI human form recognition systems assist in identifying people and VRUs within a defined detection range. While these systems provide enhanced visibility, they should not be solely relied upon to detect every person or VRU in every situation. System performance may be affected by:

- Environmental conditions (weather, lighting, visibility)
- Physical obstructions or sensor blockages
- Camera positioning and field of view
- Complex backgrounds or crowded environments
- Speed of vehicle operation
- Clothing or posture of individuals

The AI system provides visual and/or acoustic warnings as an aid to the operator. False negatives (missed detections) and false positives (incorrect detections) may occur. The system does not guarantee detection of all people or obstacles.

Operator Responsibility

When driving or manoeuvring, the vehicle operator remains completely responsible for:

- Making all assessments and decisions for safe operation
- Maintaining continuous attention to surroundings
- Taking every normal precaution when conducting manoeuvres
- Obeying all traffic rules and local regulations
- Using training, judgment, and other safety aids (such as mirrors)

EU AI Act Usage Statement

This system uses AI-based human-form recognition technology and is classified as a non-high risk AI system under Regulation (EU) 2024/1689 (EU AI Act). It is not designed or approved for use as a safety component, nor should it be relied upon to prevent accidents or ensure vehicle safety.

The system is intended only as an auxiliary driver-assistance aid. Operators must not depend on the AI function for safety-critical decisions and must maintain full awareness, supervision, and control at all times in accordance with applicable regulations.

2 Product Features

2.1. Basic Features

The BN360-4000AI surround view system delivers a 360° bird's-eye view of the vehicle in real time, combining feeds from four AHD cameras into a single composite image displayed on the connected monitor.

Feature	Description
Camera Video Signal	AHD (Analogue High Definition) 30fps
No. of Cameras	4 × wide-angle AI cameras (Front, Rear, Left, Right)
Output Resolution	1080P AHD per camera & CVBS (Pal/NTSC)
View Output	360° composite surround view + individual camera views
Display Modes	2D Bird's Eye / 3D Perspective / Single Channel
AI Detection	Human Form Recognition (HFR) / VRU Detection
Warning Zones	Configurable Red Zone and Yellow Zone
Zone Range	1 m to 6 m from vehicle edge (configurable)
Alert Output	Visual overlay + audible buzzer alert
Auto View Switch	Automatic camera selection on trigger signal / AI detection
Power Input	12V / 24V DC automotive
Operating Temp	-30°C ~ +70°C

2.2. Human Form Recognition (HFR) / AI Pedestrian Detection

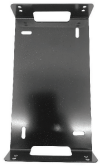
The integrated AI engine performs real-time analysis of the camera feeds to identify pedestrians, cyclists, and other VRUs within the camera field of view. When a VRU is detected, the system highlights the detected subject with a bounding box overlay and activates the configured audio/visual alert.

Detection zones are defined relative to the vehicle outline as calibrated during the system setup process:

- Red Zone (inner): Immediate danger area — highest alert priority. Audible and visual alert activated.
- Yellow Zone (outer): Caution area — VRU approaching. Visual alert and audio activated.
- Zone boundaries are independently adjustable for front, rear, left, and right sides of the vehicle and alerts are configurable.

3 Box Contents

The BN360-4000AI kit should contain the following items. Please check all items are present before commencing installation. If any item is missing, contact your supplier immediately.

		
BN360-4000-ECU	**ECU Side Bracket x 2**	**ECU Rear Bracket**
		
Interface Harness	**Power Cable**	**Cameras x 4**
		
Camera Housing x 4	**IR Receiver**	**Remote Control**
		
View Select Button	**GPS**	**Fixing Kit**

Sold Separately

Item	Model Number / Notes	Part Number
Calibration Mat	BN360-4000-CAL-MAT (4 x Required)	8650
Camera Cables	BN360-H305 (5m)	5812
	BN360-H310 (10m)	5811
	BN360-H315 (15m)	5810
	BN360-H320 (20m)	5809
	BN360-H3025 (25m)	5813

4 Specification

4.1. ECU Product Specification

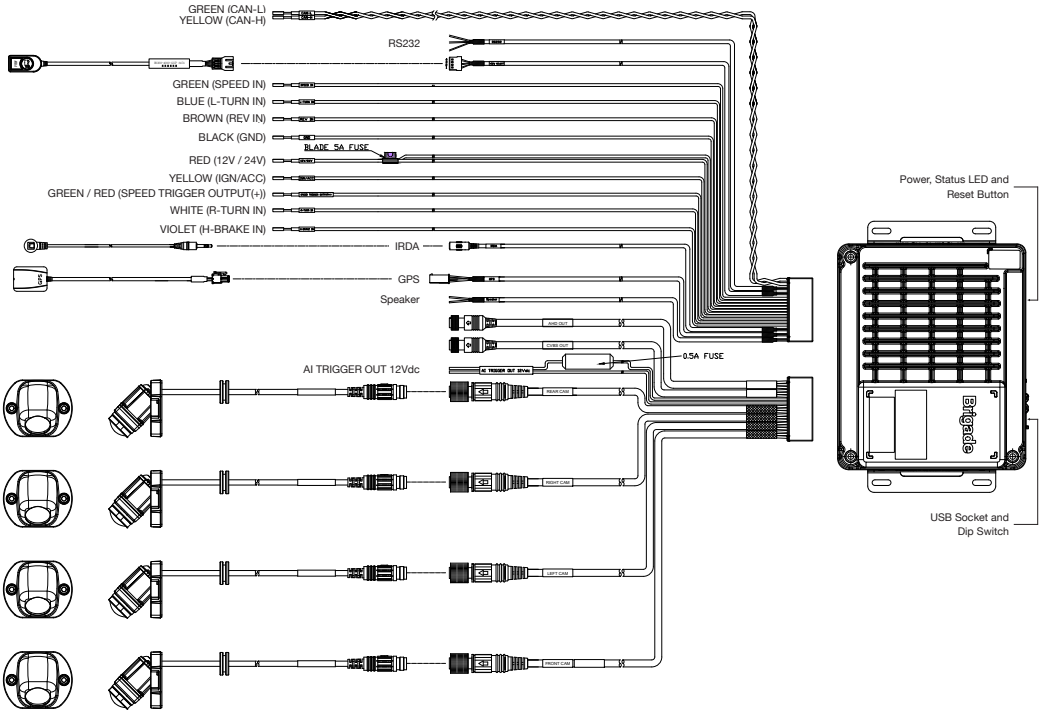
Parameter	Specification
Input Video	4 × AHD 1080P camera inputs
Display Mode	2D / 3D surround view
AHD Output	1080P (25/30 fps)
CVBS Output	NTSC / PAL
Operating Voltage	12V / 24V DC
Operating Temperature	-30°C ~ +70°C
Storage Temperature	-40°C ~ +85°C
Dimensions (W×H×D)	180 x 150 x 40 mm
Weight	900g
Waterproof Rating	IP30
Certifications	CE/FCC/ICES, E-mark R-10, Emark R46

4.2. Camera Specification

Parameter	Specification
Frame Rate	30 fps
Resolution	1920 (H) × 1080 (V)
Video Output	AHD 1080P
Viewing Angle	190 (H) x 125 (V)
Power Supply	12V (via ECU cable)
Operating Temperature	-30°C ~ +75°C
Storage Temperature	-40°C ~ +85°C
IP Rating	IP69K
Dimensions	60 x 50 x 40mm
Cable Length	1000mm

5 System Diagram

The diagram below shows the typical wiring topology for the BN360-4000AI system. Each camera connects to the ECU via its AHD cable. The ECU connects to the display monitor and receives power from the vehicle supply. A trigger input wire enables automatic view switching when the vehicle reverses, turns, or activates other manoeuvre signals.



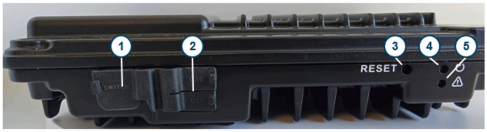
Component	Connection
Front Camera	ECU — Camera Input 1 (AHD cable)
Rear Camera	ECU — Camera Input 2 (AHD cable) + Reverse trigger
Left Camera	ECU — Camera Input 3 (AHD cable) + Left turn trigger
Right Camera	ECU — Camera Input 4 (AHD cable) + Right turn trigger
Monitor	ECU — AVD/CVBS video output
Power	ECU — 12V/24V DC from vehicle fused supply
IR Receiver	ECU — IR input port
USB Port	ECU — USB-A port for firmware update / calibration export

5 System Diagram Continued

ECU Peripheral and connectives

BN360-4000AI ECU — Ports, Indicators, Connectors & DIP Switch Functions

SERVICE SIDE — PORTS & INDICATORS



1. **DIP switch cover** (SW1–SW3)
2. **USB ports** (x2)
3. **RESET pin hole**
4. **Power indicator LED**
5. **Warning LED (yellow)** fault status

CONNECTOR SIDE — CABLE INTERFACES



6. **8475 BN360-4000-VIO** Backeye 360 Interface Harness
7. **8476 BN360-4000-PIO** Backeye 360 Power Input Output Cable

Accessing the DIP switches: the SW1–SW3 bank sits behind the sealed cover marked "SWITCH" (item 1). Refit and re-seal before returning the unit to service.

DIP SWITCH FUNCTIONS

Model	DIP Switch	Feature
Micom Update (USB download)	SW1 = ON	
AP Update (PC download)	SW2 = ON	
OUTPUT CVBS (NTSC) (AHD 30FPS)	SW3 = OFF	
OUTPUT CVBS (PAL) (AHD 25FPS)	SW3 = ON	

WARNING LED (YELLOW) — FAULT STATUS

Yellow LED state	Indication
OFF	No fault present — normal operation
Steady ON	GPS signal loss
Slow flash (1 s)	Calibration failure / system not calibrated
Rapid flash (0.3 s)	Video signal loss

6 Camera Installation Instructions

6.1. Camera Position

For optimal surround view performance, cameras must be mounted at the mid-point of each side of the vehicle (front centre, rear centre, left-side mid-point, right-side mid-point). All four cameras should be mounted at the same height from the ground (and recommended between 2.0m to 3.5m).

- Mount cameras at approximately the same height on all four sides.
- Position each camera at the horizontal midpoint of its respective side.
- Ensure the camera lens faces perpendicular to the vehicle side (not angled).
- Avoid mounting positions obstructed by external accessories, mud flaps, or body panels.



Camera mounting position diagram — top-down vehicle view showing recommended camera positions.

6.2. Camera Installation

1. Select a suitable mounting location on the vehicle body that provides an unobstructed forward/rearward/side view.
2. Drill mounting holes as required and fit the camera bracket. Ensure the bracket is secure and watertight.
3. Connect the camera AHD cable and route it to the ECU, keeping cables away from heat sources and moving parts.
4. Adjust the camera downward tilt angle so the vehicle body edge is visible in the lower portion of the camera image. See Section 6.4.
5. Secure all cables with cable ties. Ensure cables cannot contact any moving parts.

6.3. ECU Installation

6. Select a mounting location for the ECU in the vehicle cab or equipment enclosure. The ECU must be protected from direct water ingress.
7. Mount the ECU securely using the provided brackets or appropriate hardware.
8. Connect all four camera AHD cables to the ECU camera input ports (label each cable before routing for easy identification).
9. Connect the ECU power cable to the vehicle fused 12V/24V supply. Observe polarity.
10. Connect the ECU video output to the monitor.
11. Connect trigger wires for reverse and turn signal inputs as required.
12. Connect the IR receiver to the ECU IR port if using the remote control.

6.4. Adjustment of Camera Viewing Angles

After initial mounting, the camera viewing angle may need adjustment to ensure the vehicle body edge is correctly positioned within the camera image. This is a prerequisite for accurate surround view calibration.

- The vehicle body edge (bumper / side skirt) should appear in the lower 20–30% of the camera image.
- The camera image should be level (horizon line horizontal).

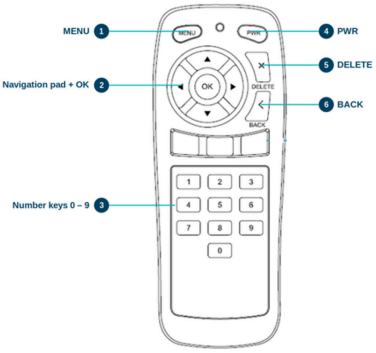
7 Remote Control Operating Instructions

The BN360-4000AI system includes an IR remote control for menu navigation and system configuration. The table below describes the function of each button.

Remote Control

Handset used to open the settings menu, move through the menus and enter numeric values during setup and calibration.

HANDSET LAYOUT



WHERE IT IS USED

- Enter the settings menu — press MENU, then key in the password.
- Move through menus and change values — arrow keys and OK.
- Enter vehicle dimensions, margins and passwords — number keys.
- Place manual calibration points — arrows to move, OK to fix.

BUTTON FUNCTIONS

Button	Function
MENU	Opens and closes the main settings menu, and steps back to the previous screen.
▲ Up	Moves up the menu, or increases the selected value.
▼ Down	Moves down the menu, or decreases the selected value.
◄ Left	Moves left, or decreases the selected value.
► Right	Moves right, or increases the selected value.
OK	Confirms the selection, or opens the highlighted sub-menu.
0 – 9	Direct numeric entry — vehicle dimensions, margins and password digits.

USING A MOUSE INSTEAD

- Left click opens the menu, the same as pressing MENU.
- Right click steps back, and releases a selected calibration point.
- Clicking a numeric field brings up an on-screen keyboard.
- A mouse is quicker for rough positioning; the arrow keys give finer movement.

Remove the rear cover to install a CR2025 battery. Battery not included.

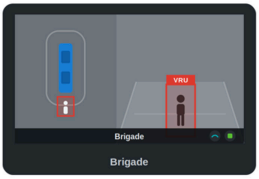
7 Remote Control Operating Instructions Continued

AI Detection strategy

How BN360-4000AI VRU detection works

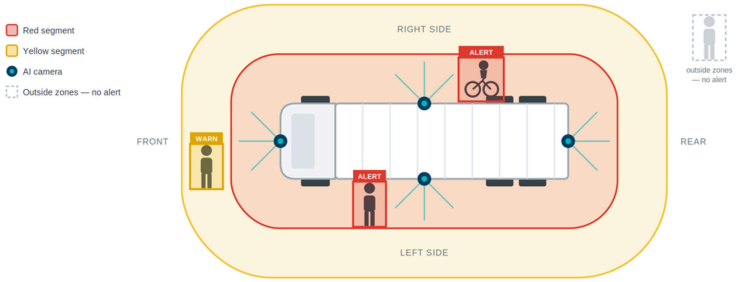
Eight detection segments · smart buzzer strategy by vehicle state · default configuration

WHAT THE DRIVER SEES



Road users inside a live segment are boxed on the display.
VRU in a red segment → main view switches to that camera.
Indicator or reverse trigger → view switches to that direction.

DETECTION ZONES — PLAN VIEW



SEGMENT BEHAVIOUR BY VEHICLE STATE — DEFAULT "SMART" CONFIGURATION

Vehicle state	RED SEGMENTS — 1 m from vehicle · harsh alert				YELLOW SEGMENTS — out to 3 m · soft alert			
	A · front	B · left	C · right	D · rear	E · front	F · left	G · right	H · rear
Stationary	BUZZER · 5 s	BUZZER · 5 s	BUZZER · 5 s	BUZZER · 5 s	OFF	OFF	OFF	OFF
Moving straight	BUZZER	BUZZER	BUZZER	DETECT	BUZZER	DETECT	DETECT	DETECT
Left indicator	BUZZER	BUZZER	BUZZER	BUZZER	BUZZER	BUZZER	OFF	OFF
Right indicator	BUZZER	BUZZER	BUZZER	BUZZER	BUZZER	OFF	BUZZER	OFF
Reverse / hazard	BUZZER	BUZZER	BUZZER	BUZZER	BUZZER	BUZZER	BUZZER	BUZZER

BUZZER = detection with audible alert · DETECT = detection shown, no audible alert · OFF = segment inactive · 5 s = timed buzzer while stationary.
Each segment can be switched on or off individually; distance is set per segment (AI Off, or 1 m to 6 m) and the buzzer per segment (Off / On / Smart). Corner blending areas follow the side on which the detection occurred.

WHAT IT DOES

- Analyses the four fisheye camera feeds for vulnerable road users — pedestrians and cyclists — around the vehicle.
- Each camera channel is assessed independently; the ring around the AI icon shows the state of each one.
- Detections are reported by on-screen highlight, audible alarm and, optionally, an external output.

WHEN IT IS ACTIVE

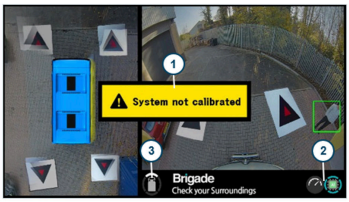
- Active only while road speed is above 0 and below the AI Deactivation Speed set in SETTING > AI.
- Above that limit the icon changes to AI pause and alerts are suppressed.
- Speed comes from GPS or SpeedPulse — the speed icon shows which source is in use.
- Alerts can also be muted on the parking brake, or timed out when stationary.

HOW THE DRIVER IS ALERTED

- Detection highlighted on the live view.
- Audible alarm at the volume set in SETTING > AI (Off / Low / Medium / High).
- Automatic screen switch to the relevant camera when a human figure is detected.
- AI Trigger Out can drive an external buzzer or beacon through the AI TRIGGER OUT cable.

8 Operation of Menu Interface

LIVE SVM DISPLAY



1. "System not calibrated" warning banner
2. Speed source + VRU (AI) status icons
3. View status indicator and branding bar

VIEW STATUS INDICATOR

Front view | Rear view | Left view | Right view

VIEW KEY BOX



Change view — steps through the 5 views configured in SETTING > VIEW > View Select

Change 3D transparency — cycles the 3D vehicle model transparency; default set in SETTING > SYSTEM

VRU (AI) STATUS ICON

AI off — VRU detection is switched off, or every AI camera channel is disabled.

AI on — VRU detection is running — vehicle speed is below the deactivation limit.

AI pause — One or more channels are enabled but road speed is above the deactivation limit.

Channel ring — Segment ring around the icon shows the detection status of each camera.

SPEED SOURCE ICON

GPS off, SpeedPulse not connected — no speed source available.

GPS inactive, SpeedPulse not connected — searching for a fix.

GPS active, SpeedPulse not connected — speed taken from GPS.

SpeedPulse connected — speed taken from the vehicle signal.

Speed is above the AI deactivation limit set in SETTING > AI.

Live view: the banner, the speed icon and the VRU icon are the only elements shown over the camera image during normal driving.

8.1. User Administration Login

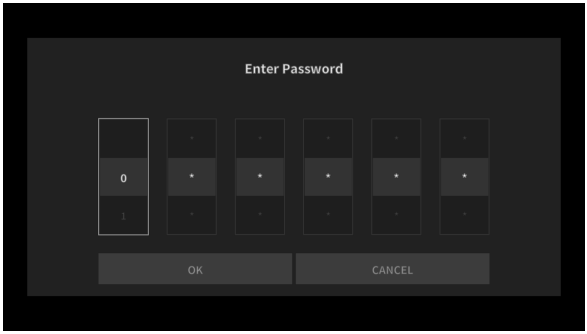
To access the settings menu and configuration options, press the MENU button on the remote control. A password entry screen will be displayed.

a) Press MENU on the remote control.

b) Use the arrow keys to enter the system password. Default password: “111111”.

c) Press OK to confirm the password and enter the main menu.

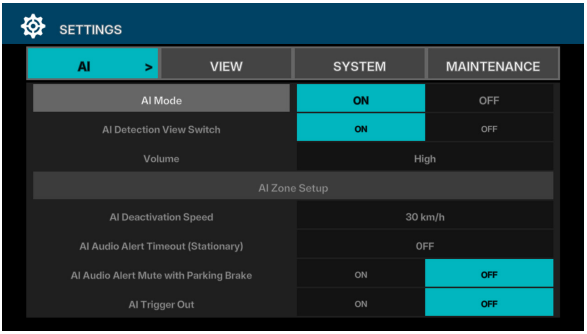
If an incorrect password is entered, the system will allow up to five (5) attempts. The screen will remain on the password entry page and will not return to the main display until all five attempts have been used. Contact your supplier if the password is not known.



Password entry screen - menu interface screenshot

9 Main Menu Interface

The main menu provides access to all system configuration options. It is organised into three top-level icons: Settings, Calibration, and Info. Accessing Settings opens a tabbed interface with four tabs: AI, VIEW, SYSTEM, and MAINTENANCE.



Main menu — Settings, Calibration and Info icons

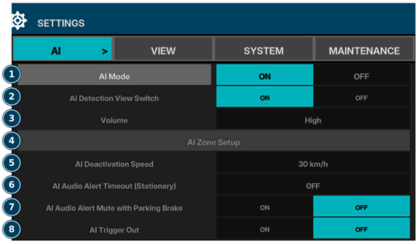
9.1. AI Setup — AI Tab

The AI tab controls all AI detection and alert behaviour. Select Settings from the main menu to open this tab.

AI Setup — AI tab

SETTING > AI — switches VRU detection on and off, sets the alert volume and behaviour, and the road speed above which detection is suspended.

THE AI TAB



Eight rows. AI Zone Setup opens a sub-menu; the rest are set directly on this screen.

RELATED SETTINGS ON OTHER TABS

- **Detection Zone Overlay** — draws the zones on screen (SYSTEM, installer use).
- **Speed Trigger Output** — speed-based output signal (SYSTEM).
- **Driver Position** — affects the side on which alerts are laid out (SYSTEM).

PARAMETERS

#	Parameter	Description
1	**AI Mode** ON / OFF	Enables or disables all AI detection. With AI Mode OFF there is no VRU detection and no alerts of any kind.
2	**AI Detection View Switch** ON / OFF	Automatically switches the display to the camera in which a road user has been detected.
3	**Volume** OFF / Low / Medium / High	Volume of the audio alert. OFF silences the alert; the on-screen warning still appears.
4	**AI Zone Setup** Sub-menu	Opens the detection distance and buzzer setup for each side of the vehicle. See the AI Zone Setup section.
5	**AI Deactivation Speed** Speed value	Road speed above which detection is suspended, to prevent nuisance alerts at road speed.
6	**AI Audio Alert Timeout (Stationary)** OFF, or a duration	With the vehicle stationary and a road user still in zone, the audio alert stops after this time. OFF keeps it sounding.
7	**AI Audio Alert Mute with Parking Brake** ON / OFF	Silences the audio alert while the parking brake is applied. Requires the parking brake cable to be connected.
8	**AI Trigger Out** ON / OFF	Enables or disables the external trigger output (buzzer or beacon) fired when the AI detects a road user.

Speed source AI Deactivation Speed needs GPS or SpeedPulse. Where no valid speed is available, detection stays active — it is suspended only when a measured speed above the limit is present.

Settings — AI tab overview showing all AI configuration parameters

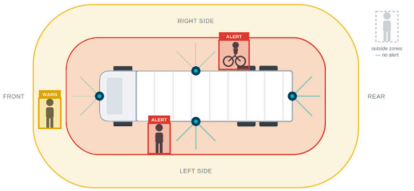
9 Main Menu Interface Continued

9.2. AI Zone Setup

AI Zone Setup

SETTING > AI > AI Zone Setup — detection distance and buzzer set independently for each side of the vehicle. All distances are measured from the vehicle body.

WHAT THE ZONES ARE

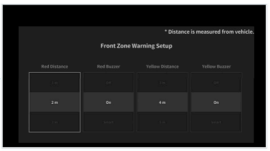


Red inner zone and Yellow outer zone, set separately for front, rear, left and right.

WHERE THEY ARE SET



One row per side. Enable turns that side on or off; Distance and Buzzer per zone.



Highlight a direction and press OK to open its Zone Warning Setup selector.

PARAMETERS

Parameter	Range / options	Description
Enable	AI On / AI OFF	Turns AI detection on or off for this side of the vehicle. When set to AI OFF, the Red and Yellow settings for that direction are greyed out.
Red Distance *	1 m to 6 m, or OFF	Inner danger zone measured from the vehicle body. Select OFF to disable the Red zone for that direction.
Red Buzzer	On / Off / Smart	Audible alert for the Red zone. Smart sounds the buzzer only when the road user is moving closer to the vehicle.
Yellow Distance *	1 m to 6 m	Outer caution zone measured from the vehicle body. Must not be less than the Red distance.
Yellow Buzzer	On / Off / Smart	Audible alert for the Yellow zone. Smart sounds only when the road user is moving closer and the vehicle is moving.

Validation The Red distance must never be greater than the Yellow distance. If a larger Red value is entered the system shows "RED cannot be longer than YELLOW" and the change is not saved.

* Distance is measured from the vehicle.

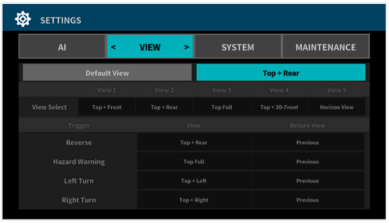
9.3. Display Mode Setup — VIEW Tab

The VIEW tab configures which camera views are available, the startup view, and the automatic view switching behaviour when trigger signals are received.

Display Mode Setup — VIEW tab

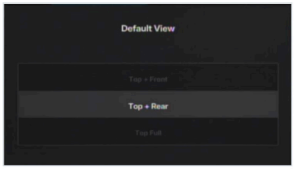
SETTING > VIEW — sets which camera views are available, the view shown at start-up, and the automatic view switching used when a trigger signal is received.

THE VIEW TAB



Default View, the five View Select slots, and the four trigger rows with their Return View setting.

SELECTOR SCREENS — HIGHLIGHT A FIELD AND PRESS OK



Default View — scroll the list to pick the start-up view.



View Select — assign a view mode to each of the five slots.

PARAMETERS

Parameter	Range / options	Description
Default View	Any available view mode	The view shown when the system powers on, and the view returned to after a triggered view ends.
View Select (1–5)	Any available view mode	Five view slots cycled with the View Select button on the key box. Each slot can be assigned any available view.
Trigger — Reverse	Any view mode	Shown automatically when the reverse signal is detected. Return View set to Previous restores the prior view.
Trigger — Hazard Warning	Any view mode	Shown while the hazard lights are activated (L-TURN IN and R-TURN IN together).
Trigger — Left Turn	Any view mode	Shown while the left indicator is active (L-TURN IN).
Trigger — Right Turn	Any view mode	Shown while the right indicator is active (R-TURN IN).

9 Main Menu Interface Continued

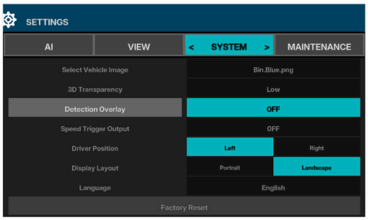
9.4. System Setup — SYSTEM Tab

The SYSTEM tab contains global display and system configuration options, including vehicle model selection, detection zone overlay, driver position, display orientation, language, and factory reset.

System Setup — SYSTEM tab

SETTING > SYSTEM — vehicle model, display options, trigger output, driver position, language and factory reset.

THE SYSTEM TAB



Eight rows. Factory Reset sits at the foot of the list.

SELECT VEHICLE IMAGE — FILE BROWSER



Root folder — open 2DModels for a flat silhouette, 3DModels for a 3D model.



Model list with preview on the right. Highlight Save and press OK to apply.

PARAMETERS

Parameter	Range / options	Description
Select Vehicle Image	File browser — 2D or 3D model	Chooses the vehicle overlay drawn on the surround view. Selecting a 2D model disables all 3D view modes.
3D Transparency	OFF / Low / Medium / High	Transparency of the 3D vehicle model in the 3D views.
Detection Overlay	ON / OFF	Draws the configured AI detection zones over the live image. For installer use — switch off before handover.
Speed Trigger Output	ON / OFF	Output that operates while road speed is above 0 and below the set limit.
Driver Position	Left / Right	Set to match the driver position of the vehicle.
Display Layout	Portrait / Landscape	Orientation of the monitor image. Set to match how the display is mounted in the cab.
Language	Language list	On-screen menu and warning language.
Factory Reset	—	Resets all configuration and calibration to defaults and restarts the system. This cannot be undone.

2D and 3D models Selecting a 2D vehicle image disables every 3D view mode, including Top + 3D-Front and Top + 3D-Rear. To restore them, return to Select Vehicle Image and choose a model from the 3DModels folder.

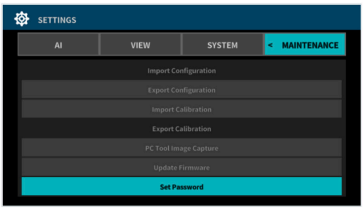
9.5. Maintenance — MAINTENANCE Tab

The MAINTENANCE tab provides access to configuration import/export, calibration import/export, image capture for the PC Setup Tool, firmware update, and password management.

Maintenance — MAINTENANCE tab

SETTING > MAINTENANCE — configuration and calibration transfer, PC tool image capture, firmware update and password management.

THE MAINTENANCE TAB



Seven maintenance functions. Items turn grey once the required USB data is present.

BEFORE YOU START

- Ensure the USB drive is formatted to FAT32 before use.
- Insert a USB drive into the ECU before using any import, export, capture or firmware function. The USB icon appears at the top right once a compatible drive is detected.
- A menu item stays black until a USB carrying the relevant data is connected; it then turns grey and can be selected. Export Calibration becomes available only after calibration has been completed.
- Do not remove the USB drive or switch off the power while a transfer is running. Wait for the "Safe to pull out USB" message before removing the drive.
- Except for Set Password, the system restarts when the USB drive is disconnected.

FUNCTIONS

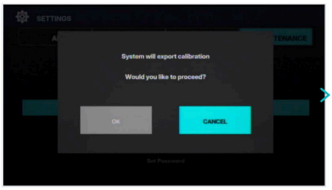
Function	Description
Import Configuration	Loads a full settings profile (AI, VIEW and SYSTEM tabs) from USB. Useful for applying one set of settings across a fleet.
Export Configuration	Saves the current settings profile to USB. The Detection Zone Overlay setting is not included in the exported file.
Import Calibration	Loads calibration data from USB. Valid only on a vehicle with the same camera positions, viewing angles and dimensions.
Export Calibration	Saves the current calibration to USB. Available only once calibration has been completed.
PC Tool Image Capture	Captures camera images to USB for use with the external PC Calibration and Configuration Tool.
Update Firmware	Updates the system firmware from USB. Active only when a USB carrying firmware is connected. Unzip the firmware file and copy the unzipped folder to the root directory of the USB drive — do not change the existing folder structure.
Set Password	Changes the six-digit user password. The only function that does not require a USB drive.

9 Main Menu Interface Continued

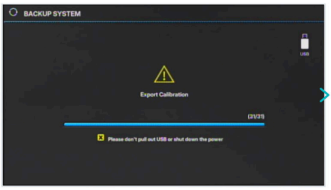
Maintenance — Export and Import Calibration

Calibration data can be saved to a USB drive and restored onto another vehicle with the same camera positions, viewing angles and dimensions.

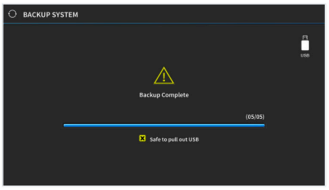
EXPORT CALIBRATION — SAVE TO USB



1 Highlight Export Calibration and press OK. Confirm at the prompt.

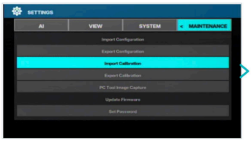


2 BACKUP SYSTEM shows the transfer running. Do not remove the USB or power down.

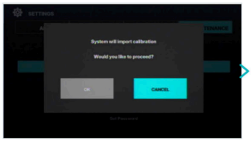


3 Backup Complete — safe to remove the USB.

IMPORT CALIBRATION — RESTORE FROM USB



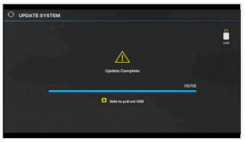
1 Highlight Import Calibration.



2 Confirm at the prompt.



3 UPDATE SYSTEM shows progress.



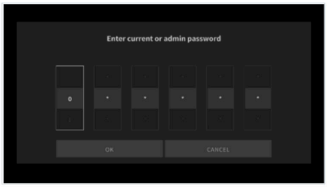
4 Update Complete — remove the USB.

Warning Do not remove the USB drive or switch off the power while a transfer is running. Wait for the "Safe to pull out USB" message. Except for Set Password, the system restarts when the USB drive is disconnected.

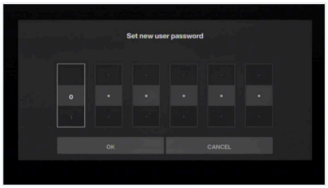
Maintenance — Set Password

SETTING > MAINTENANCE > Set Password — changes the six-digit password used to enter the settings menu.

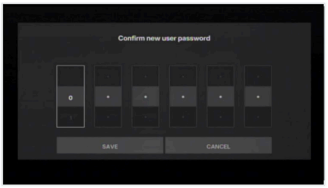
SCREEN SEQUENCE



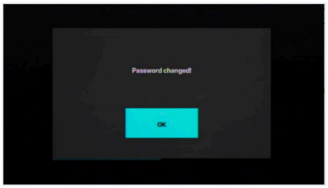
1 Enter the current or admin password.



2 Set new user password — enter the new six digits.



3 Confirm new user password — re-enter, then Save.



4 "Password changed!" confirms the change.

PROCEDURE

1. Select Set Password and press OK.
2. Enter the current or admin password.
3. Enter the new six-digit password.
4. Re-enter it to confirm, then Save.
5. "Password changed!" confirms the change.

IF THE PASSWORD IS LOST

Five consecutive incorrect entries lock the unit. The screen then asks for a reset password, which must be obtained from Brigade Electronics. Record the new password securely before handing the vehicle over.

NO USB REQUIRED

Set Password is the only maintenance function that does not need a USB drive, and the only one that does not restart the system afterwards.

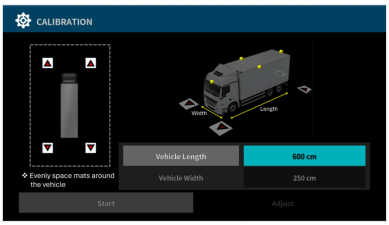
10 System Calibration

10.1. Overview

Calibration is the process of aligning the four camera images to form an accurate, seamless 360° surround view. The BN360-4000AI uses an automatic pattern recognition calibration method based on four triangular pattern calibration mats placed around the vehicle. To achieve optimal auto calibration, it is recommended to position the calibration mats level with the front and rear cameras during setup. Use the on-screen display to help with this alignment.

Calibration must be performed after initial installation, after any camera is repositioned or replaced, after the ECU is replaced, or if the surround view image shows visible misalignment.

CALIBRATION MENU



Mat layout guide, vehicle dimensions, and the Start and Adjust buttons.

MAT PLACEMENT

PLACEMENT RULES

- One mat at each corner — front-left, front-right, rear-left and rear-right.
- Each mat must be visible to both adjacent cameras at the same time.
- Distance from the side edge (D1) must equal the distance from the front or rear edge (D2).
- Typically 1.0 m to 1.5 m from the corner — follow the on-screen guidance.
- Flat, level ground only. Do not calibrate on a slope or an uneven surface.
- The whole pattern must sit inside the yellow ROI box for its camera.
- Even lighting. Avoid direct sunlight glare on the mats.

VEHICLE DIMENSIONS

Parameter	Range	Notes
Vehicle Length	100 – 1600 cm	Overall length, bumper to bumper
Vehicle Width	100 – 300 cm	Overall width, including mirrors where fitted

A value above the maximum wraps back round — re-enter it. Press OK to confirm each entry.

ENTERING THE CALIBRATION MENU

1. Park on level ground and place the four mats.
2. Press MENU on the remote and enter the password.
3. Select CALIBRATION on the main menu.
4. Enter the vehicle length and width, then Start.

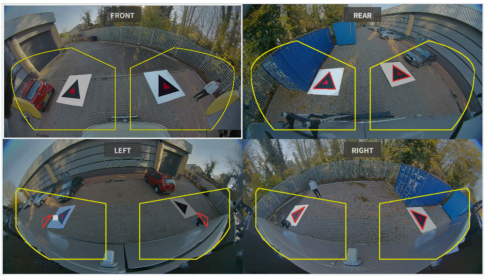
WARNING

Calibration must only be carried out by a trained installer, on level ground, with the vehicle stationary.
Keep the area around the vehicle clear of people and obstacles, and do not move the vehicle or the mats during the process.

System Calibration — automatic pattern detection

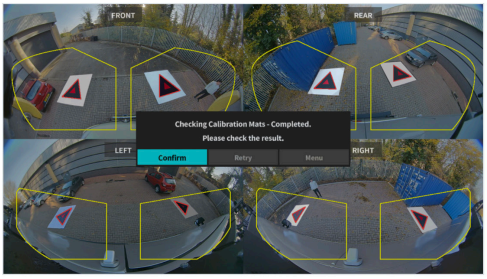
The system checks all four cameras for the triangular patterns and draws red lines on each pattern it finds. The installer confirms the result visually.

BEFORE STARTING — MATS INSIDE THE YELLOW ROI



Each camera sees two mats. The whole pattern must lie inside the yellow outline.

AFTER THE CHECK — PATTERNS DETECTED



Red lines are drawn on every triangle the system has detected.

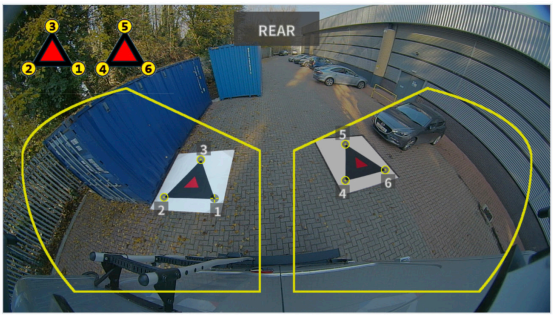
PROCEDURE

1. Check every mat sits inside the yellow ROI box for its camera.
2. Select Start and press OK. All four cameras are checked in turn.
3. "Checking Calibration Mats – Completed" appears when the pass finishes.
4. Check that the red lines sit on the triangle edges in all four views.
5. Select Confirm to save, Retry to run the check again, or Menu to go back.

If a camera fails the system names the camera that could not find its pattern. Check the mat position, lighting and the ROI box for that camera, then Retry. If it still fails, use manual calibration — see the next slide. There is no per-camera pass or fail indicator during the check; the result is confirmed visually from the red lines.

10 System Calibration Continued

MANUAL CALIBRATION — REAR CAMERA SHOWN



The legend at the top of the screen shows the numbering; the yellow markers are the points placed on the image.

Positioning a mouse is the quickest way to place a point roughly; the remote arrow keys then give the fine movement. Right-click or press OK again to release a selected point.

POINT NUMBERING

- Three points per mat — the three corners of the triangle.
- Two mats are visible per camera, so six points in all.
- Left mat: 1 bottom-right, 2 bottom-left, 3 apex.
- Right mat: 4 bottom-left, 5 apex, 6 bottom-right.
- Follow the numbered order shown in the legend.

PROCEDURE

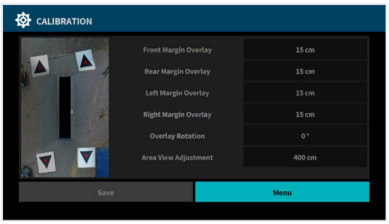
1. Select the camera that failed and press OK.
2. The camera view opens with the numbered targets.
3. Move the cursor onto each triangle corner in order.
4. Press OK to fix each point.
5. Repeat for every camera that failed.
6. Select Confirm to continue, or Retry to redo the points.

Accuracy place each marker on the corner of the black triangle, not the white mat edge.

System Calibration — adjustment page

Fine-tunes the stitched view after calibration. Changes are previewed immediately and committed with Save.

ADJUSTMENT PAGE



Live preview on the left, parameter list on the right, Save and Menu at the foot.

PARAMETERS

Parameter	Range	Description
Front Margin Overlay	−50 to +300 cm	Position of the front edge overlay relative to the bumper.
Rear Margin Overlay	−50 to +300 cm	As above, for the rear of the vehicle.
Left Margin Overlay	−50 to +300 cm	As above, for the left side.
Right Margin Overlay	−50 to +300 cm	As above, for the right side.
Overlay Rotation	−10° to +10°	Corrects an image that appears twisted or skewed.
Area View Adjustment	0 to 800 cm	Zoom of the bird's-eye view. 0 behaves the same as 400 cm.

Adjusting the front or rear view also adjusts the left and right sides accordingly.

WHICH PARAMETER TO CHANGE

Symptom	Adjustment
Black box doesn't reach the front of the vehicle	Decrease Front Margin Overlay
Black box extends past the front of the vehicle	Increase Front Margin Overlay
Black box doesn't reach the rear of the vehicle	Decrease Rear Margin Overlay
Black box doesn't reach the side of the vehicle (including mirrors)	Decrease Left or Right Margin Overlay
Stitched footage looks tilted around the black box	Adjust Overlay Rotation
Too little area shown around the vehicle	Increase Area View Adjustment
Too much area shown, vehicle looks small	Decrease Area View Adjustment
Visible seam where two camera views meet	Fine-tune the margin overlays on the affected sides
Black box doesn't match vehicle outline on multiple sides	Adjust all four margin values symmetrically

Saving press OK after each change to regenerate the preview. When the view is correct, select Save. The system restarts to apply the calibration and returns to the surround view automatically.

10.2. Calibration Validation

Once calibration has completed, the detection and alert behaviour must be validated before the vehicle is returned to service.

This test requires two people: one person in the driver's seat, and a second person walking around the vehicle through each detection zone (front, rear, left, right) to confirm the system reliably detects them and raises the correct alert.

If the handbrake trigger is connected, the handbrake must be released and the footbrake held depressed for the duration of this test. The alert suppression interlock is tied to the handbrake/parking brake signal — if the handbrake trigger is wired and the handbrake is applied, the system will suppress alerts and the walk-around will not properly validate detection. The driver instead holds the vehicle stationary using the footbrake, which does not trigger the suppression interlock, allowing alerts to be tested normally while still keeping the vehicle safely from rolling.

Two things to check specifically during this test:

Handbrake interlock (if wired): If the handbrake trigger is connected and the handbrake is engaged, the system will suppress alerts even if a person is walking through a detection zone — this is expected interlock behaviour, not a detection fault. Confirm whether the handbrake trigger is connected before the test; if it is, release the handbrake and use the footbrake to hold the vehicle stationary. Check the brake input status on the SYSTEM tab (or via the PC Setup Tool) if alerts appear to be suppressed unexpectedly.

Alert timer duration: If an alert timer is configured, the audible/visual alert may only sound briefly and then stop even while the person remains in the zone. This is expected behaviour tied to the timer setting, not a detection failure — confirm the alert fires on initial entry into the zone, and adjust the timer setting if a longer or continuous alert is required.

The driver must keep the footbrake fully depressed for the full duration of the walk-around test, releasing the handbrake first if its trigger is connected.

11 Troubleshooting

This section addresses common questions and issues that may arise during installation, calibration, and everyday operation of the BN360-4000AI.

Q: What should I do if calibration fails or does not complete successfully?

Before re-running calibration, confirm the prerequisite camera viewing angle adjustment has been completed (see Section 6.4): the vehicle body edge should appear in the lower 20–30% of each camera image, and each image should be level with the horizon line horizontal. Check that all four calibration mats are correctly and squarely positioned around the vehicle, that camera lenses are clean and free from dirt, water spots, or obstructions, and that no camera has been repositioned since the last successful calibration. Once these checks are complete, restart the calibration process from the Calibration icon on the main menu.

Q: How do I run pre-calibration, or import/export calibration data, using a PC or fleet management setup tool?

The ECU provides a USB-A port (see the System Diagram in Section 5) for firmware updates and calibration export. The MAINTENANCE tab of the Settings menu (Section 9.5) provides access to configuration import/export, calibration import/export, and image capture for use with the PC Setup Tool. Connect a PC to the ECU via the USB port, then use the MAINTENANCE tab options to export the current calibration or capture images for review before deploying the configuration across a fleet.

Q: How do I fix the camera blending or viewing angle before calibration?

Adjustment of the camera viewing angle is covered in Section 6.4 and is a prerequisite for accurate surround view calibration. The vehicle body edge (bumper / side skirt) should appear in the lower 20–30% of the camera image, and the image should be level, with the horizon line horizontal. Correcting the tilt angle before calibration prevents poor blending between adjacent camera views in the final 360° composite image.

Q: What camera cable lengths are available, and how should cabling be routed and secured?

Camera cables (sold separately, see Section 3) are available in 5m, 10m, 15m, 20m, and 25m lengths (BN360-H305 / H310 / H315 / H320 / H3025). When installing, route cables away from heat sources and moving parts, keeping them clear of pinch points or areas where they could be stepped on, and secure them with cable ties (Section 6.2). Label each cable before routing to the ECU so camera inputs can be identified correctly during installation (Section 6.3).

Q: The surround view image shows visible misalignment after installation — what does this mean?

Visible misalignment in the composite image means calibration is required. As described in Section 10.1, calibration must be performed after initial installation, after any camera is repositioned or replaced, after the ECU is replaced, or whenever the surround view image shows visible misalignment.

11 Troubleshooting Continued

Q: One or more cameras show no video, a poor image, or a discoloured picture — what should I check?

Check that the AHD camera cable is connected securely to the correct labelled input port on the ECU (Section 6.3), and that camera lenses are clean and free from dirt, water spots, or obstructions (Section 1.8). Confirm the camera and ECU are operating within their rated temperature ranges (camera: -30°C ~ +75°C; ECU: -30°C ~ +70°C, Sections 4.1–4.2), and that the camera is mounted with an unobstructed view, not blocked by mud flaps, body panels, or external accessories (Section 6.1).

Q: The system is missing pedestrian/VRU detections or producing false alerts — is this normal?

As set out in Section 1.12, the AI system provides visual and/or acoustic warnings as an aid only, and does not guarantee detection of all people or obstacles. Both false negatives (missed detections) and false positives (incorrect detections) may occur. Detection performance can be affected by environmental conditions (weather, lighting, visibility), physical obstructions or sensor blockages, camera positioning and field of view, complex or crowded backgrounds, vehicle speed, and the clothing or posture of individuals (Section 1.5). The operator must remain fully responsible for safe operation at all times and must not rely solely on the AI system.

Q: I have forgotten the menu password, or the system won't accept it — what happens?

As described in Section 8.1, the system allows up to five (5) password attempts. The password entry screen will remain displayed and will not return to the main view until all five attempts have been used. If the password is not known, contact your supplier.

Q: The camera view does not switch automatically when reversing or turning — what should I check?

Automatic view switching relies on trigger wire connections for the reverse, left turn, and right turn signals, as shown in the System Diagram (Section 5) and connected during ECU installation (Section 6.3). Confirm each trigger wire is connected to the correct vehicle signal, and that the corresponding view-switch behaviour is enabled and configured correctly in the VIEW tab of the Settings menu (Section 9.3).

Q: What environmental conditions can affect detection accuracy or calibration quality?

System performance may be affected by weather, lighting and visibility conditions, physical obstructions or camera blockages, camera positioning and field of view, complex or crowded backgrounds, relative speed and motion between the vehicle and VRUs, and the clothing, posture, or physical characteristics of individuals (Section 1.5). The system should also be kept within its rated operating temperature range (-30°C ~ +70°C for the ECU, -30°C ~ +75°C for cameras) and away from excessive moisture, dust, or smoke (Section 1.6).

Q: Can the BN360-4000AI be relied on as a standalone collision-avoidance system?

No. As stated in Section 1.11, the system is not intended as a primary collision avoidance system. It must be used in conjunction with standard mirror systems and safe driving practices, and the operator remains fully responsible for safe manoeuvring at all times (Section 1.12).

Q: I have replaced a camera or the ECU — do I need to recalibrate?

Yes. Section 10.1 states that calibration must be performed after initial installation, after any camera is repositioned or replaced, after the ECU is replaced, or if the surround view image shows visible misalignment.

11 Troubleshooting Continued

Q: Can I cut the grommet off the camera cable?

Yes, a grommet should be fitted wherever the camera cable passes through a drilled or cut hole, to protect it from sharp edges and prevent chafing damage over time. If you choose to cut or drill a hole that isn't pre-fitted with a grommet, this is done at your own responsibility, and the hole should be suitably deburred and fitted with a grommet before routing the cable through it.

Q: Where can I install the ECU?

There is an option to use either the rear or the side mounting bracket. The rear mounting bracket can be used where space is very tight. Installation should be carried out by an experienced fitter. The ECU is designed to be mounted inside the cabin, away from any heat and moisture.

Q: How do I connect to the MDR?

To record the individual cameras on the MDR, use the same setup as the Select AHD 360 with MDR-644, using the differential pair cable (AC-H305).

To record the BN360-4000 output, connect it directly to an analogue input on the MDR. Alternatively, the output can be split between the MDR input and the monitor input using a suitable splitter adapter cable.

12 Disclaimer

Our products are supplied to serve as situational awareness and/or warning systems and thus as aids to safety. They DO NOT replace the operator's and/or driver's obligation to ensure the safety of the vehicle or machine, the proper and safe operation of the vehicle or machine and nor do they replace your obligations to ensure the safety and suitability of the vehicle or machine.

Please visit the support section of our website to find more information regarding Brigade Warranties:

https://brigade-electronics.com/warranties/

Specifications subject to change.