

CAS-GPS User Manual

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Revision History

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Draft	28/11/13	SW	Draft Release.
A	28/11/13	SW	First Release.
B	14/03/14	SW	Addition of RF functionality.
C	24/07/14	TW	Additional of operator screens.
D	17/12/14	NM	Update product name, Add 868MHz Specs.
E1	17/02/16	NM	Update Compliance Information / Format Images.
E2	24/04/17	NM	Tag interference with Blasting.
F	Jan-2020	ABD	Updated Regulatory Information and Authorized Representatives.
G	July-2020	PCS	Updated Authorized Representatives and new ANATEL Certificate
H	23/06/22	PCS	Updated with new WiFi module Jody W263 & NB variants

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1. GENERAL INFORMATION

1.1. INTRODUCTION

This manual provides the information on CAS-GPS system and its variants, specifications, operation, maintenance, troubleshooting methods, decommission and disposal.

1.2. SAFETY INFORMATION

The safety section includes safety precautions which must be observed when working on items that appear throughout the manual. Examples of safety precautions and labels are outlined below:

 **DANGER** *Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*

 **WARNING** *Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.*


 **CAUTION** *Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.*

 **CAUTION** *Indicates a potential for equipment damage.*

Summary of Warnings:

Read these safety informations carefully before working on this system to avoid personal injury and damage to the equipments.

 **WARNING** *The CAS product is a driver's aid and should not be relied upon as the primary means of reducing the risks of high potential interactions between Heavy Vehicles, Light Vehicles, infrastructure and personnel.*

 **WARNING** *GPS based proximity detection may not operate when satellites are not fully visible in the sky (e.g. in a deep mining pit near a high-wall or under a workshop roof). Consideration should be given to supplementing GPS with RF proximity detection and visual aids using cameras.*

 **WARNING** *Alarm logic should be determined via site specific risk assessment based on the end-users specified high risk interactions.*

 **WARNING** *The CAS product does not take control of the vehicle although can provide inhibit signals to prevent movement from a stationary position implementation will require approval from the vehicle OEM, vehicle owner and Wabtec and a detailed risk assessment conducted.*

⚠ WARNING

The CAS-GPS system consists of various components including an in-vehicle unit and personnel tag all of which are equipped with multiple radio transmitters. AS2187-2:2006 table I1, recommends a safe operating distance from any designated blasting area as greater than 20 meters. AS2187-2:2006 table I1 is an Australian Standard and operators and users should have regard to all relevant and applicable standards which may apply within the country of use. Operators and users should also have regard to all detonator and blasting contractor and manufacturer recommendations and all applicable safety and operational procedures applicable at the site where the CAS-GPS System is used and which relate to safe operating distances. Details of operating frequency and output power of the various CAS-GPS System components are set out in the CAS-GPS specification and user documentation. Operators and users should make their own assessment in this regard

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1.4. COMPANY DETAILS

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1.5. SCOPE

This user manual covers the following variants of the CAS-GPS system (defined by the IVU features):

Table 1. CAS-GPS Systems

PART NUMBER	PRODUCT DETAILS
PROD0841-x	LAN CAS In Vehicle Unit (IVU)
PROD0842-x	WIFI/LAN CAS In Vehicle Unit (IVU)
PROD0843-x	GSM/LAN CAS In Vehicle Unit (IVU)
PROD0847-x	GSM/WIFI/LAN CAS In Vehicle Unit (IVU)
PROD0842-xNB	WIFI/LAN CAS In Vehicle Unit (IVU) Low Temperature
PROD0847-xNB	GSM/WIFI/LAN CAS In Vehicle Unit (IVU) Low Temperature

1.6. ABBREVIATIONS

For abbreviations used in this publication, refer to Table 2.

Table 2. Abbreviation Details

ABBREVIATION	DESCRIPTION
IVU	In Vehicle Unit
GPS	Global Positioning System
CAS	Collision Avoidance System
LAN	Local Area Network
WIFI	Wireless Communication Medium
GSM	Global System for Mobile Communications
OEM	Original Equipment Manufacturer
NB	No Battery

1.7. DEFINITIONS

Table 3. Definitions

TERM	DEFINITION
System	Refers to the assembled and installed operational elements which together perform the desired functionality.
System Components	Refers to the individual single elements which when assembled together at the point of installation form the "system". Each of these elements has a unique part number.

1.8. TRANSPORT OF EQUIPMENT

All possible precautions should be taken to protect the equipment against damage or losses during shipment, however before accepting delivery, check all items against the packing list or Bill of Lading. If there are shortages or evidence of physical damage, notify Wabtec Mining immediately.

Note: Notify Wabtec Mining within 7 days (maximum) in case of shortages or discrepancies, according to the packing list. This action will help ensure a speedy resolution to any perceived problems. Keep a record of all claims and correspondence. Photographs are recommended.

Do not remove protective covers prior to installation unless there are indications of damage. Boxes opened for inspection and inventory should be carefully repacked to ensure protection of the contents or else the parts should be packaged and stored in a safe place. Examine all packing boxes, wrappings and covers for items attached to them, especially if the wrappings are to be discarded.

1.9. STORAGE OF EQUIPMENT

When the equipment is not installed immediately, proper storage is important to ensure protection of equipment and validity of warranty.

Note: All the Equipments should be stored indoor in a cool dry place to protect against outside environmental elements like weather, Moisture and heat.

Do not store the equipment on the ground to avoid contact with the water, if there is a unexpected water spill. Use Platforms/racks/tables to store the equipment away from the ground.

1.10. UNPACKING OF EQUIPMENT

The method of packing used is differ depending on the size and quantity of equipment.

CAUTION *Be careful when unpacking the equipment to avoid damage.*

1.11. INSTALLATION

Installation should be in accordance with the installation procedures defined by Wabtec Mining and only performed by authorized and qualified installers.

1.12. TEST & COMMISSION

After Installation, the system will be tested to ensure it is electrically secured correct and its functionally working good without any malfunctions. After passing its final installation test, the system is ready for use with inbuilt self-diagnostic testing along with daily user monitoring ensures that any faults can be traced upon.

2. OPERATION

2.1. PRINCIPLE OF OPERATION

The CAS GPS system is designed to offer a situational awareness driver aid utilizing GPS proximity detection of vehicles/objects and data logging.

Each vehicle broadcasts its current position and relevant parameters which are used to detect warnings of possible intersections with other vehicles that receive the broadcast. The position of other vehicles, together with any warnings is shown graphically on the display unit. Refer to Figure 1.

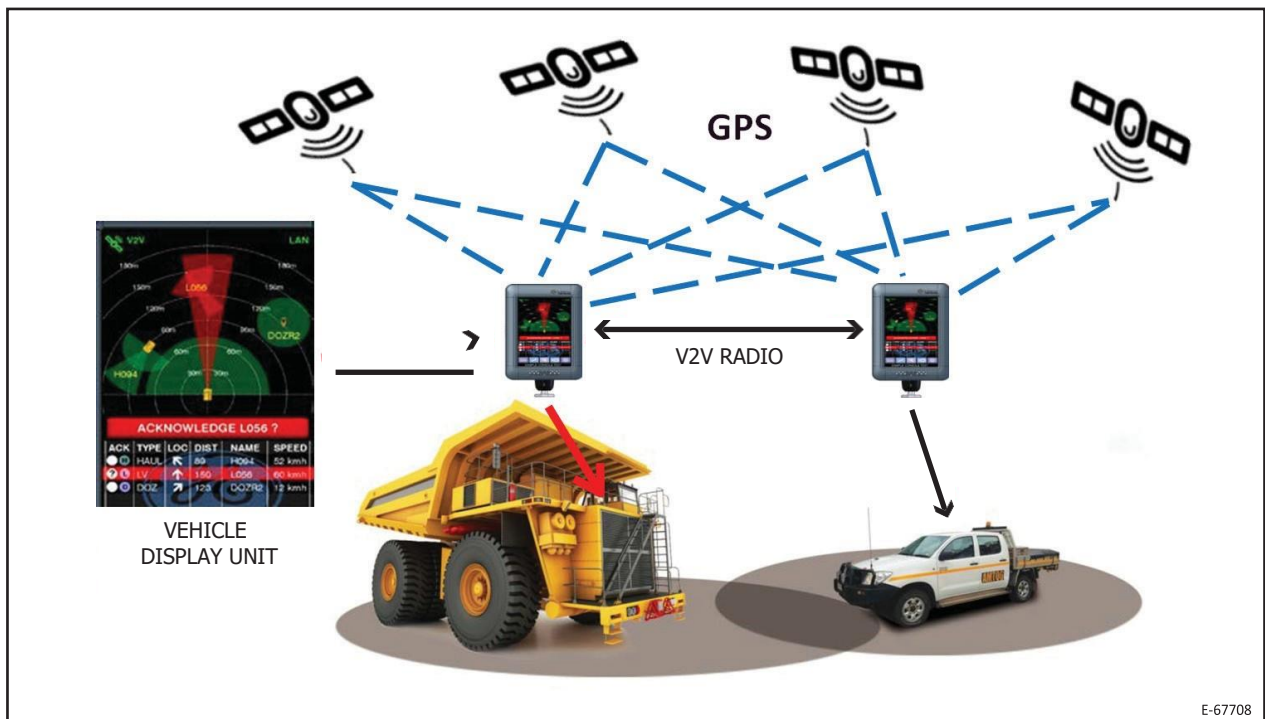


Figure 1. CAS-GPS Broadcast System

The system aids the driver with a continuous view of other objects that are moving, stationary, over the horizon, just behind the vehicle or simply out of sight due to bad visibility and blind spots when operating their vehicle. The system is designed to avoid distraction to the driver from driving, but provides the driver with an awareness tool to notify and visualize other objects surrounding the vehicle on take-off and during operation.

The CAS-GPS system notifies the driver with progressive audible and graphic alerts as shown in the Figure 2 below. The system continually broadcasts its location and receives broadcasts of other vehicles in radio communications for up to 500 meters using the in-built proprietary radio link. Vehicle interactions are projected based on the trajectories of the vehicles; an alert is triggered and depending on the configuration, an acknowledgment by the driver on the touch screen may be required (only when the vehicle is stationary).

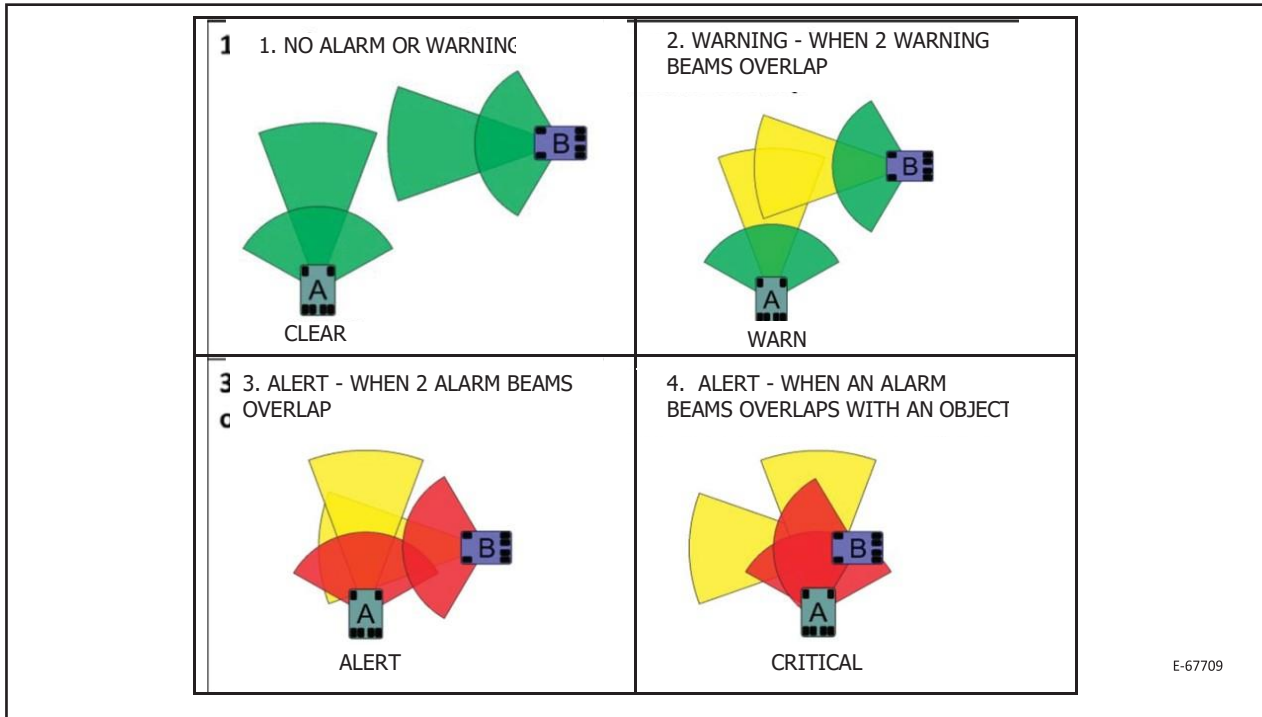


Figure 2. CAS-GPS Graphic Alerts

2.2. POSITIONAL TRACKING

The system uses the latest precision point GPS technology which gives accurate location-based tracking. The accuracy of the GPS is backed up by an advanced array of tracking aiding multidimensional G-Force and Gyro digital sensors. The tracking aiding digital sensors assist the GPS position fix when the GPS signal is inhibited resulting in accurate positions even with no view of the sky.

2.3. DATA LOGGING

The IVU continuously logs all parameters and objects in view to a local database every second (black box technology). The IVU retains 30 days of the 1 second logs. The database captures every 1 second the engine parameters, the vehicle dynamics and other vehicles in view. The local IVU database allows the site manager to retrieve all the events in a desired date range to gain access to more detail of a specific event. Refer to Figure 3.

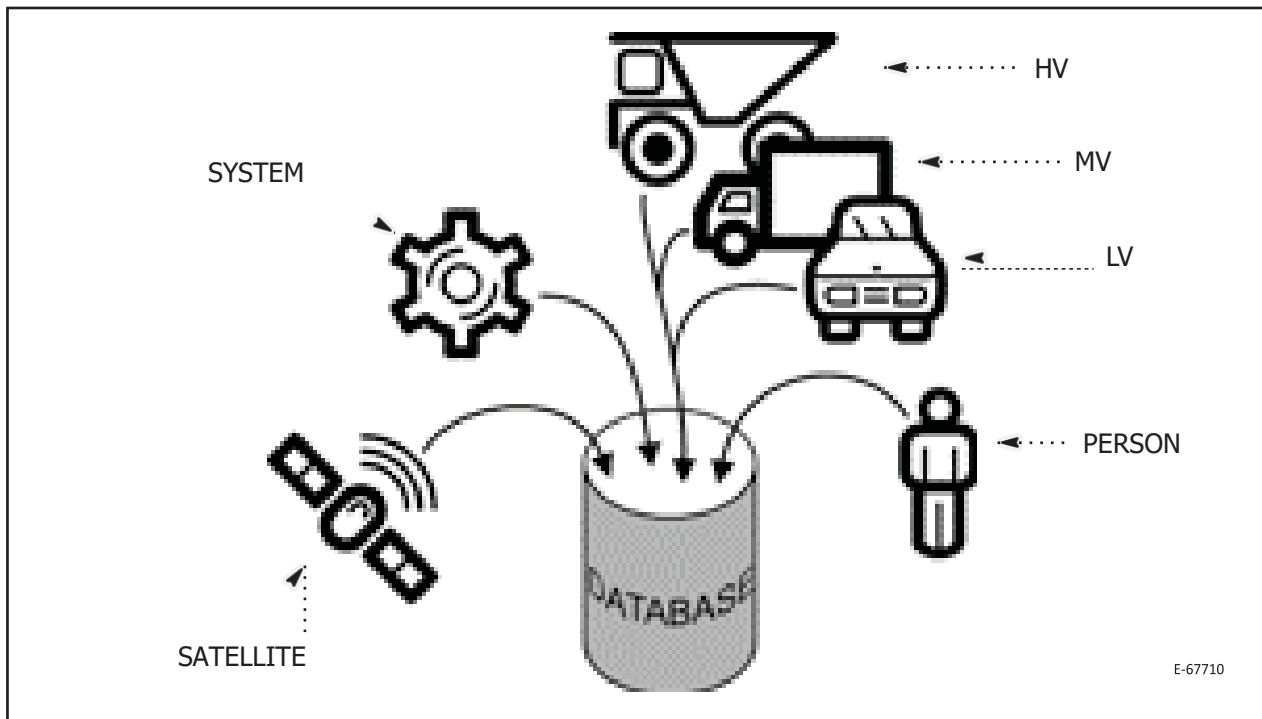


Figure 3. Data Logging

2.4. CONNECTIVITY

The IVU has the ability to upload event logs from its internal database in real-time or upload all data from within a selected date range including the detailed 1 second system-wide logs. The event logs can be transmitted to the central server's database via the following connections.

- Wi-Fi
- Ethernet,
- GPRS GSM, 3G, LTE HSDPA network.

The event logs can be retrieved manually from the removable flash card if there is no connectivity available from the IVU. The data can then be transferred into the central server's database for reporting and analysis.

2.5. OBJECT TYPES

These icons are used on the display to represent the various vehicle types. Refer to Figure 4.

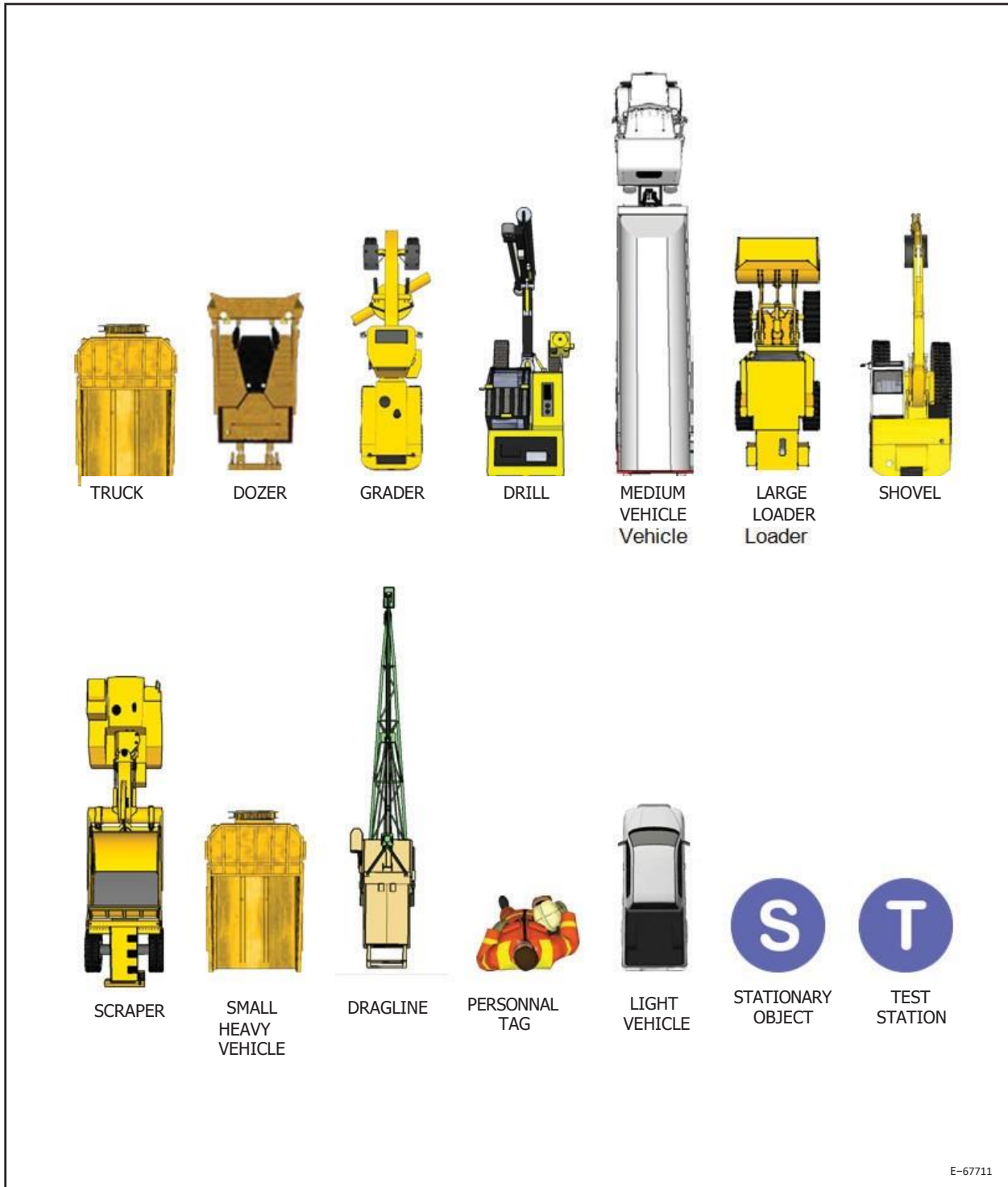


Figure 4. Object Types

2.6. KEY COMPONENTS

2.6.1. Display Unit




For display unit and its parts, refer to Figure 5.



Figure 5. Display Unit

2.6.1.1. Screen Elements

For screen element details, refer to Figure 6 and Figure 7.

V2V STATUS	GREEN - OTHER VEHICLES IN VIEW AND COMMUNICATION OK
	YELLOW - RADIO WORKING OK BUT NO VEHICLES IN VIEW
	RED - FAULT DETECTED
EXPANSION UNIT	GREEN - COMMUNICATING OK
	RED - COMMUNICATION FAULT
RF	GREEN - RF SYSTEM OPERATIONAL
	RED - RF SYSTEM FAULT DETECTED
CAMERAS	GREEN - CAMERA SYSTEM OPERATIONAL
	RED - CAMERA SYSTEM FAULT DETECTED
GPS STATUS	GREEN - HEADING AND POSITION LOCK ACHIEVED
	YELLOW - POSITION LOCK ACHIEVED BUT HEADING NOT KNOWN
	RED - FAULT DETECTED
COMMUNICATION STATUS	GREEN - COMMUNICATION INTERFACE CONNECTED
	YELLOW - NOT CONNECTED, NO FAULT DETECTED
	RED - FAULT DETECTED
REVERSE INDICATOR	APPEARS WHEN VEHICLE IS IN REVERSE GEAR
	
IGNITION INDICATOR	GREEN - VEHICLE IGNITION ON
	YELLOW - VEHICLE IGNITION OFF

E-67714

Figure 6. Screen Icons Details

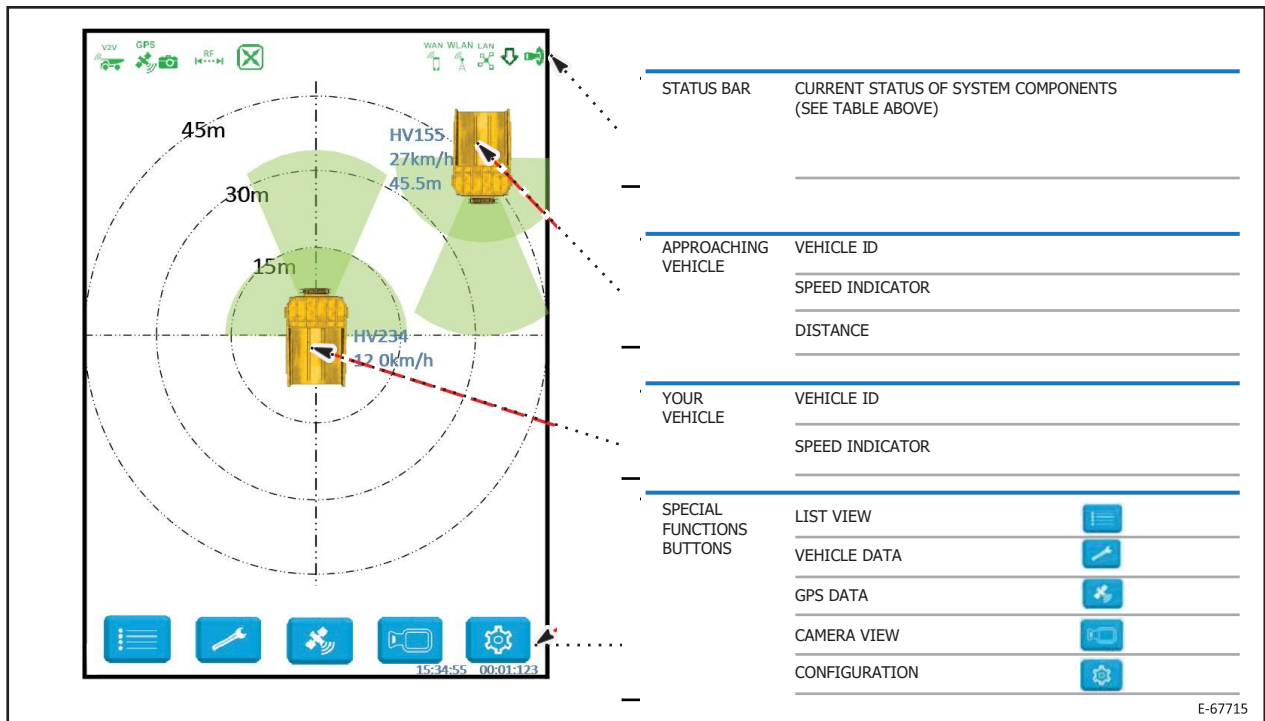



Figure 7. Screen Elements Details

2.6.1.2. List View

Pressing the  button toggles the object list view on or off. Refer to Figure 8.

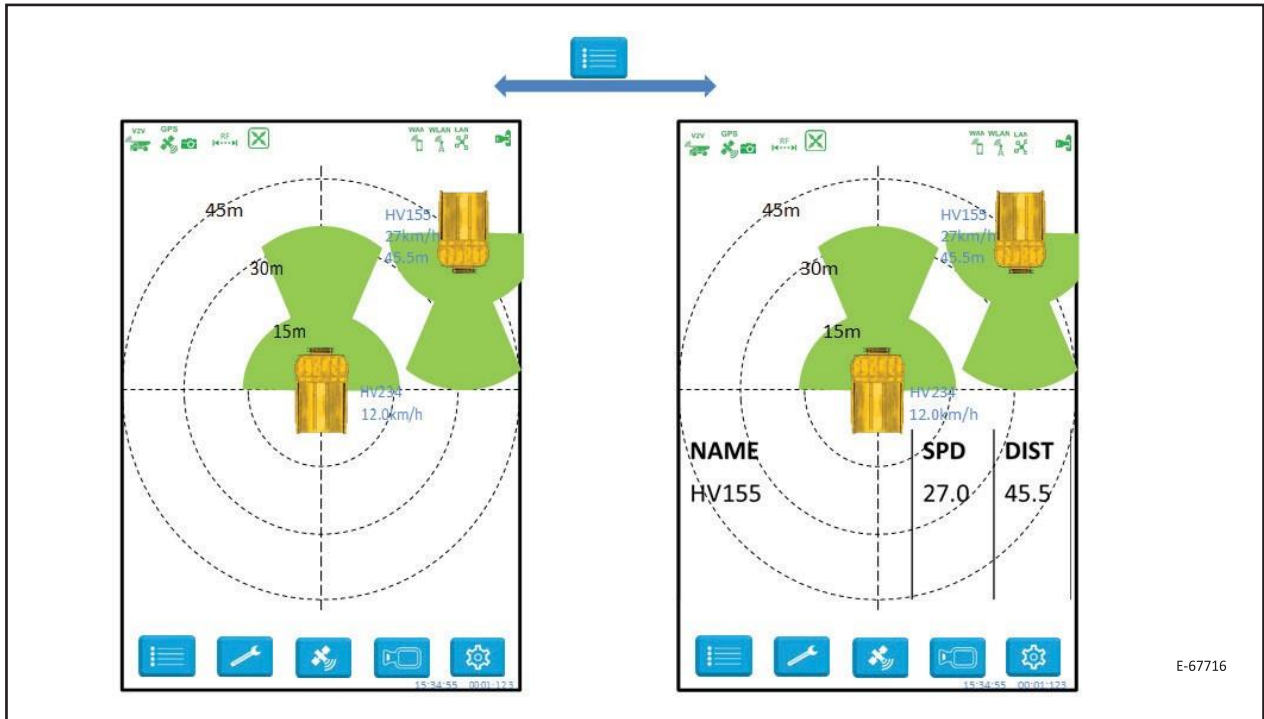



Figure 8. List View

E-67716

2.6.1.3. GPS Status view

Pressing the  button will present the operator with the GPS status screen. The GPS Status screen holds all of the crucial data that is currently available from the GPS in real time.

Pressing the GPS button again will turn off this screen and if the heading is not valid, the list view will be presented otherwise the screen will have the GPS status screen removed. Refer to Figure 9.

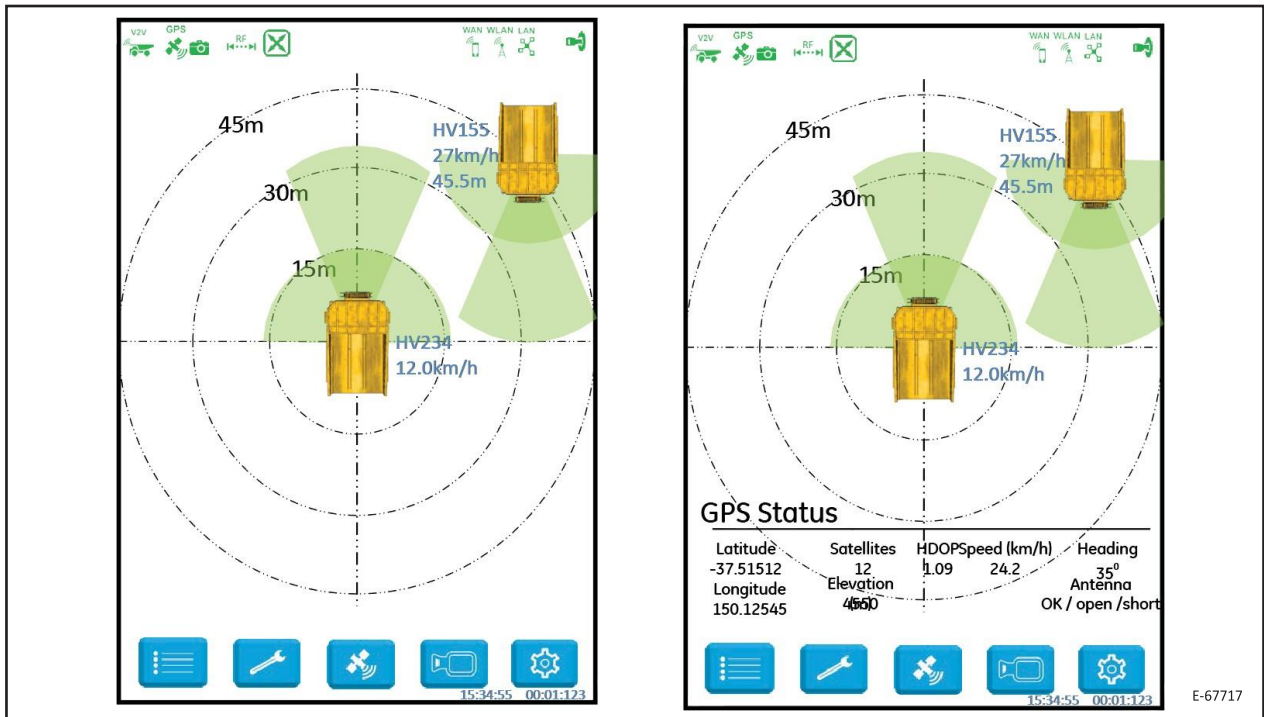



Figure 9. GPS Status View

2.6.1.4. User Settings View

Pressing the  button turns the user settings screen on. The user settings screen allows the operator to adjust the brightness of the screen from minimum to maximum settings using the slide bar.

On automatic change of day and night mode, the brightness is changed to the default day and night values and the operator selected brightness will be overridden. Also on a restart of the system, the brightness will default back to the default day and night settings. The operator can change the current brightness settings at any time. Refer to Figure 10.

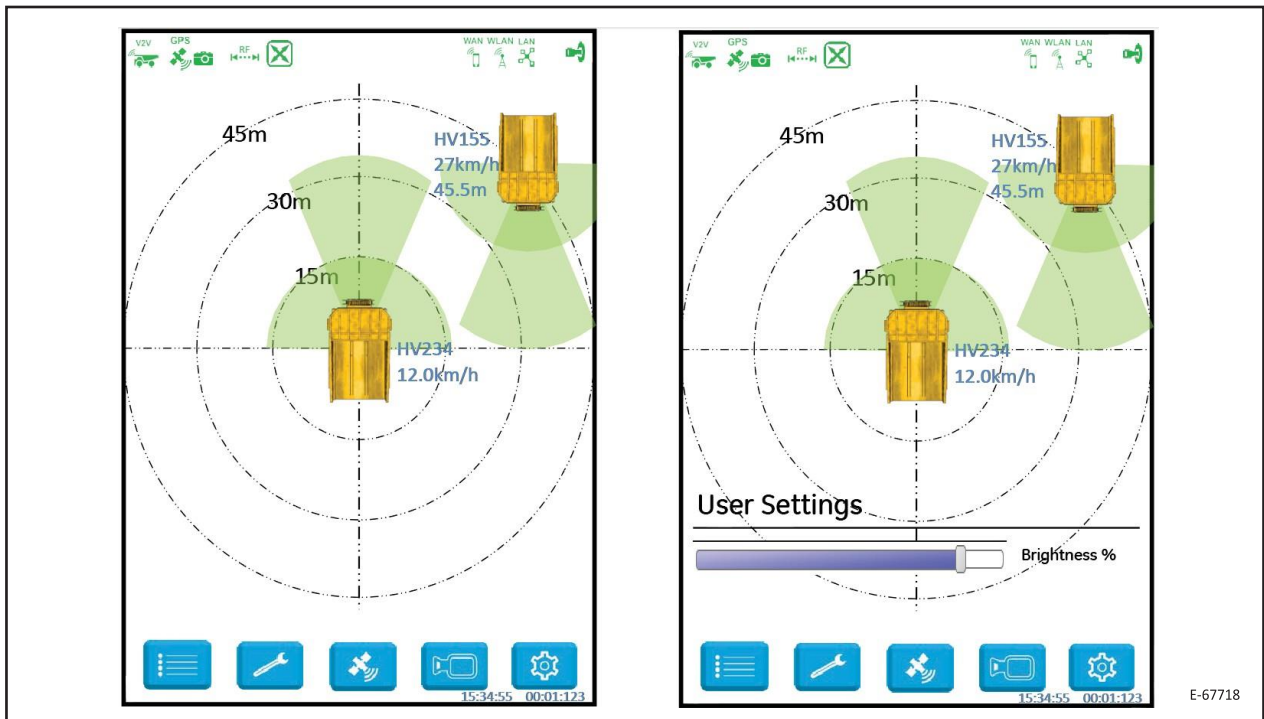




Figure 10. User Settings View

2.6.1.5. Camera View

Pressing the  button turns on the camera view.

Pressing the  button closes the camera view. Refer to Figure 11.

Note: The camera view will automatically close when the vehicle travels faster than the pre-configured camera off speed (default 10km/h).

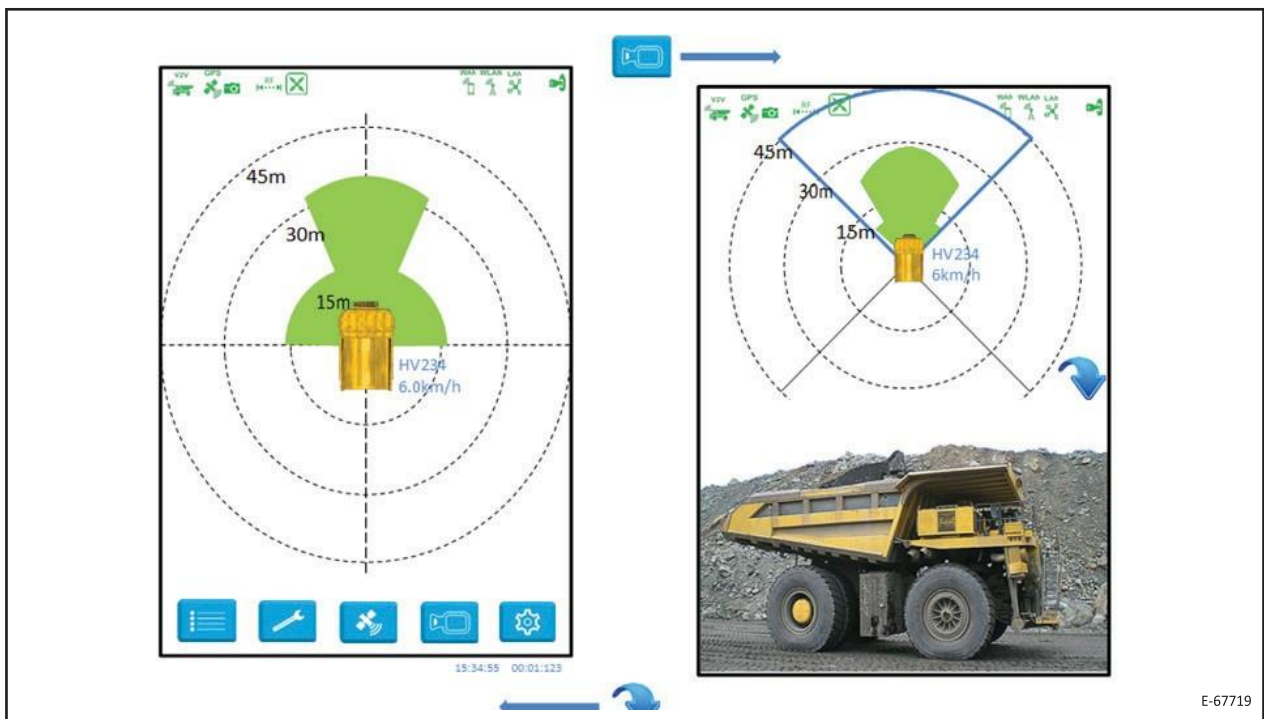
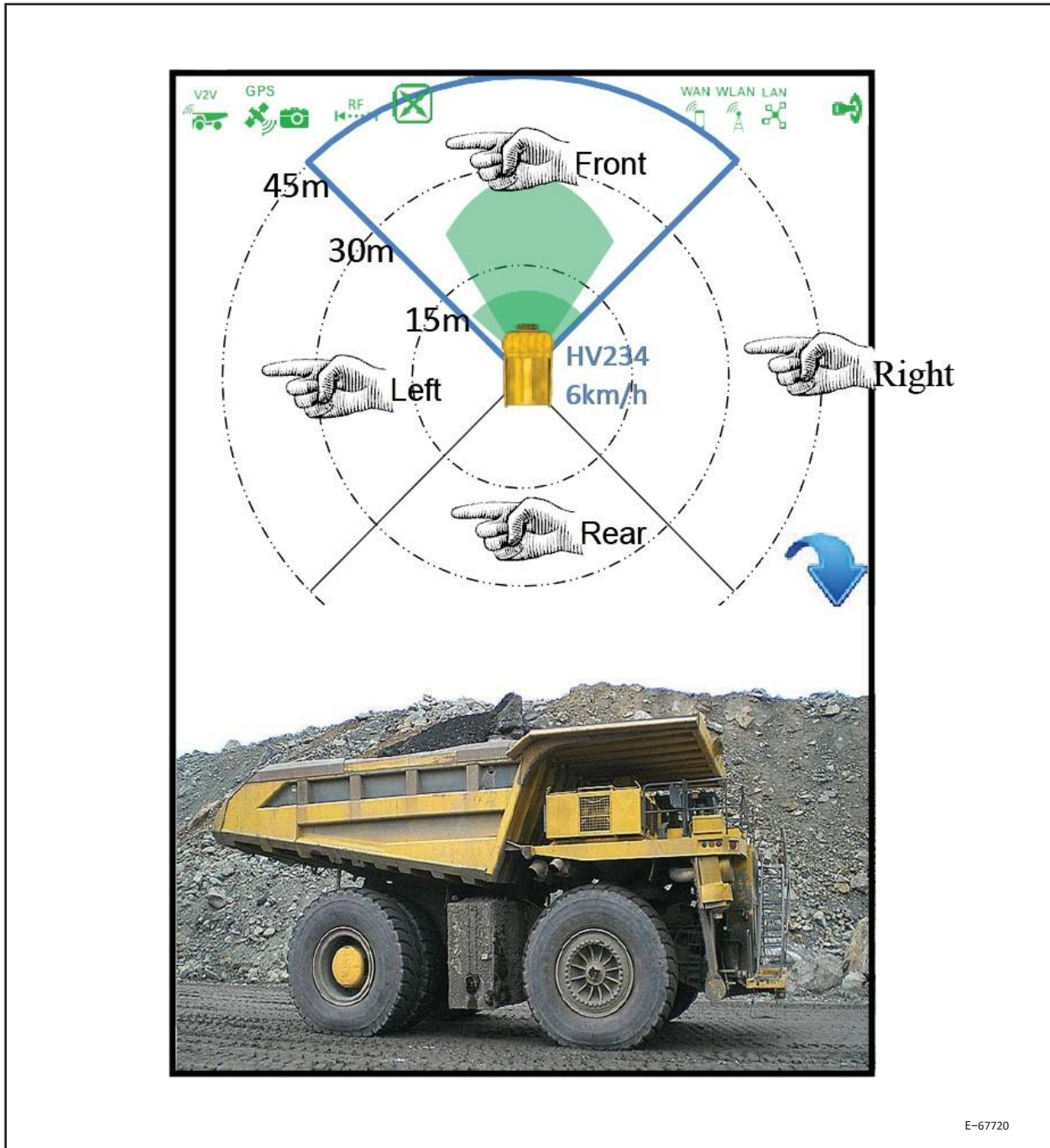


Figure 11. Camera View

2.6.1.6. Camera Selection

Once the camera view has been enabled cameras may be selected by pressing anywhere in the relevant quadrant. Refer to Figure 12.



E-67720

Figure 12. Camera Selection

2.6.1.7. RF Detections

The CAS GPS system can optionally be fitted with additional RF proximity detection unit(s). This may be the case if the site wants additional redundancy in the system or commonly when sites update their existing CAS-CAM/RF systems.

The following example shows a truck traveling forward at 6km/h with the Front camera selected. As a vehicle fitted with RF detectors (only) approaches from the RHS the Right camera will automatically be selected and the quadrant highlighted to indicate a vehicle is within the pre-configured distance (30m in this example). Refer to Figure 13.

Note: No icon is presented on the screen but the vehicles ID appears in the table (no speed or distance is displayed).

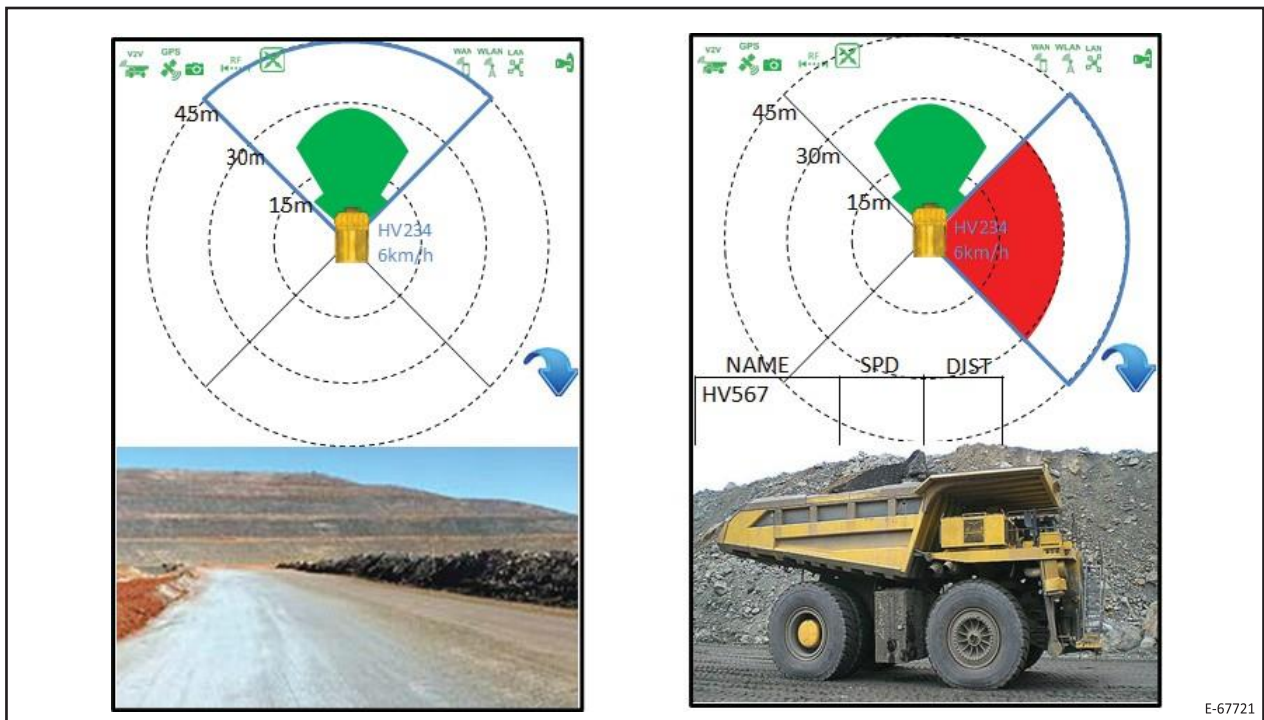


Figure 13. RF Detections

2.6.1.8. Display Usage

On Vehicle Start-up

Immediately after starting the vehicle and before putting it into motion; perform a quick check of the Display status bar. Check that none of the icons are Red, if so your CAS GPS system is not functioning correctly and its operation cannot be assured.

Note: Before engaging gear (and in addition to your normal safety procedures), use the Display to gain further awareness of other nearby CAS GPS equipped vehicles. These vehicles will be displayed as icons on your screen each representing their type of vehicle, vehicle ID, speed, distance and direction of travel.

If a nearby vehicle's beams are overlapping your vehicles beam an audible alarm will be sounded.

Note: Only when your vehicle is stationary may you silence the alarm by touching anywhere on the screen.

Vehicle in Motion

When your vehicle is moving you can operate using your normal safe operating procedures. The Display will sound an alarm to gain your attention if there is another vehicle that is getting too close. A quick glance at the display will show the location, type, ID, heading and speed of other vehicles.

Note: You cannot silence the alarm while your vehicle is moving.

Night Operations

A light sensor in the Display will put the screen into Night Mode when the ambient light level drops below a pre-configured level. In night mode the screen will change from a white to a black background, this keeps the brightness down so that the screen will not become a distraction during night operations.

Daytime Operations

A light sensor in the Display will put the screen into Daytime Mode when the ambient light level rises above a pre-configured level. In Daytime mode the screen will change from a black to a white background, this makes the information displayed on the screen easy to read in high ambient light levels.

2.6.2. In Vehicle Unit (IVU)

For In Vehicle Unit (IVU) parts and connections details, refer to Figure 14.

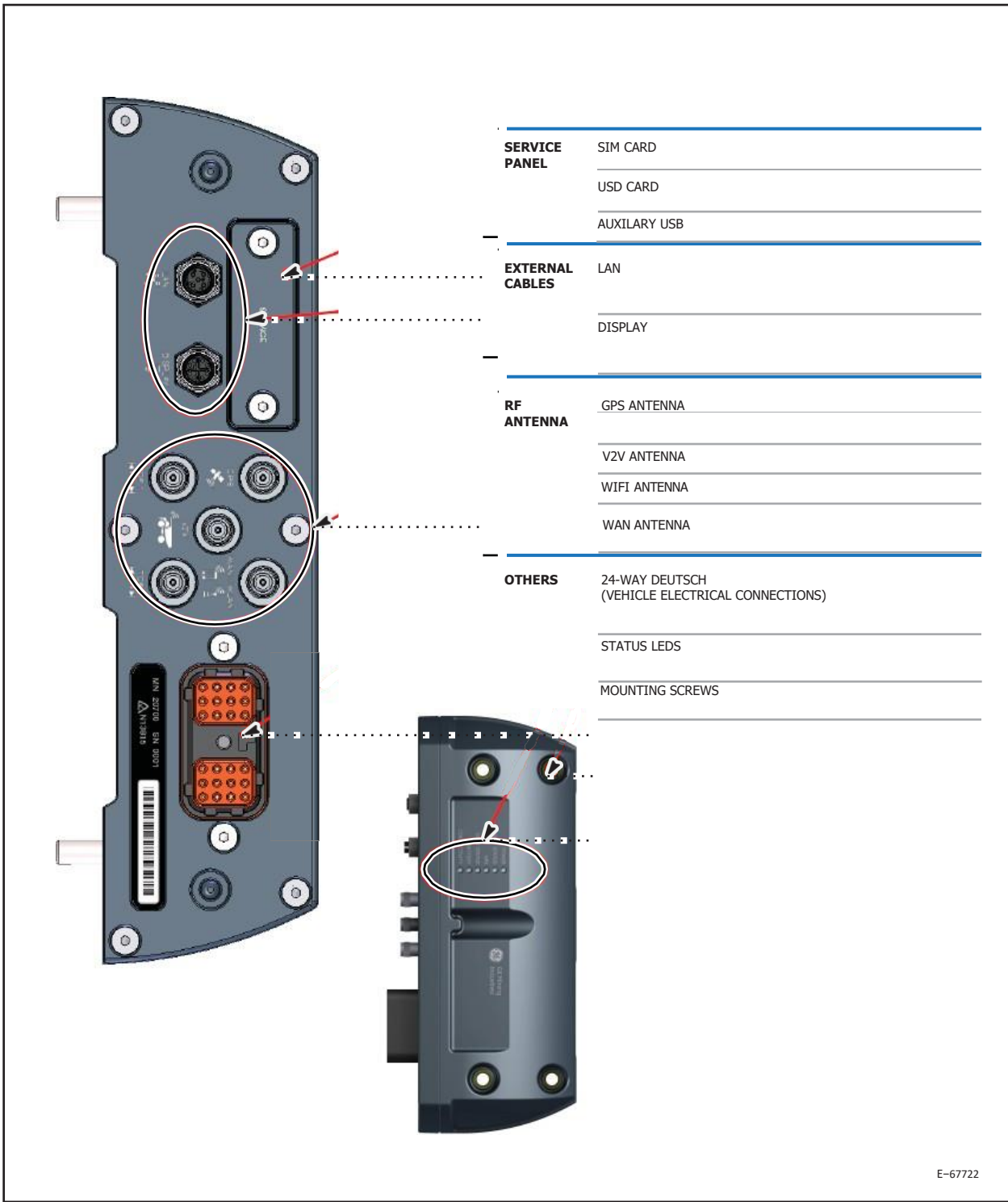


Figure 14. In Vehicle Unit (IVU)

2.6.3. System Interconnections

For the main system components and its connection, refer to Figure 15.

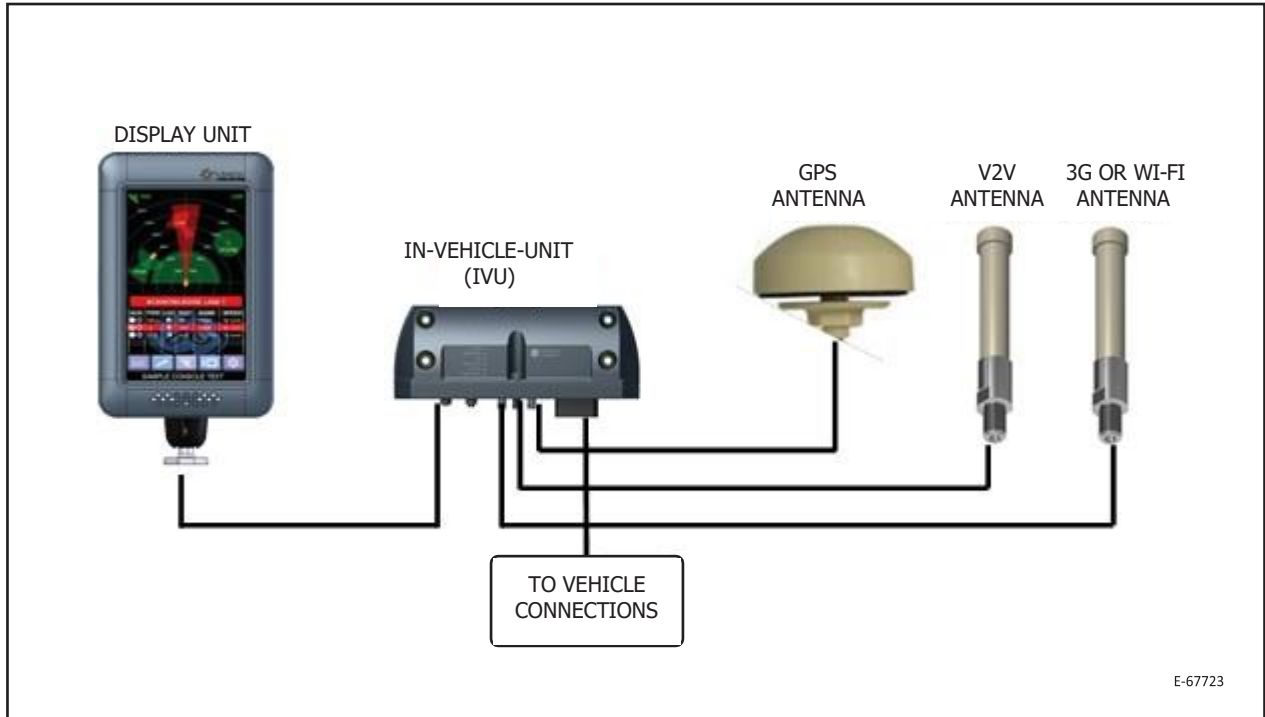


Figure 15. System Interconnections

2.6.3.1. CAS-CAM/RF interconnections (1CAM/1RF)

For CAS-CAM/RF interconnections (1CAM/1RF), refer to Figure 16.

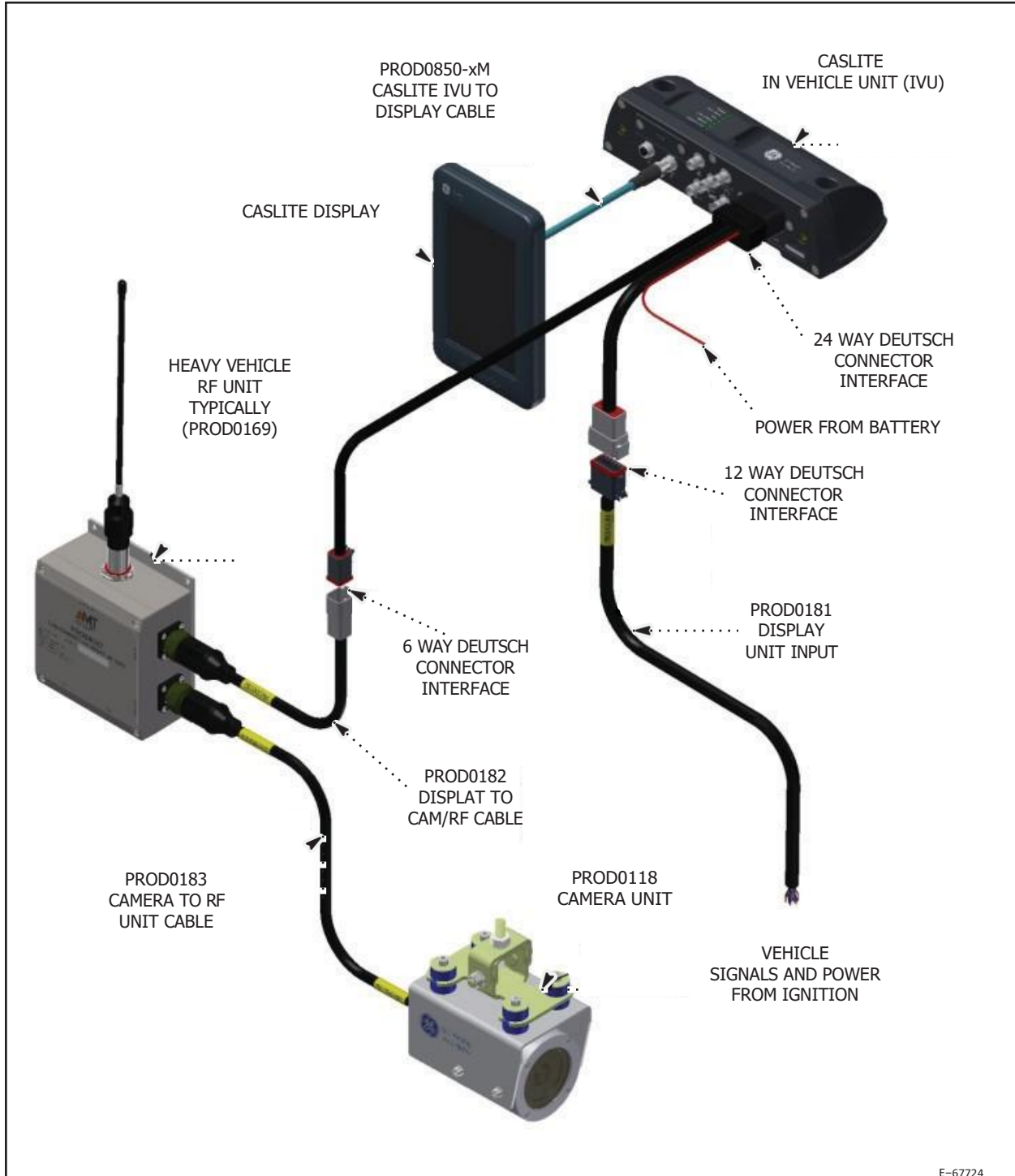


Figure 16. CAS-CAM/RF Interconnections (1CAM/1RF)

2.6.3.2. CAS-CAM/RF interconnections (4CAM/4RF)

For CAS-CAM/RF interconnections (4CAM/4RF), refer to Figure 17.

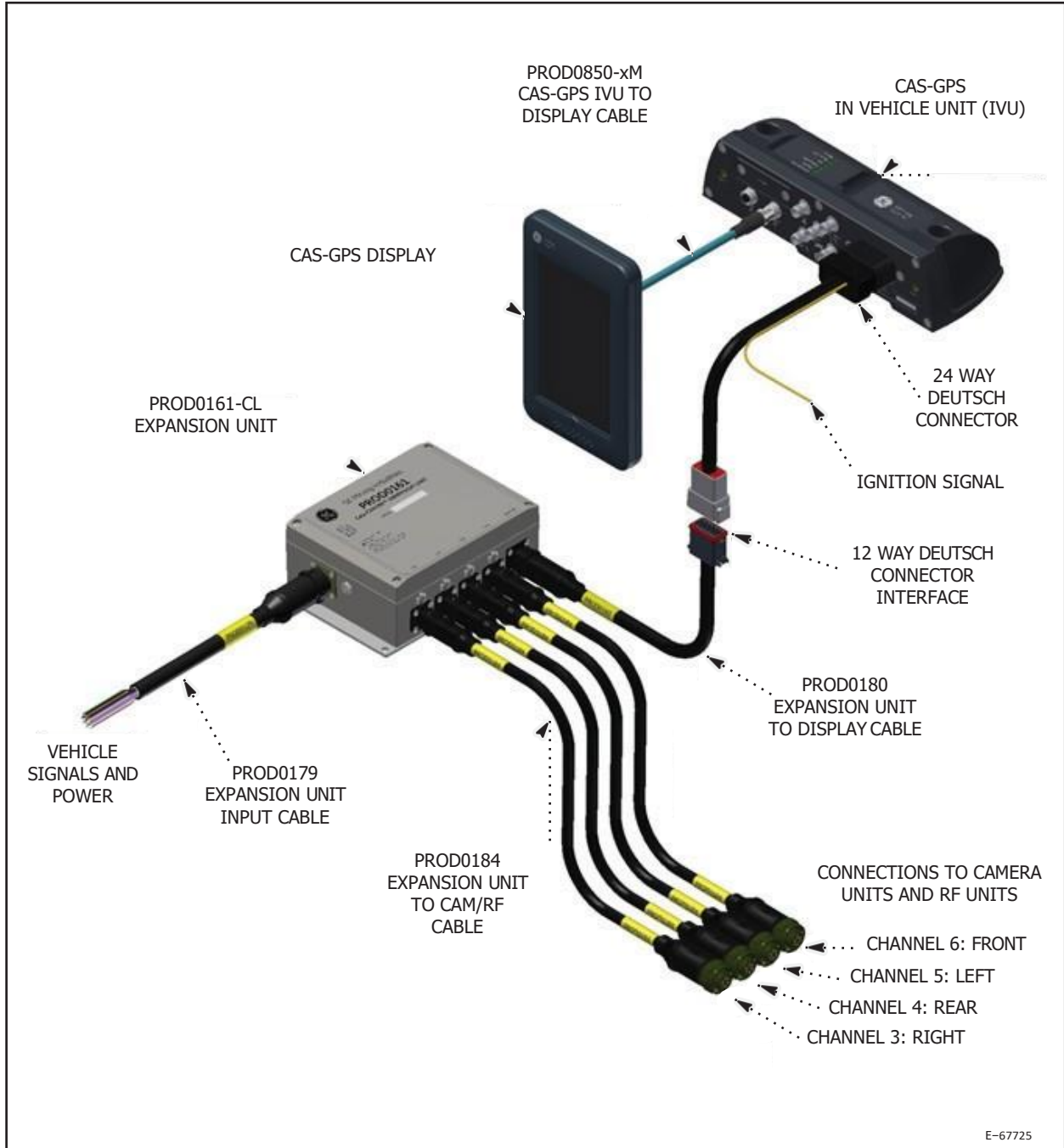


Figure 17. CAS-CAM/RF Interconnections (4CAM/4RF)

2.7. SERVICE, MAINTENANCE AND DISPOSAL

2.7.1. Equipment Service

2.7.1.1. Display Unit

- Clean screen surface with a clean dry soft cloth - Do not use solvents or cleaners on the screen surface.
- Check for physical damage to screen surface.
- Check the cable connector is securely connected at the rear of the screen - finger tighten only if loose.
- Check the mounting bracket is secure - finger tighten only if loose.

2.7.1.2. System

- Check visually that all antennas are in good condition and the antenna cables are connected.
- Check visually that no cables are loose or damaged.
- Verify that the system is working correctly prior to starting the vehicle and during operations.

2.7.2. Scheduled System Servicing

It is recommended that the system undergo preventative scheduled maintenance and inspections. These should be carried out by trained and authorized personnel every 6 month or 1500hrs (whichever occurs first).

2.7.3. Software Updates

Software updates are automatically pushed out to all IVUs connected to the CAS server.

2.7.4. Equipment Maintenance

If the system is not functioning as expected, refer to 5.8 "TROUBLESHOOTING" . If a fault cannot be resolved, please contact your nearest authorized representative.

It is essential that no attempt be made to repair the equipment (other than replacement of individual components). Opening equipment enclosures should never be attempted and will void any warranty and could compromise the safe operation of the system.

2.8. TROUBLESHOOTING

2.8.1. No power / blank screen

For an apparent loss of power or blank screen, refer to flow diagram shown in Figure 18.

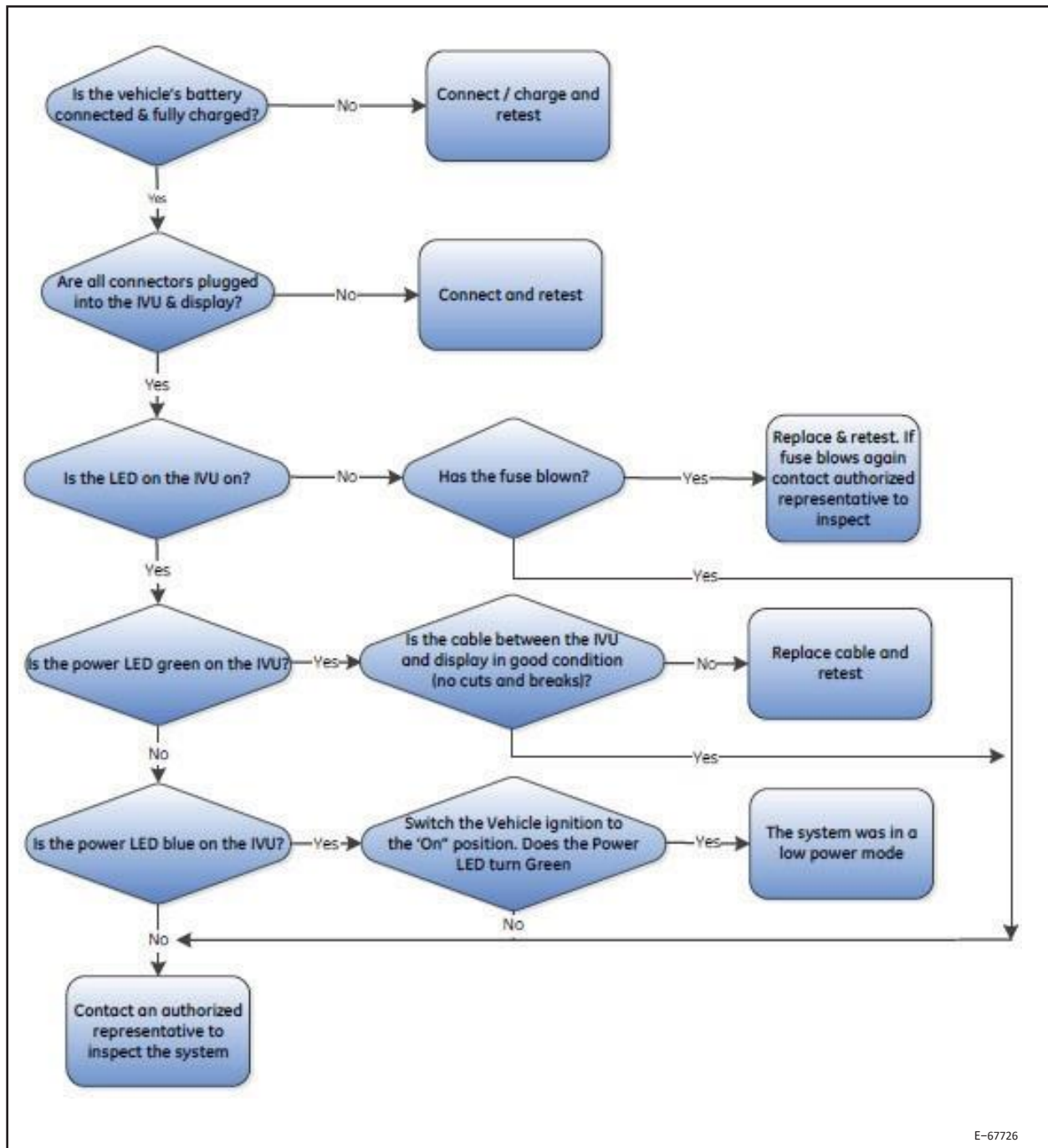


Figure 18. Troubleshooting - No Power / Blank Screen

2.8.2. GPS Problems

The GPS signal status is indicated by the colour of the  icon at the top of the display.

- Green - Position and Heading fix - no faults.
- Yellow - Position fix but no heading - no faults.
- Red - No GPS signal or GPS error - fault or no signal detected.

For GPS related problem, refer to the flow diagram shown in Figure 19.

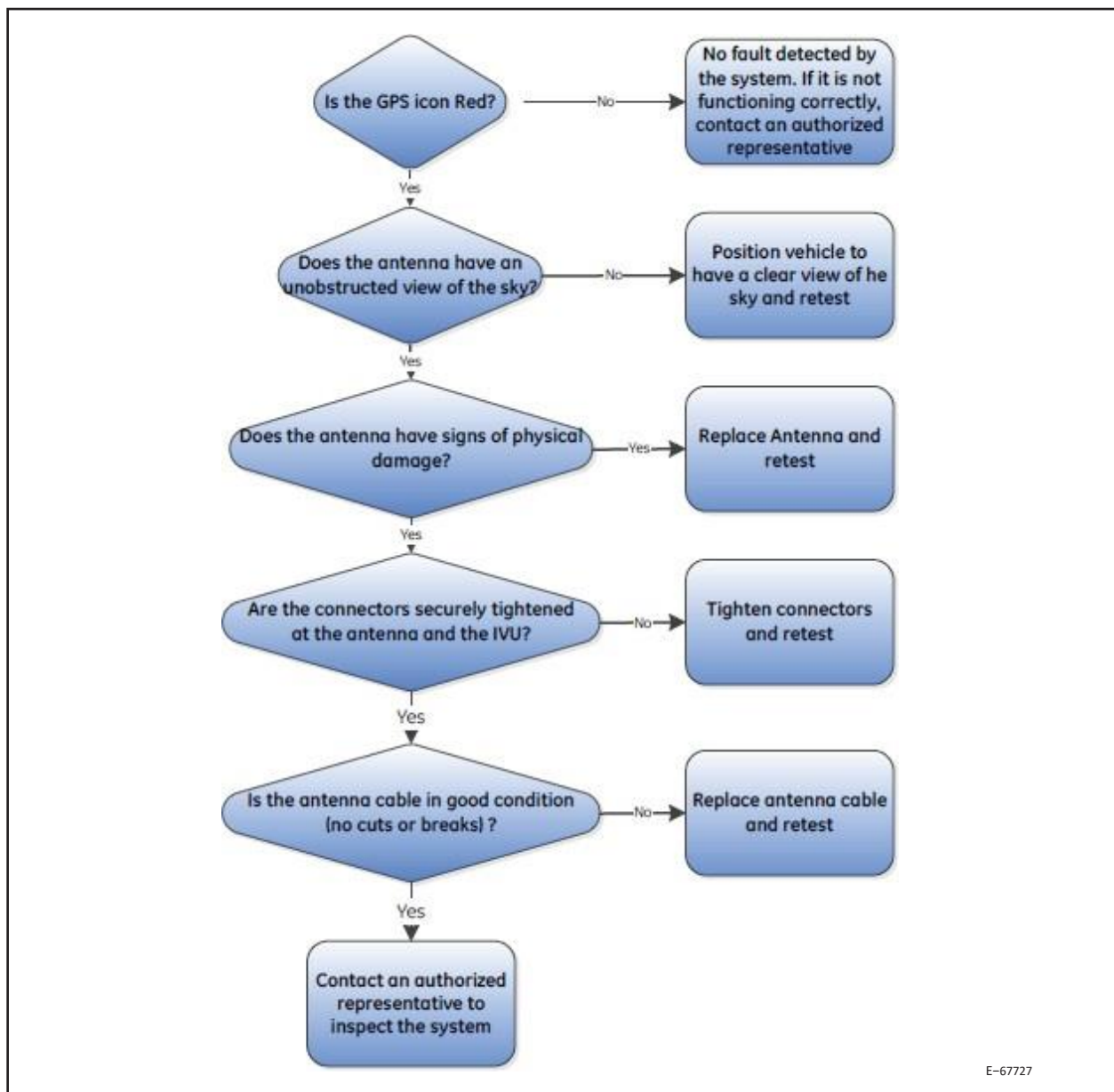



Figure 19. Troubleshooting - GPS Problems

2.8.3. V2V Problems

The Vehicle to Vehicle communication status is indicated by the colour of the  icon at the top of the display.

- Green - Communicating with other vehicles - no faults.
- Yellow - No other vehicles in range - no faults.
- Red - Radio error - fault or error detected.

For V2V related problem, refer to the flow diagram shown in Figure 20.

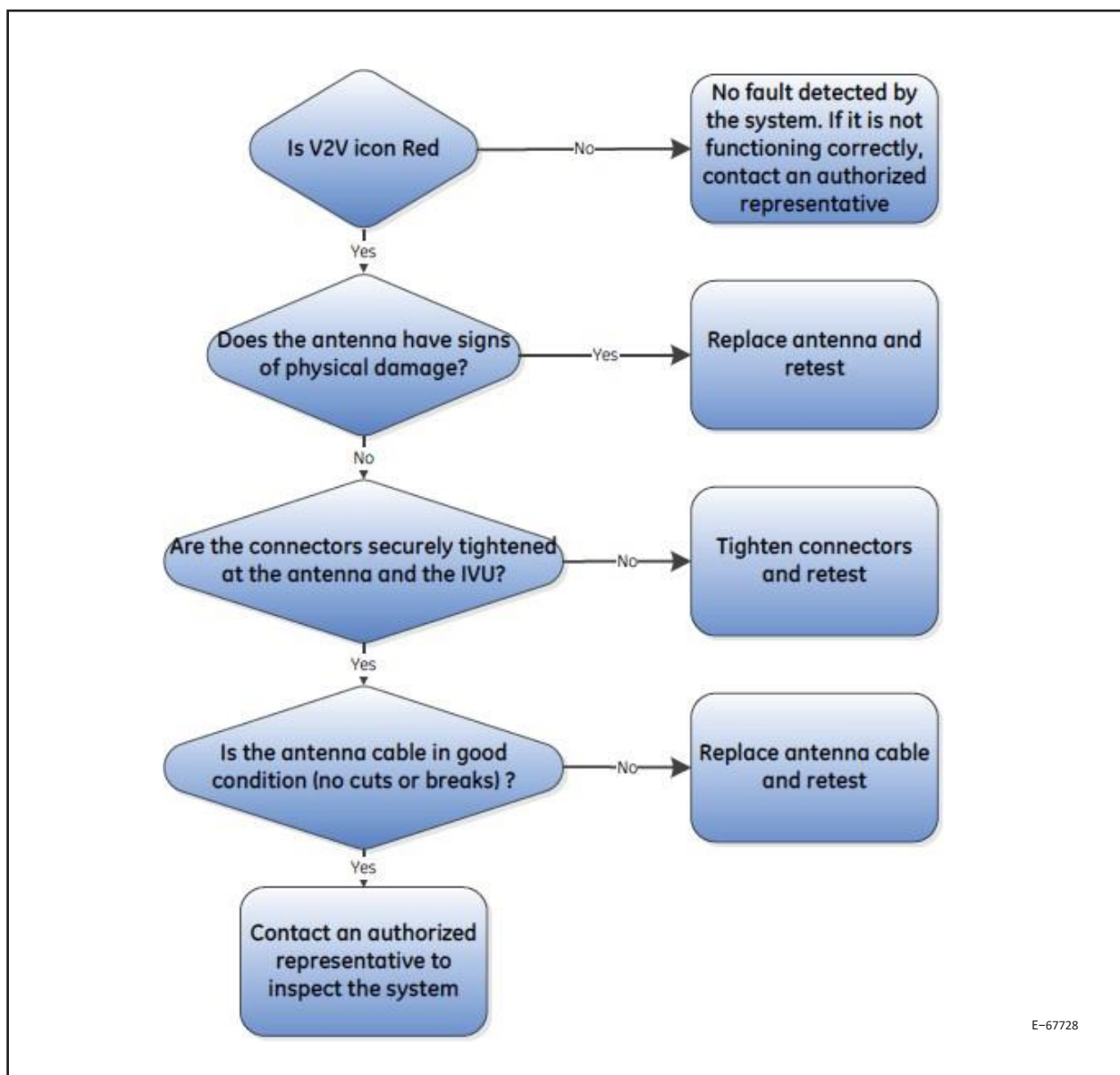




Figure 20. Troubleshooting - V2V Problems

2.8.4. WiFi/GSM Problems

The Wi-Fi or GSM/3G/LTE communication status is indicated by the colour of the  or  icons at the top of the display.

- Green - Connected to the network - no fault.
- Red - No signal or fault/error detected.

For WiFi/GSM related problem, refer to the flow diagram shown in Figure 21.

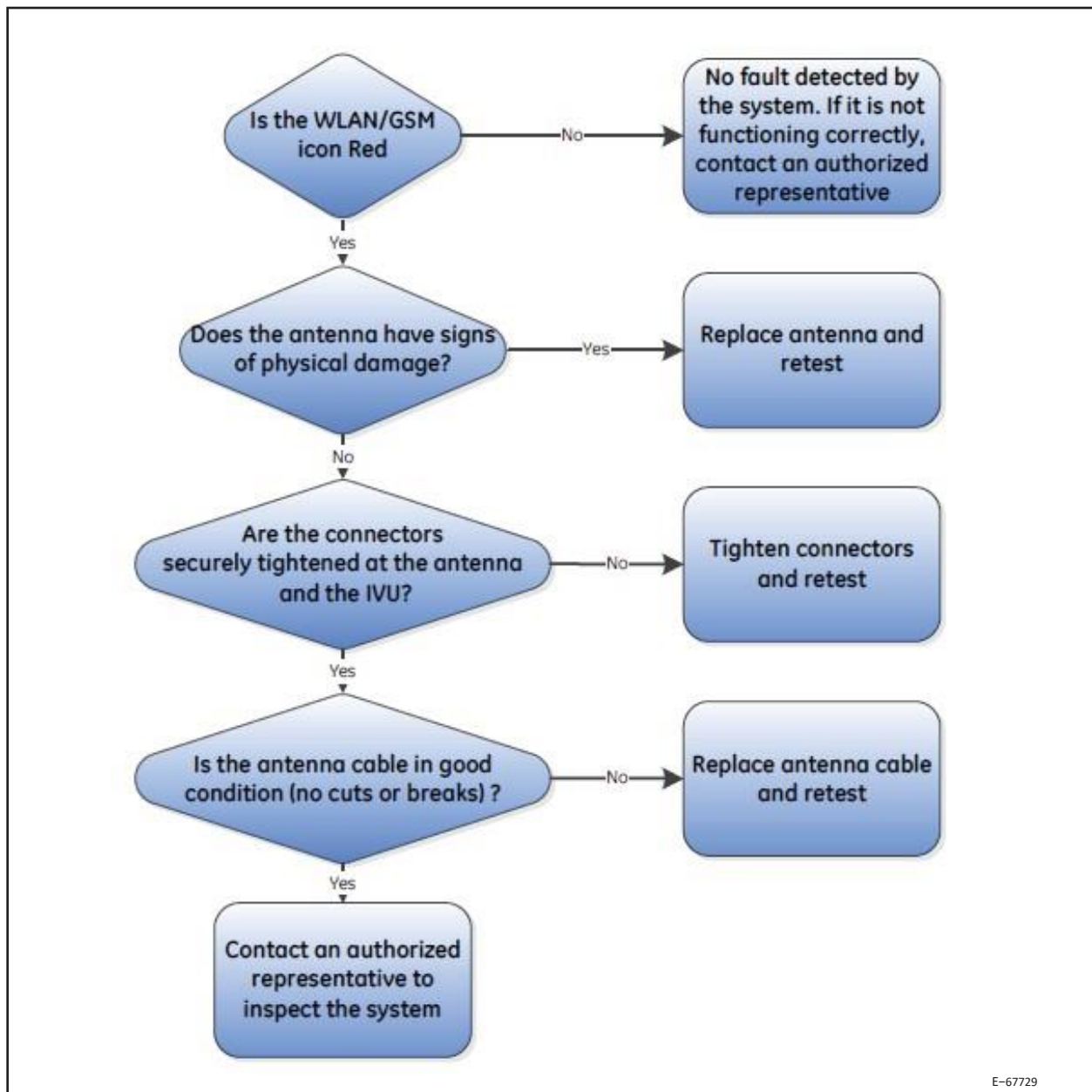


Figure 21. Troubleshooting - WiFi/GSM Problems

2.9. DECOMMISSION

- Removal of the system should only be performed if authorized by the owner of the vehicle.
- Removal should be performed by a qualified Auto Electrician.
- All system components and wiring should be removed.
- All vehicle wiring should be restored back to original condition.
- Dispose or store removed system in accordance with this manual.

2.10. DISPOSAL

The electronic equipment discussed in this manual must not be treated as general waste. By ensuring that this product is disposed of correctly, you will be helping to prevent potentially negative consequences for the environment and human health which could otherwise be caused by incorrect waste handling of this product.

The system should be disposed of in accordance with local regulations. The electronics of CAS-GPS are ROHS compliant.



The system contains a lithium ion battery and it should be disposed of in accordance with local regulations. The electronics of CAS-GPS are ROHS compliant.

2.11. SPECIFICATIONS

For CAS-GPS product approvals details, refer to Table 4.

Table 4. CAS-GPS Product Approval Details

INTERNATIONAL APPROVALS	
Australia ACMA RCM	PROD0841-2, PROD0842-2 + WiFi PROD0843-2 + GSM PROD0847-2 + WiFi & GSM
USA FCC	PROD0842-2: FCC ID: YIY-PROD08422 PROD0847-2: FCC ID: YIY-PROD08472
Brazil ANATEL	PROD0842-2: 09438-20-12930
Chile SUBTEL	PROD0842-2: ORD No.: 13750/DO No. 42396/F26 PROD0847-2: ORD No.:17280/DO No. 51425/F26
India WPC ETA	PROD0842-4: SR-ETA/20189428 PROD0847-4: SR-ETA/20189426
Indonesia POSTEL	PROD0842-7: 53880/SDPPI/2017 PROD0847-7: 53881/SDPPI/2017 PLG ID: 3944
Peru MTC	PROD0842-2: TRSS40276 PROD0847-2: TRSS40421
Mozambique INCM	PROD0842-1: N° 21/R/RML/2018 & N° 22/R/RML/2018 PROD0847-1: N° 23/R/RML/2018, N° 24/R/RML/2018 & N° 25/R/RML/2018
Ghana NCA	PROD0842-1: BR3-1M-GE2-02D PROD0847-1: BR3-1M-GE2-02B
Canada ISED	PROD0842-2: IC ID: 8903A-PROD08422 PROD0847-2: IC ID: 8903A-PROD08472
South Africa ICASA	PROD0842-1, PROD0847-1, PROD0842-1H & PROD0847-1H: TA-2015/074 & TA-2019/474
Papua New Guinea NICTA	PROD0842-2: PNG17/1003 PROD0847-2: PNG17/1102
ENVIRONMENTAL PERFORMANCE	
Storage Temp.	-30°C to +85°C (-22°F to +185°F)
Vibration	Withstands 3.5 mm at 5-18.7Hz, 5g at 18.7-150Hz
Shock	Withstands 15g ½ sine 10ms on each axis, bi-directional on all 3 axes
POWER REQUIREMENTS	
Input Voltage	9-36VDC
Typical power consumption for 24/12V input.	0.01A for IVU standby & V2V powered by internal battery
	0.5/1.0A for IVU and display
	0.8/1.6A for IVU & display & 1 camera & 2 TOF
	1.2/2.4A for IVU & display & 4 camera & 4 TOF (+0.2/0.4A when charging backup battery)

Table 4. CAS-GPS Product Approval Details

INTERNATIONAL APPROVALS	
DISPLAY UNIT	
Type	Capacitive Touchscreen
Dimensions	133 wide x 223 high x 25 mm deep (basic) 57 mm deep (with ball)
Weight	810g
IP Rating	IP52
Operating Temp.	-30°C to +60°C (-22°F to +140°F)
Mounting	1 in. (25.4 mm) Ball (RAM Mount)
Power	From IVU
Screen size	7 in. (177.8 mm)
Screen Resolution	1024 x 600 WSVGA
Inputs	From IVU via M12 connector
Microphone	yes
Buzzer	78dB at 50 cm (500 mm)
Speakers	2 x 1W, programmable up to 81dB at 50 cm (500 mm)

For In Vehicle Unit's (IVU) details, refer to Table 5.

Table 5. In Vehicle Unit Details

IN VEHICLE UNIT (IVU)	
Dimensions	290 wide x 72 high x 130 mm deep (basic)
Weight	2060g
IP Rating	IP66
Operating Temp.	-15°C to +60°C (5°F to +140°F) -30°C to +60°C (-22°F to +140°F) – No Battery IVU variant
Mounting holes	Footprint 215 x 48 mm (suits 4 x M8 SHCS)
Typical battery backup	14 hrs standby operation (GPS + V2V active) 3 hrs charge time
Optional internal Battery type	LiFePO4, 3.7V, 3200mAh, UN38.3 Certification
Main CPU Standby CPU	ARM 32-bit Cortex™ A8, 800MHz ARM 32-bit Cortex™ M3
Memory Card	Micro SD
RAM	1GB DDR3
Sensors	3-Axis Gyroscope
	3-Axis Accelerometer
	3-Axis Magnetometer
	Altimeter -500m to 9000m
Main interface	Deutsch DRC series 24-pin connector
12V DC Output	1 x 12VDC @ 1.2A Max

Table 5. In Vehicle Unit Details

IN VEHICLE UNIT (IVU)	
Digital Output	2 x SPST (wet contact) Vin @ 250mA Max
Digital Inputs	2 x dry 2.5kV isolated
	2 x Wet Common Ground (60Vdc Tolerant @30mA)
CAN interface	J1939 support
USB interface	2 x USB2.0
LAN interface	1 x 10BASE-T / 100BASE-TX
Other interface	2 x RS232 / 485 configurable
Video input	1 x differential
RF connectors	TNC
V2V Radio PROD084x-x	Digital radio: Region Code is denoted in the Model No. suffix code (x). Region 1: 869.525 MHz Region 2: 920 MHz Region 4: 866 MHz Region 7: 921/922 MHz
	100 mW transmit power
	4GFSK Modulation (4 Gaussian Frequency Shift Keying Region 1: 250 kHz Bandwidth Region 2: 960 kHz Bandwidth Region 4: 250 kHz Bandwidth Region 7: 960 kHz Bandwidth
	Duty cycle < 1%. (0.3%)
	Range up to 500m
	3 dBi nominal antenna gain. Pre-terminated cable to dedicated antenna mount.
GPS	Multi-GNSS: GPS, GLONASS, Galileo, BeiDou, plus QZSS compatible.
	Horizontal accuracy $\pm 1.5m$ *
	* (CEP, 50%, 24 hours static, -130 dBm, > 6 SVs)
Mobile communications (optional)	FDD-LTE: 700, 800, 850, 900, 1700/2100 (AWS), 1800, 1900, 2100 & 2600 MHz
	UMTS (WCDMA/FDD): 800, 850, 900, 1700/2100 (AWS), 1800, 1900 & 2100 MHz
	GSM: 850, 900, 1800 and 1900 MHz
WIFI (optional)	IEEE 802.11 b/g/n (EIRP 21 dBm Max)
TOF proximity ranging (optional)	2.4GHz IEEE 802.15.4a (100mW Max)
	0-250m, $\pm 2m$ accuracy

For Reference standards, refer to Table 6.

Table 6. Reference Standard Details

REFERENCE STANDARDS	
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60068-2-6	Vibration
IEC 60068-2-27	Shock
IEC 61000-4-2	Electrostatic Discharge
EN 62311	Human exposure restrictions for electromagnetic fields
EN 61000-4-3	Immunity to Radiated Electromagnetic Field
IEC 61000-4-4	Electrical Fast Transient / Burst (EFT)
IEC 61000-4-5	Surge Immunity
EN 61000-4-6	Immunity to Conducted Disturbances
ISO 7637-2	Automotive Electrical Disturbances
ETSI EN 301 489	Electromagnetic Compatibility (EMC / EMI) (Parts 1, 3, 7, 17, 24)
EN 55032 (CISPR32)	Electromagnetic Compatibility Class B (EMC)
ETSI EN 300 220	RF Performance Characteristics (V2V)
ETSI EN 300 328	RF Performance Characteristics (WIFI)
ETSI EN 301 511	RF Performance Characteristics (GSM)
ETSI EN 301 908-1 & 2	RF Performance Characteristics (3G)
ETSI EN 301 908-13	RF Performance Characteristics (LTE)
IEC 62368 -1	Electrical Safety
AS/NZS 4268	Radio-Communications Limits (RSE)
FCC 47 PART 15A&B	Electromagnetic Compatibility Class B (EMC)
FCC 47 PART 15c	Radio-Communications Limits (RSE)
ICES-003	Electromagnetic Compatibility Class B (EMC)
RSS-247	Radio-Communications Limits (RSE)
RSS-102	Electromagnetic Radiation

3. AUTHORIZED REPRESENTATIVES

3.1. Brazil



Wabtec Brasil Fabricação e Manutenção de Equipamentos Ltda

Avenida General David Sarnoff, n 4600
Cidade Industrial
Contagem, MG 32210-110
Brazil
P: +55 31 2103 5348
F: +55 31 2103 5100
www.wabteccorp.com

3.2. Sub Sahara Africa

The address of Sub Sahara Africa representatives:



Probe Integrated Mining Technologies (PTY) Ltd

245 Albert Amon Road
Meadowdale Germiston 1614
P: +27 11 453 0924
F: +27 11 453 2141
www.probebattery.co.za

3.3. Indonesia

The address of Indonesia representatives:



PT Intecs Teknikatama Industri
Jl. Ciputat Raya No. 18D Kebayoran Lama Selatan
Jakarta 12240.
P: +62 21 729 3351
F: +62 21 729 3352
www.intecs.co.id

3.4. Canada



Wabtec Transportation Canada Inc

27047 Oakwood Road, Oakbank, Manitoba,
R0E 1J2 Canada
P: +1 905 251 0074
www.wabteccorp.com

3.5. North America



Digital Mining

2901 East Lake Road, Erie,
Pennsylvania, 16531, US
P: +1 480 264-2063
F: +1 480 264-6402
www.wabteccorp.com

3.6. Australia



Industrea Mining Technology Pty Ltd

T/A Digital Mining Technology
3 Co-Wyn Close, Fountaindale,
New South Wales, 2258, Australia
T: +61 2 8863 4730
Email: GETProductionIMT@wabtec.com
Web: www.wabteccorp.com

3.7. Mexico

The address of Mexico representatives:



COMERCIALIZADORA MINERA DEL NORTE, S.A. DE C.V.

Ave. H. Colegio Militar No. 2000-B Col. Las Fuentes

Piedras Negras, Coahuila

México. C.P. 26010.

P: +52 (878) 783-8215 / +1 (830) 352-5519

F: +52 (878) 783-8218

www.cominsa.com.mx

3.8. India



Wabtec India Industrial Private Ltd.

ITC Green Centre

6th Floor, Southwest Tower

No. 18, Banaswadi Main

Road, Maruthisevanagar,

Bangalore – 560005, India

P: +91 080 68387816

www.wabteccorp.com

4. WARRANTY TERMS

Equipment and Parts:

15 months from delivery or 12 months from when the system is placed in service (whichever occurs first). Modifications to this product without written consent from the manufacturer or its designated authorized representatives will void all warranty obligations.

5. REGULATORY INFORMATION

Compliance information of the CAS-GPS is available via the service menu. To access this information:

1. Select  at the bottom of the screen.
2. Select 'CERT' Tab across the top of the screen.

CAUTION

Modifications to this product without written consent from the manufacturer or its designated authorized representatives could void the user's authority to operate the equipment.

Supplier's Declaration of Conformity 47 CFR § 2.1077 Compliance Information

We, Digital Mining Technology, of 3 Co-Wyn Close, Fountaindale, NSW, 2258, Australia declare under our sole responsibility the products:

Make: CAS-GPS IVU

FCC ID: YIY-PROD08422
YIY-PROD08472

Unique Identifier: PROD0842-2
PROD0847-2
PROD0842-2NB
PROD0847-2NB

Responsible Party: Digital Mining
2901 East Lake Road
Erie, PA, 16531
(814) 875-2234

PROD0842-2: Contains FCC Approved Module: FCC ID: XPYJODYW263,
Model No.: JODY W263 WiFi Module.

PROD0847-2: Contains FCC Approved Modules: FCC ID: QIPPLS62-W,
Model No.: PLS62-W Modem
FCC ID: XPYJODYW263,
Model No.: JODY W263 WiFi Module.

to which this declaration relates:

Complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

5.1. FCC Interference Statement for Class B devices.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



WARNING *A shielded type Ethernet cord is required to meet FCC Class B emission limits and also prevent interference to the nearby radio and television reception.*

This device and its antenna(s) must not be co-located or operate in conjunction with any other antenna or transmitter.

The antenna is considered an integral system component. Use of any antenna other than those specified in the installation manual or supplied with the product may void the product's compliance.

5.2. Federal Communication Commission (FCC) - Radiation Exposure Statement

To comply with FCC RF exposure limits for general population / uncontrolled exposure, the antennas used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons and must not be colocated or operating in conjunction with any other antenna or transmitter.

5.3. Industry Canada Compliant

This Class B digital apparatus complies with Canadian ICES-003. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

5.3.1. Concerning Radio Transmitters

This device complies with Industry Canada's licence-exempt RSSs.

Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

5.3.2. Detachable Antennas

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the installation manual with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

5.3.3. Industry Canada - Radiation Exposure Statement

To comply with Industry Canada RF exposure limits for general population / uncontrolled exposure, the antennas used for this transmitter must be installed to provide a separation distance of at least 37 cm for GSM product variants or 20 cm for non-GSM product variants from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

5.3.4. Industrie Canada – Déclaration sur l'exposition aux radiations

Afin de respecter les limites d'exposition pour l'ensemble de la population/l'exposition non contrôlée de la FCC/IC RF, les antennes utilisées pour cet émetteur doivent être installées de manière à offrir une distance de séparation minimum de 37 cm pour les variantes de produits GSM ou de 20 cm pour les variantes de produits non GSM de toutes les personnes et ne doivent pas être utilisées en conjonction avec d'autres antennes ou émetteurs.

5.3.5. Conforme aux normes d'INDUSTRIE CANADA

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003. Les changements ou les modifications non approuvés expressément par la partie responsable de la conformité pourraient annuler l'autorisation de l'utilisateur de faire fonctionner l'équipement.

5.3.6. Au sujet des émetteurs radio

Cet appareil respecte les systèmes de satellite de radiodiffusion d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne peut pas causer de l'interférence; et
2. Cet appareil doit accepter toute interférence, y compris celle qui provoque un fonctionnement non souhaité de l'appareil.

Conformément aux règlements d'Industrie Canada, cet émetteur radio peut fonctionner uniquement au moyen d'une

antenne de type et avec un gain maximal (ou plus petit) approuvés pour l'émetteur par Industrie Canada. Afin de réduire la possible interférence radio avec les autres utilisateurs, le type d'antenne et son gain devraient être choisis de manière à ce que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne soit pas plus grande que nécessaire pour une communication réussie.

5.3.7. Antennes détachables

Cet émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes inscrites dans le manuel d'installation avec le gain maximum permis et l'impédance d'antenne requise pour chaque type d'antenne indiqué. Les types d'antennes non compris dans la liste, qui ont un gain supérieur au gain maximum indiqué pour le type en question, sont strictement interdits.

5.4. Australian Radio Communications Equipment - Radiation Exposure Statement

The equipment complies with the the Radiocommunications Equipment (General) Rules 2021 for General Public Exposure, Non-Aware User, for a Compliance Level 2 Radiocommunications Equipment, when the minimum safety distance of 20 cm is adhered to, and shall bear the RCM.

5.5. Anatel Resolution 680/2017 Statement (ANATEL - 09438-20-12930)

RESOLUÇÃO No: 680/2017: "Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados"

RESOLUTION No: 680/2017: "This equipment is not entitled to protection against harmful interference and cannot cause interference in properly authorised systems"

6. SUMMARY DATA

Not applicable.