

CAS GPS

Collision Avoidance System

User Manual

Rev E1



imagination at work

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1 Document Revision

REV	DESCRIPTION	Author	Review	Approval	Date
Draft	Draft Release	SW			28/11/13
A	First Release	SW	CH	CH	28/11/13
B	Addition of RF functionality	SW	TW	TW	14/03/14
C	Additional of operator screens	TW	CH	TW	24/07/14
D	Update product name, Add 868MHz Specs	NM	CH	TW	17/12/14
E	Update Compliance Information / Format Images	NM			17/02/16

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3 Disclaimer

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4 Warnings

- 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.
- 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.
- Alarm logic should be determined via site specific risk assessment based on the end-users specified high risk interactions.
- 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 GE and a detailed risk assessment conducted.

5 Company Details

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6 Scope

CAS GPS User Manual

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

- 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)

6.1 Abbreviations

Abbreviation	Meaning
IVU	In Vehicle Unit
GPS	Global Positioning System
CAS	Collision Avoidance System
LAN	Local Area Network
Wi-Fi	Wireless Communication Medium
GSM	Global System for Mobile Communications
OEM	Original Equipment Manufacture

6.2 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.

7 Transport

All possible precautions are 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 GE Mining immediately.

Notify GE 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.

Where practicable 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.

8 Storage

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

All equipment should be stored indoors protected from the elements in a cool dry area. If storing on the ground, ensure that the storage area is not an area where water will collect.

9 Unpacking of Equipment

The method of packing used will depend on the size and quantity of equipment.

Take care when unpacking the equipment to avoid damage.

10 Installation

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

11 Test & Commission

At installation the system will be tested to ensure that electrically and functionally the system is correctly installed

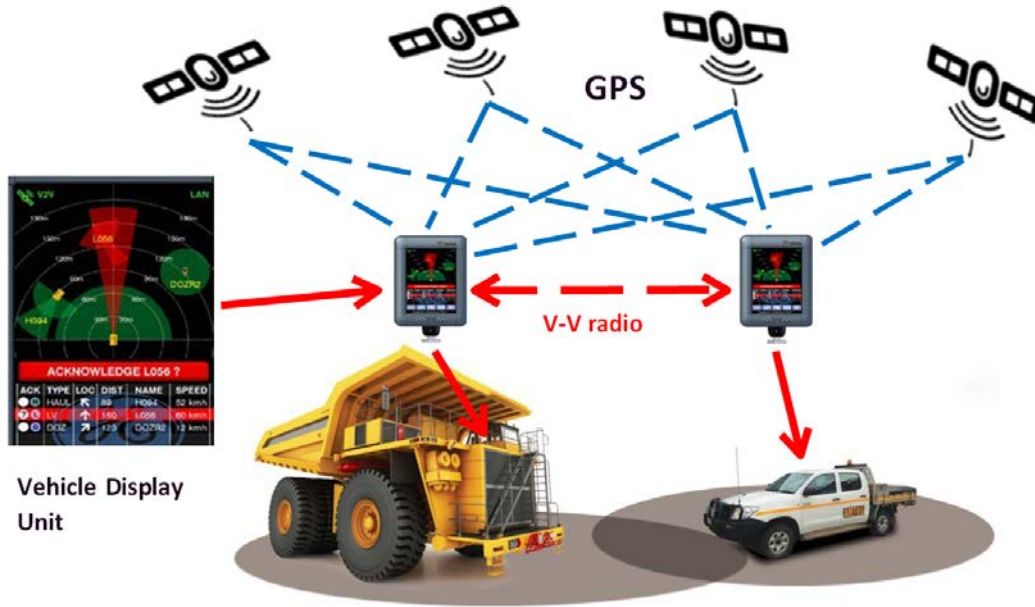
After passing its final installation test, the system is then ready for use after which inbuilt self-diagnostic testing combined with daily user monitoring ensures that any faults can be acted upon

12 Operation

12.1 Principle of Operation

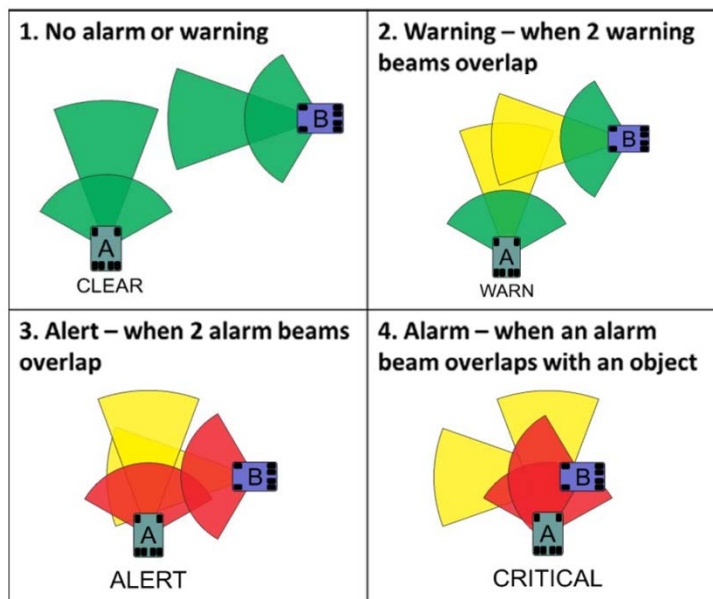
The CAS GPS product is designed to offer a situational awareness driver aid utilising GPS proximity detection of vehicles/objects and data logging.

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.



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 when operating their vehicle. The system is designed to avoid distracting the driver from driving, but provides the driver with an awareness tool to notify and visualise 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 table 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 acknowledgement by the driver on the touch screen may be required (only when the vehicle is stationary).

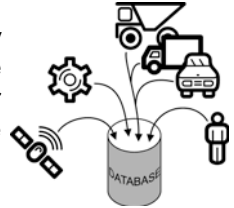


Positional Tracking

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.

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 of the events in a desired date range to gain access to more detail of a specific event.



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, HSDPA and in future models the 4G LTE 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.

12.2 Object Types

These icons are used on the display to represent the various vehicle types:



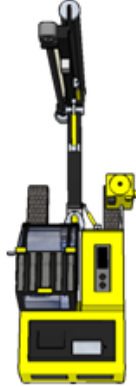
Truck



Dozer



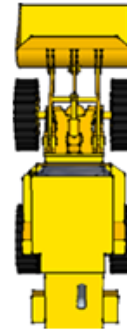
Grader



Drill



Medium Vehicle



Large Loader



Shovel



Scraper



Small Heavy Vehicle



Dragline



Personnel Tag



Light Vehicle



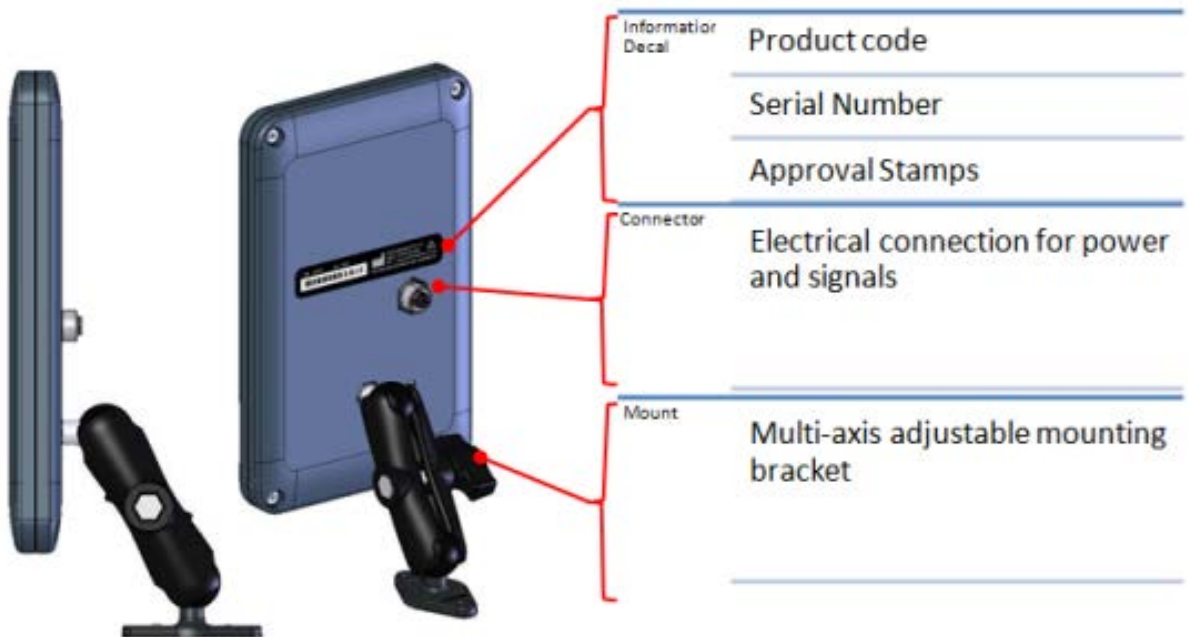
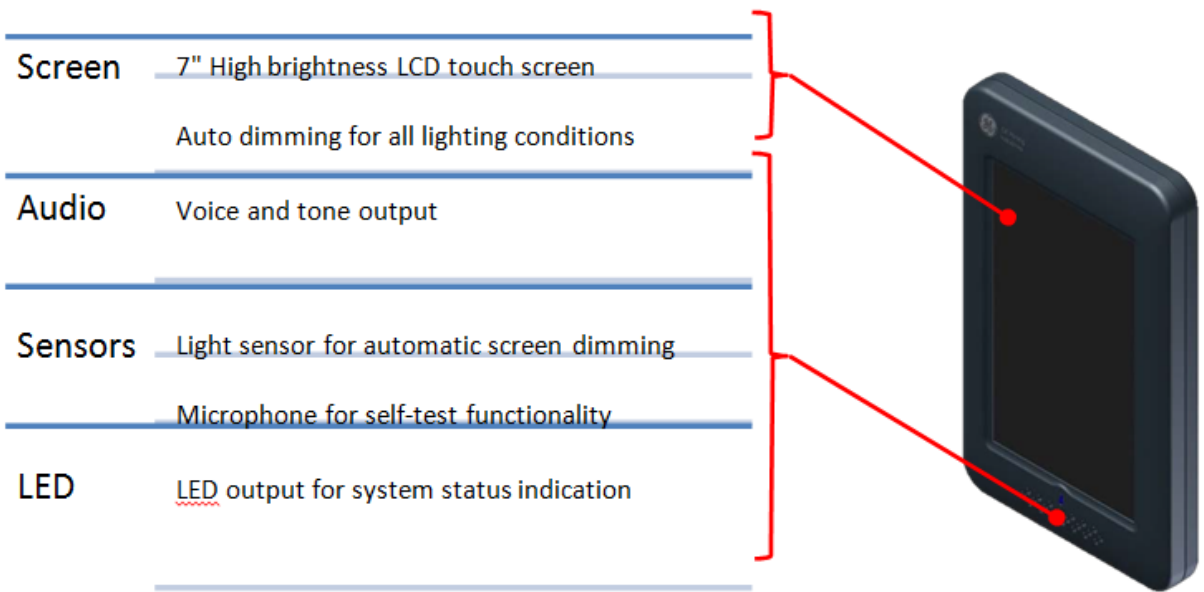
Stationary Object











Test Station

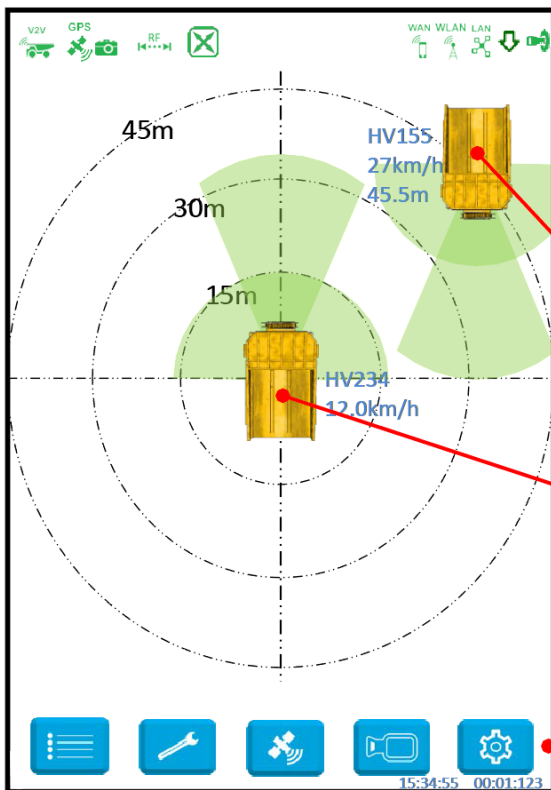
12.3 Key Components






12.3.1 Display Unit




12.3.1.1 Screen Elements

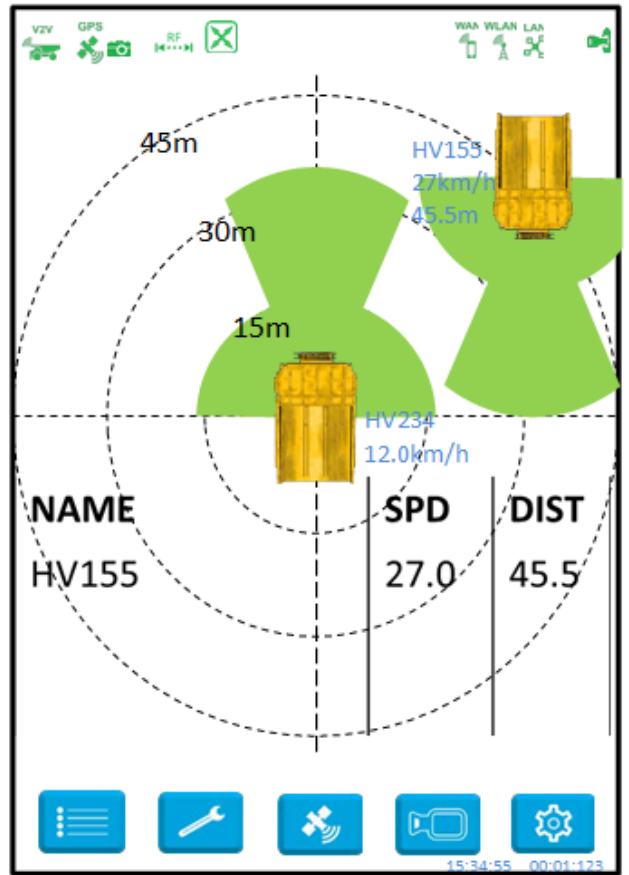
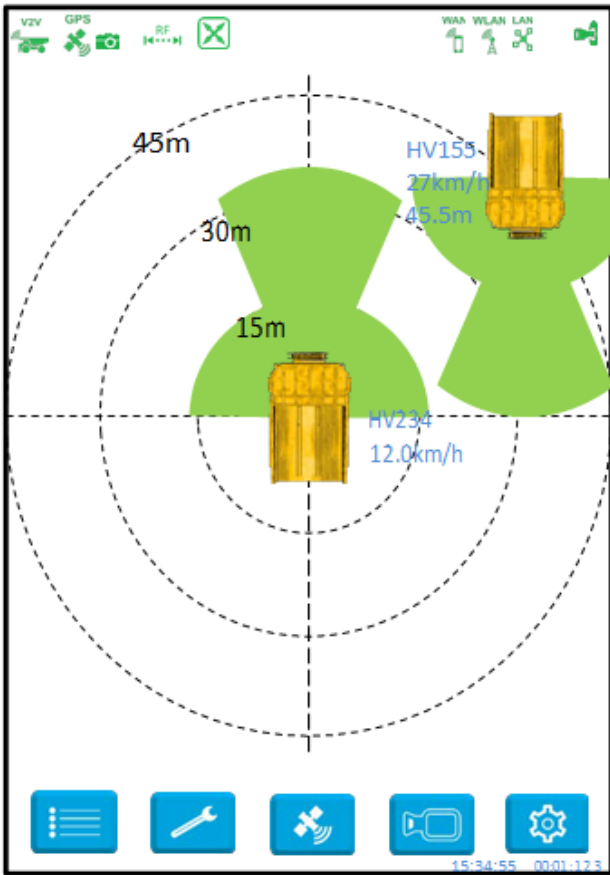
V2V Status	Green - Other vehicles in view and communicating ok
	Yellow - Radio working ok but no vehicles in view
	Red - Fault detected
Expansion Unit	Green - Communications OK
	Red - Communication Fault
RF	Green - RF system operational
	Red - RF system fault detected
Cameras	Green - Camera system operational
	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




Status Bar	Current status of system components (See Table above)
Approaching Vehicle	Vehicle ID
	Speed Indicator
	Distance
Your Vehicle	Vehicle ID
	Speed Indicator
Special Functions Buttons	List View 
	Vehicle Data 
	GPS Data 
	Camera View 
	Configuration 

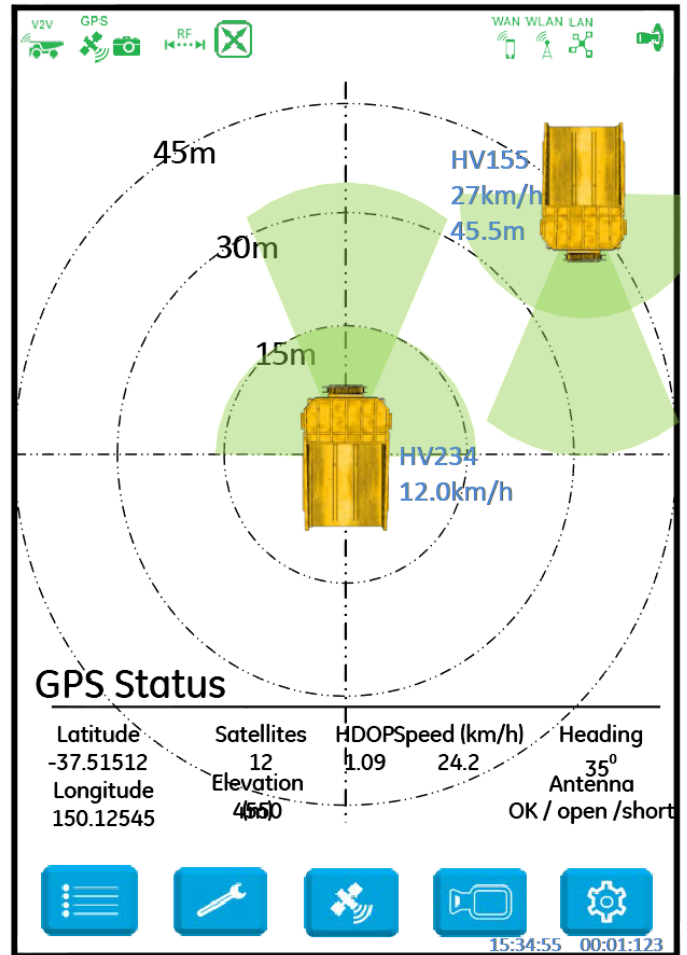
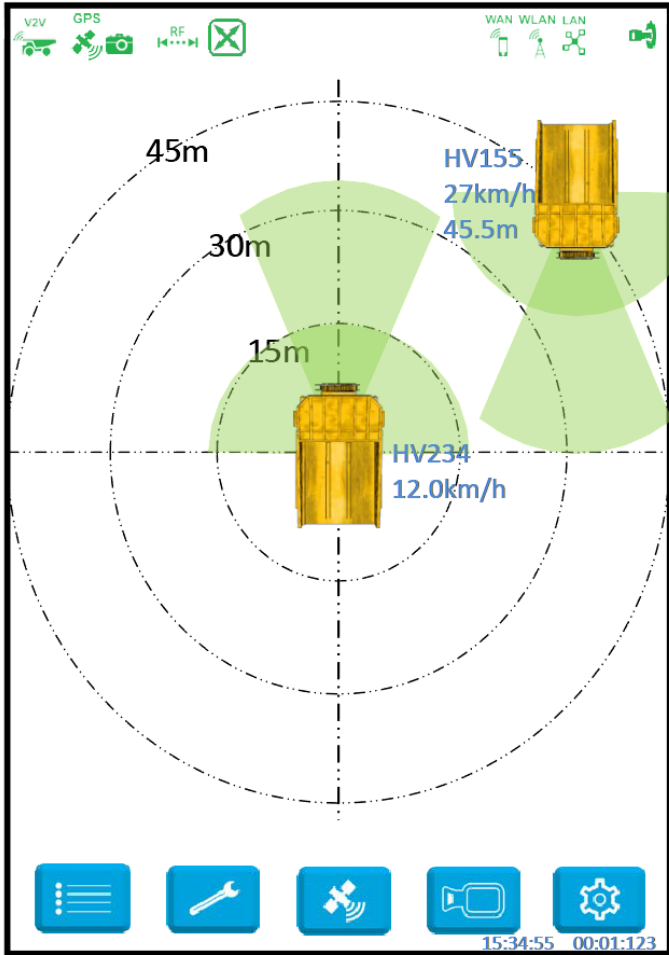
12.3.1.2 List View

Pressing the  button toggles the object list view on or off




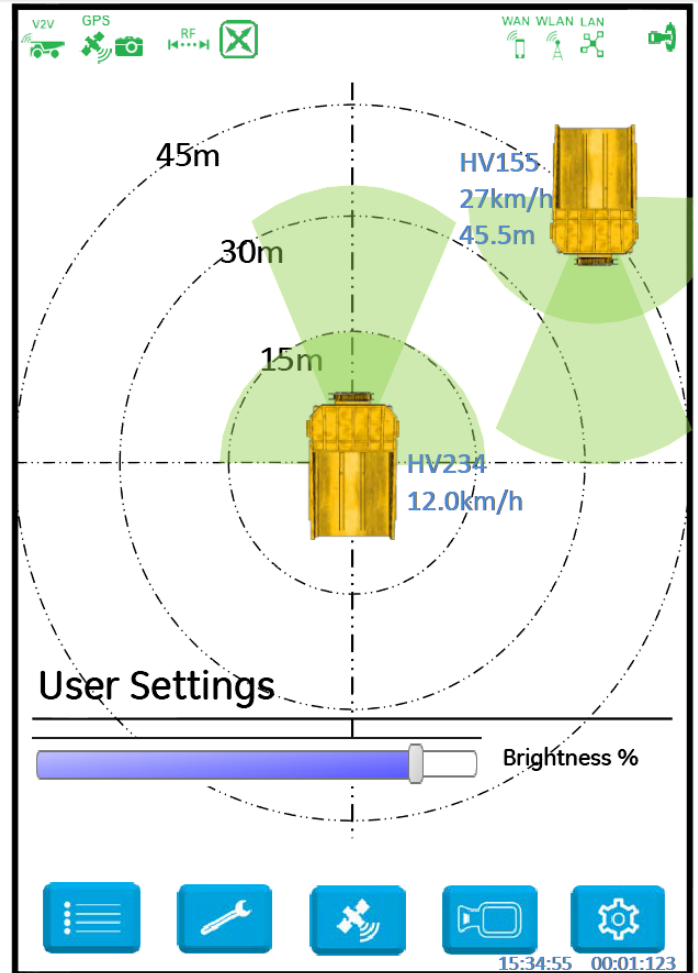
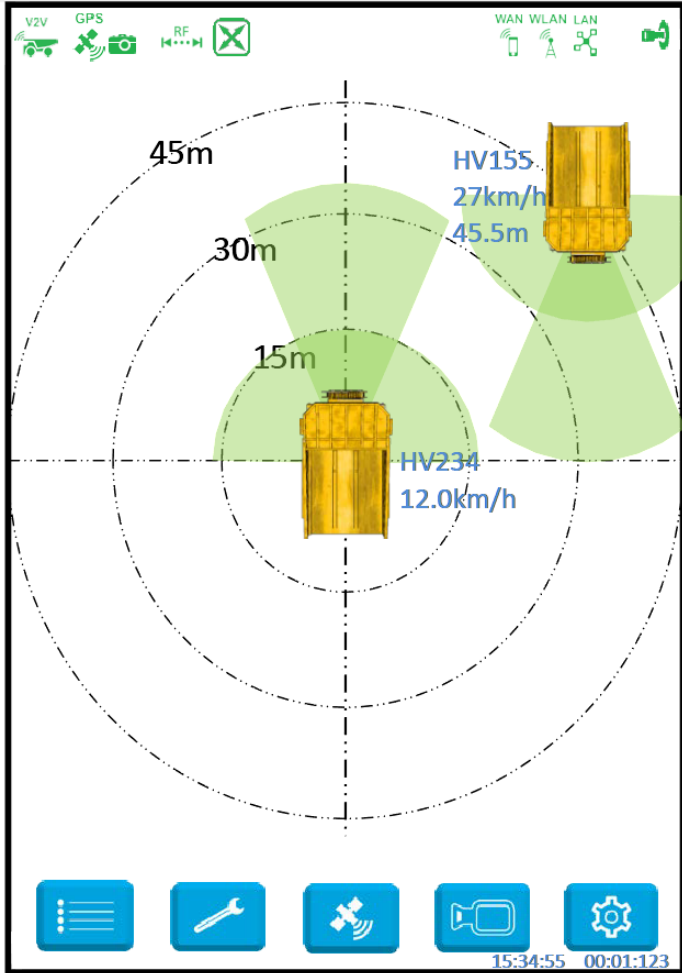
12.3.1.3 GPS Status view

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.





12.3.1.4 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.

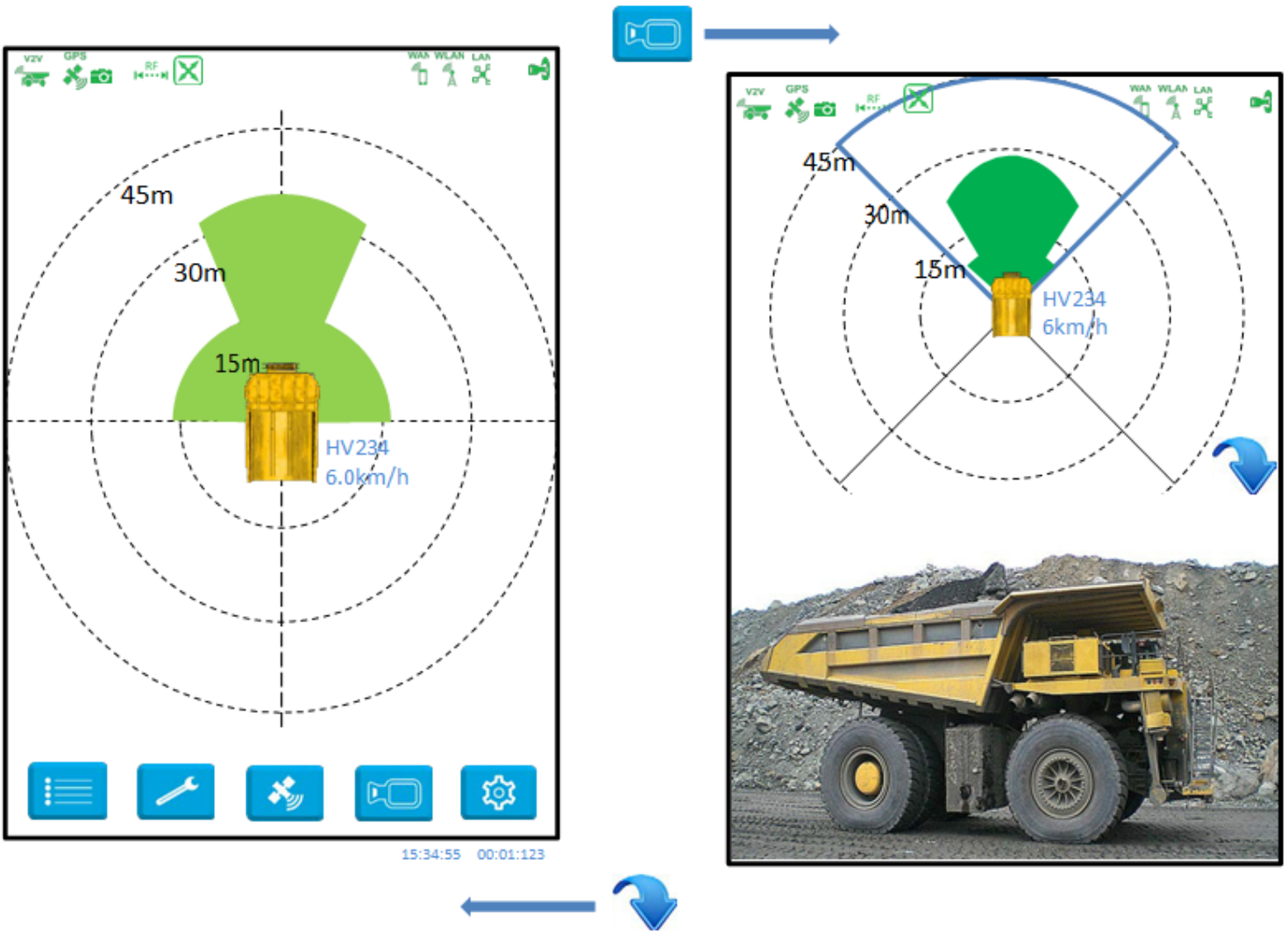


12.3.1.5 Camera View

Pressing the  button turns on the camera view.

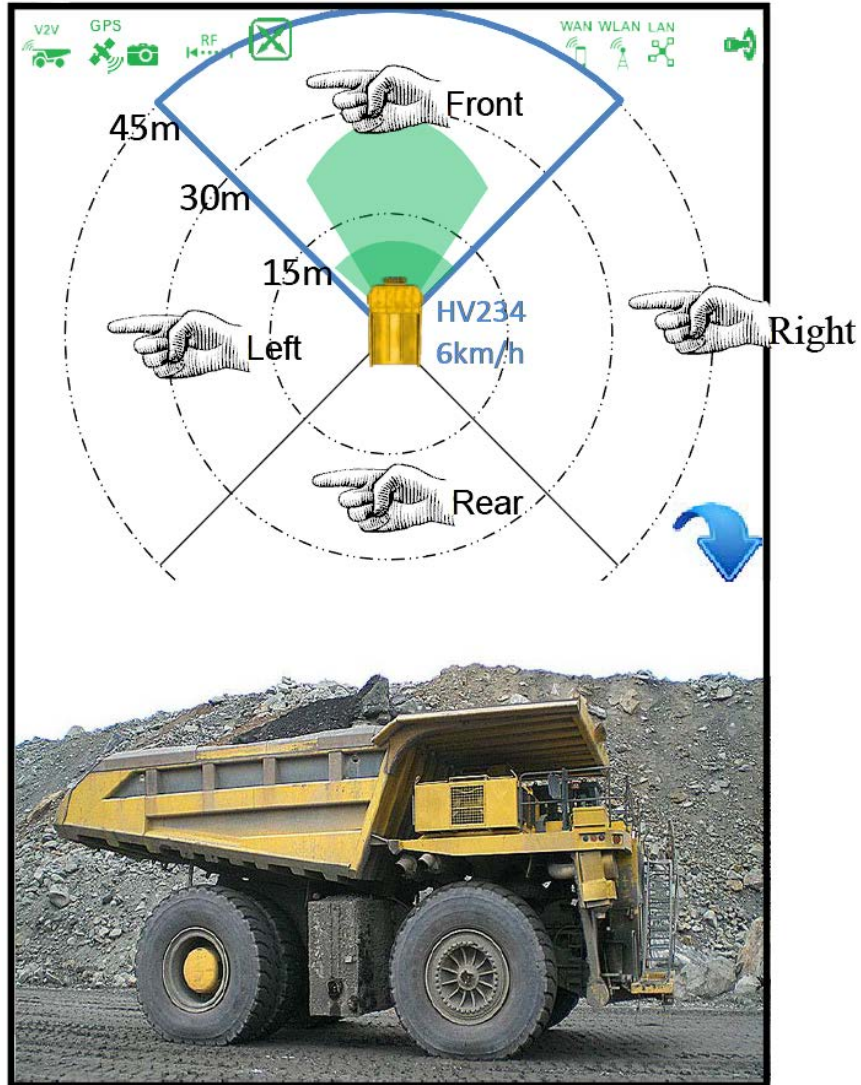
Pressing the  button closes the camera view

The camera view will automatically close when the vehicle travels faster than the preconfigured camera off speed (default 10km/h).



12.3.1.6 Camera Selection

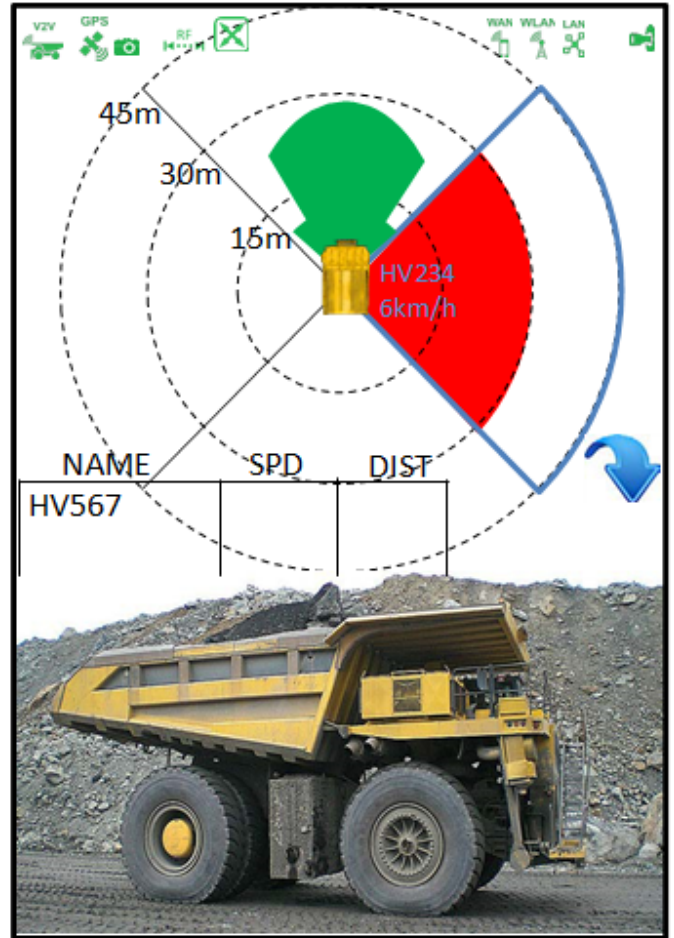
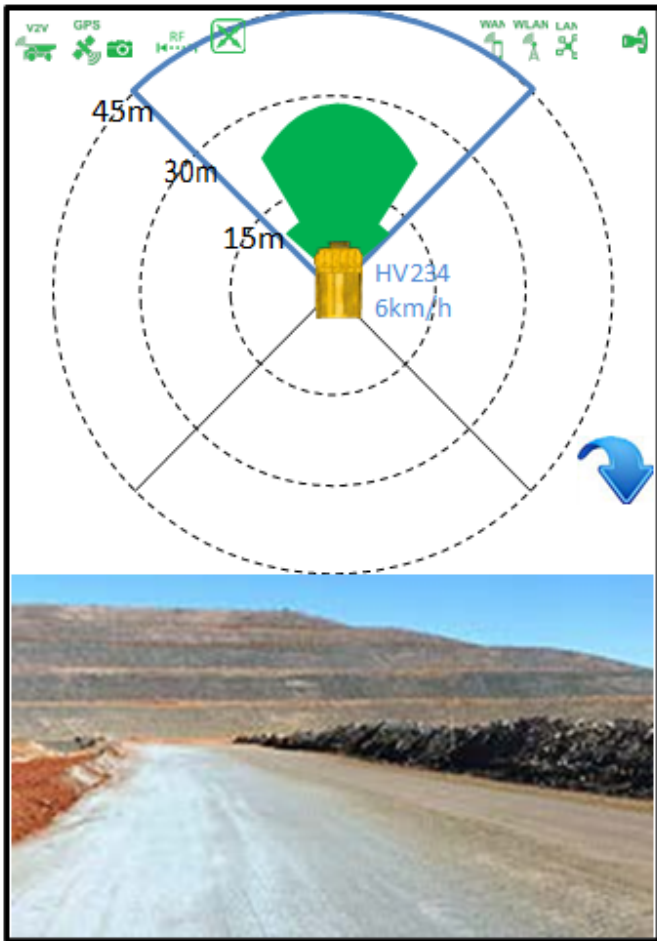
Once the camera view has been enabled cameras may be selected by pressing anywhere in the relevant quadrant as shown in the diagram below:



12.3.1.7 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 travelling 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 preconfigured distance (30m in this example). Note no icon is presented on the screen but the vehicles ID appears in the table (no speed or distance is displayed).



12.3.1.8 Using the Display

On Vehicle Start-up

Immediately after starting the vehicle and before putting it into motion; perform a quick check of the Display's 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!

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. 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. You cannot silence the alarm while your vehicle is moving!

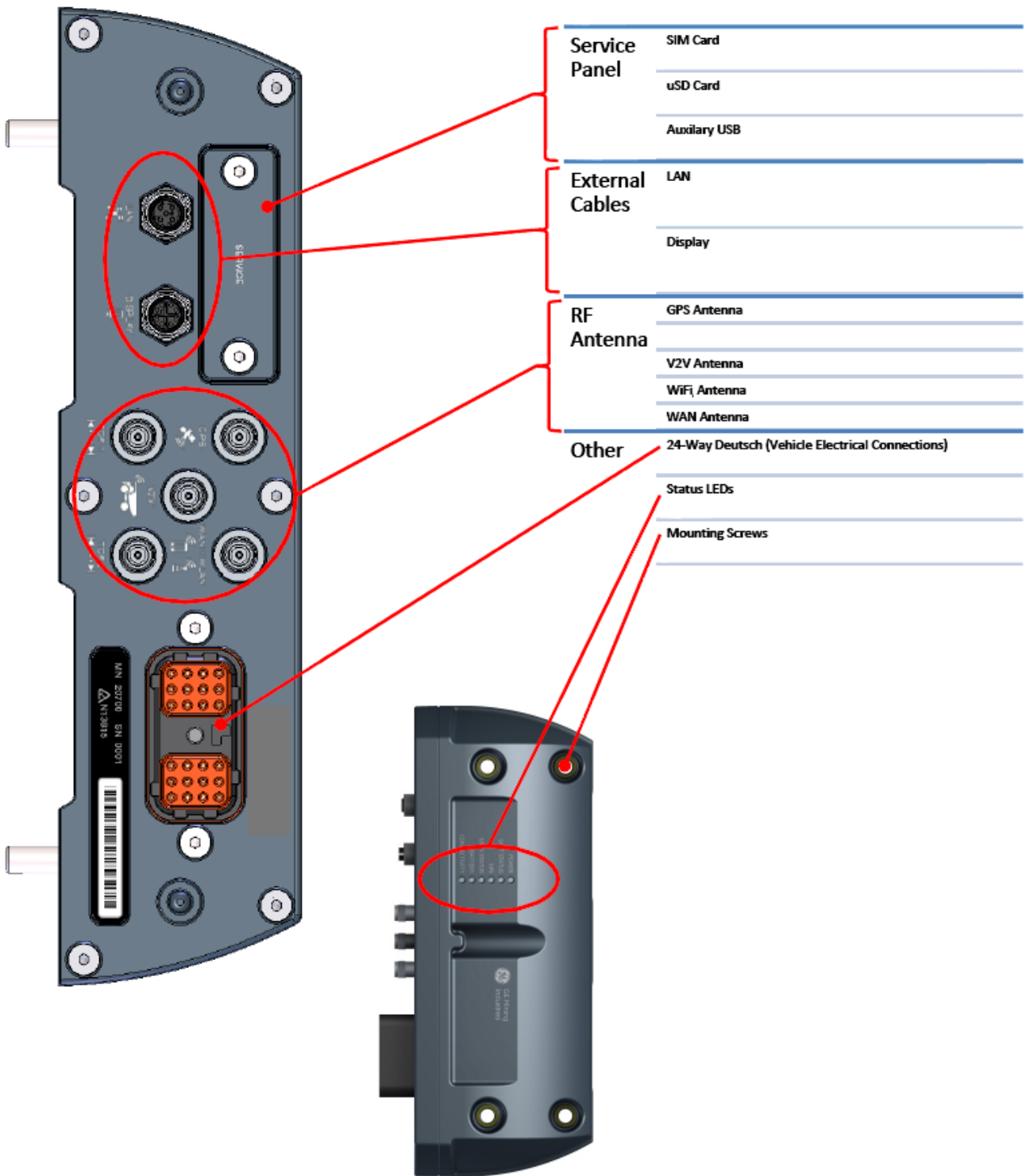
Night Operations

A light sensor in the Display will put the screen into Night Mode when the ambient light level drops below a preconfigured 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

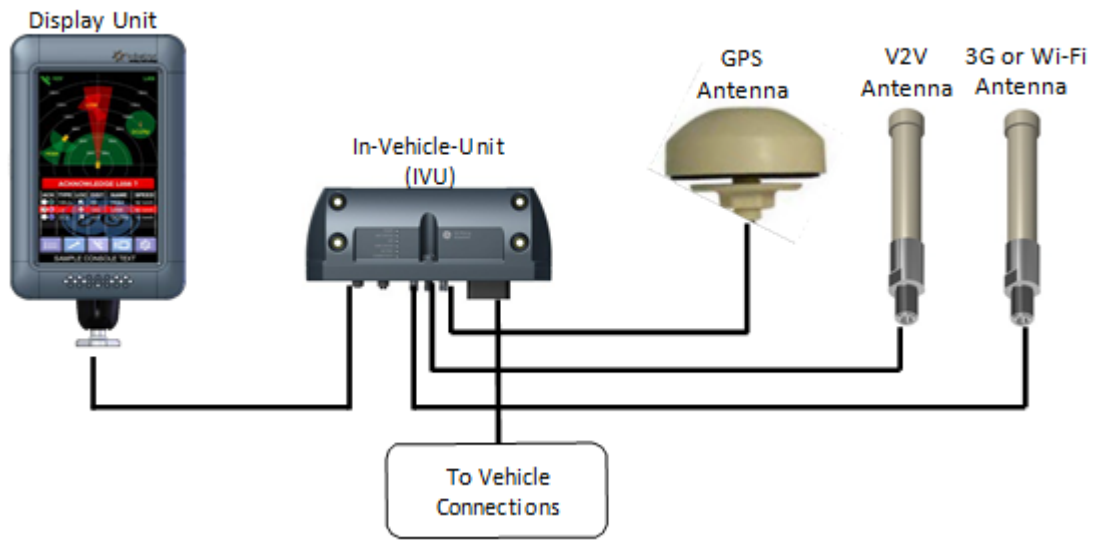
A light sensor in the Display will put the screen into Daytime Mode when the ambient light level rises above a preconfigured level. In Daytime mode the screen will change from a black to a white background, this makes the information displayed on the screen easy to read in high ambient light levels.

12.3.2 In Vehicle Unit (IVU)

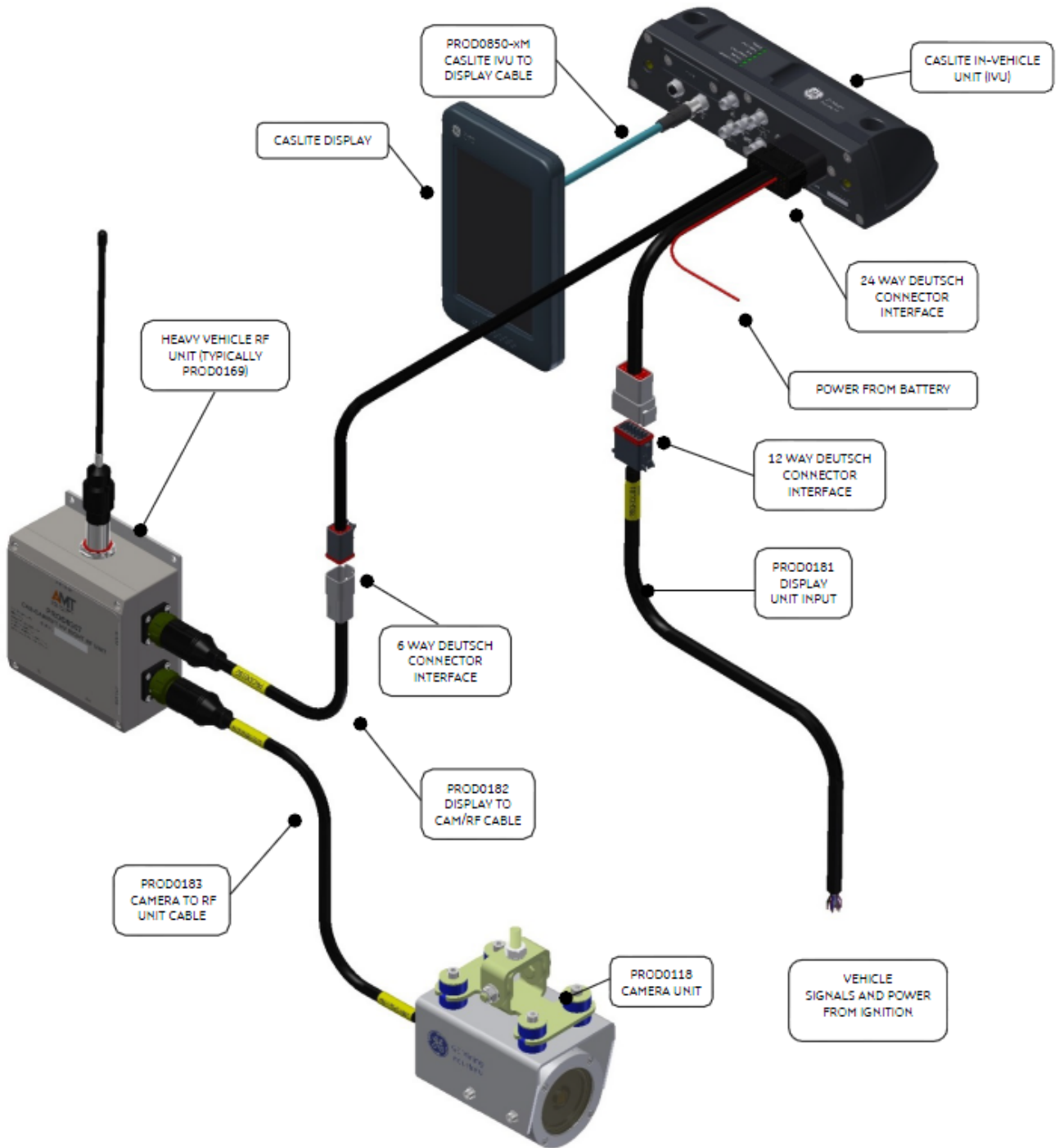


12.4 System Interconnections

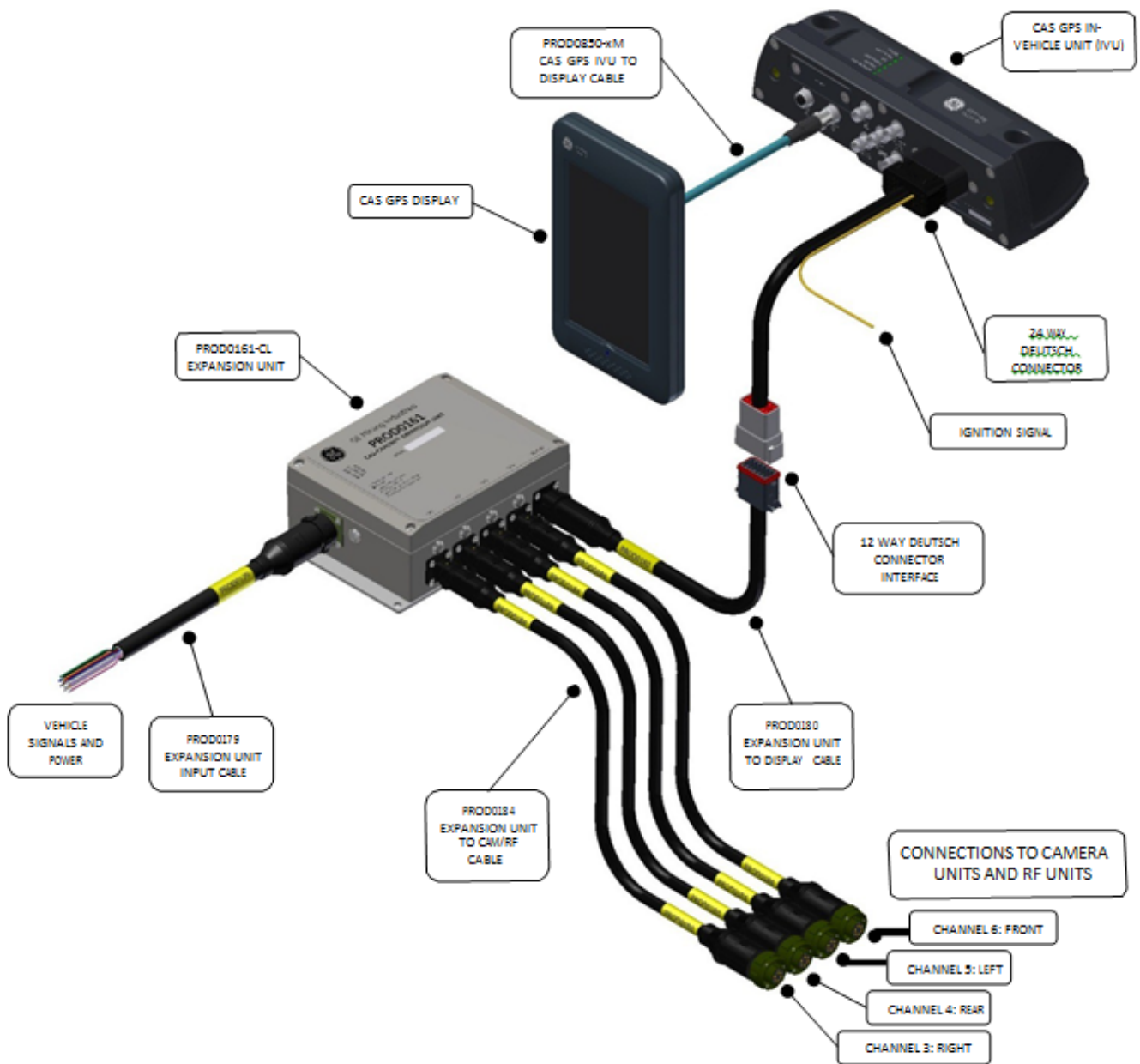
The main system components and their connections are shown below:



12.4.1.1 CAS-CAM/RF interconnections (1CAM/1RF)



12.4.1.2 CAS-CAM/RF interconnections (4CAM/4RF)



13 Service, Maintenance & Disposal

13.1 Equipment Service

13.1.1 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

13.1.2 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

13.1.3 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).

13.1.4 Software Updates

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

13.2 Equipment Maintenance

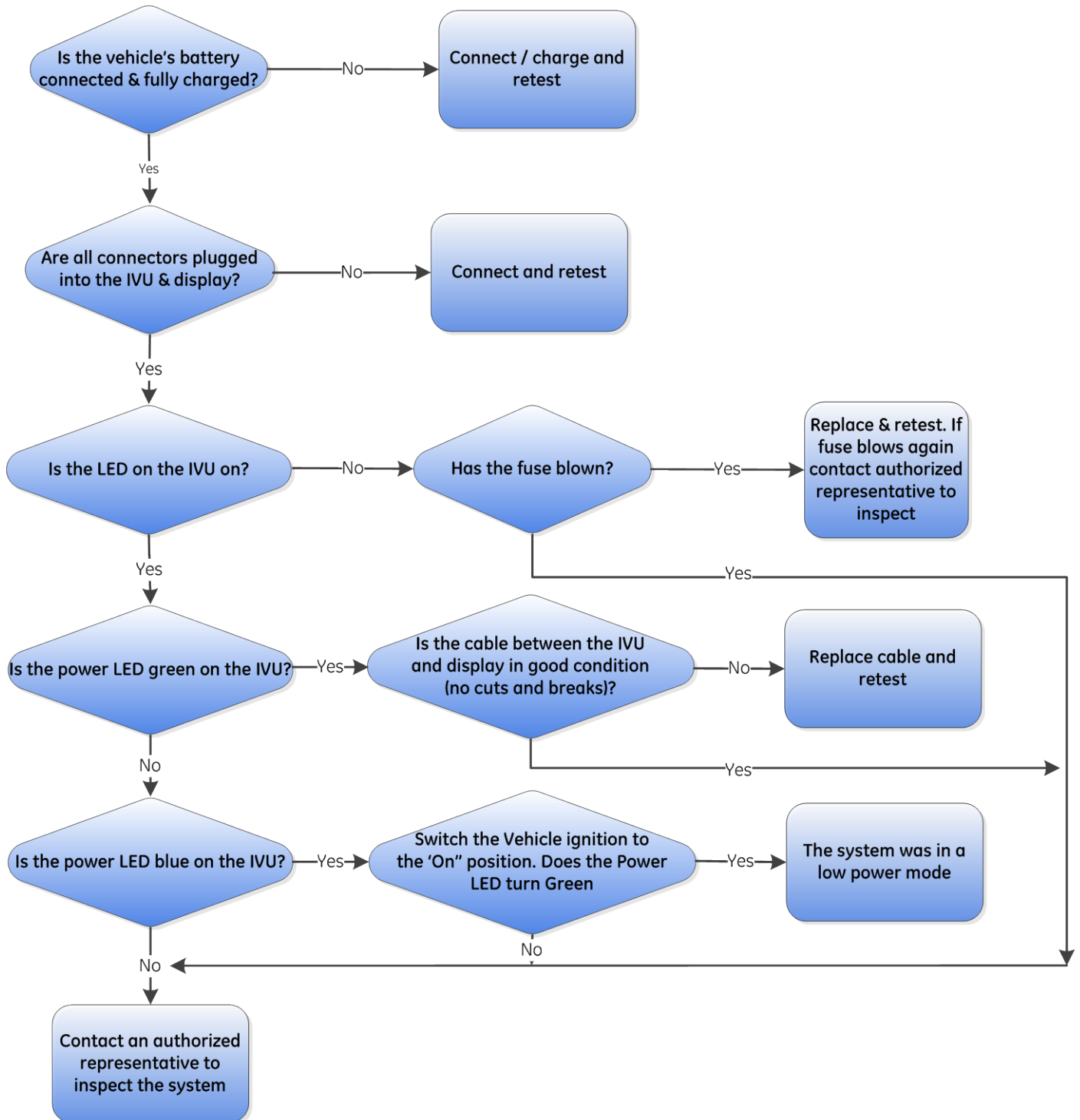
If the system is not functioning as expected, refer to section **14** Troubleshooting. If a fault cannot be resolved, please contact your nearest authorized representative.

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.


14 Troubleshooting

14.1 No power / blank screen

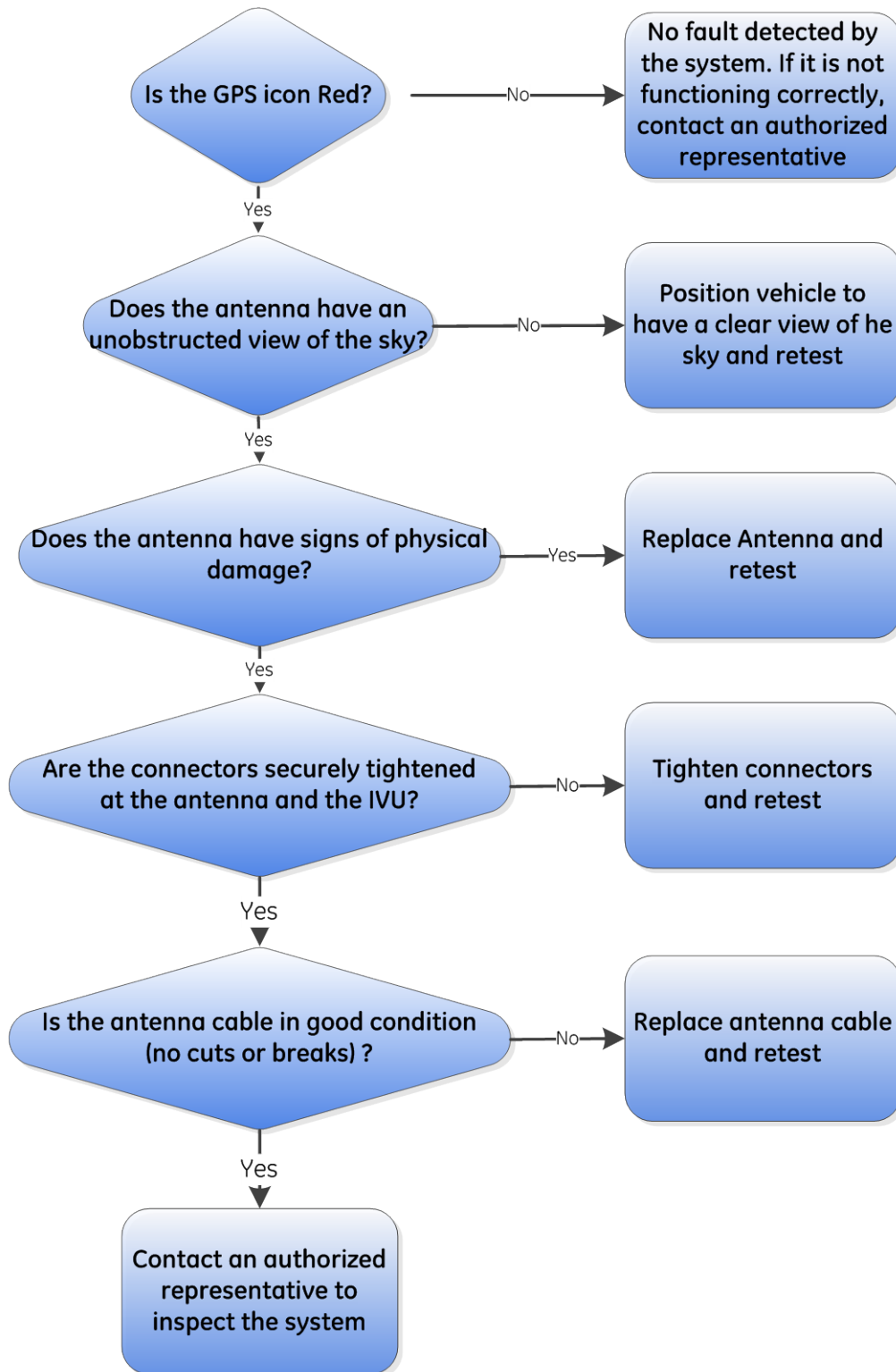
Use this flow diagram to troubleshoot an apparent loss of power or blank screen:




14.2 GPS Problems

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

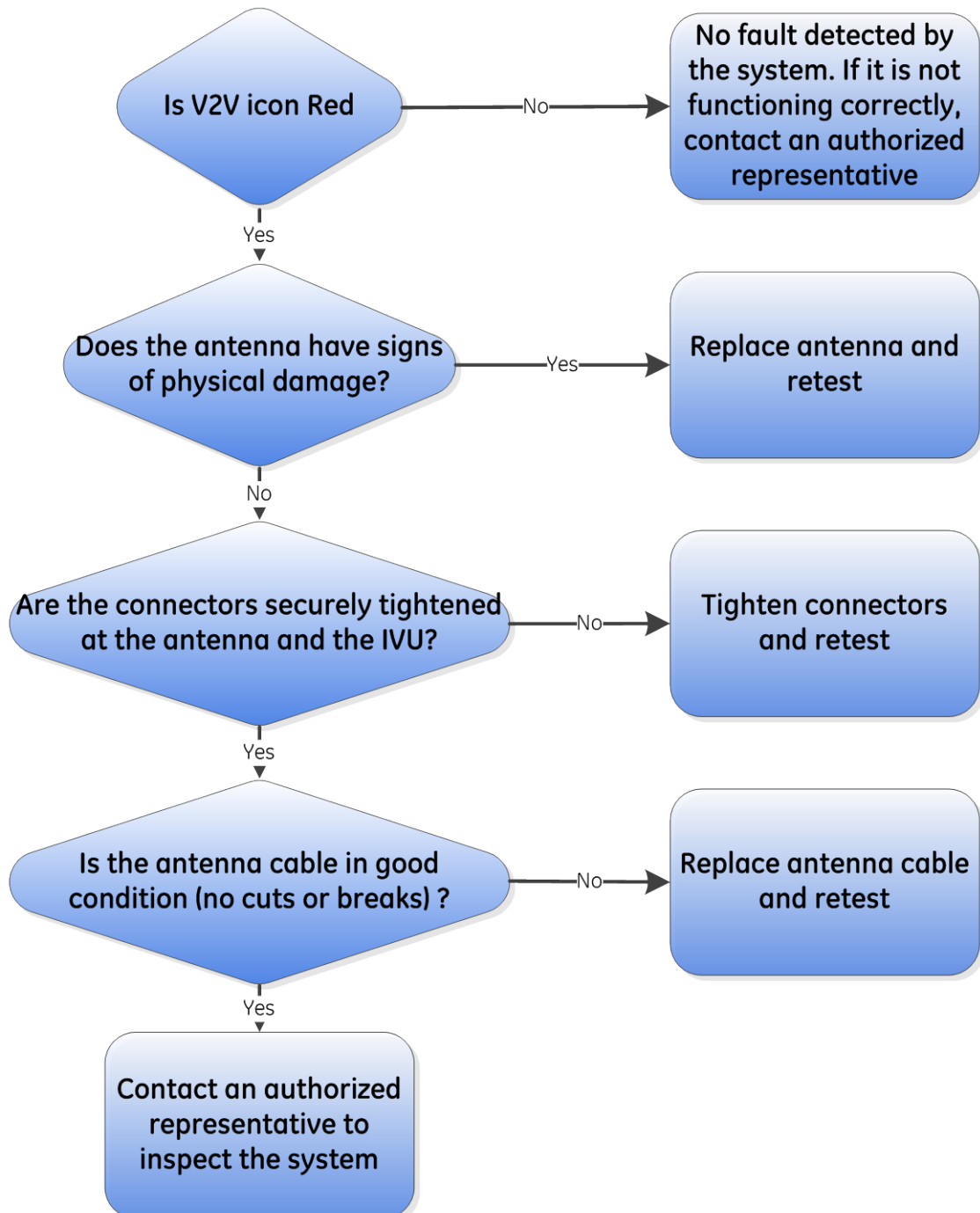
- Green – Position and Heading fix – no faults
- Yellow – Position fix but no heading – no faults
- Red – No GPS signal or GPS error – fault or no signal detected



14.3 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



14.4 WiFi/GSM Problems

The Wi-Fi or GSM communication status is indicated by the colour of the of the display.

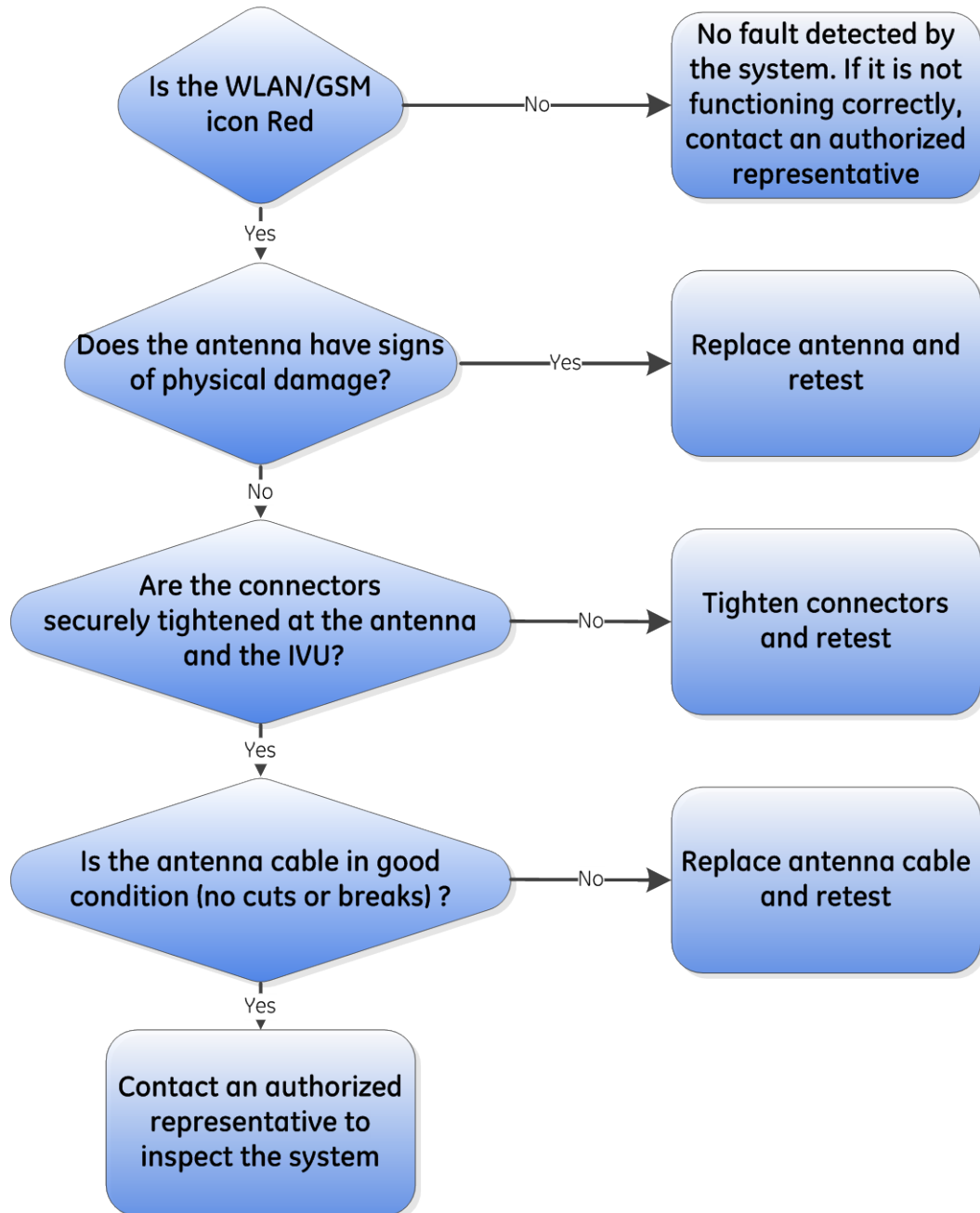


or



icons at the top

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



15 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

16 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 should be disposed of in accordance with local regulations.

17 Specifications

International Approvals	
Australia	ACMA RCM (PROD0841-2) (PROD0842-2) + WiFi (PROD0843-2) + GSM (PROD0847-2) + WiFi & GSM
North America	FCC (PROD0841-2) FCC ID: YIY-PROD08422 (PROD0842-2) FCC ID: YIY-PROD08422 (PROD0843-2) FCC ID: YIY-PROD08472 (PROD0847-2) FCC ID: YIY-PROD08472
Brazil	ANATEL 3973-13-1486 (PROD0841-2) (PROD0842-2)
Indonesia	POSTEL 34481/SDPPI/2014 PLG ID: 3944 (PROD0841-2) (PROD0842-2)
Canada	INDUSTRY CANADA (PROD0841-2) IC: 8903A-PROD08422 (PROD0842-2) IC: 8903A-PROD08422 (PROD0843-2) IC: 8903A-PROD08472 (PROD0847-2) IC: 8903A-PROD08472
South Africa	ICASA TA-2015/074 (PROD0841-1) (PROD0842-1) (PROD0843-1) (PROD0847-1)
Environmental Performance	
Storage Temp.	-30°C to +85°C
Vibration	Withstands 3.5mm 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 & 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)
Display Unit	
Type	Capacitive touchscreen
Dimensions	133 wide x 223 high x 25mm deep (basic) 57mm deep (with ball)
Weight	810g
IP Rating	IP52
Operating Temp.	-10°C to +60°C
Mounting	1" Ball (RAM Mount)
Power	From IVU
Screen size	7"
Screen Resolution	1024 x 600 WSVGA
Inputs	From IVU via M12 connector
Microphone	yes
Buzzer	78dB at 50cm
Speakers	2x1W, programmable up to 81dB at 50cm

In Vehicle Unit (IVU)	
Dimensions	290 wide x 72 high x 130mm deep (basic)
Weight	2060g
IP Rating	IP66
Operating Temp.	-15°C to +60°C
Mounting holes	Footprint 215x48mm (suits 4 x M8 SHCS)
Typical battery backup	14hrs standby operation (GPS+V2V active).
	3hrs charge time
Battery type	LiFePO ₄ , 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
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-2	965 kHz 6dB RF bandwidth.
	920 MHz Digital radio.
	100 mW transmit power.
	1000 kbps data rate. (500 kHz symbol rate, 2 bits/symbol), Single channel, 4GFSK Modulation (4 Gaussian Frequency Shift Keying, 125 kHz inner deviation).
	960 bits per packet (490 symbols). 980 μs packet duration. 320 ms packet repetition period. Duty cycle < 1%. (0.3%).
	Range up to 500m
GPS	3 dBi nominal antenna gain (< 6dBi). Pre-terminated cable to dedicated antenna mount.
	Multi-GNSS. GPS, GLONASS, Galileo and QZSS compatible.
	Horizontal accuracy ± 2.5m *
Mobile communications (optional)	* (CEP, 50%, 24 hours static, -130 dBm, > 6 SVs)
	UMTS WCDMA/HSDPA/HSUPA/HSPA+.
	800 MHz, 850 MHz, 900 MHz, 1800 MHz, 1900MHz, 2100 MHz
WIFI (optional)	GSM, GPRS, EDGE.
	IEEE 802.11 b/g/n
TOF proximity ranging (optional)	2.4GHz IEEE 802.15.4a
	0-250m, ±2m accuracy

Reference Standards

IEC 60529	Degrees of protection provided by enclosures (IP Code)	ETSI EN 300 220	RF Performance Characteristics (V2V)
IEC 60068-2-6	Vibration	ETSI EN 300 328	RF Performance Characteristics (Wi-Fi)
IEC 60068-2-27	Shock	ETSI EN 300 440	RF Performance Characteristics (GPS)
IEC 61000-4-2	Electrostatic Discharge	ETSI EN 301 511	RF Performance Characteristics (GSM)
EN 61000-4-3	Immunity to Radiated Electromagnetic Field	ETSI EN 301 908	RF Performance Characteristics (3G)
IEC 61000-4-4	Electrical Fast Transient / Burst (EFT)	EN 60950 -1	Electrical Safety
IEC 61000-4-5	Surge Immunity	AS/NZS 4268	Radio-Communications Limits (RSE)
EN 61000-4-6	Immunity to Conducted Disturbances	FCC 47 PART 15A&B	Electromagnetic Compatibility Class B (EMC)
ISO 7637-2	Automotive Electrical Disturbances	FCC 47 PART 15c	Radio-Communications Limits (RSE)
ETSI EN 301 489	Electromagnetic Compatibility (EMC / EMI) (Parts 1, 3, 7, 17, 24)	ICES-003	Electromagnetic Compatibility Class B (EMC)
EN 55022 (CISPR22)	Electromagnetic Compatibility Class B (EMC)	RSS-247	Radio-Communications Limits (RSE)
		RSS-102	Electromagnetic Radiation

18 Authorized Representatives

18.1 - Brazil



Avenida Portugal 4511/Bairro Itapoa Belo Horizonte,
 M.G. 31710-400, Brazil
 P: +55 31 3311 7200
 F: +55 31 3311 7205
 Email: brasil@joyglobal.com
www.joyglobal.com

18.2 - South Africa



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

18.3 - Indonesia



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

18.4 - Canada



General Electric Canada
 2300 Meadowvale Blvd,
 Mississauga, ON, L5N 5P9
 P: 1-800-561-3344
 P: +1 905-858-5100
www.ge.com

18.5 - North America



General Electric Company, Mining
 2901 East Lake Road, Erie,
 Pennsylvania, 16531, US
 P: 480 264-2063
 F: 480 264-6402
www.getransportation.com

18.6 - Australia




GE Mining, Industrea Mining Technology
 3 Co-Wyn Close, Fountaindale,
 NSW, 2258, Australia
 P: +612 4336 1800
 F: +612 4389 2355
www.getransportation.com

19 Warranty Terms

Equipment and Parts:

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

20 Regulatory Information

Compliance markings of the CAS-GPS are available via the service Information menu  of the system display.

FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

CAUTION: This device 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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

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 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

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

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.

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 25 cm for GSM product variants or 20cm for non GSM product variants from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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 25 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.

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.

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.

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.

Australian Radio Communications Equipment - Radiation Exposure Statement

The equipment complies with the Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014 for General Public Exposure, Non-Aware User, for a Compliance Level 2 Radiocommunications Equipment, when the minimum safety distance of 36cm is adhered to, and shall bear the RCM.

Anatel Resolution 506 Statement

This equipment operates in a secondary manner, that is, does not have the right of protection against prejudicial interference, even from stations of the same type, and nor can they cause interference to systems operating in a primary manner.