INTANGLES
INGENIOUS

Data Sheet

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INTANGLES
A DIGITAL TWIN COMPANY

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Intangles

INGENIOUS

Ingenious, an advanced portable device, is at the heart of the Digital Twin technology and is an enabler in creating a digital replica of physical assets, processes, or systems, either on the cloud or on the device itself. Based on real-world requirements, the device is configured to acquire a multitude of data from different sensors. Its powerful quad-core processor and built-in data transmission capability, either through 4G/LTE, Bluetooth or Wi-Fi, enables the data to be processed on the device or the cloud.

The core objective of this solution is to leverage physics & machine learning-based predictive analytics and impact the total cost of ownership (TCO), improve operational efficiency, and enhance the end-user experience through an intuitive web and mobile-based app to stay connected to their asset 24x7. From monitoring asset health to insightful reporting to raising alerts of various severity levels, the solution is a companion to fleet operators.

Vehicle Health Monitoring

Intangles' Ingenious uses historical and real-time data to deliver warnings/alerts of possible failures, significantly reducing vehicles' on-road breakdowns, thereby increasing operational hours and lowering maintenance/repair costs. With Ingenious, you have the necessary information related to fault codes that may arise in your vehicles, whether minor, major, or critical, at your fingertips. You can look at remedies depending on the severity. Along with faults, our proprietary predictive algorithms, coupled with machine learning, help fleet operators conduct preventive and proactive maintenance, making sure your vehicles stay healthy. A significant advantage of the vehicle health monitoring feature is to raise alerts and communicate via texts or web portals long before the ECU displays a diagnostic trouble code on the vehicle's dashboard.

Driver Behavior Monitoring

Intangles' comprehensive solutions track more than 20 exceptions in driver behavior, like overspeeding, idling, hard braking, and free running, to name a few, which helps generate actionable insights. Our Driving Scorecard feature is an automated peer-to-peer ranking model that enables you to promote and incentivize good driving behavior. It provides accurate feedback on gear utilization trends, idling instances, and other erroneous driving practices, thereby improving fuel efficiency and the overall health of your vehicle.

Fuel Monitoring

Intangles' patented ML-based fuel tracking algorithms can detect the exact amount and location of fillings/pilferages and, in turn, help compute the accurate cost per km of fuel consumed. In addition, the fuel monitoring solution doesn't need an external sensor to be mounted on the fuel tank, an added advantage of not needing calibration and long installation times.

DEF Tracking

Ingenious tracks the usage and level of AUS-32 (also known as Diesel Exhaust Fluid, AdBlue, or Urea) in vehicles that use Selective Catalytic Reduction (SCR) technology. It also detects pilferage and monitors consumption, allowing you to have real-time visibility and control over the usage of AUS-32 in your vehicles.

Operations Automation

Ingenious is known on many occasions to preempt critical engine breakdowns resulting in lower downtimes and maintenance costs. Visibility on the route and application-specific performance aggregates help you better plan your operations with a focus on higher margins. Fuel pilferage alerts enable a direct reduction in trip overheads. Automated reports reduce dependency on manpower. You can leverage a suite of ML and deep learning-based algorithms to analyze real-time data from retailed vehicles, improve products, and experience proactive service in the truest sense.

Range Prediction

Our comprehensive feature sets around cloud-integrated range prediction provide data on the number of charging cycles from the moment our device is installed on the vehicle, as well as backtracked data from the moment the vehicle hits the roads. Ingenious also provides accurate SOC and DTE predictions considering varying ambient and driving conditions. In addition to weather forecasts, our models have been trained to make predictions around motor torque, wheel speed, and sunset-sunrise trends, which influence HVAC and lighting. This multi-parametric approach enables you to preempt critical engine breakdowns resulting in lower downtimes and reduced maintenance costs. Visibility on the route and application-specific performance aggregates help you better plan your operations with a focus on higher margins.

Location Tracking

Intangles' Ingenious recreates vehicle trips and analyzes incidents, providing real-time and historical data of vehicles' location through the location tracking feature.

EC25-AF

- Model Name: **System Health Monitoring Device**
- Variant 1 Model Number:INT-SHMD-V2.0E-EC25AF
- Variant 2 Model Number: INT-SHMD-V2.0I-EC25AF

OBD Device Technical Specifications and Features

Communication		
Network Modes	Regions: North America ; LTE-FDD: B2/B4/B5/B12/B13/B14/ B66/B71 ; LTE-TDD: / ; WCDMA: B2/B4/B5	
SIM	Replaceable Micro SIM/ESIM	
Antenna	Internal: wide band flexi antenna External: SMA Connector + Wide Band wired Antenna	
Packet Data	Supports: TCP/UDP/PPP/NTP/NITZ/FTP/HTTP/PING/ CMUX/HTTPS/FTPS/SSL/FILE/MQTT/MMS Protocols	
SMS	Text messages for data forwarding Text and PDU mode	
Bluetooth	Bluetooth 5.2 Module(BLE)	
WiFi	WLAN Protocol	IEEE 802.11b/g/n
	Wi-Fi Frequency Band	2.4 GHz
	Wi-Fi Modulation Mode	BPSK/QPSK/ CCK/16QAM/64QAM
	Wi-Fi Operating Mode	AP/STA
Antenna	PCB Antenna	
LTE-FDD	LTE-FDD:- B2 (1850–1910 MHz)	Class 3 (23 dBm ±2 dB)
	LTE-FDD:- B4 (1710–1755 MHz)	Class 3 (23 dBm ±2 dB)
	LTE-FDD:- B5 (824–849 MHz)	Class 3 (23 dBm ±2 dB)
	LTE-FDD:- B12 (699–716 MHz)	Class 3 (23 dBm ±2 dB)
	LTE-FDD:- B13 (777–787 MHz)	Class 3 (23 dBm ±2 dB)
	LTE-FDD:- B14 (788–798 MHz)	Class 3 (23 dBm ±2 dB)
	LTE-FDD:- B66 (1710–1780 MHz)	Class 3 (23 dBm ±2 dB)
	LTE-FDD:- B71 (663–698 MHz)	Class 3 (23 dBm ±2 dB)

WCDMA	WCDMA:- B2 (1850–1910 MHz)	Class 3 (24 dBm + 1/-2 dB)
	WCDMA:- B4 (1710–1755 MHz)	Class 3 (24 dBm + 1/-2 dB)
	WCDMA:- B5 (824–849 MHz)	Class 3 (24 dBm + 1/-2 dB)

GNSS	
Technology (LC86G)	GPS + GLONASS+BDS+Galileo+QZSS
Technology (EC25E)	GPS + GLONASS + BDS + Galileo
Sensitivity (Tracking)	-166dBm
Acquisition (normal)	Cold Start: 25 s Warm Start: 22 s Hot Start: 1s
Antenna	Internal: Patch-on-top antenna External: SMA Connector + Wide Band wired antenna

Interfaces	
CAN 1	Standard CAN 2.0 up to 1 Mbps Data Protocols: ISO 15765, SAE J1939-21, SAE J1939-FMS Diagnostic/application protocols: Standard OBD2, WWH-OBD, UDS (ISO 14229), KWP (ISO 14230), XCP
RS485	MODBUS, J1708
K-line	Data Protocols: ISO 9141, ISO 14230
I/O	Digital I/O: 6 Analog I/O: 4 Panic alert I/P: 1

Power	
Input Voltage	8 V to 32 V, supports both 12 V and 24 V electrical systems
Rated Input Current	2A
Internal Battery	Lithium-Ion Cell - 3.6 V, 2600 mAh Protections: overcurrent, overcharge, and over-discharge
Sleep current	4mA for 24V system 6.5 mA for 12V system

Storage	
Internal memory for user data	Upto 100 MB
External flash memory	Upto 32 MB

Vehicle Environment Immunity	
Immunity	Compliant with ISO 7637

Environment	
Power transients	ISO 7637 Test level IV
Temperature (operation)	-40°C to +85°C
Temperature (storage)	-40°C to +85°C
Ingress Protection	IP67
Vibration/ Impact	Vibration - Frequency: 10-55-10 Hz, Amplitude: 1.5 mm Amplitude Shock - 50 g
Mounting	Double-sided Adhesive Tape or M6 Bolts

OTA support	
Firmware Updates	For New Features, Custom Applications and Maintenance
Parameters	For Enabling or Disabling Additional Features sending Configuration Settings

Certifications (India)	
AIS	AIS-004 Part 3
Certifications (outside India)	FCC,ISED REACH, WEEE, RoHS compliant

Mechanical	
Dimensions	153 x 145 x 53.5 mm
Weight	480 grams
Housing	ABS

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Dimensions	153 x 145 x 53.5 mm
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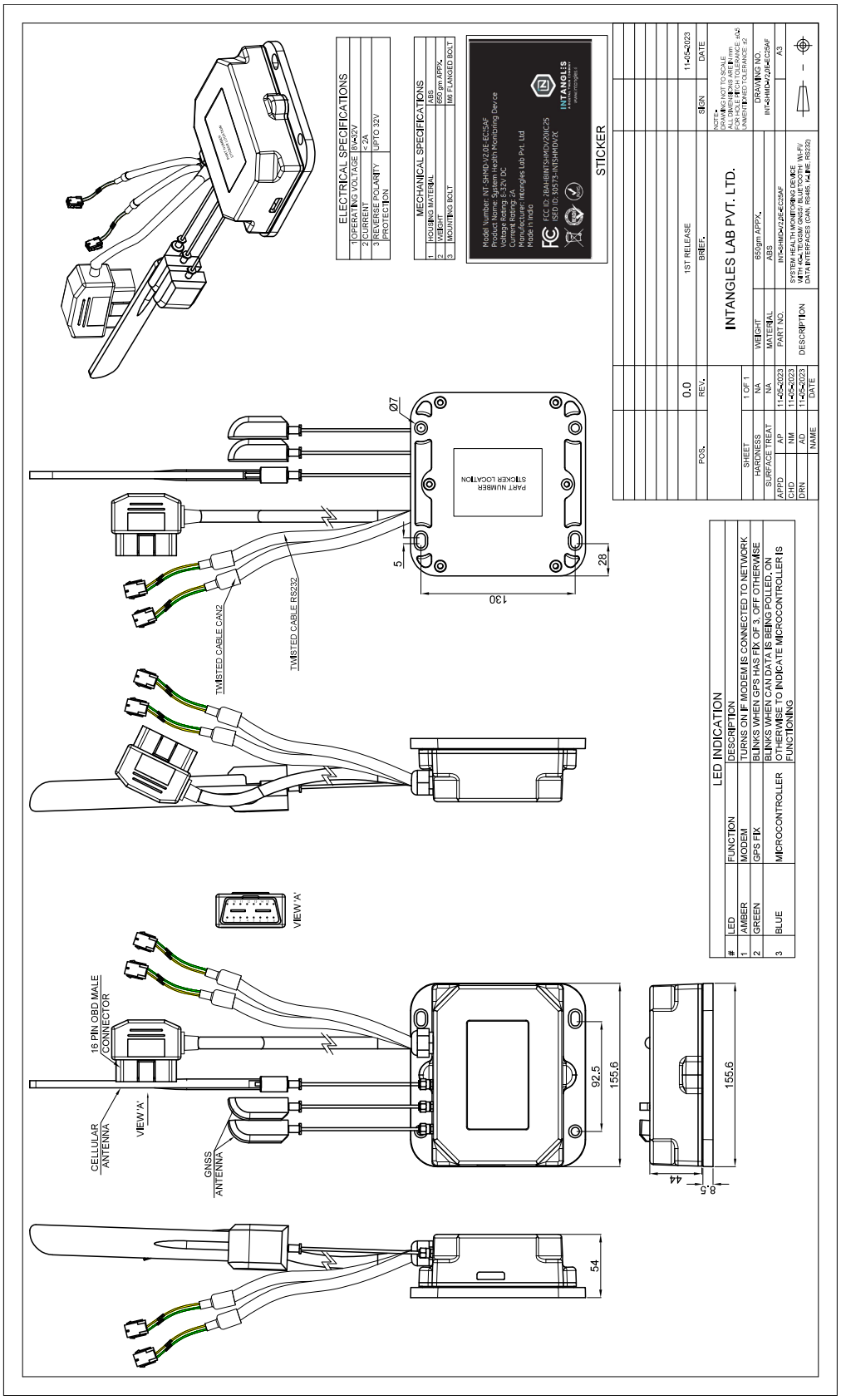
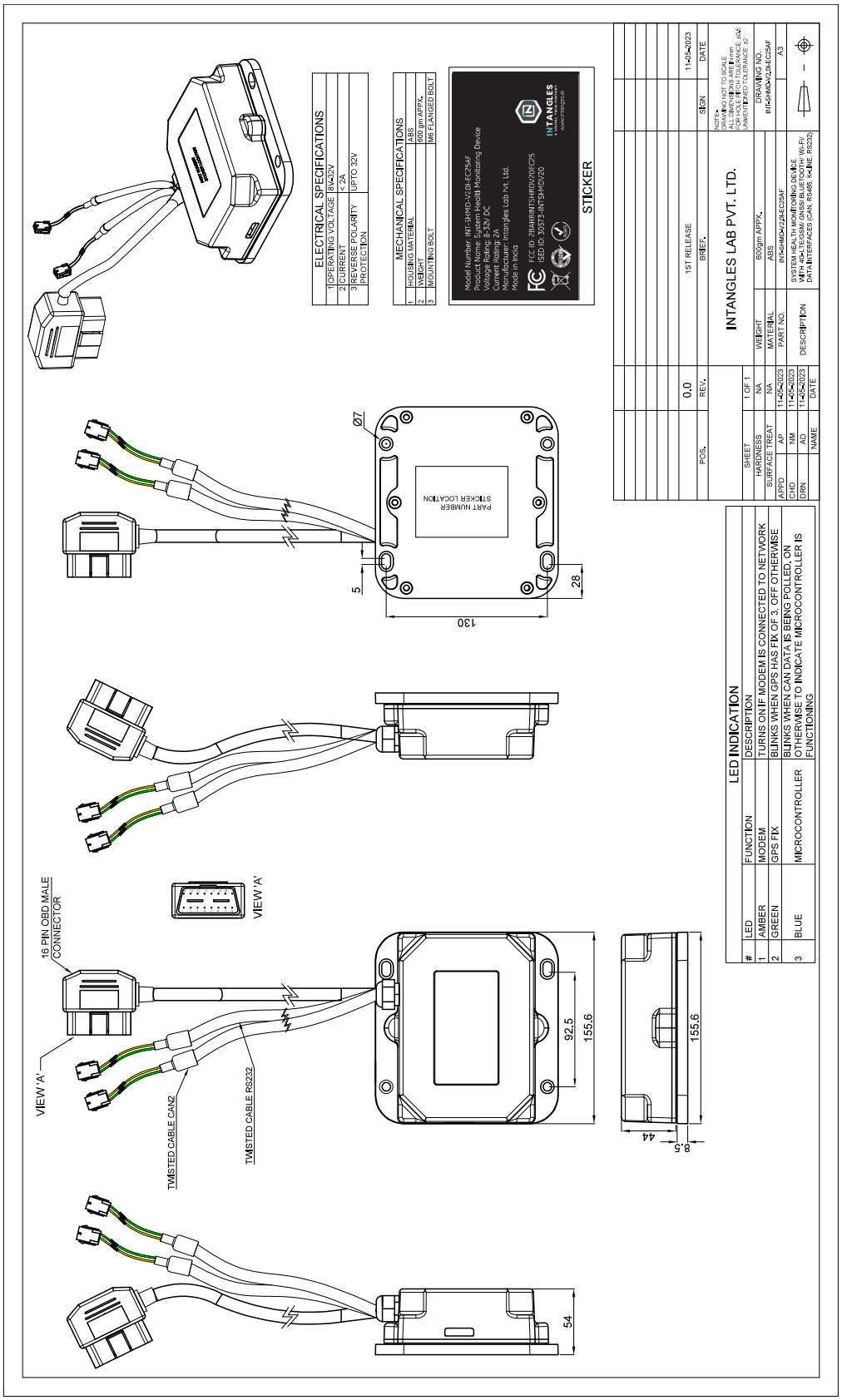
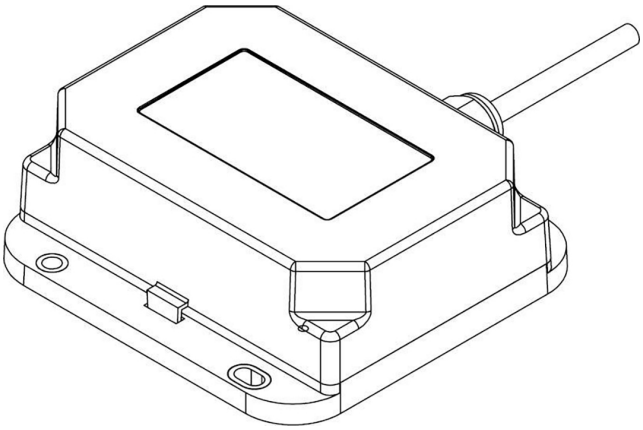
Harness	
INTCAB-OBDSTD-01	16 pin OBD2 harness (included in the standard kit)
INTCAB-OBDJ1939-01	16 pin OBD2 to 9 pin J1939 adaptor
INTCAB-OBDJ1939-02	16 pin OBD2 to 9 pin J1939 adaptor for CAT
INTCAB-OBDVLV8-01	16 pin OBD2 to 8 pin adaptor for Volvo
INTCAB-OBDY-01	Y-cable (16 pin OBD2)





Product Overview



Device Identification

A device is identified by its unique IMEI number available on the stickers pasted on the device, as shown in the red box in the image below. Note it down and keep it handy for future communication with the Intangles Support Team.

Device Installation

Prerequisites

Check the device compatibility matrix to verify if the device supports your vehicle. Ensure you have the correct diagnostic connector or adaptor. If you have any questions or concerns, please consult your Account Manager.

Before installing the device, please record the device's IMEI number. The IMEI number is a unique number and is used to verify the communication status of the device.

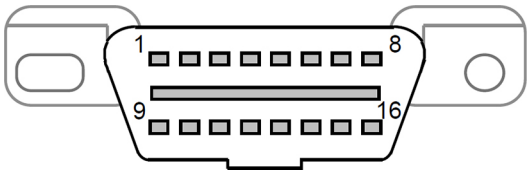
Ensure no warning lamps on the vehicle's instrument panel are on while it is running and other components, such as headlamps and indicators, switches, etc., are functioning as expected prior to installing the device. If all functions are behaving normally, proceed with the installation.

SAFETY INSTRUCTIONS

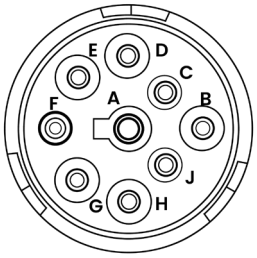
- DO NOT OPEN THE UNIT
- DO NOT OBSTRUCT THE TOP SIDE OF THE UNIT
- DO NOT DISPOSE OFF THE UNIT IN FIRE
- DO NOT CONNECT THE UNIT IF IT IS CRACKED OR DAMAGED

Installation Instructions

Locate the vehicle's engine diagnostic port, typically found in the driver's area or below the dashboard. The device has a 1.5 m Harness with a 16-Pin OBD-II connector. For heavy-duty trucks or off-highway equipment, you may require a vehicle-specific adaptor.



16-Pin OBD-II Connector



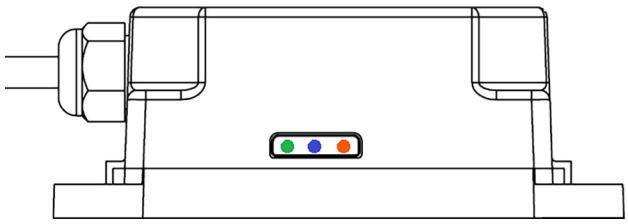
9-Pin J1939 Connector

PIN Number	Connection Details	Protocols
4	Chassis Ground	-
5	Signal Ground	-
6	CAN H	(J1939 or ISO15765) H
7	K-LINE	ISO14230 and ISO 9141
12	J1708/RS485 H	J1708 H-RS485 H
13	J1708/RS485 L	J1708 L-RS485 L
14	CAN L	(J1939 or ISO15765) L
16	V-BAT	-

2. Align the connector with the diagnostic port and push it in place. Please ensure the device is well-connected to the diagnostic port.

3. Once the device is connected and receives power, the **Blue** LED will turn on.

Amber LED — Cellular Network Connectivity
Blue LED — Vehicle Data
Green LED — GPS Connectivity



LED Behaviour

- **Amber** Turns on if the device is connected to the network
- **Blue** Blinks when vehicle data is being polled
- **Green** Blinks at 1Hz when the device has a GPS fix

4. For mounting the device, you can use the double-sided adhesive tape applied at the bottom or M6 Bolts to fix the device on a bracket.

5. If you are deploying the device under the dashboard, ensure the top side of the device has enough clearance to ensure GPS connectivity. Do not keep the device near a source emitting radio frequency, as it can adversely affect GPS connectivity.

6. After installing the device, please connect with your Account Manager to ensure the installation has been done correctly and the device has been activated.

WARNING!

Power supply for the VHMS should be between 8V and 32V.

The device should be placed atleast 1 m away from the operator.

Do not attempt to install, reconfigure, or remove any product from a vehicle while the vehicle is in motion or otherwise in operation. This could result in malfunctions or collisions, leading to serious personal injury. In case of malfunctions, park the vehicle and then remove the device.

The device can malfunction if the conditions are not met according to the mentioned technical specifications.

Maintenance, Spares, Repair and Service

The equipment is designed to be a plug-and-play device. As such, there are no user-serviceable parts. In the case of a malfunction, contact the Intangles Support Team.

Warranty

Intangles Lab Pvt. Ltd. provides a limited warranty to the equipment purchaser at the point of sale. Contact the Intangles Support Team for full details of any applicable warranty.

Limitations of Use

Location mapping and vehicle tracking features available through the software are dependent on third-party providers and the availability and accuracy of the Global Positioning System ("GPS") operated by the United States government. Third-party mapping and GPS

data and services are subject to changes and/or interference which may affect the accuracy or performance of location information or graphics presented through the use of the software and your use of the products and software for navigation, route planning, and similar purposes should take these limitations into account.

Device communication features may be interrupted or inoperable if a vehicle travels outside a network coverage area or where there is a fault or service interruption with the carrier. Device communication also requires the transmission of data through the internet. Failure in internet access will result in the interruption of communications. As a result, the product and related software and services are not designed or intended as the primary means used in an emergency or fail-safe situations, including, without limitation, situations: (A) where a failure of same may result in a risk of property damage, death or personal injury; (B) where the product, software or services are used to alert others upon the occurrence of certain vehicular events recorded by the device; or (C) where the product is used as part of a fail-safe design for dangerous or emergency applications or as part of control measures required for hazardous materials, life support systems, munitions or weapons.

Federal Communications Commission (FCC) Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part15 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 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.

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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

RF Exposure Warning

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This product may not be collocated or operated in conjunction with any other antenna or transmitter

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

Industry Canada (IC)

CAN ICES-3 (B)/NMB-3(B)

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

Cetappareilestconforme à la norme RSS d'Industrie Canada. Son fonctionnementestsujet aux deux conditions suivantes:

(1) ledispositif ne doit pas produire de brouillagepréjudiciable, et
(2) cedispositifdoit accepter tout brouillagereçu, y compris un brouillage susceptible de provoquer un fonctionnementindésirable.

Important note:
Radiation Exposure Statement:
This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 25cm between the radiator and your body.

Déclarationd'exposition aux radiations:
Cetéquipementestconforme aux limitesd'exposition aux rayonnements IC établies pour unenvironnement non contrôlé. Cetéquipementdoitêtreinstalléetutilisé avec un minimum de 20cm de distance entre la source de rayonnement et votre corps.