

# **Vehicle Tracking & Monitoring System**

## **Kerala Implementation – VLT Enlistment**

**AIS140 - IRNSS Models**

**(KMVD/CDAC/VTMS/2021/5)**

**For**



## **Motor Vehicles Department**

**Government of Kerala**  
**Transport Commissionerate**  
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## **Document Control**

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**Abstract:** This document provides the detailed procedure for enlisting VLT units for the implementation of AIS-140 standard based Vehicle Tracking and Monitoring System for all Public Transport Vehicles registered in Kerala. For this AIS-140 certified IRNSS supported VLTs from manufacturers will be enlisted based on the selection procedures specified in this document.

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## Abbreviations/ Acronyms

ARAI	Automotive Research Association of India
C-DAC	Centre for Development of Advanced Computing
GSM	Global System for Mobile Communication
ISO	International Organization for Standardisation
KMVD	Kerala Motor Vehicles Department
RTO	Regional Transport Office
SIM	Subscriber Identity Module
VLT	Vehicle Location Tracking Unit
GNSS	Global Navigation Satellite System
MORTH	Ministry of Road Transport and Highways
AIS	Automotive Industry Standard
eSIM	Embedded SIM
IRNSS	Indian Regional Navigation Satellite System

## Glossary of Terms

The definitions of various terms that have been used in this document are as follows.

**"Manufacturer"** means a registered firm manufacturing AIS-140 certified Vehicle Location Tracking units in India.

**"Registered Agency/ Franchisee/ Dealer"** means a firm registered in Kerala who is authorised to resell, install, support and service AIS-140 certified Vehicle Location Tracking Unit of enlisted Manufacturer.

## 1. Datasheet for Enlisting VLT Manufacturer

1.	Enlisting Ref. No.	KMVD/CDAC/VTMS/2021/5
2.	Testing Fee	Refer table below
3.	Call for Applications	Soft copy can be downloaded from SurakshaMitr website <a href="http://surakshamitr.org">http://surakshamitr.org</a>
4.	Submission of application with AIS-140 standard certificates and test reports by VLT Manufacturers. Only AIS-140 - IRNSS certified VLT models will be considered.	Testing will be started as soon as the pre-qualification criterion is met and the applicant is ready with the product as per the requirements specified in the document.
5.	Address for submitting the documents	The Group Head, CSTG, C-DAC, Vellayambalam, Thiruvananthapuram - 695033
6.	Email for communication	surakshamitr@cdac.in
7.	Contact No	9446556001
8.	Enlisting Validity	The enlisted model(s) will be valid for a period of 1 year provided a valid COP is maintained for the model. Otherwise the enlistment will stand cancelled. After 1 year the model has to be re-submitted for validity renewal.

## 2. Testing Fee Details

Sln.	Items	Fee Applicable
1.	Non Refundable Registration Fee which includes 1 iteration for 1 month usage validity for 5 devices.	Rs. 30,000/- + GST
2.	Non Refundable Registration Fee which includes 3 iterations for 3 months usage validity for 5 devices.	Rs. 50,000/- + GST
3.	Iteration Testing Fee (per Iteration)	Rs. 20,000/- + GST
4.	Fee for extended usage of Testing platform (1 month for 1 device)	Rs. 10,000/- + GST
5.	Fee for additional device in extended usage of Testing platform	Rs. 10,000/- + GST

6.	Fee for verifying Conformity of Production Certificate	Rs. 10,000/- + GST
7.	Fee for verifying Conformity of Production after AIS140 Re certification (1 iteration, 1 month usage validity, 1 device)	Rs. 25,000/- + GST

Table 1 : Testing Fee Details

**\*GST rate applicable is 18%**

### 3. Background

Kerala, the southernmost State of India has a good network of roads. The total length of roads in Kerala is nearly 3,72,472.216 Kms in 2015. Nearly 95 lakhs of vehicles are currently registered under different categories in this tiny state.

Kerala Motor Vehicles Department (KMVD), under the Ministry of Transport, Government of Kerala is the principal agency for the enforcement of the Motor Vehicles Act and Rules in the State. Enforcement of public road transport rules and its effective monitoring for the large number of vehicles is definitely a challenge. Vehicle Tracking & Monitoring System is a technology used by many countries, companies and individuals to track vehicles using Global Navigation Satellite System (GNSS). Apart from enforcement of public road transport rules, the system can also give other valuable services to KMVD and the general public. KMVD has taken steps to track and monitor all public transport vehicles registered in Kerala.

For tracking, a Vehicle Location Tracking unit has to be installed in these vehicles. MORTH has released a common standard for tracking devices under AIS-140 standard. KMVD has decided to follow MORTH's AIS-140 standard with few modification in data protocol and data formats to send data from the VLT units to the State server. For this KMVD has decided to enlist manufacturers who can meet the specifications of AIS-140 standard and the specific requirements of the State. The Manufacturers are selected through an enlisting process, as defined in this document and KMVD will approve the selected Manufacturers to sell their devices in Kerala.

#### 1.1. About KMVD

The Kerala Motor Vehicles Department is a line department of Transport Department, Government of Kerala. The Motor Vehicles Department functions under the provisions of Section 213 of the Motor Vehicles Act, 1988. The Motor Vehicles Department, Kerala, was formed in the year 1958. The Department is administered by the Transport Commissioner who is the Head of the Department.

The Department has four functional levels

(i) Head Office under the Transport Commissioner

(ii) Four Zonal Offices under Deputy Transport Commissioners

(iii) Eighteen Regional Transport Offices under Regional Transport Officers, of which one Regional Transport Office having state wide jurisdiction exclusively for Nationalized Sector and

(iv) Fifty five Sub Regional Transport Offices under Joint Regional Transport Officers.

In addition, there are 19 Motor Vehicles Border Check Posts headed by Motor Vehicle Inspectors. These vehicles are categorized into

- Stage Carriages (Transport / Private Buses)
- Educational Institution Buses (EIB)
- Hospital Vehicles
- Taxis & Auto Rickshaws
- Goods Carriers
- Contract Carriers
- Government Vehicles
- Private/Public Vehicles

### **1.2. About C-DAC (T)**

C-DAC, Thiruvananthapuram, formerly known as the Electronics Research and Development Centre (ER&DC), was established in 1974 as the Research wing of the Kerala State Electronics Development Corporation (KELTRON), the first State Electronics Corporation in the Country. After going through a series of transformations, the establishment has metamorphosed into the giant conglomerate of today – The Centre for Development of Advanced Computing (C-DAC), with a new outlook and a new motto- Creating Definitions and Achieving Competencies.

Among all the 17 labs of C-DAC, spread over 12 major cities in the Country, C-DAC, Thiruvananthapuram unit is the largest, both in terms of Workforce (about 850) and Projects undertaken (over 100 ongoing projects worth more than 200 Crores). With its multi-disciplinary expert manpower and strong multi-state logistic support machinery, thanks to the merger of organizations NCST, CEDTI, ER&DCI with C-DAC, today this national Centre of Excellence is all set to make its marks on a global canvas.

The majority of the projects undertaken by C-DAC (T) are application oriented and most of them uphold elements of social commitment and strong linkages to the masses. Many of the projects have direct and indirect impact on promoting the well-being of the Society. The projects encompass most spheres of human endeavour covering space sciences, energy conservation, energy production & energy management, pollution control, rural

development, software solutions, healthcare, information security, strategic defence applications and the like.

C-DAC, Thiruvananthapuram has been assigned the task of implementing "AIS-140 based Vehicle Tracking and Management System " for public transport vehicles in Kerala, standardisation of VLT Firmware Protocols for state specific requirements, recommending for approval of VLT models to KMVD and supporting KMVD in implementation activities.

### **1.3. About "AIS-140 standard based Vehicle Tracking & Monitoring System"**

Kerala Motor Vehicles Department envisages to track the public transport vehicles in Kerala. The objective of the project is to introduce a tracking system for continuous monitoring of public transport vehicles for better road safety and better support for enforcement services.

#### **Components of AIS-140 based Tracking System**

The tracking system is a combination of hardware, software and communication technologies. The major components of tracking system are

1. **Vehicle Location Tracking Unit (VLT):** VLT is a hardware unit equipped with GNSS logger, a GPRS/3G/4G based communication system, power supply and back up mechanism. The entire system is packed into a rigid enclosure with proper indications and power input.
2. **Vehicle Tracking Software:** A software system receives the data from VLT, parses it and logs it. This data is further processed for generating automated alerts and messages. The software resides in server(s).
3. **Communication facility:** VLT sends the geo-location information to the server in a predefined interval. The most common communication method is using GPRS/3G/4G, made possible through the existing mobile networks using eSIM.
4. **Monitoring System:** A map system is integrated to the software for real time plotting of the vehicles on a map. Monitoring centres can view this map displayed on a web browser.

### **4. Enlisting of VLTs**

KMVD has entrusted C-DAC to carryout the entire VLT Enlistment process and forward the enlisted Vehicle Location Tracking units (VLTs) to KMVD, which can be used in the public transport vehicles, for enabling tracking and monitoring of the vehicles. Slots for enlistment testing shall be on first come first serve basis. The objective of VLT enlisting is to standardise the VLT data protocol and data format specification to meet the state specific requirements in addition to the AIS 140 requirements and to support the customers to avail good quality VLT devices and after sales services. Accordingly, the pre-qualification requirements for the manufacturer and the specifications for vehicle tracking unit firmware details are listed in this document. Enlisting is for the devices, and as such, multiple devices

from the same manufacturer will require separate applications for enlisting. The KMVD will publish the list of enlisted VLT models and the vehicle owners will be advised to procure only the enlisted VLT models.

1. The Manufacturers can apply their VLT models for enlisting based on the criteria specified in this document.
2. Only VLT models with IRNSS based AIS140 certificates are allowed to participate in the enlisting process.
3. If manufacturer wants more than one VLT model to be enlisted, separate application is to be submitted for each VLT model.
4. The evaluation of application for enlisting would be carried out based on the pre-qualification criteria and technical evaluation.
5. Only enlisted VLT models are to be used by public vehicles in Kerala.
6. VLT manufacturers cannot sell their models for the Public vehicles in Kerala once their authorisation/ certification is suspended, cancelled or not renewed for any reason.
7. Manufacturers must give an undertaking to KMVD that in case their authorisation/ certification is suspended, cancelled or withdrawn for any reason, they will continue to support the devices already sold for the public transport vehicles.
8. Manufacturers must have a Call-centre or similar arrangements to address the queries and any other issues from the end users.
9. Manufacturers must arrange a registered agency or franchisee that is authorised to sell, install, support and service the VLTs in 4 zonal regions of KMVD in Kerala. KMVD may issue a notification later to extent the support and service availability of VLTs to RTO and sub RTO wise. Hence the manufactures must submit a declaration for the same along with the application form.
  - a. Approval to agency/ franchisee is provided based on the site inspection and verification of facilities provided by agency/franchisee by KMVD officials.
  - b. The manufacturer/agency/ franchisee should facilitate eSIM in VLTs along with 1 year/2 years subscription based on permit validity from service providers on behalf of the Vehicle Owners. And must take necessary steps to ensure the continuity of the service once the eSIM validity period is expired.
  - c. Agency/ franchisee of corresponding manufacturers should have sufficient infrastructure like computer, internet service, official phone number, technicians etc to provide assistance to end users.
  - d. KMVD can terminate the approval of the registered agency/ franchisee at any time.
10. KMVD reserves the right to change the terms and conditions governing the certification and approval at any point of time.
11. Unless the Certification of any VLT model is cancelled by KMVD, the certification of VLT model shall remain valid as long as such model continues to comply with the

terms and conditions in AIS-140 standard or for 3 years whichever is less. Before the expiry period manufacturers have to renew the certification in accordance with KMVD regulations.

12. KMVD reserves the right to modify the VLT firmware specification or add additional features to existing specification. The release of the VLT specifications will be in a version controlled fashion.
13. Every VLT models and service of manufacturers selected through enlistment process will be reviewed every 3 months and subsequent actions will be taken against those who violate any of the regulations listed out in this document.
14. KMVD may initiate the enlistment process, as and when required.

Interested Manufacturers for the respective VLT models which comply with the KMVD requirements may download the registration document from the website <http://surakshamitr.org/> and submit the same duly filled in and supplemented with all relevant documents to CDAC for further processing.

## 5. Scope of the project

Kerala Motor Vehicles Department is planning to track all public transport vehicles operating in Kerala in phased manner. These vehicles should be tagged with VLT devices. The Owners should purchase the VLT devices from selected manufacturers/franchisees only.

VLT Manufacturers/ registered agencies will be given controlled access to the KMVD application for tagging (connecting) the VLTs to the application. Manufacturers should train the registered agencies/ franchisees for installing the VLT devices in vehicles and support the customers whenever required. Manufacturer shall provide warranty (at least for one year) and AMC for their products. Manufacturers/ the registered agency have to supply and support certified VLT models across the State. Any compliant registered through the KMVD application should be serviced within 48 hours of complaint raised by the customer.

## 6. Pre-Qualification Criteria for VLT Manufacturer

KMVD shall constitute an evaluation committee, which shall carry out the evaluation process of VLTs. Manufacturers have to meet the following pre-qualification criteria for enlisting.

### Pre-Qualification Criteria

S. No.	Criteria	Required Documents
1	The Manufacturer should be a registered company in India under the Companies Act	Certification of incorporation or Partnership registration deed or

	1956/2013 or Partnership firm registered under section 59 of the Partnership Act,1932 or Limited Liability Partnership firm registered under the Limited Liability Partnership Act, 2018 or Proprietorship/Proprietary firm with SSI/MSME registration	LLP registration document or SSI/MSME Registration document or MSME/SSI registration Udyog Aadhaar
2	The Manufacturer should not be blacklisted by any Central/ State agencies in India.	Self-declaration by the manufacturer signed by the authorized signatory
3	Only OEMs will be allowed to participate in enlisting.	Copy of relevant Certificate
4	The VLT model which Manufacturer intends to submit for enlisting must be certified according to AIS-140 standard with IRNSS.	Copy of Type Approval Certificate(s) & test reports. The date of issue of certificate should be on or before the date of application submission
5	The VLT model name and model number / part number as specified in the AIS 140 certificate should be clearly and permanently inscribed on the VLT device.	Photograph displaying model name and model number / part number as specified in the AIS 140 certificate on the device
6	The Manufacturer shall arrange an authorised Registered Agency in 17 RTOs in Kerala.	Self declaration by the manufacturer signed by the authorized signatory
7	The Manufacturer shall agree to open an Office in Kerala region within one month, once the Manufacturer is enlisted.	Self declaration by the manufacturer signed by the authorized signatory

The Manufacturer must submit all the certified and authenticated documentary proof for meeting the pre-qualification criteria. Such documents shall include AIS-140 certification for submitted model, company registration certificates and other credentials.

Manufacturer is also requested to submit self declaration stating that the design and IPR of the mentioned model belongs to the manufacturer itself. Another declaration stating that, once shortlisted by KMVD, manufacturer will continue to provide support and service to customers for already installed VLT devices till the completion of agreement period even if the circumstances arise in which the manufacturer is not authorised to install the devices by KMVD or KMVD cancels the device authorisation due to unforeseen reasons, must also be submitted by manufacturer along with application form.

## 7. Technical Evaluation

Once the Applicant has passed through the Pre-qualification stage, they have to subject their AIS-140 certified VLT models to the following tests and get it passed.

- All operational specifications mentioned in Annexure A (Data Protocol and Format) - To get certified from C-DAC(T). Testing must be completed within one month from the date of first testing of the submitted model, (Refer - Datasheet). **The updates in the Data Protocol and Format are highlighted in yellow.**
- Hardware Features - Manufacturers are instructed to follow strictly the hardware features as per AIS-140 IRNSS standards. Also the certification for the VLT device from any of the authorised AIS-140 certifying agencies must be present. In addition to the AIS 140 standard, Kerala Motor Vehicle Department (KMVD) recommends below features.

- 1 Hooter (Mandatory)
- 2 Tilt Alert (Mandatory)
- 3 Impact Alert (Optional)
- 4 Minimum 2 emergency buttons in all passenger cars; one for passenger seat and one for driver (Mandatory). Details shall be released with 'Guidelines for implementation' document later.
- 5 Minimum 5 emergency buttons in all other public transport vehicles (Mandatory).
- 6 The emergency buttons should be fitted in location easily accessible to the person (driver/passenger) intended to use it. In public transport vehicles like buses the emergency buttons should preferably be fitted on the vertical pillar above the window rail below the luggage rack. Refer Annexure E.

## 8. Submission of Application for Enlisting

The Manufacturer can apply for enlisting of one or more models of VLT devices.

### 8.1. General Conditions

Manufacturers are advised to study the document carefully. Submission of application will be deemed to have been done after careful study of all instructions, eligibility norms, terms and requirement specifications in this document with full understanding of its implications. Applications not complying with all the given clauses in the document are liable to be rejected. Failure to furnish all information specified in this document or submission of

application not substantially responsive to the document in all respects will be liable for rejection.

- Application for enlisting will be hosted in KMVD official web site ([www.keralamvd.gov.in](http://www.keralamvd.gov.in)) as well as in Suraksha Mitra website (<http://surakshamitra.org/>) and can be downloaded and used for submission of application forms. Registration fee shall be paid along with the submission of application.
- Un-signed and un-sealed application shall not be accepted.
- All pages of the application and documents being submitted must be signed and sequentially numbered by the VLT Manufacturer.
- Ambiguous applications will be out-rightly rejected.
- Applications not submitted as per the format will be rejected straightway.
- No deviations from the specifications will be accepted.
- The VLT Manufacturers will bear all costs associated with the preparation and submission of their applications. KMVD will, in no case, be responsible or liable for those costs, regardless of the outcome of the enlisting process.
- No VLT applicant / enlisted VLT Manufacturer is authorized to use, modify, adapt, or prepare derivative works of the logo of KMVD, C-DAC or Suraksha Mitra in India for the product, packaging, marketing, promotion, distribution, importation, offering sale of the product without the written consent from KMVD / C-DAC.

**\*KMVD may, at its own discretion, cancel the VLT Enlisting.**

## **8.2. Registration fee**

For testing each VLT model, separate application form needs to be submitted along with the corresponding registration fee. The registration fee shall be applicable as per Table 1: Testing Fee Details. The registration fee must be paid along with the application form. It should be submitted as a demand draft drawn in favour of "CDAC" payable at Thiruvananthapuram. An application not accompanied by the aforesaid payment shall be considered as non-responsive and will be rejected. The fees paid to CDAC will not be refunded.

On acceptance of registration, the VLT manufacturer shall be eligible for the following as per the fees paid against options in Table 1: Testing Fee Details.

- Using the VLT Device Testing Platform
- Enlistment testing of VLT device.

All fee payments must be made as advance. The amounts indicated are exclusive of taxes.

**All relevant taxes at the time of making the payment shall be applicable.**

### **8.3. Submission of Application**

- a) A Manufacturer can apply for enlisting of one or more models of VLT devices. Separate application is to be submitted for each model.
- b) The Manufacturer is required to submit statement of compliance of the devices with the specifications as set out in this document.
- c) The Manufacturer is required to submit their application in the prescribed format in this document.
- d) After completing the test, the Manufacturer is required to submit two VLT devices ( the test completed device and another same model VLT device with the latest firmware updated), eSIM with 3 month data plan validity and all other necessary accessories needed for interfacing and testing. The devices will be retained by KMVD and will not be returned to manufacturer irrespective of the enlisting outcome.
- e) All communications and proceedings shall be in writing and in English language only.

### **8.4. Details of Document to be submitted**

The Manufacturers are required to submit the following documents.

- a) Table of contents listing documents and other details submitted.
- b) DD towards Registration Cost.
- c) VLT Registration Form.
- d) Compliance Certificate and Report in terms with Specifications for VLT devices.
- e) Self declarations as mentioned in the document

Both hardcopy and softcopy (in pdf format) of the above documents are required to be submitted. The documents along with registration form needs to be submitted in a sealed envelope clearly bearing the following:

**"Application for VLT Enlisting", for Motor Vehicles Department - Kerala.**

Name and address of Vendor with contact number.

The application should reach CDAC at the following address.

**The Group Head,  
Communication and Software Technology Group (CSTG),  
Centre for Development of Advanced Computing,  
Vellayambalam,  
Thiruvananthapuram. PIN: 695033**

## 8.5. Evaluation of Applications

- a) The application found complete in all respects shall be considered for processing and testing of VLT devices for compliance with specifications.
- b) C-DAC/KMVD reserves the right to verify all statements, information and documents submitted by the Applicant. Applicant may be asked to submit more documents, if any clarifications are required.
- c) If any information or document provided by the manufacturer is found to be false or misleading during the evaluation process, such application would be liable for rejection and if the VLT device has been enlisted, its enlisting would be liable for cancellation. Further, the Manufacturer may be considered for blacklisting.
- d) If any malpractice made by the manufacturer is found out during the evaluation process, such application would be liable for rejection. Further, the Manufacturer may be considered for blacklisting.
- e) If any malpractice made by the manufacturer is found out after enlistment of the VLT device, then its enlistment will be cancelled. Further, the Manufacturer will be blacklisted.
- f) Decision of C-DAC/KMVD regarding enlisting/ rejection of the VLT devices under this process will be final and no correspondence in this regard will be entertained by C-DAC/KMVD.
- g) For enlisting of devices, C-DAC/KMVD will follow pre-qualification criteria and the technical evaluations. Final selection will be based on technical evaluation.
- h) Selected VLT models will be published in KMVD website.
- i) KMVD may conduct site inspection and validate the facilities of registered agencies / franchisees identified by manufacturers for distributing the VLT devices to customers.
- j) In case KMVD delist any agency / franchisee due to any dissatisfaction or any agency / franchisee withdrawal, then the corresponding manufacturer shall arrange alternate agency / franchisee in the same region.

## 8.6. Operational Specifications

Compliance against the operational specifications below needs to be submitted by the Applicant. The same shall be subjected to demonstration by the Applicant and / or testing by KMVD/ C-DAC(T) for validation, as mentioned below.

Sl.No.	Specifications	Compliance Process	Confirmation (Yes / No)
1.	The primary source of power for the device should be from vehicle's battery. When the device is disconnected from vehicle battery it	A demonstration by Applicant together with supporting	

	should start operating on internal battery.	document as under:  AIS-140 Certification with IRNSS.	
2.	Alert on tampering and vehicle battery removal.	A demonstration by Applicant together with supporting  document as under:  AIS-140 Certification with IRNSS.	
3.	Device should meet all the features mentioned in Annexure A	A demonstration by Applicant:	

**Legend:**

**Yes:** Feature is available in the Vehicle Location Tracking Device model submitted.

**No:** Feature is not available in the Vehicle Location Tracking Device model submitted.

## Annexure – A: Data Protocol and Format

The VLT device will be tagged to the application software; to get it tagged, the device has to send data continuously to the server based on different device states. The device will manage the data packets according to the requirements mentioned in this document. This specifies the communication protocol between VLT device and the server. It defines a standard for communication such as data packet format and the parameters that should to be included in data packets on occurrence of predefined events. In addition there will be configuration parameters set from the server to the device namely Over-The-Air (OTA) parameters (Refer Section 7.4: OTA Keys). The server will be sending OTA parameters either via GPRS (piggybacking) or via SMS. The device has to respond to each command as mentioned in this document. The data protocol for VLT devices shall conform to the requirements mentioned below:

### 1. VLT Firmware Requirements

The VLT devices that satisfy AIS-140 hardware requirements should send data packets to the server depending on the VLT states. Each data packet consists of predefined parameters. The data packets should be sent using HTTP to the URL published by MORTH/States. The version of HTTP used should be 1.1 or higher, HTTP key should be 'vltdata' and the **HTTP POST** method should be used to send data.

- Each parameter in the data packet should be of fixed length.
- The sequence of parameters is fixed for each packet
- There will be no separator between parameters
- At any point if a parameter doesn't have predefined full length value then rest of the bytes should be filled with zeros (unless otherwise specified) without changing the actual value of parameter. In case of parameters having decimal values the length of the integer part should be prepended by zeros and the length of decimal part should be appended by zeros.
- The parameters should be encoded in ASCII format.

The VLT states are defined according to the GNSS/GSM signal availability, emergency condition and alerts. There are mainly two types of alerts: critical alerts and normal alerts.

### **VLT/Vehicle Modes**

Based on the speed of the vehicle 3 VLT/vehicle modes has been defined namely

#### **Motion Mode**

A vehicle is in motion mode if one of the following conditions is satisfied.

- Ignition is ON and speed > 3 km/hr

OR

- Ignition is ON/OFF and speed < 3 km/hr and Duration in this condition < Halt Time (HT).

#### **Halt Mode**

A vehicle is in halt mode if one of the following conditions is satisfied

- Ignition is ON/OFF and speed < 3 km/hr and Duration in this condition > Halt Time (HT).

#### **Sleep Mode**

A vehicle is in sleep mode if the following condition is satisfied.

- Duration in halt mode > Sleep Time (ST)

### **VLT States**

The various **VLT states** are

#### **i. Normal State**

The device is in normal state when there aren't any alerts or emergency. The update rate in this state is determined by the mode of the vehicle.

- Update rate in motion mode is specified by OTA parameter UR.
- Update rate in halt mode is specified by OTA parameter URT.

- Update rate in sleep mode is specified by OTA parameter URS.

## ii. Emergency State

A vehicle is in emergency state if there has been a panic button press. Emergency ON Packets should be sent continuously at a configurable interval (URE) when there is an emergency button press. **During emergency state if any critical alert is generated it should be send immediately.** The non-critical alerts generated during emergency state should be logged and send in batch once emergency state has been turned off. All other packets (like normal, full, health) can be ignored during emergency state. The batch and acknowledgement packets are not allowed in emergency state, these packets need to be sent only after emergency state has been turned off.

The emergency state is turned off either by setting it from the control room through OTA parameter EO or when the duration in emergency state has exceeded duration set via OTA parameter ED.

The command for setting Emergency OFF in device from control room should be :

**SET<space>EO**

The server has to be informed about the emergency state off by the device by sending the Emergency OFF packet satisfying following conditions.

- If GPRS is available send Emergency OFF Packet immediately.
- If GPRS is not available send Emergency OFF Packet as soon as GPRS becomes available before sending any other packets. Send Emergency OFF packet as a single packet and not in batch. You can specify the Packet Status parameter as H (History) when sending this packet.
- If GPRS is unavailable during entire duration between an emergency state ON and OFF then send all Emergency ON and OFF packets in batch.

## iii. Critical Alert State

A Critical Alert State is defined to inform the server about any critical events occurring in a vehicle. Hence Critical Alert Packet should be sent immediately when any critical alert occurs (Refer Section 4: Alerts under Each Packet). If multiple critical alerts occur at the same time then all packets should be sent in the order of priority as multiple packets (Refer Section 5: Alerts Priority). In case when a

continuous critical alert (like tilt, panic button wire-cut, over speeding etc) occurs, first packet should be sent at the time of occurrence and the next packets should be send at the next update interval (UR or URE or URT or URS). If any other critical alerts occur along with a continuous critical alert then both alerts should be sent based on priority as multiple packets. All critical alerts should be send as live (not in batch) packet as far as possible even in emergency and continuous critical alert state. The critical alert intimation should go also as SMS to configured mobile numbers. Priority should be given to sending Critical Alert Packet to server i.e. packet should be send first and then send SMS. If GPRS is unavailable then send SMS immediately. (Refer Section 10: SMS Format from VTL to Server). In case of continuous alerts like over-speed, tilt, emergency button wire disconnect etc the SMS need to be sent every **30 minutes** after the first SMS.

#### iv. Normal Alert State

A Normal Alert State is defined to inform the server about any non-critical events occurring in a vehicle. The Normal Alert Packet should be sent to the server in the next update interval (UR. If multiple normal alerts occur at the same time the high priority alert should be send and the low priority alert(s) should be logged.

In addition to the packets in various **VLT states** there are 5 other packets that need to be send by the device to the server. The packets are

- a. **Batch Packet** (Refer Section 6.5)
- b. **OTA Parameter Acknowledgment Packet** (Refer Section 6.6)
- c. **Full Packet** (Refer Section 6.7)
- d. **Health Packet** (Refer Section 6.8)
- e. **Login/Activation Packet** (Refer Section 6.9)

#### Various Conditions of VLT based on GNSS and GSM

**GNSS-ON/GSM-ON** : This is the valid state and VLT data packet should contain valid GNSS information and should sent packet data to the server on every time interval specified by update rate parameters (Refer Section 7.4).

**GNSS-OFF/GSM-ON:** Here GNSS information will be zero and should sent this packet data to the server on every time interval specified by update rate parameters (Refer Section 7.4).

**GNSS-ON/GSM-OFF:** In this state VLT should log all generated data packets and send them as batch packet to the server whenever GSM becomes available. (Refer Section 6.5: Batch Packet).

**GNSS-OFF/GSM-OFF:** In this state VLT should record all parameters as logs and each log corresponds to one data packet to the server. Whenever GSM signal becomes available VLT should send these as batch data packet to the server.

## 2. Data Parameters

The parameters in the protocol can be classified as follows:

### General Static Parameters

Sl No	Parameter	Length in bytes	Description
1.	Header	3	NRM = Normal Packet FUL=Full Packet EPB= Emergency Packet CRT=Critical Alert Packet BTH=Batch Packet ACK=OTA Parameter Acknowledgment Packet HLM=Health Monitoring Packet LGN= Login Packet
2.	Vendor ID	6	Unique identifier for registered vendor.
3.	Firmware Version	6	The version of firmware currently used
4.	Vehicle Reg. No	16	The value should be padded with 0 in the beginning for matching the length. For eg : 000000KL01AA5555
5.	End Character	1	Value '*'. Only applicable for OTA Parameter Acknowledgment Packet since the key-value pair count is varying.

## GNSS Parameters

Sl No	Parameter	Length in bytes	Description
1.	GNSS Fix	1	1= GNSS Fix 0= GNSS Invalid
2.	Date	6	DDMMYY
3.	Time	6	IST (hhmmss)
4.	Latitude	10	Decimal not less than 6 places(10 cm precision) Eg: 023.125503
5.	Latitude Direction	1	N=North, S= South
6.	Longitude	10	Decimal not less than 6 places (10 cm precision) Eg: 080.068033
7.	Longitude Direction	1	E=East, W= West
8.	Speed	6	km/hrs. Rounded off to Two Decimal Values. Eg: 070.48
9.	Heading	6	In Degrees Eg: 120.50
10.	No of Satellites	2	The number of satellites in view.
11.	Altitude	7	In Meters. Eg: 0183.50
12.	PDOP	2	Eg: 01
13.	HDOP	2	Eg : 02

### GSM Parameters

SI No	Parameter	Length in bytes	Description
1.	IMEI	15	
2.	Network Operator Name	6	
3.	GSM Signal Strength	2	0 - 31
4.	Mobile Country Code (MCC)	3	
5.	Mobile Network Code (MNC)	3	The length if less should be prepended with 'x'
6.	Location Area Code (LAC)	4	In hexadecimal.
7.	Cell ID	9	In Decimal Representation
8.	NMR	60	4*15 bytes GSM Signal Strength 2 bytes followed by LAC 4 bytes followed by Cell ID 9 bytes. The above format is repeated 4 times.

### Device Parameters

SI No	Parameter	Length in bytes	Description
1.	Packet Status	1	L=Live or H= History
2.	Ignition	1	1= Ignition On , 0 = Ignition Off
3.	Main Power Status	1	1= connected, 0 = disconnected
4.	Main Input Voltage	5	Volts, Up to one decimal value

5.	Internal Voltage Battery	5	Volts, Up to one decimal value
6.	Digital I/O Status	4	1= On , 0 = Off Eg: 1000
7.	Frame Number	6	000001 to 999999 Incremented only for Full Packet
8.	Checksum	8	Sum of all the bytes excluding checksum converted into <b>hex format</b>
9.	Alert ID	2	01-15. Refer Table 6E in AIS-140. 01. Location Update 02. Location Update (history) 03. Alert – Disconnect from main battery for more than 60 seconds 04. Alert – Low battery 05. Alert – Low battery removed 06. Alert – Connect back to main battery 09. Alert –Box Open 10. Alert – Emergency state ON 11. Alert – Emergency State OFF 12. Alert Over the air parameter change 13. Harsh Braking 14. Harsh Acceleration 15. Rash Turning Alert 16. Emergency button wire disconnect/ wire cut 17. Over speed (Additional) 18. Geofence Entry(Additional) 19. Geofence Exit(Additional) 20. Overspeed in Geofence(Additional) 22. TILT(Additional) 23. IMPACT (Optional) (Additional)
10.	Vehicle mode	1	H=Halt M=Motion S=Sleep
11.	Batch Log Count	3	No of data packets when sending batch data. The maximum no of logs in a single batch is 360.
12.	Geo fence ID	5	To identify the alert reported Geo fence area.
13.	Data update rate - Ignition ON	3	In seconds. The value set via OTA Parameter UR

14.	Data update rate - Ignition OFF	3	In seconds. The value set via OTA Parameter URT
15.	Battery percentage	3	The internal battery percentage
16.	Low battery threshold value	2	The value set via OTA Parameter LBT
17.	Memory percentage	3	The device memory used in percentage
18.	Analog Input Status	2	0 if not connected 1 if connected Eg: 10
19.	Tamper Alert	1	O - open C - closed

### 3. Data Packets

The VLT device should format the parameters into the following packets based on the VLT State and alerts being generated.

Sl No	Packet Type	Description
1.	Normal Packet	Refer Section 1 - i
2.	Full Packet	Refer Section 6.7
3.	Emergency Packet	Refer Section 1 - ii
4.	Critical Alert Packet	Refer Section 1 - iii
5.	Alert Packet	Refer Section 1 - iv
6.	Batch Packet	Refer Section 6.5
7.	OTA Parameter Acknowledgment Packet	Refer Section 6.6

8.	Health Monitoring Packet	Refer Section 6.8
9.	Login Packet	Refer Section 6.9

#### 4. Alerts under each Packet

Header	Alert ID
NRM = Normal Packet	01(Location Update )
FUL = Full Packet	25(Full Parameter Update )
EPB= Emergency Packet	10(Emergency state ON) 11(Emergency State OFF)
CRT=Critical Alert Packet	16 (Emergency button wire disconnect/wirecut) 03(Disconnect from main battery for more than 60 seconds) 17(Over speed) 22(Tilt) * Detection using VLT's Gyroscope 23(Impact) * Optional 20(Overpseed in Geofence)
ALT= Alert Packet	13(Harsh Braking) 14(Harsh Acceleration) 15(Rash Turning) 09(Box Opened) * Optional 18(Geofence Entry) 19(Geofence Exit) 06(Vehicle Battery Reconnect/ Connect back to main battery) 04(Low battery) 05(Low battery removed)
BTH=Batch Packet	All Alert IDs
ACK = OTA Parameter Acknowledgment Packet	12(Alert Over the air parameter change)
HLM=Health Monitoring Packet	N.A
LGN= Login/Activation Packet	N.A

## 5. Alerts Priority

The alerts should be managed in the device according to the priority i.e. if two alerts are happening at the same time then the alert with the highest priority should be set for parameter Alert ID. The assigned priority for each alert is given below where priority 1 has the highest priority. If multiple critical alerts occur simultaneously all packets should be send in the order of priority as multiple packets.

Priority	Alert	Alert ID
1.	Emergency Alert	10,11
2.	Emergency button wire disconnect/wire-cut	16
3.	Vehicle Battery Disconnect/ Main power removal for more than 60 seconds	03
4.	TILT	22
5.	Box opened	09
6.	Over speed	17
7.	Harsh Breaking	13
8.	Harsh Acceleration	14
9.	Rash Turning	15
10.	Impact	23
11.	Overspeed in Geofence	20
12.	Geofence Entry	18
13.	Geofence Exit	19
14.	OTA Parameter Changed	12
15.	Vehicle Battery Reconnect/ Connect back to main battery	06
16.	Internal Battery Low	04

17.	Internal Low Battery Removed	05
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## 6. Data Format from VLT to Server

The packets defined in this section describe the data format, its parameters and order of parameters that should be transferred from VLT to the server. The rate at which the VLT should send packet data is defined by update intervals. However if the vehicle approaches a curve or turning with angle of deviation more than **20** degree then the device should send current live packet data to the server irrespective of update interval.

### 6.1 Normal Packet

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: NRM12345678901234501L1060418102230023.125503N080.068033E4041231234123456789070.48120.5025273011M0183.50BSNLXX

### 6.2 Emergency Packet

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

#### Emergency ON Packet

Eg: EPB123456789012345**10**L1060418102230023.125503N080.068033E4041231234123456789070.48120.5025273011M0183.50BSNLXX

#### Emergency OFF Packet

Eg: EPB123456789012345**11**L1060418102230023.125503N080.068033E4041231234123456789070.48120.5025273011M0183.50BSNLXX

### 6.3 Critical Alert Packet

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of

Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**, <<GF ID for Alert ID 20>>

### **Emergency button wire disconnect/wire-cut Alert Packet**

The panic button wire-cut alert should be a continuous alert.

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **CRT**123456789012345**16**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

### **Vehicle Battery Disconnect/ Main power Removal Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **CRT**123456789012345**03**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

### **Overspeed Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **CRT**123456789012345**17**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

### **Tilt Alert Packet**

The tilt alert should be a continuous alert.

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **CRT**123456789012345**22**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

### **Impact Alert Packet (Optional)**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **CRT**123456789012345**23**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

### **Overspeed in Geofence Alert Packet**

This alert should be generated when the vehicle is over-speeding in a geofence (Refer 8. Geofence)

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**, GF ID

Eg: **CRT**123456789012345**20**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX**00001**

## **6.4Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**, <<GF ID for Alert ID 18,19>>

### **Harsh Breaking Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **ALT**123456789012345**13**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

### **Harsh Acceleration Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of

Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **ALT**123456789012345**14**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

#### **Rash Turning Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **ALT**123456789012345**15**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

#### **Vehicle Battery Reconnect/ Connect back to main battery Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **ALT**123456789012345**06**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

#### **Internal Battery Low Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **ALT**123456789012345**04**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

#### **Internal Low Battery Removed Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **ALT**123456789012345**05**L1060418102230023.125503N080.068033E404123

1234123456789070.48120.5025273011M0183.50BSNLXX

### **GNSS Box Opened Alert Packet**

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**

Eg: **ALT**123456789012345**09**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX

### **Geofence Entry Alert Packet**

This alert should be generated when the vehicle enters a geo fence configured as Entry fence. If the vehicle exit from this type of fence no need to provide Exit alert. (Refer 8. Geofence)

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**, GF ID

Eg: **ALT**123456789012345**18**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX **00001**

### **Geofence Exit Alert Packet**

This alert should be generated when the vehicle exit a geo fence configured as Exit fence. If the vehicle enters into this type of fence no need to provide Entry alert. (Refer 8. Geofence)

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, **Altitude, Network Operator Name**, GF ID

Eg: **ALT**123456789012345**19**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXX **00002**

## 6.5 Batch Packet

Batch packet is defined primarily to send data logs as batch to server. Data logs are generated due to following conditions

- GPRS unavailability
- Packets logged due to emergency state

The first packet in the batch packet should be the latest live data packet. The critical alert packets logged should follow the live packet such that the latest critical alert is placed first. In batch the priority of critical alerts need not be considered, only that they should be in LIFO. The remaining packets in the log should be appended after critical alerts in LIFO manner.

Batch Format should be:

Live Packet followed by

Critical Alert Packets (including Emergency packets) in LIFO followed by  
Remaining Packets in LIFO

Header, IMEI, Batch Log Count,

(Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle mode,

<<Altitude, Network Operator Name for all Alert IDs except Alert ID 25>>,<<GF ID for Alert ID 18, 19, 20>>,<<Vendor ID , Firmware Version, Vehicle Reg.No, Altitude, PDOP, Network Operator Name, NMR, Main Input Voltage, Internal Battery Voltage, Tamper Alert, Digital Input Status, Digital Output Status, Frame Number, Checksum for Alert ID 25>>) \*

\* Repeated 'Batch Log Count' times.

Eg: BTH12345678901234500301L1060418102230023.125503N080.068033E4041231234123456789070.48120.5025273011M0183.50BSNLXX16H1060418102230023.125503N080.068033E4041231234123456789070.48120.5025273011M0183.50BSNLXX02H1060418102230023.125503N080.068033E4041231234123456789070.48120.5025273011M0183.50BSNLXX

## 6.6 OTA Parameter Acknowledgment Packet

OTA Parameter Acknowledgement packet is defined to acknowledge the server about the OTA Parameter change made by server either by piggybacking or via SMS. OTA Parameter Acknowledgement packet should be sent when any of the OTA parameters other than Geofence (GF) and Emergency Off (EO) are updated via SMS or piggybacking. The format of this packet is parameters in Normal Packet followed by key value pairs of updated OTA parameters separated by comma (,). The end of this packet should be marked by character (\*).

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle mode, **Altitude, Network Operator Name,Key1:Value1, Key2:Value2,...,end character**

Eg: **ACK**123456789012345**12**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M0183.50BSNLXXPU:10.0.0.1,SL:060.00,O  
U:10.0.0.0\*

### 6.7 Full Packet

Full Packet is defined to send all the remaining AIS-140 parameters to server. Full packet should be send at the configured interval (URF).

Header, IMEI, Alert ID, Packet Status, GNSS Fix, Date, Time, Latitude, Latitude Dir, Longitude, Longitude Dir, MCC, MNC, LAC, Cell ID, Speed, Heading, No of Satellites, HDOP, GSM Signal Strength, Ignition, Main Power Status, Vehicle Mode, Vendor ID , Firmware Version, Vehicle Reg.No, Altitude, PDOP, Network Operator Name, NMR, Main Input Voltage, Internal Battery Voltage, Tamper Alert, Digital I/O Status, Frame Number, Checksum

Eg:**FUL**123456789012345**25**L1060418102230023.125503N080.068033E404123  
1234123456789070.48120.5025273011M**VENID11.1.00000000KL01AA55550183**  
**.5002OPTNAM27123412345678928123412345678926123412345678925123412**  
**3456789023.5003.7C0001000001CHECKSUM**

### 6.8 Health Monitoring Packet

Health Monitoring Packet is defined to send the health status of the device to the server. Health Monitoring Packet should be send at the configured interval (URH).

Header, Vendor ID, Firmware Version, IMEI, Data update rate - Ignition ON, Data update rate - Ignition OFF, Battery percentage, Low battery threshold value, Memory percentage, Digital I/O status, Analog Input Status, Date, Time

Eg: **HLM**VENID11.1.0112345678901234500500109220060000110060418102230

### 6.9 Login/Activation Packet

Login/Activation Packet is defined to ensure that the data is originated from device. The Login/Activation Packet should be send from the device when an

Activation SMS (Refer 9) is received by the device. The length of the activation key will be 16 bytes.

Header, IMEI, **activationKey**, Latitude, Latitude Dir, Longitude, Longitude Dir, Date, Time, Speed

Eg: **LGN123456789012345activationKey456023.125503N080.068033E060418102230070.48**

## 7. Data Parameters from Server to VLT (OTA Parameters)

The commands SET, GET and CLR should be enabled for all OTA parameters **unless specified otherwise explicitly**. The format should be same when parameters are set, get or cleared via SMS/GPRS (piggybacking).

### 7.1 SET OTA Parameters

The format for setting OTA parameters except Emergency OFF command should be:

**SET<space>key1:value1,key2:value2...**

The VLT device should set the values of the OTA parameters with the received values based on keys received via SMS or as piggybacking. Multiple OTA parameters can be set on a single command. The next data packet to the server should be OTA Parameter Acknowledgement Packet containing the updated control parameters and their values **excluding Geo-fence parameters**.

### 7.2 GET OTA Parameters

The format for getting OTA parameter values should be:

**GET<space>key1,key2...**

The VLT device should respond to the GET request with the requested OTA parameters as key-value pairs if request is received via SMS or as piggybacking. Multiple OTA parameters can be get on a single command. Also the next data packet to the server should be OTA Parameter Acknowledgement Packet containing the requested control parameters and their values. **For Geo-fence parameter GF, the configured Geofence ids should be returned as value.**

### 7.3 CLR OTA Parameters

The format for clearing/resetting the parameter values will be in the following format

**CLR<space>key1, key2...**

The VLT device should clear/reset (if default value is specified) the OTA parameters corresponding to the received keys. Multiple OTA parameters can be cleared on a single command. When cleared, if default values are present for the keys, the value should be updated to the default value; otherwise clear the value.

The VLT device should respond to the CLR request with the cleared OTA parameters as key-value pairs if request is received via SMS or as piggybacking. Multiple OTA parameters can be cleared on a single command. Also the next data packet to the server should be OTA Parameter Acknowledgement Packet containing the cleared control parameters and their values **including Geo-fence parameters**.

## 7.4 OTA Keys

The key for each OTA parameter should be as given in the below table.

SI No	Parameter	Key	Description
1.	Primary/Regulatory Purpose URL	PU	URL with port no Eg: 10.10.10.5:80
2.	Control Centre Number	MO	In case a critical alert is triggered an SMS should be send to the predefined Control Centre mobile numbers stating the alert type. The emergency clear command should be received from this number.
3.	Emergency State OFF (This will be overridden if ERSS is implemented)	EO	On receiving this signal the Emergency ON state of the vehicle should be switched to Emergency OFF state. Eg: SET<space>EO (Only SET is valid)
4.	Emergency State Time Duration (This will be overridden if ERSS value is published)	ED	After this duration the Emergency ON state should automatically go to Emergency OFF state. In minutes Default Value : 30
5.	Sleep Time	ST	In minutes Duration in Halt mode after which Vehicle Mode should be changed to Sleep

6.	Halt Time	HT	In minutes Duration to be exceeded to switch to halt mode from motion mode.
7.	Speed Limit	SL	In km/hr Default Value : 70 Calculate over speed always with the value of Speed Limit
8.	Harsh Breaking Threshold	HBT	Default Value: To be provided by the manufacturer.
9.	Harsh Acceleration Threshold	HAT	Default Value: To be provided by the manufacturer.
10.	Rash Turning Threshold	RTT	Default Value: To be provided by the manufacturer.
11.	Low Battery Threshold	LBT	In percentage Default Value : 20
12.	Tilt Angle	TA	In degrees Default Value:45 degrees
13.	Vehicle Registration Number	VN	
14.	Data Update Rate in Motion Mode	UR	In seconds Default Value : 20
15.	Data Update Rate in Halt Mode	URT	In minutes Default Value : 1
16.	Data Update Rate in Sleep Mode	URS	In minutes Default Value : 60
17.	Data Update Rate in Emergency Mode	URE	In seconds Default Value : 5
18.	Data Update Rate of Full Packet	URF	In minutes Default Value : 120
19.	Data Update Rate of Health Packets	URH	In minutes Default Value : 60
20.	Vendor ID	VID	
21.	Firmware Version	FV	Only GET is valid.

22.	Default Speed Limit	DSL	In km/hr Default Value : 70 The maximum speed limit based on vehicle category. The speed limit (SL) should be updated with Default Speed Limit (DSL) whenever the vehicle exits a Geofence (whether configured as IN or OUT).
23.	Contact Mobile Number	M1	
24.	Contact Mobile Number 2	M2	
25.	Contact Mobile Number 3	M3	
26.	Geofence	GF	Refer 8
27.	OTA Updated Mobile	OM	The mobile number from where the request for updating OTA parameters is received. This is a mandatory field in Acknowledgement Packet if updated via SMS.
28.	OTA Updated URL	OU	The URL from where the request for updating OTA parameters is received. This is a mandatory field in Acknowledgement Packet if updated via HTTP/Piggybacking.

## 8. Geofence

Every VLT device should be capable of handling polygon geo-fence data. The geo-fences configured by server will vary dynamically depending on real-time data analysis. A single geo-fence configuration will contain geo-fence-id, alert type (entry=1/exit=2/**entry&exit=3**), latitude and longitude. The number of geo-fences configured will vary between 1 and 10. Maximum location points (latitude and longitude) in a geo-fence are limited to 10 numbers. Each geo-fence data will be separated by the delimiter ampersand (&).

Sl.No.	Parameter	Maximum Length
1.	Geo-fence-id	5
2.	Alert Type	1
3.	Latitude	10
4.	Longitude	10

The format for one geo-fence is defined below

Geofence id - Alert type – latitude - longitude # latitude - longitude# latitude -longitude &

Geo-fence-id and alert type will be followed by number of latitude and longitude coordinates which creates a polygon geo-fence area. Each latitude and longitude will be separated by hyphen (-) delimiter and one set of latitude and longitude coordinates will be separated by hash (#) delimiter.

eg:12345-1-078.12345678-078.12345678#080.12345678-080.12345678#098.12345678-098.12345678&

For more than one Geo-fence data:

Geofence id - Alert type – latitude - longitude # latitude - longitude# latitude - longitude & Geofence id - Alert type – latitude - longitude # latitude - longitude# latitude – longitude & etc...

eg:12345-1-078.12345678-078.12345678#080.12345678-080.12345678#098.12345678-098.12345678&67890-3-078.12345678-078.12345678#080.12345678-80.12345678#098.12345678-098.12345678& etc..

The device should generate following alerts based on the Geofence types.

- Geofence IN Alert while entering a Geofence configured as Alert Type 1 or **Alert Type 3**.
- Geofence OUT Alert while exiting out of a Geofence configured as Alert Type 2 or **Alert Type 3**.

In case of over speeding inside a Geofence the following alerts should be generated

- **Over speed in Geofence** if over speeded in a Geofence configured as Alert Type 1, 2 or 3.

After exiting a geofence (whether configured as Alert Type 1, 2 or 3) the value of parameter SL should be replaced with the value of parameter DSL immediately.

### Acknowledging Geofence Setting

The instruction to set the Geofence from the server should be acknowledged with an OTA Acknowledgement packet (Refer 6.6). In this acknowledgement packet the value of the **key GF** should be the **Geofence ids** separated by #, that were set from the server.

For eg: if command SET GF:**12345**-1-078.12345678-078.12345678#080.12345678-080.12345678#098.12345678-098.12345678&**67890**-3-078.12345678-078.12345678#080.12345678-80.12345678#098.12345678-098.12345678 is received from server.

The acknowledgment packet should include the key-value pair **GF: 12345#67890**

## 9. Tagging Activation SMS

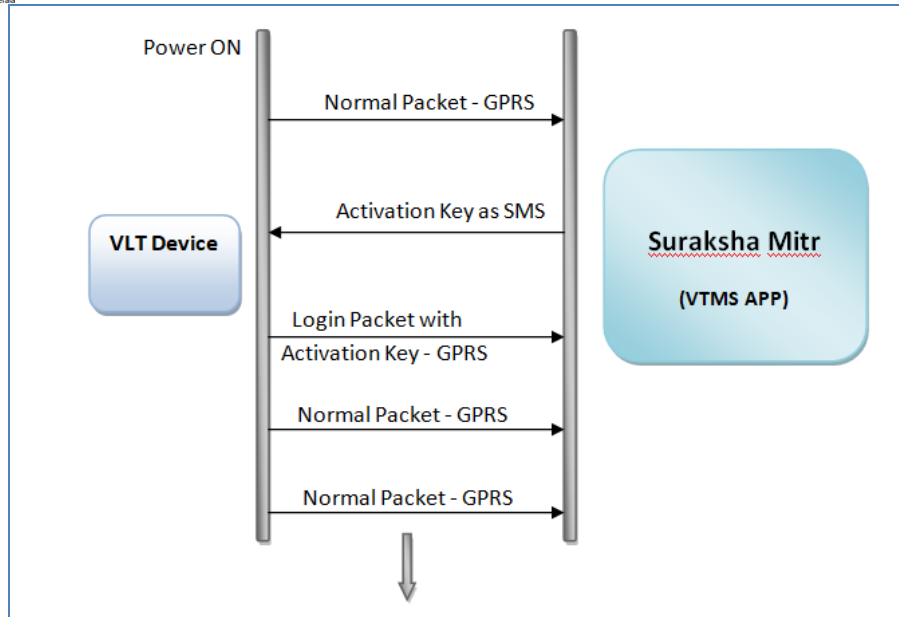
Every VLT device should be capable of receiving the activation SMS from a SMS gateway and any mobile device in the following format.

**ACTV<space>activationKey**

On receiving this SMS the device should respond with the Login/Activation data packet containing the received activationKey to the server via GPRS. The length of activationKey is 16 bytes

### Process Flow

When the VLT is powered ON it should send Normal Packets to 'Suraksha Mitr' IP address. While tagging (Activation) the server will send an Activation Key to the Device in the specified format (Refer: Section 9). The device has to receive the SMS and send back the Activation key in Login Packet (Refer: Section 6.9) to the server through GPRS. Server will cross check the key and will activate the device in the application.



## 10. AIS140 Activation SMS

Every VLT device should be capable of receiving the activation SMS as per AIS140 from backend in the following format.

### ACTV, Random Code, Reply SMS Gateway No

On receiving this SMS the device should respond with an Activation Message  
Reply SMS as per table below .

Field Name	Characters	Activation Example
Header	5	ACTVR
Separator	1	,
Random code	6	343434
Separator	1	,
Vendor ID	4	VEND
Separator	1	,
Firmware version	6	V1.6.1
Separator	1	,
IMEI	15	012345678912345
Separator	1	,
Alert ID	2	1
Separator	1	,
Latitude	12	14.034533
Separator	1	,
Direction	1	N

Separator	1	,
Longitude	12	79.32045
Separator	1	,
Direction	1	E
Separator	1	,
GPS fix	1	1
Separator	1	,
Date and Time	15	16112018 120317
Separator	1	,
Heading	6	263.19
Separator	1	,
Speed	4	25.4
Separator	1	,
GSM Strength	2	23
Separator	1	,
Country Code (MCC)	3	404
Separator	1	,
Network Code (MNC)	4	10
Separator	1	,
LAC	4	d6d6
Separator	1	,
Main Power Status	1	1
Separator	1	,
IGN Status	1	1
Separator	1	,
Battery Voltage	4	24.6
Separator	1	,
Frame Number	6	100000
Separator	1	,
Vehicle Mode	2	M/H/S = 0M/0H/0S
<b>Total Characters</b>	<b>139</b>	

## 11. AIS140 Health Check SMS

Every VLT device should be capable of receiving the random health check SMS as per AIS140 from backend in the following format.

### HCHK, Random Generated ID, Reply SMS Gateway no

On receiving this SMS the device should respond with a Health Check Message Reply SMS as per table below

Field Name	Characters	Health Check Example
Header	5	HCHKR
Separator	1	,
Random code	6	474747
Separator	1	,
Vendor ID	4	
Separator	1	,
Firmware version	6	V1.6.1
Separator	1	,
IMEI	15	012345678912345
Separator	1	,
Alert ID	2	1
Separator	1	,
Latitude	12	14.034533
Separator	1	,
Direction	1	N
Separator	1	,
Longitude	12	79.32045
Separator	1	,
Direction	1	E
Separator	1	,
GPS fix	1	1
Separator	1	,
Date and Time	15	16112018 120317
Separator	1	,
Heading	6	263.19
Separator	1	,
Speed	4	25.4
Separator	1	,
GSM Strength	2	23
Separator	1	,
Country Code (MCC)	3	404
Separator	1	,
Network Code (MNC)	4	10

Separator	1	,
LAC	4	d6d6
Separator	1	,
Main Power Status	1	1
Separator	1	,
IGN Status	1	1
Separator	1	,
Battery Voltage	4	24.6
Separator	1	,
Frame Number	6	100000
Separator	1	,
Vehicle Mode	2	M/H/S = 0M/0H/0S
<b>Total Characters</b>	<b>139</b>	

## 12. SMS Format from VLT to Server

SMS functionality allows the VLT to send a configured SMS when an event is triggered. This event can be triggered for any of the alerts specified below.

- 10(Emergency state ON)
- 11(Emergency State OFF)
- 16 (Emergency button wire disconnect / wirecut)
- 17 (Overspeed)
- 03(Disconnect from main battery for more than 60 seconds)
- 20(Overspeed in Geofence)
- 22(Tilt)
- 23(Impact)

When any of the above alerts is triggered, the VLT should send a configured SMS message to the Control Centre Number and / or to Contact Mobile Numbers. In case of continuous alerts like over-speed, tilt, emergency button wire disconnect etc. the SMS need to be send every **30 minutes**.

Following are the parameters to be included in SMS from the VLT to the server.

SI No	Parameter Name	Length	Description
1.	IMEI	15	To identify the VLT device.

2.	Date	6	DDMMYY
3.	Time	6	HHMMSS
4.	Latitude	10	078.123456
5.	Latitude Direction	1	N/S
6.	Longitude	10	078.123456
7.	Longitude Direction	1	E/W
8.	Alert Name		Specified below
9.	Vehicle Number		

Following are the Alert names against Alert IDs to be included in SMS from the VLT to the server.

Alert ID	Alert Name
03	Main Battery Removed
10	Emergency ON
11	Emergency OFF
17	Overspeed
16	Tamper
20	Overspeed in Geofence
22	Tilt
23	Impact

### **SMS format to Control Centre Mobile Number**

Alert ID, IMEI, Vehicle Number, Date, Time, Latitude, Latitude Direction, Longitude, Longitude Direction



eg:

03,123456789012345,KL01AA5555,151019,103050,078.123456,N,078.123456,E

### **SMS format to Contact Mobile Number(s)**

The following values should be send in any human readable format. An indicative format is given below.

AlertName<space>VehicleNumber<space>Date<space>Time<space>Latitude<space>  
Longitude

eg: Main Battery Removed KL01AA5555 15-10-2019 10:30:50 078.123456 078.123456

## Annexure - B. Application Form for VLT Enlisting

### Format for VLT Application Form

( on the official letter head of manufacturer)

Date :

The Group Head,  
Communication and Software Technology Group (CSTG),  
Centre for Development of Advanced Computing,  
Vellayambalam,  
Thiruvananthapuram. PIN: 695033

**Sub : Registration of VLT device for the Public Vehicles in Kerala**

Sir,

We have fully understood the requirements of the process "Enlisting of Vehicle Location Tracking Unit (VLT) for Public Vehicles in Kerala" and are submitting our registration application for the following AIS 140 Certified VLT device(s) being manufactured by us together with the required details, other information as per the registration process and the compliance report for VLT specification and protocols.

Name of the Manufacturer	
AIS 140 Certified IRNSS VLT device Model name	
AIS 140 Certified IRNSS VLT device Model number / Part number	
Full address of the Manufacturer	
Manufactured at ( address of VLT production centre)	
Contact Person details (If different from undersigned) with email & mobile no	

In relation to our application, KMVD may also note the following:

1. Our application is unconditional and all information provided in the application is true and correct.

2. We hereby declare that the VLT device(s) being submitted for registration is AIS-140 certified and complies with the specifications as set out in the registration process document and we shall make available any additional information as KMVD may find necessary as required for clarification.
3. We acknowledge the right of KMVD to reject our application without assigning any reason and accept the right of KMVD to cancel the registration process at any time without incurring any liability to the registered Manufacturers.
4. We confirm that we are not blacklisted by any state government or central government / department/ agency in India from participating in bids for last three financial years.
5. We agree to keep the quality of the registered VLT models and support the customers whenever required.
6. We confirm that we will train all the franchisees to distribute the certified VLT models of our products.

Sincerely,

(Signature, name and designation of the authorised signatory)

(Contact no. including email address)

## **Annexure - C. List of Documents for Submission**

### **List of Submissions**

#### **1. Details of the Manufacturer**

- a) Name of the Company
- b) Address of Head Office/ branch offices, if any
- c) Incorporation / Registration certificates
- d) Details of VLT devices manufacturing facilities (also mention whether owned or contracted its capacity, third party etc)
- e) Certificates of agencies, manufacturing facility (like ISO, CE etc)
- f) Brief description of the Company including details of its main lines of business.
- g) Details of production facilities (area, machinery, manpower, production capacity).
- h) Website details
- i) Particulars of the authorised signatory of the Company

#### **2. Documents in support of compliance of the Manufacturer with regard to criteria mentioned in this document.**

- a) Supporting documents for points mentioned in prequalification criteria.
- b) DD towards the Registration fee.
- c) Statement of Compliance reports and other self declarations.

## **Annexure - D. Terms and Conditions Governing Registration**

1. Commercial arrangement of VLTs between Manufacturers and registered Agency/ Franchisees and Vehicle Owners - Any commercial or other arrangements/ agreements between the Manufacturer/ registered agency/ franchisee and the vehicle owners (customers) shall be as mutually agreed between them. The price of the certified VLT device and all other terms and conditions including those related to warranty, AMC, nature of service etc shall be as mutually agreed by and between the Manufacturer/ registered agency/ franchisee and the vehicle owners. KMVD shall have no role, responsibility and liability in relation to the same.
2. Response Time - If any complaint raised against the installed VLT device, then the concerned manufacturer/registered agency/ franchisee should resolve the complaint within 48 hrs of reporting the complaint. If more time is required, then a standby VLT should be installed temporarily and replaced once the original VLTs issue gets solved. The complaint and clarifications should be logged into the KMVD application.
3. Monitoring and Audit - Once the manufacturer/ registered agency/ franchisee is authorised/ approved, KMVD shall have the right to monitor/audit the certified VLT devices installed in the Vehicles and the service and support provided with a view to ascertain their continued compliance with the terms and conditions governing the registration.
4. Cancellation of Registration - If any fault is found or any complaint received from end user customers, then KMVD shall take actions against the manufacturer/ registered agency/ franchisee and have the right to suspend the approval or cancel the certification issued to that particular VLT model.
5. Liability - Manufacturer/ registered agency/ franchisee shall be liable and responsible for performance of the VLT devices supplied to the Vehicle owners.
6. Jurisdiction - Any issues related to registration of VLT or licensing of agencies are governed by the laws established in India and competent to deal with disputes, if any, arising out, then the court in Thiruvananthapuram District alone have jurisdiction to lay any matter relating to this enlisting.
7. Dispute - In case of any dispute related to technical (operational testing), the decision of KMVD shall be final and binding.
8. Use of Trademark/ Logo of KMVD/ Logo of Suraksha Mitra - Manufacturer shall not use the Suraksha Mitra logo, KMVD logo or any other trademark, symbol, or icon on or in connection with the registered GNSS Devices or any of the manufacturers VLT devices including those on its packaging, manuals, promotional and/or advertising materials, or for any other purpose without an express written permission from C-DAC/KMVD.

## Annexure - E. Fitment Location for Buses

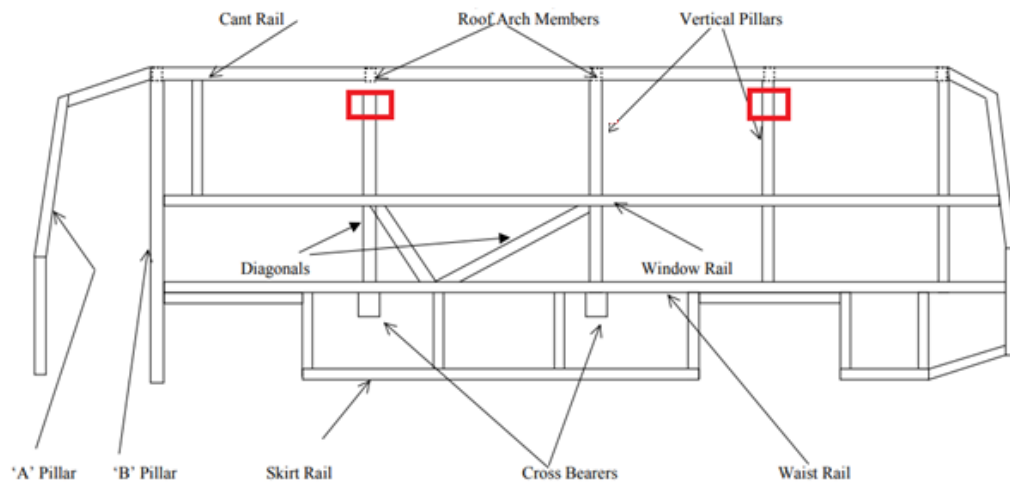


Figure 1: Panic Button position in vertical pillars

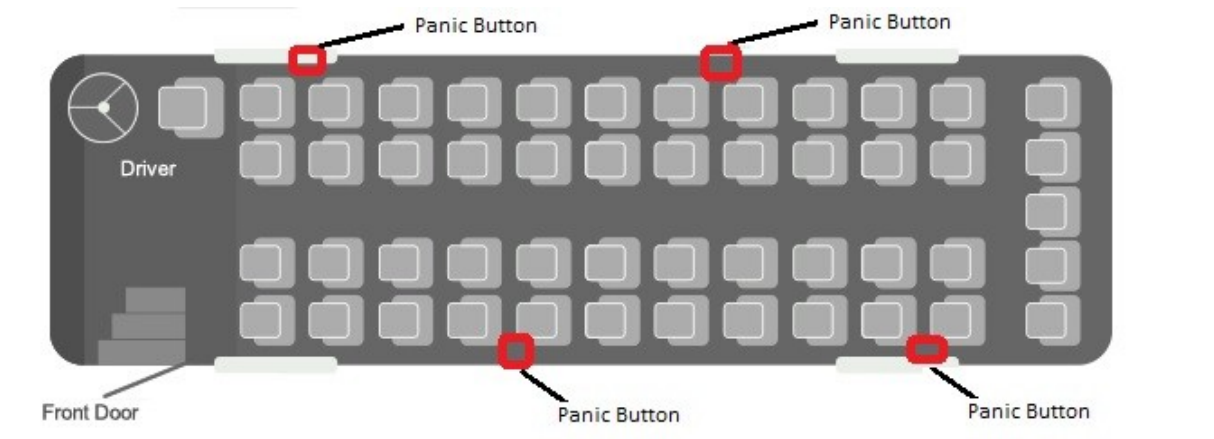


Figure 2: Indicative Panic Button positions for 49 seater