Vehicle Location Trackers: Certification & Deployment
AIS 140 Standard

Pritesh S Shinkar
Automotive Research Association Of India, Pune

Date:09-Dec-2019
ICG-14, Bengaluru
History of ITS in India
Passenger Safety: AIS 140 Standard for Tracking Device
VLT Validation and Reliability
Applications of AIS 140 device
Government Initiatives-Electric Vehicles
Cyber Security for Connected Vehicle
ITS-India History: 2013 MoUD covered ITS system for buses in UBS-II Specifications for JnnURM Scheme

Key Features – ITS

• Multiplex of wiring to Simplify, Remove Fuses & Relays
• Communication with Control Center: Wifi and GPRS

• Vehicle Health Monitoring and Diagnostics System (VHMD)
• Single Driver Console: Driver Display
  • Route selection, security cameras, vehicle location information system,
  • Pop up warnings on console
• PIS inside and outside integrated with audio announcement system: LED Displays
  • Display and announcement of Location based information, pre-recorded message, Special signs
• Security Camera Network
  • Inside bus camera, Camera for Rear view, Recording in panic situation
2014: To ensure safe transportation of children, **Central Board of Secondary Education** (CBSE) has made it compulsory to install GPS in all school buses. The Global Positioning System which will help track school buses will be approved by **Automotive Research Association of India** (ARAI) according to the new guidelines issued by CBSE. Again issued guidelines in 2017
ITS-India History: Transportation of hazardous goods requires Vehicle Location Tracking Device.
ITS-India History

- Fare collection Technologies: Delhi Metro
- Intelligent Signalling
  - Mumbai, Delhi
- Telematics
  - Public transportation management using telematics at Koyambedu, Chennai bus terminal
  - ITS project is underway for public transport management in Mysore city
- Highway Traffic Management
  - Some experiments in vehicle counting, number plate recognition, incident management and lane control
Mandatory vide S.O 5454(E) Implementation is mandatory for new public service vehicles registered from 1st Jan 2019
Vehicle Location Tracking System & Emergency Button

System is GNSS Receiver with **Support to IRNSS** (Indian Regional Navigation Satellite System) and GAGAN is must along.

In addition it can have hybrid constellation (GPS, GLONASS, Baeidu, Galileo)
## GNSS Chipset Requirement

<table>
<thead>
<tr>
<th></th>
<th>GPS</th>
<th>IRNSS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cold Start</strong></td>
<td>&lt; 120 sec</td>
<td></td>
</tr>
<tr>
<td><strong>Warm Start</strong></td>
<td>&lt; 60 sec</td>
<td></td>
</tr>
<tr>
<td><strong>Hot Start</strong></td>
<td>&lt; 10 sec</td>
<td></td>
</tr>
<tr>
<td><strong>Acquisition Sensitivity</strong></td>
<td>-145 dBm</td>
<td>-140 dBm</td>
</tr>
<tr>
<td><strong>Tracking Sensitivity</strong></td>
<td>-160 dBm</td>
<td>-153 dBm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>GPS</th>
<th>IRNSS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Previous Position</strong></td>
<td>Erase</td>
<td>Keep</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>Erase</td>
<td>Keep</td>
</tr>
<tr>
<td><strong>Almanac</strong></td>
<td>Erase</td>
<td>Keep</td>
</tr>
<tr>
<td><strong>Ephemeris</strong></td>
<td>Erase</td>
<td>Erase</td>
</tr>
<tr>
<td><strong>Cold Start</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Warm Start</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hot Start</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Function Requirements for VLT

- L and/or S band NAVIC/IRNSS, GAGAN, the Indian SBAS supported device.
- Position accuracy of 2.5 m CEP or 6 m 2DRMS
- Input/Output supported by Device: 4 Digital, 2 Analogue, 1 Serial Communication
- Data sent to 2 IP address (1-primary server, 2-Emergency server)
- Data sending frequency configurable: 5 sec to 10 min
- Device shall have an Embedded eSIM.
- Device sleep mode current $\leq$ 20 mA with Internal back-up battery support: 4 hours
- 3 axis accelerometer and gyroscope
- Indicative data message format: Normal Operation, Emergency Situation, in Alert condition.
- Emergency button disconnection between switch and controller should be detected through Alert.
Configuration of Device Parameters Over the Air (OTA)

- Setting/Change of the Primary or Secondary IP and port number
- Setting/Change of the APN
- Set configuration parameter like sleep time, overspeed limit, harsh braking, harsh acceleration, rash turning threshold limits etc.
- Emergency control SMS Centre Number(s)
- Configuring the vehicle registration number
- Configuring the frequency of data transmission in normal / Ignition state / OFF state sleep mode/ Emergency state, etc.
- Configuring the time duration for Emergency state
- Capability to reset the device
- Command to get the IMEI of the device
VLT Validation Flow

- **Mechanical**
  - Vibration
  - Shock
  - IP test
  - Free fall

- **Dynamic**
  - Vehicle Test
  - NMEA data communication with back end control centre
  - OTA configuration
  - SMS data
  - Alert ID.
  - Vehicle Health Monitoring

- **AIS 140 standard**
  - AIS 004 Part 3
  - High Voltage Test
  - Load Dump Test
  - Reverse Polarity Protection
  - Over Voltage Protection
  - Insulation Resistance
  - Battery Back up

- **Functional**
  - Accuracy
  - Sensitivity
  - TTFF

- **Environmental**
  - Dry Heat / High Temperature Test
  - Cold Test
  - Damp Heat Test
  - Temperature shock Test
  - Slat Spray Test.
  - Flammability

- **Protocol**
  - NMEA data communication with back end control centre
  - OTA configuration
  - SMS data
  - Alert ID.
  - Vehicle Health Monitoring

- **EMC**
  - AIS 140 Part 3
  - High Voltage Test
  - Load Dump Test
  - Reverse Polarity Protection
  - Over Voltage Protection
  - Insulation Resistance
  - Battery Back up
Reliability: EMC and Environmental Testing

- EMC-ALSE Chamber
- ESD
- Conducted Immunity
- ENV Chamber
- Cyclic Temp./RH
- HALT/HASS
Procedure for VAHAN and Backend Control Center

- Certification of VLT devices from any of the test agencies

- After the type approval, NIC shall issue a unique username and password to each VLT Device manufacturer for uploading the Type approval data on VAHAN portal.

- State or Union Territories to ensure fitmentment and functional status of the VLT device in the public service vehicles at the time of checking of the vehicles for fitness certification.

- VLT manufacturers shall register the devices along with details of vehicle on the corresponding backend systems in real-time.

- VLT device manufacturers shall get their devices tested for conformity of production every year after the first certification, from the testing agencies.
Steps Required

- **Vahaa n portal**
  - Functionality Status
  - NIC

- **Backen d server**
  - Functionality Status
  - BSNL and others...

- **Response to Emergency**
  - State SOP
Data to be uploaded by VLT Devices Manufacturers in VAHAN portal:

a) VLT Device make and model
b) Type Approval Certificate (TAC) and / or Conformity of Production Certificate (COP) as applicable
c) IMEI Number
d) Icc ID Number
e) Unique identification number as per format displayed in next slide:

<table>
<thead>
<tr>
<th>Four alphanumeric characters</th>
<th>Two alphanumerical character One alphabetical character for Test Agency</th>
<th>Four numerical digits</th>
<th>Eight numerical digits</th>
</tr>
</thead>
<tbody>
<tr>
<td>For name of Manufacturer</td>
<td>For name of the model</td>
<td>For month and year of manufacture in format MMYY</td>
<td>For Production Sr. No.</td>
</tr>
<tr>
<td></td>
<td>[A] - Automotive Research Association of India</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[C] - Central Institute of Road Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[ I ] - International Centre for Automotive Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[ V ] - Vehicle Research &amp; Development Establishment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[ F ] - Central Farm Machinery Training &amp; Testing Institute</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[ P ] - Indian Institute of Petroleum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[ G ] - Global Automotive Research Centre, Chennai</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ARAI Approved GPS Only Devices= 28 Nos.
ARAI Approved IRNSS Devices = 52 Nos.
Thank You