



Surat Smart City Development Limited



SURAT SMART CITY DEVELOPMENT LIMITED (SSCDL)

Request for Proposal

for

**SELECTION OF SERVICE PROVIDER FOR PROCUREMENT, SUPPLY,
INTEGRATION AND MAINTENANCE OF VARIOUS HARDWARE COMPONENTS
FOR INTELLIGENT TRANSIT MANAGEMENT SYSTEM (ITMS) FOR BUS RAPID
TRANSIT SYSTEM (BRTS) AND CITY BUS OPERATION FOR SURAT CITY FOR
SURAT MUNICIPAL CORPORATION SURAT (FOURTH ATTEMPT)**

APPENDIX 8: TECHNICAL SPECIFICATION

Tender No (On line): GM(IT)/BRTS/ITMS/03/2017 2018

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Surat Smart City Development Limited (SSCDL)



APPENDIX-8 : TECHNICAL SPECIFICATION

SHORT TENDER FOR SELECTION OF SERVICE PROVIDER FOR PROCUREMENT, SUPPLY, INTEGRATION AND MAINTENANCE OF VARIOUS HARDWARE COMPONENTS FOR INTELLIGENT TRANSIT MANAGEMENT SYSTEM (ITMS) FOR BUS RAPID TRANSIT SYSTEM (BRTS) AND CITY BUS OPERATION FOR SURAT CITY FOR SURAT MUNICIPAL CORPORATION SURAT (FOURTH ATTEMPT)

JANUARY 2018

1. ITMS Project Background

The purpose of this section is to provide information and background about the Integrated Transit Management System (ITMS) being implemented by Surat Municipal Corporation/Surat Smart City Development Ltd. This section provides brief introduction to the solution for the purpose of understanding the project and thereby help bidders to provide relevant devices that would be integrated with the projects functional, technology and end use requirements and further the goal of SMC to achieve integrated, highly automated and stable environment for integrated transportation operations management environment within city of Surat.

1.1. Objective of Implementing ITMS

SSCDL aims to enhance operational capability, citizen's satisfaction, reliability and on-time availability of its services offered through various departments like public transportation, solid waste, engineering services and emergency services etc. SSCDL is soliciting proposals through this RFP from qualified services providers to implement an integrated operations management city platform which will render its services to different departments in a collaborative manner and augment SMC/SSCDL's initiative of delivering quality services which meet citizen's expectations. The services thereby are aimed at enhancing the efficiency of SMC/SSCDL's operational capability and better management of fleet of vehicles which in-turn will instill confidence within citizens of Surat city. SSCDL, through this RFP is desirous of implementing the "Intelligent Transit Management System" (hereinafter referred to as the "ITMS" OR "The Project"). To this end, SSCDL has decided to monitor the movement and manage the fleet of vehicles owned and operated for SMC, collect data related to their geographical position, vehicle movement patterns and to provide relevant information to citizens /SSDCL and SMC's management to better manage services. Onboarding of fare collection devices on its public transportation systems to enable electronic and integrated fare collection system delivery to its citizens.

1.2. ITMS Requirement Summary

SSCDL envisages implementing ITMS as a city wide integrated platform for its diverse set of transportation needs which include operations of public transportation, management of vehicles operating for other civic services like solid waste, engineering and emergency services. The aim of implementing ITMS is to bring in best-in-class operational efficiency and automation to its operations capability to ensure services are delivered on consistent basis and in a manner that meets objectives of SSCDL/SMC. ITMS is expected to meet the objectives of enhancing service standards, bring about paradigm shift in service quality and availability, better organization of planning and operations; integration of transit systems and overall improvements in line with service excellence.

ITMS shall enable SSCDL/SMC to automate its operational processes with respect to mobility management of its vehicles, better insight into operations and hence balance demand & supply issues, perform analytics to optimize system capability to increase operational efficiency, bring in service sustainability, and enable forward looking environment which facilitates policy environment meeting corporation and citizen needs on continual basis.

ITMS system shall deliver above mentioned management objectives by integrating technologies and services using latest hardware, software, computing and communications technologies. The system shall offer relevant operational capability to individual departments while delivering services through an integrated and intelligent platform which is common to all the services. The system is expected to have capability to cater to diverse end use requirements from different service areas of different department within SMC. ITMS will play an important role in delivering policy objectives of SMC/SSCDL, improving service accessibility, providing integrated transport solution and making best use of existing infrastructure and resources in delivering service resilience.

The system shall deliver noticeable economic benefits through reduced journey times and increased reliability, improvements in safety and reductions in pollution, easier service consumption systems, increased citizen trust in civic services, higher operations management capability to authority and integrated work management and delivery scenarios.

The aim of SSCDL is to implement AVLS and GIS and city platform which shall be utilized by diverse set of users to deliver individual or integrated services. The platform will be designed to add services on continual basis and same shall be achieved by establishing system using open protocols and integration capabilities driven by international standards. SMC /SSCDL does envisage that vehicles of all transport types and services like informal transit systems taxis' autos etc. shall be on-boarded on the same platform in phases, so as to offer technologically advanced, integrated, safe and common transit services to citizens with the city.

ITMS Implementation Benefits:

- Making travel within city seamless and more efficient (safer, less polluting, economical, better informed travel) – increased PT usage;
- Improving access to public transit system by augmenting easier access to service and information
- Improved and scientific decision making;
- Deliver accurate real time information about services;
- Aid policy decision by availability of analytics platform.
- Faster and efficient management of incidents within the city;
- Higher economics within transport service by increased use of electronic fare services.
- Enhanced and easier service platform for emergency and engineering services.
- Optimized fleet management for higher availability.
- Safe fleet availability by implementing controls of operations and SLA's.
- Improved communication between operations staff and management resulting in coordinated and managed service environment

In-order to deliver above stated objectives and benefits through technology intervention, ITMS shall comprise of following distinct application areas:

- Integrated Automated Vehicle Location Monitoring System
- Passenger Information System and ETA Prediction System
- Vehicle Scheduling, Tracking & Dispatch System
- Depot Management System

- Business Intelligence System
- Enterprise Management System
- Enterprise Security Management System
- Call Centre Management System
- City Transportation Control Centre

1.3. Purpose of Open ITS standards & Architecture

Interoperability: The ITMS Architecture shall be based on standards needed to provide a sound foundation for system interoperability (interfaces and products). Because the ITMS shall serve as the common foundation for ongoing ITS development work for Surat city, factoring it into current system implementation will facilitate transition to a standard interface definition. Using standard interfaces will provide for regional interoperability and even interchangeability of some devices used in ITS management, even though they may be from different manufacturers.

Increased competition: By implementing use of open standards (non-proprietary), multiple vendors will be able meet the standards and be able to respond to RFPs. Support and upgrades will also be available from multiple potential sources, avoiding the problems of being locked in to one source.

Future expandability: By designing within a common framework and using open standards, Service Provider will create an environment that integrates legacy systems with new ITS applications and allows more functionality to be added as needed.

Lower costs: ITS equipment and device compatibility will create larger total markets attracting more suppliers resulting in more capable products at lower prices. The resulting long-term costs of deployment will be pushed down by these economies of scale for off-the-shelf ITS equipment and products and by competition through open-system enabling of multiple vendors.

Increased transportation system integration: The open nature and structure of the ITS architecture and use of standards-compliant components will make integration of complex transportation management components and regional systems easier. Improved integration of systems operated by different agencies will permit effective information sharing and more effective use of resources. Seamless mobility services across agency lines will become a reality.

Note: The bidder shall be required to provide all protocols, API's interfaces etc. to SMC and solutions should be delivered using standard globally accepted protocols and practices.

2. Solution Overview

2.1. Integrated ITMS Overview

The integrated view of ITMS shall enable you to have a detailed understanding of SSCDL's understanding of implementing city wide transit management system. The system being proposed to be implemented will act as a city foundation framework for integrating objectives of diverse set of stakeholders with Surat city. SMC provides several other services other than transportation to its citizens like solid waste, emergency services, engineering services etc. and hence all such services mentioned within the scope of this RFP shall utilize common ITS infrastructure like tracking and GIS systems to deliver its desirable end objectives.

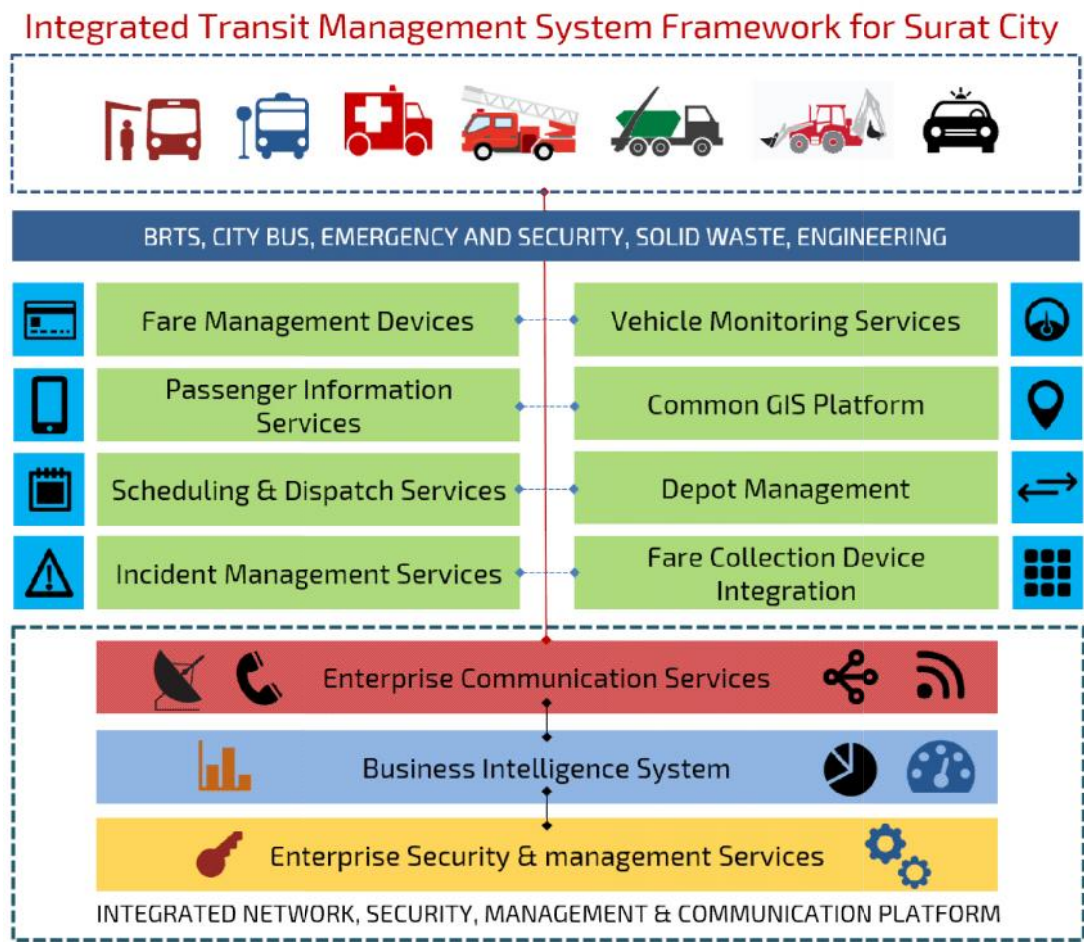


Figure 1: Integrated Surat City ITMS Architecture**

**The figure 1 above is indicative and does not include all the activities that would need to be carried out as part of implementation of ITM. Detailed scope is mentioned in the document below.

3. Technical Specifications

API and Interfacing protocols of exiting ITMS Service Provider shall be provided to selected Bidder upon signing of Non Disclosure Agreement.

Passenger Information System Display for BRTS Station

PIS at Bus Stations and terminals

LED based display screens that provide sufficient visibility in broad daylight condition shall be installed at SMC bus stations and terminals. There shall be two displays per station. They shall display route and estimated arrival time (ETA) including digital advertisements and other digital content as may be approved by SMC. They may also be used to display public service information. The display shall receive encoded information of route and ETA from the AVTS control centre through the common wired/wireless communication link set up at each bus station as part of the AFCS system. The displays must have the ability to decode the information received from CCS and display appropriate message on the screen.

LED Board at Bus Stations shall have the following functional specifications:

- Display of PIS in a display unit at bus station shall be configurable based on bus station and platform. Single unit should display services of more than one platform.
- Information Display units will be supplied and mounted appropriately, configured and commissioned by the vendor.
- PIS information shall be displayed in Gujarati, Hindi and English alternatively (single or multiple language shall be configurable).
- At all these bus stations, display units will receive/display transmitted contents from the central system through a gateway or mention other suitable means in the technical architecture.
- Display systems needs to support full colour display for streaming advertisements, Digital display of text, images and video on LED screens.
- Displayed messages must be readable in high bright, day light.
- Display system in addition to the display of information for PIS shall be capable of displaying advertisements and multimedia content at the bus stops and may need to alternate between Passenger information and Advertisements.
- The frequency and period of information display on PIS display shall be configurable from central location for advertisements and other transit information.

- Display shall provide for modular configurable layout enabling parallel display of content on different areas of the screen – Real time Transit information (Routes, ETA, Type of service, Fare, Time/Date, Public announcements, Safety information, Commercial advertising, a ticker tape at the bottom for text announcements/advertisements, other local Tourist information).
- All displays for PIS will have a configurable refresh rate with minimum of 10 seconds.

Display System Technical Requirement (PIS):

- Display units shall be mounted on a rugged enclosure to withstand harsh environmental conditions with reasonable physical security.
- Display will be located at a convenient height to have a clear view of the message of next arrival bus.
- Fitment provision will have to be provided in the Bus stations. The power supply shall be made available by SMC/SSCDL.
- Display Hardware Specification
- One Integrated tamper proof casing for complete PIS Unit addressing physical security considerations.
- Provide any hardware like PC, networking, etc. required to run the PIS and advertisements on LED Display Units.
- Ensure smooth transition from main power supply to UPS in case of power outage.
- Aesthetic requirements such as fonts, colours, rows per page, display time to be remotely configurable and displayed based on business requirement.

PIS on bus

Passenger information system on bus shall function as an independent system and shall not be directly dependent on the CCS. They shall receive display information and voice announcement commands from the onboard GPS vehicle control module based on stored memory on the bus. **PIS controller on board Bus will also have inbuilt GPS receiver.**

The Voice PIS must play clearly audible pre-recorded voice announcements informing passengers of next bus station on route. The voice PIS shall interface with the on-bus GPS module to gather location information and making the appropriate next station announcement.

Voice Announcement system on Bus

The Voice PIS must play clearly audible pre-recorded voice announcements informing passengers of next bus station on route. The voice PIS shall interface with the on-bus GPS module to gather location information and making the appropriate next station announcement.

Bus PIS Displays

- **On-Bus Passenger Information System (PIS) Specifications for 'Midi' Buses**

Sr. No	On-Bus Passenger Information System (PIS) Specifications for 'Midi' Buses
1.	1. PIS System Requirements
2.	PIS System shall be able to function independent of any other sub system on the Bus
3.	The System will constitute of
4.	i. LED destination Signs i.e. 'Front' and 'Rear' –External facing One each and one 'Inner'
5.	ii. PIS 'Controller' i.e ICU with in-built GPS Receiver.
6.	iii. GPS Antenna
7.	iv. Amplifier, Driver Hand held Microphone and Speakers
8.	v. Wire Harness.
9.	a) Supplier will provide a Compliance report from Test Agencies, notified under Rule no. 126 of CMVR for Tests under '7' below. Certificate from Any agency notified under rule no 126 of CMVR for tests shall be considered.
10.	2. Dimensions and Technical Specifications of LED Signs
11.	a) Front &Rear :
12.	i. Display size minimum 200x900mm, Pitch max H10.5 mm x V 14.1mm
13.	ii. Amber colored LED, Dominant wave length 591~595nm.
14.	iii. Viewing Angle 120° horizontal, 80° verticalOR Viewing Angle 120° horizontal, 60° vertical, as per UBS-II.
15.	iv. UV resistant diffused lens 4mm (minimum)
16.	v. Non-multiplexed (constant drive circuit) system with typical LED intensity 400~700 mCd at If =20Ma, In addition to above Multiplexed design (4:1) with typical LED intensity 950~1150 mCd at 20 ma is also acceptable
17.	vi. Light Weight Structure with toughened glass fixed with UV resistant adhesive in Front
18.	vii. Conformal coated PCBA and ROHS Compliant
19.	viii. In-built light sensor with continuously variable brightness control to enable the display intensity to change based on ambient light conditions
20.	b) Inner:
21.	i. Display size minimum 100x800mm,Pitch max 8x8mm

22.	ii. LED amber dot matrix, viewing angle 45° all around ,intensity 40mCd,dominant wave length 591 ~595nm
23.	iii. Light weight structure with poly glass/acrylic/toughened glass
24.	iv. Conformal coated PCBA and ROHS Compliant
25.	v. In-built light sensor with continuously variable brightness control to enable the display intensity to change based on ambient light conditions.
26.	3. Technical Specifications of ICU
27.	a) Operating Voltage 9V~32V.
28.	b) Processor :32 bit minimum
29.	c) Memory :256 MB minimum
30.	d) Operating system: Linux / Windows/Android SMC needs system having capability of embedded OS to ensure current rich functionality requirement and also to accommodate future requirements
31.	e) In-Built GPS module for On-Bus location based display and announcement
32.	f) Interface minimum: RS 485, RS 232, USB, GPS, Ethernet ,Digital I/O and Audio
33.	g) Communication with Signs will be on RS 485.
34.	h) Conformal coated PCB Boards and ROHS Compliant
35.	i) Route Data upload on Controller from PC via RS232/USB port USB 2.0, FAT 32, upto 8 GB capacity at least). <i>Devices prone to pilferage e.g.SD Card is not permitted.</i> Buzzer indication to be there when loading is complete.
36.	j) Incorporate LCD Graphic Display Panel (resolution 64 x 256 minimum) , illuminated with automatic brightness control and Backlit Keypad with minimum 20 soft keys including alphanumeric.
37.	k) In-built MP3 files storage/playback function and compatibility with external amplifier suitable for 4 Ohm impedance. (Built in amplifier is also acceptable as long as the functional and operational requirements are not compromised).
38.	l) Programming Software compatible with Window 10, includes simulation, Brightness control, scroll speed control, scroll direction, Template configuration, Graphic library, customized graphics
39.	m) Programming Software to include Route configuration with bus stops and Point Of Interest (POI) with geo-location.
40.	n) Provide capability to upload firmware on Signs via RS 485.
41.	o) Should be possible to check Firmware Version, Route Data base version on the Controller Display
42.	4. Usability/Functionality/Capability of PIS System
43.	a) Architecture
44.	i. The ICU should control complete Public Information System on Bus including Destination Signs, External Amplifier and Speakers and Hand held microphone. (Built in amplifier is also acceptable as long as the functional and operational requirements are not compromised).
45.	ii. All drivers related interfaces/information for PIS must be provided on ICU.
46.	iii. The route programming files to be uploaded on ICU via USB.
47.	iv. Route selection function is to be provided on ICU with easy sorting of Routes by Line/Route/ Destination. Last selected Route must be retained in memory and should appear automatically on Power reset.
48.	v. The Driver has to select a 'Route', from a Pre-loaded Route Data Base and all

		configured Information will be displayed and or announced automatically based on Bus Location (GPS).
49.	b)	LED Sign Display Characteristics
50.	i.	Amber colored , alphanumeric with graphic capability
51.	ii.	Viewing distance for single line text, in day and night Front and Rear Signs: 50 meters minimum, Inner Sign: 15 meters minimum.
52.	iii.	Fixed, scrolling and flashing mode (with fixed route number, upto 6 characters, on front, rear signs).
53.	iv.	Capability to show customized graphics.
54.	v.	Two lines English /one line local language.
55.	vi.	Total display height should accommodate two lines in English language and the Individual heights of each line should be adjustable to enable one line to be larger/smaller than the second line. However during next stop announcement only single line text is required
56.	vii.	It should be possible to display, concurrently, different messages on each of the signs (front, rear and inner).
57.	viii.	It should be able to display special signs like signs for 'PWD enable bus', 'ladies special'.
58.	ix.	It should be able to show special characters like (, ' " . ! + - * : ?)
59.	x.	Signs should have ability to retain the last message displayed in the memory of the sign even in the event of power failure and without the message being reloaded from ICU. Test will be performed by disconnecting the ICU from the sign and power to the sign will be switched 'off' and 'on' to see if the Last message is retained and displayed. It is to be noted that above functionality is required in event that controller failed, however the destination signs will still offer information to commuters.
60.	xi.	In case one or more signs get disconnected (malfunction), the rest of the Signs should continue to function regardless (including fresh communication from ICU)
61.	xii.	Display and voice announcement in English and local languages using Microsoft fonts via Window based software package –Windows 10 compatible.
62.	xiii.	Sign should be able to store 'diagnostic trouble codes (DTC)' and 'parameter identifier (PID)' and data should be retrievable. List of such codes and parameters will be as per UBS II Specifications Chapter 10, Clause 17,Annex 3 Appendix 1 and Appendix 1.1 Retrieval of the data from Signs At Depot by connecting to the devices.
63.	c)	The system should have a programming capability as under
64.	i.	Minimum 75 routes UP and DOWN (150 numbers of destinations) on front and rear signs.
65.	ii.	GPS triggered next stop display on Inner sign with synchronized voice announcement for minimum 75 stops on each route.
66.	iii.	The inner sign should be able to display and announce upto three languages, one after the other in sequence. For example make display and announcement in English, then Hindi or local to be followed by local language for benefit of the passengers. Display and announcements should be possible "before arrival" of

		the bus at the bus stop, "on arrival" of the bus at bus stop and "after departure" of the bus from the bus stop. The 'distance' from the Bus stop should be configurable.
67.	iv.	In event of GPS failure the above functionality should be possible through manual intervention on ICU.
68.	v.	Display driver and conductor ID once in between the stops on Inner sign (No announcement)
69.	vi.	Inner sign should be able to display text and customized graphics and announce upto pre-recorded messages by driver selecting 1~9 on ICU display panel of the controller.
70.	vii.	Display customized graphics plus synchronized voice announcement – location based (different between each set of stops) Point Of Interest (POI) with geo-location, linked audio file and display content for location based announcements) Typical POIs are Bus station, railway station, airport, Tourist Spots, Malls, Hospitals, transit mode change points and others.
71.	viii.	Emergency 'stop' request function- by pressing an emergency switch placed anywhere in the bus the inner sign should display 'stop' message and buzzer located near the driver makes the sound alerting the driver to stop the bus.
72.	ix.	A 'beep' sound is made when vehicle speed exceeds set speed limit. The limit is configurable through Software with default as 50 Kmph.
73.	x.	If connected to external switch via I/O on Controller –pre recorded messages can be displayed on inner Sign and pre recorded announcement can be made to the passengers e.g a pre recorderd 'Hooter' sound for evacuation under emergency
74.	xi.	Inner Sign should be able to display a preconfigured default messages during periods other than those mentioned above.
75.	xii.	During the default message display, the message should also include 'Time' and 'Outside Temperature 'on the Right hand top corner. 'Time' will be based on GPS Input.(Temperature data shall be provided by way of an API from control centre). PIS (ICU) will receive temperature information from GPS Device.
76.	5. Interface with Other On-Bus devices	
77.	a) On-Board Vehicle Tracking device via Ethernet Port (Ethernet Port is required for future perspective. However Bidder can propose RS232 additionally)	
78.	ICU will provide 'Selected Route' at preconfigured Interval. Supplier will provide the Protocol Document and demonstrate adequacy of such communication using universally available Applications for the Server use. Above aspects are elaborated further as follows. ICU will have provide capability to manually & automatically select the routes based on defined intervals as required by operations plan and also provide adequate documentation for CCC to communicate.	
79.	b) External 'Gate Way' -Two way Communication with Control Centre via Ethernet Port	
80.	i.	Provide current route information remotely.
81.	ii.	Change/Choose/Select Route remotely
82.	iii.	Transmit adhoc messages from (English) from back office to Internal Sign

83.	iv. Check Firmware and Data base version of ICU remotely.
84.	Service Provider will provide the Protocol Document and demonstrate adequacy of such Communication using universally available Applications for the Server use. (SMC shall provide APIs of existing ITMS Service Provider to Service Provider to facilitate integration after signing of Non Disclosure Agreement specified hereunder)
85.	Such arrangement must be pre agreed between supplier and the buyer (Protocol shall be shared to Service Provider under Non Disclosure Agreement with SMC and Present ITMS Service Provider)
86.	6. Physical Mounting on the Bus
87.	a) Front & Rear signs should be mounted with a gap with the glass so that the Glass on Signs and of the Bus can be cleaned by swiping. The Front Signs and the Glass in its front need more frequent cleaning, so gap should be more and adequate.
88.	b) 'Chassis part' of the vehicle on which Bracket for Sign mounting will be bolted, must be rigid and part of Bus Body 'structure' (and not sheet panels).
89.	c) Sign Location recommendation only
90.	i. Front Sign: Central of Front Glass of the Bus.
91.	ii. Rear Sign: Central of Rear Glass of the Bus
92.	iii. Inner Sign: RH side of the width of bus behind the driver's partition
93.	d) Controller to be mounted in a Secured and ventilated compartment near the roof, easily accessible for Route selection. If mounted on dash board mounting in Radio Slot acc ISO 7736, to be used. OR Controller to be mounted in a Secured and ventilated compartment near the roof, easily accessible for Route selection provided the requirements of ISO 7736 are met
94.	e) GPS Antenna -On the dashboard with direct line of view for 'affixing' the unit.
95.	f) Amplifier to be mounted in a Secured and ventilated compartment near the roof
96.	g) Speakers with protective grill-One each near the doors and others equally distributed across the length of the bus.

7. Test Compliances Supplier will provide a Compliance report from Test Agencies, notified under Rule no. 126 of CMVR for Tests below				
Sr. No .	Test standards compliance	Specifications	LED Signs	Controller
1	Performance parametric test	Nine points, tri temperature/tri voltage-18V, 27V, 32V,-25°C, room temperature, +80°C test. At each test point the system will be powered on and shut down 5 times as per the supplier's designated procedure and thereafter evaluated for malfunction if any		
2	Cold	IS 9000 (Part II/Sec 4)-1977 (reaffirmed 2004)at -15 C for 2 hours in 'on' condition		
3	Dry heat	IS 9000 (Part III/Sec 5)-1977: at + 80 C for 16 hours in 'on' condition.		
4	Damp heat	IS 9000 (Part V/Sec 2)1981 at +25 C /+55 C, Humidity 95%, 24 hours for 6 cycles in off condition. Functional test with power in 'on' condition at start of 2nd, 4th and 6th cycle		
5	Vibration standard AIS 012/AIS:062 - 10g	<ul style="list-style-type: none"> • Frequency 5~55Hz and return to 5Hz at a linear sweep period of 1 minute/complete sweep cycle and 10g at maximum frequency • Excursion -1.65 mm peak to peak over the specified frequency range • Test duration 60 minutes Direction of vibration –X, Y, Z axis of device as it is mounted on the vehicle. • Test to be carried out in 'on' condition as per ARAI 		
6	Dust and water ingress protection	IS /IEC 60947-1:2004 in conjunction with IS/IEC 60529:2001– Signs IP66, Controller IP66		
7	Free fall	IS 9000 (Part VII/Sec 4) Free fall at 500 mm	X	
8	Fire resistant	Wiring Harness		
9	Reverse polarity protection without fuse	The component must fulfil the function-and service life requirements after being subjected to reversed polarity up to 27 V for 2 minutes. ISO 16750-2		
10	Over voltage protection	To ensure service life requirements and functionality. The component shall run for 60 minutes at 38V, without effecting the service life or function. ISO 16750-2		
11	Insulation resistance	The Insulation resistance measured as per ISO 16750-2 with avoltageof500 V dc shall not be less than 1Mega ohm. Insulation Resistance Test will be carried out after completion of Damp Heat Test' and then		

		the Test sample to be kept at room temperature for at-least 0.5 hrs.																	
13	Load dump	123V, 8 Ohms 200ms pulse 5a as per standard ISO 7637-2. After Test DUT should meet at least class B as per ISO 7637 2	X																
14	Salt spray test	(AIS: 012/ IS10250) 96 hours																	
15	EMC/EMI	AIS 004 (PART 3)																	
16	Operating parameters	Supply voltage 24 V± 25%																	
17	LED color test –dominant wave length amber	AIS -010 (Part 5), (Rev 1),2010		X															
18	LED chromaticity coordinates	<p>The light emitted by LDB shall be of amber colour having trichromaticity coordinates conforming to:</p> <p>A12 Green boundary $y = x - 0.120$ A23 The spectral locus A34 Red boundary $y = 0.390$ A41 White boundary $y = 0.790 - 0.670x$</p> <p>With intersection points:</p> <table><thead><tr><th></th><th>X</th><th>Y</th></tr></thead><tbody><tr><td>A1:</td><td>0.545</td><td>0.425</td></tr><tr><td>A2:</td><td>0.560</td><td>0.440</td></tr><tr><td>A3:</td><td>0.609</td><td>0.390</td></tr><tr><td>A4</td><td>0.597</td><td>0.390</td></tr></tbody></table> <p>The dominant wavelength of the light emitted by the LEDs of LDBS shall fall between 585 nm and 595 nm.</p>		X	Y	A1:	0.545	0.425	A2:	0.560	0.440	A3:	0.609	0.390	A4	0.597	0.390		X
	X	Y																	
A1:	0.545	0.425																	
A2:	0.560	0.440																	
A3:	0.609	0.390																	
A4	0.597	0.390																	
19	LED bulb/SMT intensity and viewing angle	In accordance with CIE 127 condition B		X															
20	Slow Increase and decrease (Ramp up/ Down)	Apply a Voltage of 0V to 27V at increasing rate of 0.5V per second for slow Increase of Power Supply. Apply a Voltage of 27V to 0V at decreasing rate of 0.5V per second for slow Decrease of Power Supply.																	
21	Short Circuit Protection	ISO 16750-2																	
22	Momentary Interruption	ISO 16750-2																	
23	Ripple	ISO 16750-2																	
24	Thermal Shock-Controller Only	ISO 16750-4 Clause 5.3.2	X																

25	ESD Test	Powered <ul style="list-style-type: none"> • Direct Contact $\pm 6 \text{ kV} \pm 8 \text{ kV}$ • Direct Air $\pm 8 \text{ kV} \pm 15 \text{ kV}$ Unpowered <ul style="list-style-type: none"> • Direct Contact $\pm 6 \text{ kV} \pm 8 \text{ kV}$ • Direct Air $\pm 8 \text{ kV} \pm 15 \text{ kV}$ 		
26	Endurance Test	Ambient Temperature, preferably $27 \pm 2^\circ\text{C}$, 28 V, 100 000 cycles. Each cycle shall consist of switching ON & OFF the system with dwell time as follows: Dwell time: 10 s \pm 1 s (ON condition), 4 s \pm 1 s (OFF condition).		
27	USB port over loading test	USB Port Pin No. 1 (+5 VDC) & Pin No. 4 (GND) to be Short Circuited with external wire in ON condition. The System should continue to work without any problem.	X	
28	ISO 16750-5 Chemical Exposure	Fluids as applicable for 'Cabin Compartment' as per annex A ISO 16750-5—Battery Fluid, Interior cleaner, Refreshment containing caffeine and Sugar, glass cleaner, denatured alcohol		
29	UV Test (plastic/polymer material which are exposed to sunlight i.e. Raster, housing)	UV Protected Materials to be used (Supplier to disclose the material)		

BRT /HMCstation/Terminal LED TV based PIS Display System

Sr. No	Parameter	Min. Requirement
1	Type of Display, Screen Size	Full Colour, LED Display, Day Light Readable Min 55 Inch LED TV
2	Min & max viewing distance and angle of viewing	Viewing distance 20 - 100 meters Minimum $60^\circ\text{V} - 110^\circ\text{H}$
3	Environmental specifications	Temperature: 0 to $+55^\circ\text{C}$; Sealing: IP 65 (Front), IP 54 (Rear) Humidity: 95% RH, Industrial Grade
4	Minimum life of the display system	100,000 hours
5	Power supply	90 V to 250 V AC
6	Display format	Multimedia content, Text in Gujarati, Hindi & English with presentation in tables, Fixed and scrolling Text
		Casing is acceptable in case IP 65 & IP 54 protection is provided and all other operating parameters as above are met.

The mounting kits for BRT station/HMC/Terminal station installation to be provided along with the displays. Bidders are requested to visit BRT station and examine the current installation of PIS LED boards.

Display shall provide for modular configurable layout enabling parallel display of content on different areas of the screen – Real time Transit information (Routes, ETA, Type of service, Fare, Time/Date, Public announcements, Safety information, Commercial advertising, a ticker tape at the bottom for text announcements/advertisements, other local Tourist information). The content management in these displays is not in bidder's scope of this tender.

Test Compliances for PIS Equipment's PIS Signs Station Signs

Sr. No	Test standards compliance Test Report by Agencies, as notified under rule 126 of CMVR, to be submitted for each item.	Specifications Station Signs
1.	Performance parametric test	Nine points, tri temperature/tri voltage-18V, 27V, 32V,-25°C, room temperature, +80°C test. At each test point the system will be powered on and shut down 5 times as per the supplier's designated procedure and thereafter evaluated for malfunction if any
2.	Cold	IS 9000 (Part II/Sec 4)-1977 (reaffirmed 2004)at -15 C for 2 hours in 'on' condition
3.	Dry heat	IS 9000 (Part III/Sec 5)-1977: at + 80 C for 16 hours in 'on' condition.
4	Damp heat	IS 9000 (Part V/Sec 2)1981 at +25 C /+55 C, Humidity 95%, 24 hours for 6 cycles in off condition. Functional test with power in 'on' condition at start of 2nd, 4th and 6th cycle
5	Vibration · Frequency	5~55Hz and return standard AIS 012/AIS:062 -10g
6	Dust and water ingress protection	IS /IEC 60947-1:2004 in conjunction with IS/IEC 60529:2001– Signs IP66. No controller is required at Station
7	Free fall	IS 9000 (Part VII/Sec 4) Free fall at 500 mm. . No controller is required at Station
8	Fire	resistant Wiring Harness
9	Reverse polarity protection without fuse	The component must fulfil the function-and service life requirements after being subjected to reversed polarity up to 27 V for 2 minutes. ISO 16750-2
10	Over voltage protection	To ensure service life requirements and functionality. The component shall run for 60 minutes at 38V, without effecting the service life or function. ISO 16750-2
11	Insulation resistance	The Insulation resistance measured as per ISO 16750-2 with avoltageof500 V dc shall not beless than 1Mega ohm. Insulation Resistance Test will be carried out after completion of 'Damp Heat Test' and then the Test sample to be kept at room temperature for at-least 0.5 hrs.
12	Salt spray test	(AIS: 012/ IS10250) 96 hours
13	EMC/EMI	AIS 004 (PART 3)
14	EMC/EMI	'e' Certificate

15	Operating parameters	Supply voltage 24 V± 25%
16	LED color test	dominant wave length amber AIS -010 (Part 5), (Rev 1),2010
17	LED chromaticity	Coordinates Limit towards green: $y = x-0.120$ Limit towards red: $y = 0.390$ Limit towards white: $y = 0.790-0.670x$ Reference to AIS010, (Part 5), (Rev 1), 2010 In accordance with CIE 127 condition
18	LED bulb/SMT	intensity and viewing angle In accordance with CIE 127 condition B
19	Slow Increase and decrease (Ramp up/ Down)	Apply a Voltage of 0V to 27V at increasing rate of 0.5V per second for slow Increase of Power Supply. Apply a Voltage of 27V to 0V at decreasing rate of 0.5V per second for slow Decrease of Power Supply.
20	Short Circuit Protection	ISO 16750-2
21	Momentary Interruption	ISO 16750-2
22	Ripple	ISO 16750-2

GPS and GPRS based Vehicle tracking unit

GPS Tracking Device

SI No	Requirements
	GPS based On-board unit for City Bus
1	Input Voltage Range 5.5V - 36V
2	Average current 90 to 100mA
3	Average current with Battery charging 125 to 135mA
4	Battery Specification Lithium-ion 3.7V /1000mAh
5	Battery Backup Time 40 min with 30 sec tracking interval
6	GPS Cold Start <55 sec
	Hot Start < 10 sec
8	GPS Sensitivity Tracking -157 dBm
	navigation -154 dBm
	Acquisition -142 dBm
11	Antenna Internal Antenna for GPS and GPRS (External GPS antenna mounting should be done in a way that it cannot be vandalized. However, it is recommended to have internal GPS antenna as the devices shall also be used on vehicles other than buses)
12	Horizontal Position Accuracy upto 16 meter (4 sat fix, 9 sat search)
13	Digital Inputs 3 minimum
14	Digital outputs 2 minimum

15	Analog Inputs 2 minimum
16	GEO Fence User settable Distance range, SMS alert packet when out of Geo-fence
17	Over speed User Settable Speed limit, SMS alert packet when speed cross over speed limit(maximum)
18	Movement control 100 metre range, SMS alert packet when vehicle moves out of movement area
19	Parameters Setting Through SMS APN, live ip1, live ip2, unit id, server reconnect frequency, serverchange frequency, reset odometer, geofence control, over speed control, movement control ,sms serving numbers, UTC time configuration, factory setting, digital output control, memory data erase
20	EEPROM 2Mbit
21	GPS Track Recording and Resending Built in 2MBit large flash memory to store data when out of GPRS radio coverage
	Automatically resend Non- GPRS coverage data when device goes into GPRS coverage
23	Ignition status ON/OFF status
24	POWER SUPPLY - External & Internal Battery
25	Internal Battery-Should provide GPS data for at-least 4 hours when external power supply is disconnected.
26	Battery Status-Battery Health indication
27	GPS based Speed measurement Range:-up to 180 KMPH
28	GPS based Odometer-Required
29	Factory setting-Switch for default factory setting
30	Data send frequency settable-Adjustable upto 8 seconds or more
31	Server change frequency settable- min. 1minute
32	Server reconnect frequency settable,- min. 1minute
33	LED status-Power
34	USB for parameter configuration-Required
35	Multi IP connection two server-Primary, Secondary
36	AGPS supported-Required
37	Operating Temperature -10°C to +50°C
38	Storage Temperature -10°C to +50°C
39	Humidity- 95% non-condensing
40	Protection- IP 40 and above
41	API/SDK-Should provide API's protocols and necessary documentation for integration purpose.
42	Connection-USB/RS232 port
43	GPRS-1 Sim slot internal
	Driver Feedback System
	· Provides continuous real time, visual and audible feedback to the driver, via a display regarding driving parameters (pl see the note below*)

	· Integration capability with major GPS devices via APIs protocols.
	· It should detect and report event for fuel consumption, emission and accelerated wear and tear (brakes, axles, engine, etc.). (Device should be able to connect to bus electronic data port to send such data to control centre.)
	· It should provide logs and reports a wide set of events, accident events and/or raw data concerned with hazardous or aggressive driving behavior for later re-construction on the server side. (Vehicle data including parameters given in driving behavior hereunder should be used to reconstruct events at CCC.)
	· It should provide trip statistics information, which includes information gathered and processed on-board during a trip.
	· It should provide the below mentioned events
	· Acceleration
	· Braking
	· Harsh Lane Crossing
	· Turn
	· ON/Off Road
	· Over Speed
	· Idling

- 1 All tracking device (GPS) shall implement a TCP interface between AVLS and the device.
- 2 There is no specific open standard for sending the data to AVLS. So the tracking device can decide data format (preferably ASCII clear text messages). ARS will be implementing the TCP server as per the device protocol as change request.
- 3 The protocol shall support data exchange in both directions (between control center and device)
- 4 The tracking data shall contain NMEA gps format with configurable update interval. The maximum update interval should be less than 10 seconds.
- 5 The in bus PIS LED display does not have standard protocol. Based on the chosen model of display the BDC units/GPS units has to implement the interface with display.

UPS for BRTS Bus Station

Online UPS 2KVA-4 Hours backup		
Sr. No.	Description	Minimum Required Specification
1	Rating (in KVA)	2 KVA / 800W
[A]	Input	
1	Nominal Voltage	230 V AC
2	Nominal Frequency	50 Hz
3	Input Power Factor	>0.95
4	Input Voltage Range	165 ~ 275 VAC

5	Frequency Range	45 to 55 Hz
[B]	Output	
1	Invertor Design	IGBT Based Technology
2	Voltage	220 V / 230V / 240 VAC
3	Voltage Regulation	1% to 2%
4	Waveform	Pure Sine wave
5	Total Harmonic Distortion	< 3% for linear load
6	Crest Factor	3 :1
[C]	Environmental	
1	Operational Temperature	0 to 40 Deg.
2	Relative Humidity	20 ~ 90% (Non Condensing)
[D]	Physical	
1	Enclosure Protection	IP 20
2	Cooling	Forced Air Cooling
[E]	Bypass	
1	Static Bypass	Auto & Manual
2	Transfer	No Break
[F]	Battery	
1	Type	Sealed Maintenance Free
2	DC Voltage	Upto 96 V
3	Recharge Time	8-10 hrs
4	VAH Required	3600 VAH
5	Battery Backup	4 hours
6	Battery make	Exide / Quanta / Rocket
[G]	General	
1	Overall Efficiency on Full load	> 87%
2	Acoustic Noise (in dbA)	< 50 dbA @ 1 Meter
3	Alarms	Audible Alarm required for Mains Failure, Low Battery, Over Load
4	Display Panel	LCD Display with Measurements (Input / Output/Frequency, Battery Voltage)
[H]	Communications	
1	Connection type	USB
2	SNMP Interface	Intelligent slot for SNMP / AS400/ Modbus

Depot Desktop Specifications:

Feature	Technical Specifications
Processors	Intel® 6th generation Core™ i5 Quad Core
Chipset	Intel® H110 Chipset; or equivalent

Operating System		Microsoft® Windows 10 Home 64 - bit, Microsoft® Windows 10 Pro 64 - bit Microsoft® Windows 8.1 Standard 64-bit, Microsoft ® Windows 8.1 Pro 64-bit Microsoft® Windows 7® Professional SP1 (32/64 bit) Ubuntu®	
Graphics Options		Integrated Intel® HD Graphics 530 Supports optional discrete graphics: AMD Radeon™ R7 350X, AMD Radeon™ R5 340X (MT/SFF only)	
Memory ^{2,3}		2 Long DIMM slots; Non-ECC dual-channel 1600MHz DDR3L SDRAM, supports up to 16GB (MT/SFF); 2 SO-DIMM slots (Micro)	
Networking		MT/SFF: Integrated Realtek® RTL8111HSD Ethernet LAN 10/100/1000; supports optional PCIe 10/100/1000 network card; Optional wireless: 802.11ac+ Bluetooth 4.1 card Micro: Integrated Realtek® RTL8111HSD Ethernet LAN 10/100/1000; Optional wireless M.2 802.11ac +Bluetooth 4.1 card	
I/O Ports		MT/SFF : 10 External USB: 6 x 3.0 (2 front/4 rear) and 4 x 2.0 (2 front/2 rear); 1 Internal USB 2.0; 1 RJ-45; 1 Serial; 1 Display Port 1.2; 1 HDMI 1.4; 2 PS/2; 1 UAJ, 1 Line-out; 1 VGA (optional) Micro: 10 External USB: 6 x 3.0 (2 front/4 rear) and 4 x 2.0 (2 front/2 rear); 1 Internal USB 2.0; 1 RJ-45; 1 Serial; 1 Display Port 1.2; 1 HDMI 1.4; 2 PS/2; 1 UAJ, 1 Line-out; 1 VGA (optional)	
Removable Media Options		Supports optional optical disc drives and SD media card reader (MT/SFF only)	
Hard Drive ⁴ Options (internal)		Hard Disk Drives: up to 1TB Supports Solid State Drives, Hybrid and Hybrid Opal SED FIPS No Hard Drive	
Chassis (Approx)	Minitower (MT)	Small Form Factor (SFF)	Micro
Dimensions (H x W x D) Inches/(cm)	13.8x 6.1*10.8/ 35 x 15.4 x 27.4	11.4 x 11.5 x 3.6 / 29.0 x 29.2 x 9.26	7.2 x 7.0 x 1.4 / 18.2 x 17.8 x 3.6
Min. Weight (lbs./kg)	17.62 / 8	10.7 / 4.48	3.12 / 1.41
Number of Bays	1 internal 3.5" 2 internal 2.5" 1 external 5.25"	1 internal 3.5" 1 internal 2.5"	1 internal 2.5"
Expansion Slots	1 full height PCIe x16 3 full height PCIe x1	1 half height PCIe x16 1 half height PCIe x1	1 M.2 (22x30mm)
Power Supply ⁵ Unit (PSU)	Standard 240W PSU Active PFC 240W up to 85% Efficient PSU (80 PLUS Bronze) ENERGY	Standard 180W PSU Active PFC 180W typical 85% Efficient PSU (80 PLUS Bronze) ENERGY STAR complaint, Active PFC 180W typical 92% Efficient PSU (80 PLUS Platinum); ENERGY STAR complaint, Active PFC	65W external adapter, 87% minimum average efficiency

	STAR complaint, Active PFC 240W up to 92% Efficient PSU (80 PLUS Platinum); ENERGY STAR complaint, Active PFC	
Accessories		Monitors - 22"
Micro Mounting Options: Vertical Stand, VESA Mount, Dual VESA Mount, All in One Mount, Console with DVD-RW, All in One Mount for E Series Displays		
Keyboards: Wired Keyboard with Multimedia functionality		
Mouse: wired Mouse / wireless mouse		
Audio Speakers: Internal audio speaker,		
Security Options		Trusted Platform Module, Data Protection, Security Tools, Chassis lock slot support, Chassis Intrusion Switch, Setup/BIOS Password, I/O Interface Security, optional Smart Card keyboards, Intel® Trusted Execution Technology, Intel® Identity Protection Technology
Systems Management Options		Client Command Suite; In-Band Systems Management

LAN connection, network cabling is bidder's scope for Depot , Station and Terminals . Bidder shall have to quote as part of price Bid .

Router and Network cables are required to be provided by Bidder as Network components for BRT Station, Terminal and Depot.

Communication Unit for BRTS Bus Station: Router

Specifications

I/O ports and slots: 2 SIC slots, or 1 DSIC slot + 1 RJ-45 autosensing 10/100/1000 WAN port + 1 SFP fixed Gigabit Ethernet SFP port + 4 RJ-45 autosensing 10/100/1000 LAN ports + 1 Serial port
Additional ports and slots: 1 USB 2.0 + 1 RJ-45 console port to access limited CLI port
AP characteristics: Radios (via optional modules) 3G, 4G LTE
Memory and processor: RISC @ 667 MHz, 1 GB DDR3 SDRAM, 256 MB flash
Performance: Throughput - up to 500 Kpps (64-byte packets); Routing table size - 200000 entries (IPv4), 200000 entries (IPv6); Forwarding table size - 200000 entries (IPv4), 200000 entries (IPv6)
Operating temperature: (0°C to 50°C)
Reliability: MTBF (years) - 137.5
Safety: UL 60950-1; IEC 60950-1; EN 60950-1; CAN/CSA-C22.2 No. 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; GB 4943.1
Emissions: VCCI Class A; EN 55022 Class A; CISPR 22 Class A; EN 55024; ICES-003 Class A; EN 300 386 v1.6.1; CISPR 24; AS/NZS CISPR 22 Class A; EN 61000-3-2; EN

61000-3-3; FCC (CFR 47, Part 15) Class A

Management: IMC - Intelligent Management Center; command-line interface; Web browser; out-of-band management (serial RS-232C); out-of-band management (DB-9 serial port console); SNMP Manager; Telnet; RMON1; FTP; IEEE 802.3 Ethernet MIB

It is to be noted that SMC/Authority shall supply the communication network (SIM cards etc) for communication from City Buses/BRT Buses to Control Centre, SMC Vehicles to Control Centre & BRT Stations to Control Centre.

Station Server Specification (To be used at Terminal)

The service provider shall determine the actual require and according decide on the specifications, However industrial design is a must to comply with harsh conditions.

Processor	CPU	Dual core or Above
	Frequency	1.66 GHz & above
	Core Number	2
	L2 Cache	1 MB
	BIOS	AMI EFI 16Mbit
Memory	Technology	DDR2 667MHz
	Capacity	2 GB
	Socket	1 x 200-pin SODIMM
Expansion	Slot Type	1
	Mini PCI	1
	MIOe (Optional)	1
Ethernet	Controller	Support wake on LAN.
	Speed	10/ 100/ 1000 Mbps
	Connector	RJ45 x 2 (Minimum)
Audio	Audio Interface	HD Audio
	Connector	1 (Line-in, Line out, Mic-in)
Watchdog Timer	Watch Dog Timer	Yes
Storage	SATA	1 x SATA II
	CompactFlash	1

I/O	USB2.0	6
	GPIO	8
	COM Port	6 (1 x RS232, 3 x RS232/ 422/ 485, 2 x RS-422/ 485)
Power	Power Type	ATX, AT
	Power Supply Voltage	Vin: 12-24V
	Connector	2-pin
	Power Consumption (Idle)	12.62W
	Power Consumption (Full Load)	15.87W
	Power Adaptor	Optional
Environment	Non-Operational Temperature	-40~ 85° C and 40° C @ 95% RH Non-Condensing
Physical	Dimension (mm)	264.5 x 133.0 x 69.2 mm
	Weight	2 kg (4.4 lb)
	Construction	Aluminum / Iron
	Mounting	Desk/ Wall/ VESA/ DIN-Rail mounting
Operating System	Microsoft Windows	Yes
	Linux	Yes
	SUSIAccess	Yes
Certification	EMC	CE, FCC, CCC, BSMI, KC
	Safety Certifications	UL, CCC, BSMI, KC

BRTS Bus Controller and Driver Console

Architecture

The architecture defines the overall inter connectivity of the different sub system inside the vehicle, communication within the sub systems and connectivity to the backend solution for the transmission of the real time vehicle information. It shall consists of following sub systems

- i Passenger information system (PIS) On-Bus
- ii Automatic vehicle location system (AVL) On –Bus
- iii Controller and Bus Driver Console-On Bus

Automatic vehicle location (AVL) system

Controller will transmit raw GPS data ,of vehicle locations, in NMEA protocol , to back office control centre at user configurable frequency (5 seconds or less),via 3G(GSM)/GPRS, for further processing and use ,including that for signs on bus stops ,BRTS and bus terminals.

Controller and BDC architecture

Usability/Functionality/Capability

- a Provide the driver/user interface/display on BDC
- b Control PIS functionality as specified elsewhere in the document
- c Provide two-way voice and data link with control centre to communicate data and information.
- d The link will be based on open public communications network services 3G (GSM) with downward compatibility with 2G
- e Provide audio interface to the driver's microphone and earpiece or speaker using wired link to Controller
- f BDC ,on a selectable 'menu' will have 'panic' options' for communicating pre-configured messages to control centre
- g **It should be possible to transmit to CCC : Device IMEI, SIM No., Driver ID, Conductor ID, Panic Button (E) pressing, Ignition on/off, Door Open Close, Battery Volts any other**
- h **It should be able to provide Time Table related information to the Driver and CCC**
- i Two way communication with central control centre(CCC) via Contoller
 - i. It should be possible to change/choose/select a 'route' remotely over the air from back office and provide current route information to back office
 - ii. It should be possible to transmit adhoc messages (English) from back office to internal sign.
- j To comply with test standards

Technical specifications: Controller

- a Processor : 32 bit minimum
- b Operating system: embedded Windows/Linux with programming software
- c Memory : flash: 2 GB minimum, RAM 512 MB minimum (RAM memory includes SCU and BDC)
- d Interface : As required for the functionality
- e Interface protocols :as specified elsewhere in this document
- f In built GPS and 3G(GSM) modules
- g Combi antenna

- h In built /external two channel amplifier minimum 10 Watts rms each suitable for 4 ~8 Ohm impedance with input for external microphone
- i In-built MP3 files storage/playback function.

Technical Specifications: BDC

- a Display
 - i Size 5.7" diagonal minimum
 - ii Full color graphic TFT-640 x 480 dots minimum, capable of showing minimum 20 lines in English.
 - iii Viewing angle (horizontal)70°/70° (right/left)/ (vertical) 60°/60° (up and down)
 - iv Adjustable back lighting
- b Key board :4 keys minimum

Technical specifications: GPS modules

- a Tracking sensitivity :-165 dBm typ
- b Navigation sensitivity ; -148 dBm typ
- c Update rate 1 Hz (configurable to 10 Hz)
- d Time to first fix cold acquisition 35-42 seconds typ
- e Hot acquisition 1-2 second typ.
- f Navigation accuracy 3M horizontal

Technical specifications: 3G(GSM) modules

- a GSM/GPRS SMT quad band and UMTS (3G)
- b Temperature range -15°C to +80°C

Technical specifications: 'Combi' Antenna

- a AMPS 850MHz, GSM900MHz, DCS1800MHz, PCS1900MHz, 3G UMTS 2.1GHz, GPS (1575.42MHz).
- b GPRS
 - i Impedance 50 Ohm
 - ii Radiation pattern Omni-directional
 - iii Polarization linear (vertical)
- c GPS
 - i Impedance 50 Ohms
 - ii VSWR <1.5:1
 - iii Polarization RHCP
- d Waterproof IP-66
- e Temperature range -15°C to +80°C
- f RG174 cable

Fitment on bus

- a All equipment including wiring harness, antennas to be original factory fitment.
- b Front, side, rear signs should be mounted with a gap with the glass so that the glass on signs and of the bus can be cleaned by swiping
- c All equipment should be fitted in a way to minimize unintentional damage, shielded from direct engine heat, protected from water splash and dust.
- d All cables need to be properly anchored
- e Others:
 - i Front sign: central

- ii Rear sign: central
- iii Side sign: first window ahead of rear door (central line of sign should coincide with central line of window)
- iv Inner sign: centralize along the width of bus behind the driver's partition
- v Speakers with protective grill : one each near the doors and others equally distributed across the length of the bus- Total no. 4
- vi Controller, recorder, amplifier : secured and ventilated compartment right above the driver
- vii BDC: ergonomically placed for driver ease
- viii Camera: as specified else where
- ix Combi antenna: suitable place to define inside the bus (preferably) with direct line of view for 'affixing' the unit.

Communication amongst sub systems

- a 'Signs' to 'SCU'/'BDC' RS 485
- b Controller to 'BDC' Ethernet/DVI/VGA/HDMI/RS232/RS485 as required.

Approvals

The notified agencies, as under rule number 126 of CMVR, will be responsible for approvals and certification of the system as defined above

Sr. No	BRTS/HMC Bus Controller and Driver Console
1	The main function of OBU is to: <ul style="list-style-type: none"> Acquire data related to the bus real-time scenarios and transmit it to the control centre. Fetch driver demands to the control centre and send them through the communications system. Receive messages and voice communications from the CCC controllers. <p>Data received from OBU shall provide following (this is minimum list and actual list may vary depending on requirement finalization):</p> <ul style="list-style-type: none"> Geographic position of the bus, calculated with the GPS receiver and odometer data if available 'CAN BUS'. Service related data: driver number, line, route etc. Real-time Stop information. Current speed. Bus ignition status. <p>The BDC shall provide functions for drivers to login / log-off, read predefined messages, read messages received from control centre, voice call request, volume control etc.</p> <p>The bus driver console shall provide facility for drivers to send information to control centre like call initiation, Message retrieval, vehicle stoppage, detour information, occupancy, medical help, accident info, service requirement etc.</p>
15	Architecture <p>The architecture defines the overall inter connectivity of the different sub system inside the vehicle, communication within the sub systems and connectivity to the backend solution for the transmission of the real time vehicle information. It shall consist of following sub systems</p> <ul style="list-style-type: none"> i Passenger information system (PIS) On-Bus ii Automatic vehicle location system (AVL) On –Bus

	iii Controller and Bus Driver Console-On Bus
	Controller and BDC architecture
23	Usability/Functionality/Capability
	a Provide the driver/user interface/display on BDC
	b Control PIS functionality as specified elsewhere in the document
	c Provide two-way voice and data link with control centre to communicate data and information.
	d The link will be based on open public communications network services 3G (GSM) with downward compatibility with 2G
	e Provide audio interface to the driver's microphone and earpiece or speaker using wired link to Controller
	f BDC ,on a selectable 'menu' will have 'panic' options' for communicating pre-configured messages to control centre
	g BDC should provide Mic and speaker system for manual announcement.
	h It should be possible to transmit to CCC : Device IMEI, SIM No., Driver ID, Conductor ID, Panic Button (E) pressing, Ignition on/off, Door Open Close, Battery Volts any other.In case of Electronic engine it should also transmit: <i>Vehicle Speed, Engine RPM, Engine Coolant temperature, Engine Oil Pressure, Accelerator Pedal position(%).. In case of Automatic Transmission it should also transmit :Transmission sump oil temperature, Transmission oil level, Transmission service indicator</i>
	i It should be able to provide Time Table related information to the Driver and CCC
	j Two way communication with central control centre (CCC) via Controller
	i. It should be possible to change/choose/select a 'route' remotely over the air from back office and provide current route information to back office
	ii. It should be possible to transmit ad-hoc messages (English) from back office to internal sign.
	k To comply with test standards– <i>attached below</i>
37	Technical specifications: Controller
	a Processor : 32 bit minimum
	b Operating system: embedded Windows/Linux with programming software
	c Memory : flash: 2 GB minimum, RAM 512 MB minimum (RAM memory includes SCU and BDC)
	d Interface : As required for the functionality
	e Interface protocols :as specified elsewhere in this document
	f In built GPS and 3G(GSM) modules
	g Combi antenna
	h In built /external two channel amplifier minimum 10 Watts rms each suitable for 4 ~8 Ohm impedance with input for external microphone
	i In-built MP3 files storage/playback function.
	Technical Specifications: BDC
	a Display
	i Size 5.7" diagonal minimum
	ii Full color graphic TFT-640 x 480 dots minimum, capable of showing minimum 20 lines in English.
	iii Viewing angle (horizontal) 70°/70° (right/left)/ (vertical) 60°/60° (up and down)
	iv Adjustable back lighting

	b Key board :4 keys minimum
54	Technical specifications: GPS modules
55	a Tracking sensitivity :-165 dBm typ
56	b Navigation sensitivity ; -148 dBm typ
57	c Update rate 1 Hz (configurable to 10 Hz)
58	d Time to first fix cold acquisition 35-42 seconds typ
59	e Hot acquisition 1-2 second typ.
60	f Navigation accuracy 3M horizontal
61	Technical specifications: 3G(GSM) modules
62	a GSM/GPRS SMT quad band and UMTS (3G)
63	b Temperature range -15°C to +80°C
64	Technical specifications: 'Combi' Antenna
65	a AMPS 850MHz, GSM900MHz, DCS1800MHz, PCS1900MHz, 3G UMTS 2.1GHz, GPS (1575.42MHz).
66	b GPRS
67	i Impedance 50 Ohm
68	ii Radiation pattern Omni-directional
69	iii Polarization linear (vertical)
70	c GPS
71	i Impedance 50 Ohms
72	ii VSWR <1.5:1
73	iii Polarization RHCP
74	d Waterproof IP-66
75	e Temperature range -15°C to +80°C
76	f RG174 cable
77	Fitment on bus
78	a All equipment including wiring harness, antennas to be original factory fitment.
79	b Front, side, rear signs should be mounted with a gap with the glass so that the glass on signs and of the bus can be cleaned by swiping
80	All equipment should be fitted in a way to minimize unintentional damage, shielded from direct engine heat, protected from water splash and dust.
81	d All cables need to be properly anchored
82	e Others:
83	i Front sign: central
84	ii Rear sign: central
85	iii Side sign: first window ahead of rear door (central line of sign should coincide with central line of window)
86	iv Inner sign: centralize along the width of bus behind the driver's partition
87	v Speakers with protective grill : one each near the doors and others equally distributed across the length of the bus- Total no. 4
88	vi Controller, recorder, amplifier : secured and ventilated compartment right above the driver
89	vii BDC: ergonomically placed for driver ease
90	viii Camera: as specified else where

91	ix Combi antenna: suitable place to define inside the bus (preferably) with direct line of view for 'affixing' the unit.
92	Communication amongst sub systems a 'Signs' to 'SCU'/'BDC' RS 485
93	b Controller to 'BDC' Ethernet/DVI/VGA/HDMI/RS232/RS485 as required.
94	Approvals
95	aThe notified agencies, as under rule number 126 of CMVR, will be responsible for approvals and certification of the system as defined above.

Test Compliance for BDC and Integrated Bus Controller				
Sr. No	Test standards compliance Test Report by Agencies, as notified under rule 126 of CMVR, to be submitted for each item.	Specifications	Bus Controller	Bus Driver Console
1	Performance parametric test	Nine points, tri temperature/tri voltage- 18V, 27V, 32V,-25°C, room temperature, +80°C test. At each test point the system will be powered on and shut down 5 times as per the supplier's designated procedure and thereafter evaluated for malfunction if any	Y	Y
2	Cold	IS 9000 (Part II/Sec 4)-1977 (reaffirmed 2004) at -15 °C for 2 hours in 'on' condition	Y	Y
3	Dry heat	IS 9000 (Part III/Sec 5)-1977: at + 80 °C for 16 hours in 'on' condition. BDC at +80°C for 2 hours	Y	Y
4	Damp heat	IS 9000 (Part V/Sec 2)1981 at +25 °C /+55 °C, Humidity 95%, 24 hours for 6 cycles in off condition. Functional test with power in 'on' condition at start of 2nd, 4th and 6th cycle	Y	Y
5	Vibrationstandard AIS 012/AIS:062 -10g	<ul style="list-style-type: none"> Frequency 5~55Hz and return to 5Hz at a linear sweep period of 1 minute/complete sweep cycle and 10g at maximum frequency Excursion -1.65 mm peak to peak over the specified frequency range Test duration 60 minutes Direction of vibration –X, Y, Z axis of device as it is mounted on the vehicle. Test to be carried out in 'on' condition as per ARAI 	Y	Y

Test Compliance for BDC and Integrated Bus Controller				
Sr. No	Test standards compliance Test Report by Agencies, as notified under rule 126 of CMVR, to be submitted for each item.	Specifications	Bus Controller	Bus Driver Console
6	Dust and water ingress protection	IS /IEC 60947-1:2004 in conjunction with IS/IEC 60529:2001– IP66	Y	Y
7	Free fall	IS 9000 (Part VII/Sec 4) Free fall at 500 mm	Y	N
8	Fire resistant	Wiring Harness & Dash Mounted equipment e.g Driver Console Housing	Y	Y
9	Reverse polarity protection without fuse	The component must fulfill the function- and service life requirements after being subjected to reversed polarity up to 27 V for 2 minutes. ISO 17650-2	Y	Y
10	Over voltage protection	To ensure service life requirements and functionality. The component shall run for 60 minutes at 38V, without effecting the service life or function. ISO 16750-2	Y	Y
11	Insulation resistance	The Insulation resistance measured as per ISO 16750-2 with a voltage of 500 V dc shall not be less than 1 Mega ohm. Insulation Resistance Test will be carried out after completion of 'Damp Heat Test' and then the Test sample to be kept at room temperature for at least 0.5 hrs.	Y	Y
12	Cranking voltage	The components shall have an electrical energy reserve that can handle voltage drop during cranking. Component shall not reset during cranking-'FSC B'. The supply voltage during crank is 18.0 V for 40 ms. The test to be carried out as per ISO 7637	Y	Y
13	Load dump	123V, 8 Ohms, 200ms pulse 5a as per standard ISO 7637-2. After Test DUT should meet at least class B as per ISO 7637-2	Y	N
14	Salt spray test	(AIS: 012/ IS10250) 96 hours	Y	Y
15	EMC/EMI	'e' Certificate	Y	Y
		AIS 004 (PART 3)	Y	Y
16	Operating parameters	Supply voltage 24 V \pm 25%	Y	Y

Test Compliance for BDC and Integrated Bus Controller				
Sr. No	Test standards compliance Test Report by Agencies, as notified under rule 126 of CMVR, to be submitted for each item.	Specifications	Bus Controller	Bus Driver Console
17	LED color test – dominant wave length amber	AIS -010 (Part 5), (Rev 1),2010	NA	NA
18	LED chromaticity coordinates	Limit towards green: $y - x - 0.120$ Limit towards red: $y - 0.390$ Limit towards white: $y - 0.790 - 0.670x$ Reference to AIS010, (Part 5), (Rev 1), 2010, In accordance with CIE 127 condition B	NA	NA
19	LED bulb/SMT intensity and viewing angle	In accordance with CIE 127 condition B	NA	NA
20	Slow Increase and decrease (Ramp up/ Down)	Apply a Voltage of 0V to 27V at increasing rate of 0.5V per second for slow Increase of Power Supply. Apply a Voltage of 27V to 0V at decreasing rate of 0.5V per second for slow Increase of Power Supply.	Y	Y
21	Short Circuit Protection	ISO 16750-2	Y	Y
22	Momentary Interruption	ISO 16750-2	Y	Y
23	Ripple	ISO 16750-2	Y	Y
24	Thermal Shock-Controller Only	ISO 16750-4 Clause 5.3.2	Y	N
25	ESD Test*	Powered <ul style="list-style-type: none"> Direct Contact $\pm 6 \text{ kV} \pm 8 \text{ kV}$ Direct Air $\pm 8 \text{ kV} \pm 15 \text{ kV}$ Unpowered Direct Contact $\pm 6 \text{ kV} \pm 8 \text{ kV}$ Direct Air $\pm 8 \text{ kV} \pm 15 \text{ kV}$	Y	Y
26	Endurance Test*	Ambient Temperature, preferably $27 \pm 2^\circ\text{C}$, 28 V, 100 000 cycles. Each cycle shall consist of switching ON & OFF the system with dwell time as follows: Dwell time: $10 \text{ s} \pm 1 \text{ s}$ (ON condition), $4 \text{ s} \pm 1 \text{ s}$ (OFF condition).	Y	Y
27	USB port over loading test	USB Port Pin No. 1 (+5 VDC) & Pin No. 4 (GND) to be Short Circuited with external wire in "ON" condition as shown below. The	Y	Y

Test Compliance for BDC and Integrated Bus Controller				
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		System should continue to work without any problem.		
28	ISO 16750-5 Chemical Exposure	Fluids as applicable for ' Cabin Compartment' as per annex A ISO 16750-5—Battery Fluid, Interior cleaner, Refreshment containing caffeine and Sugar, glass cleaner, denatured alcohol.	Y	Y
29	UV test (plastic/polymer material which are exposed to sunlight i.e. Raster ,housing	UV Protected Materials to be used (Supplier to disclose the material)	Y	Y

**With regards to ESD and Endurance Test, if proposed product does not provide Test Certificates for ESD and Endurance Test then Bidder shall have to provide undertaking on relevant value of stamp paper from its OEM stating that it shall provide Test certification of Test no 25 and 26 as specified above before Go Live of the Project if it unable to provide the same along with its Technical Bid. Bidder shall also provide undertaking specifying that if its OEM unable to obtain such Test Certificates as specified above then it shall replace the brand of the Product with other brand having all required Test certifications and meeting specifications stated in the RFP without changing its Price.*

Maintenance Requirement for ITMS Items

- ñ Service Provider shall have to maintain the Hardware Unit during the contract period as per instruction of Authority/Authority appointed ITMS Service Provider
- ñ Any faulty equipment shall be replaced with a tested unit from the spares maintained by service provider.
- ñ Repair and testing of equipment shall be done at the Service provider's maintenance centre and not at site.
- ñ A repaired unit shall be tested for full functionality as at the time of initial deployment and certified before it is reinstalled at any site.
- ñ Spare Items shall be kept so as to replace as and when required.