

ANNEXURE -1

TO

SCHEDULE VII BUS SPECIFICATION

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Annexure

Annexure 1: Service Schedule as per manufacturer’s guideline for New fully built, 900 mm, Diesel Standard Non AC Buses under JNNURM by Tata Motors Limited

Annexure 2: Service Schedule as per manufacturer’s guideline for New fully built, 900 mm, Diesel Midi Non AC Buses under JNNURM by Tata Motors Limited

1. Introduction

This Document comprises Technical Specifications of each Bus type/category to be contracted under this RFP. The number of Buses along with its category is specified in table below.

Sr. No	Type of Bus	Bus Manuf.	Date of Purchase Order	No of Buses
<i>New purchases Buses</i>				
1	New Fully built, 900 mm Diesel standard Non AC Buses under JNNURM	Tata Motors Ltd.	04/03/2014	59
2	New Fully built, 900 mm Diesel Midi Non AC Buses under JNNURM	Tata Motors Ltd.	04/03/2014	10
3	Fully built, 400 mm Diesel Premium segment AC Buses under JNNURM	Volvo India Limited	30/09/2014	05

Technical Specification of above category of Buses is specified in subsequent sections of this Document.

2. New fully built, 900 mm, Diesel Standard Non AC Buses under JNNURM by Tata Motors Limited

2.1. Technical Specifications

Offered Model: LPO 1618TC BS-III front engine bus.

The Bus has a front mounted Cummins ISBe5.9 BSIII engine, Manual G750 gear box with TML pneumatic air suspension at rear and weveller suspension at front with introduction of OBITS (On Board Intelligent Transport System) system.



A. Technical Specifications

Description	Technical Specifications
ENGINE	
Model	Cummins 6BTA 5.9 180 HP BS-III
Type	Water cooled ,Turbo Charged & air after cooled Diesel Engine
No. of Cylinders	6 inline
Bore / Stroke	102 mm x 120 mm
Capacity	5883 cc
Capacity of Cooling System	27 Ltr.
Air Filter	Dry type remote mounted with Precleaner
Coolant	Water and ethylene glycol, Ratio 60:40 pre-mixed
CLUTCH	
Type	Single plate dry friction type clutch
Outside Diameter of lining	380 mm
Actuation	Air Assisted Hydraulically operated
GEAR BOX	
Model	TATA GB-750 (6-speed)

No. of gears	6 Forward and 1-Reverse
Gear Shift	Manually remote shifts
Transmission Type	Synchronous on all forward and constant mesh on reverse gear
REAR AXLE	
Make & Model	TATA - RA109RR
Type	Single Reduction, Hypoid Gear, fully floating axle shaft
Ratio	41/6
FRONT AXLE	
Model	TATA - Heavy duty Forged I Beam
Type	Reverse Elliot Type
Designed Capacity (Kgs)	6000
BRAKES	
Brake Drum Diameter (Front & Rear - mm)	410
Service Brakes (Front and Rear)	Dual circuit, Full air S-CAM brake on all wheels
Brake Lining area	Front - 2500 sq. cm., Rear- 2750 sq. cm.
Parking Brake Type	Spring actuated parking brake acting on rear wheels with hand brake valve
Auxillary Braking System	Exhaust Brake
CHASSIS FRAME	
Type	Ladder Type Heavy duty
Depth	285 mm
Frame Width	888 mm
SUSPENSION	
Front	Weveller
Rear	Pneumatic
Leaf Width	70 mm
Shock Absorber	Hydraulic Double acting Telescopic Type at Front and Rear
Antiroll Bar	At Front only
STEERING	
Type	Hydraulic Power Steering
Steering Wheel diameter	Ø 475 mm
Steering Column	Adjustable Steering Column
WHEEL & TYRES	
No. of Wheels / Tyres (No. of Tyres)	Front - 2, Rear - 4, Spare - 1
Tyres	295/80R22.5
Wheel Rim	8.25 X 22.5
FUEL TANK	
Capacity	160 Ltr
PROPELLER SHAFT	
Nos.	3

ELECTRICAL SYSTEM	
System Voltage	24 Volts
Alternator Capacity	100A - Single
Battery	2 X 12 Volts 150Ah
PERFORMANCE	
Max. Geared Speed in Top Gear	75 KMPH
Climbing ability (Restart)	17%
Max. Grade ability at rated GVW	32.2 % (Launch Grade ability)
Minimum Turning Circle Dia in mm as per IS: 9435 OVERALL DIMENSIONS (mm) Overall Length (with bus body) 11735 (MAX.)	23661
Overall Width (with bus body)	2580 (Max)
Wheel Base	6200
Front Overhang	2370
Track Front	1955
Track Rear	1821
WEIG HTS (kg)	
Max. Permissible FAW (Kg)	6000
Max. Permissible RAW (Kg)	10200
Max. Permissible GVW (Kg)	16200

Body Specification for LPO 1618/62 MT NAC BSIII

Category	Parameter	Body Specifications
General	Category	900 mm MCV Non BRTS
Dimension	Floor Height	900 mm
	Overall .Width	2600 mm
	Overall Length	12000 mm
	Wheel Base	6200 mm
	Overall Height	3083 mm
	Internal Height (mm)	2150 mm
	Gangway	700mm & 400mm at front near engine hood
	FOH	2500 mm
	Dimension ROH	3300 mm
	1st Foot Step	400 mm
	Height/Depth	250 mm
	2nd Foot Step	190 mm
	Height/Depth	220 for parts fixed to bus body & 170 for the parts
	Minimum Axle clearance	Moving vertically with axle.
	Wheel Area clearance	
Minimum ground clearance (un-kneeled) in mm at GVW	Within the wheelbase not less than 270	

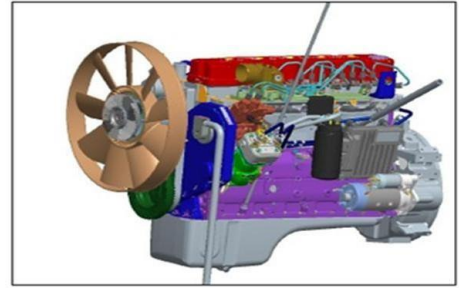
	3rd Foot Step Height/Depth	250mm
Face / Windshield / Panel	Front Face (FRP/ Sheet Metal)	FRP
	Rear Face (FRP/ Sheet Metal)	FRP
	Face /Ext Panel Side Stretch	GI sheet 0.65 mm
	Windshield Ext Panel Side Skirt / Panel ExtPanel Roof	GI sheet 0.95 mm
	Int Panel Side	GI sheet 0.95 mm
	Int Panel Roof	PVC sheet 0.65 mm
	Body Insulation	PVC sheet 0.65 mm
	Bumper (Front & Rear)	FRP
Floor	Flooring (Plywood/Thickness in mm)	As per UBSII, 12mm thick Phenolic resin bonded densified laminated compressed wooden floor board (both side plain surface) having density of 1.2 gms/cc conforming to BIS:710-1976/ latest and fire retardant as per (IS15061:2002)
	Flooring Thickness (Chequered/Thickness OR Vinyl/Thickness)	3 mm thick anti-skid type silicon grains ISO 877/76 for color, IS15061for fire retardancy
	Door Mechanism	Electro-Pneumatically operated as per AIS 052
	Frt Door type	JK
	RR & B.Axl Door type	Double JK Door
Window	Windows Sliding (Vertical/Horizontal)	Top fixed, bottom Sliding
	Window type	Rubber Mounted
	Window Glass thk (mm)	4.8 to 5.3 mm
	Window mounting	Rubber Mounted
	No. of Seats with and without Handicap arrangement	40+1
	Seat Type	MDI moulded
	Seat Upholstery	Pile fabric / jekard (or any other superior material) 0.7-1mm thickness
	Seat back / Pad Material / Thickness:	Polyurethane foam (or any other Superior material) IS 15061:2002 (Padding is optional)
	Emg Exit position	1 no.s behind rear axle (As per AIS 052/CMVR)
Electronics	Destination Indicator (Destination Indicators+PIS (audio &video))	4 Nos Destination indicators at Front , Side, Rear and internal
Electrical	Battery Location	At LH side behind front Axle
	Battery Cut-off Switch	Inside the Battery box
	Headlamp	2+2Nos
	Taillamp	3+3Nos
	Stepwell	1 nos at each Door

	Internal Lights	LED lights meeting Lux Value as per UBSII
	Roof Marker Lamp	2 Front with white lens & 2 rear with red lens One charging point provided for charging ticket vending machine etc
	Charging Point	One nos on each side
	Side Blinkers	
	Driver Fan	Drivers work area provided with blower or suitable device (200 mm diameter fan) to ensure proper ventilation. These devices may be capable of 3 – speed adjustment
	Bell Switch	High visibility bell pushes shall be fitted at a height of 1.2 meter on all alternate stanchions.
	Wiper	Electrically operated with two wiper arms & blades, wiper motor heavy duty steel body with minimum 2-speed operation wiping system as per CMVR/BIS:7827 part-1, 2, 3 (Sec.1 & 2)/latest. As per AIS 011
	Fire Extinguisher (nos/kg)	1 No.s of 2 KG
	Sun visor Type/nos	Roller Type
	First Aid Box Type/nos	Provided
Others	Tool Box	Provided
	Roof Hatch	2 no's (Roof hatch provided in driver area at a suitable location for proper inflow of air inside the driver cab & one nos in passenger saloon at rear)
	Outer RVM	Provided
	Inner RVM	Provided
	D Partition	Provided
	S Partition	Provided
	Grab Rail	2 No's
	Stanchions	Vertically fitted, Stainless steel tubing with color contrasting and slip resistant. 40 mm diameter & 3.15 mm thick. Rest as per AIS 052
	Towing Hook	Provided
	Horn	Provided

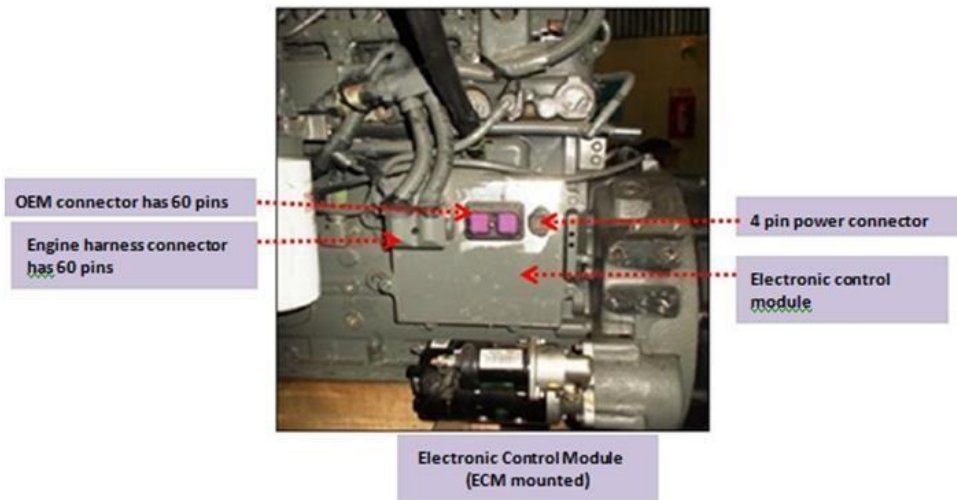
B. Salient Features

New Aggregates: Major new aggregates are ISB 5.9 BS-III Engine, Manual gear Box G – 750, TML Rear Air suspension, Multiplex wiring electrical system with two CBCU-3E Front & Rear, OBITS system along with Lumax Display Boards

ISB 5.9 BS-III Engine

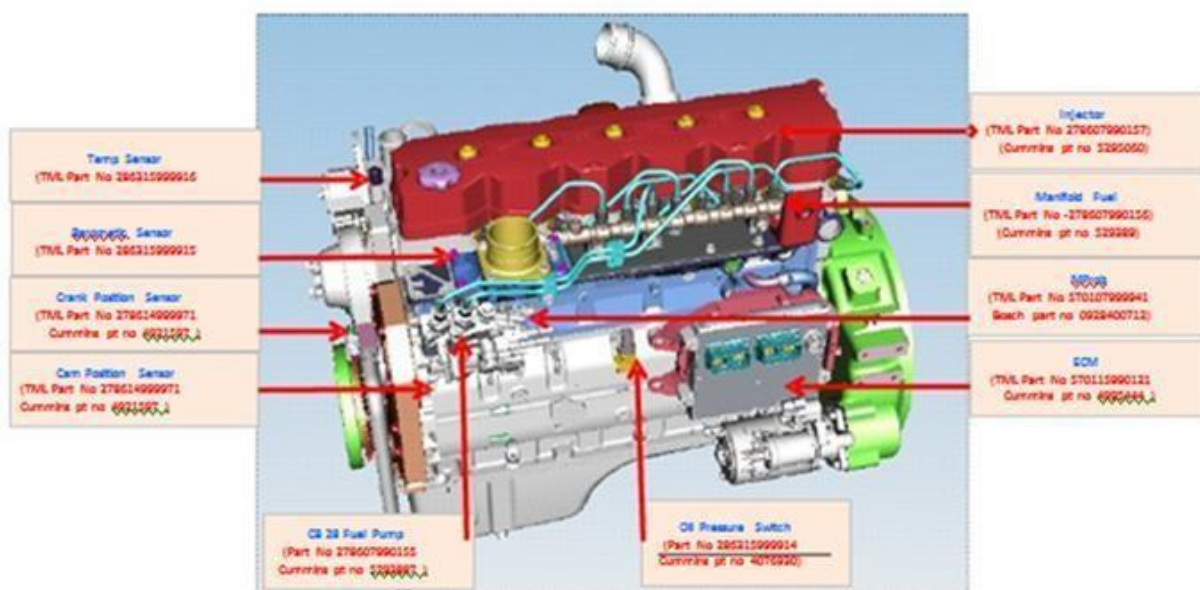
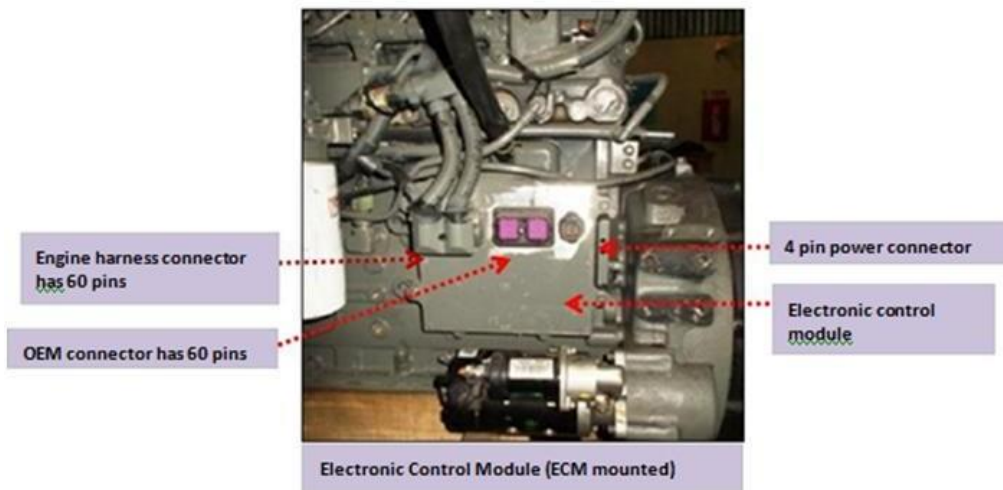
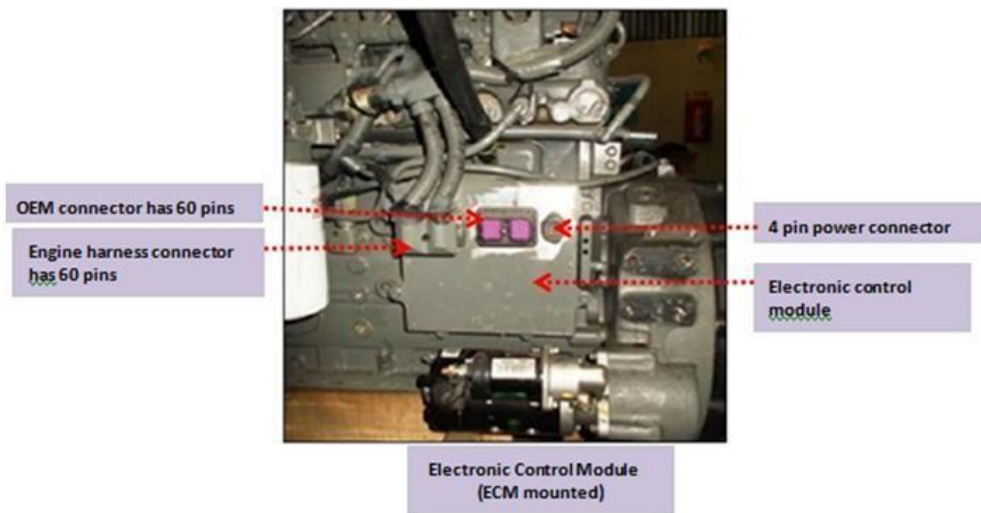


Engine Feature:



ISB 5.9 Engine Feature





C. Electronic Control Modules



ECM is electronic control module signals form input sensors and output signal to sensors/ switches working of engine in order to get output. ISB5.9 BS-III uses ECM



Position of Cam Sensor

that receives send signal to to control the optimum CM2150

This ECM consists of two sixty pin connectors and one four pin connector.

(1) Input Sensors Oil Pressure Switch

This is single wire Normally Closed (NC) switch. This determines the oil pressure and gives signal to ECM. Switch contact open at 7-10 psi of oil pressure. Engine shuts down, If the oil pressure is detected below 10 psi for 30 seconds.



(2) Cam position sensor

This is three wire sensors. This determines the 1st cylinder TDC position and provides signal to ECM for fuel timing. This sensor also acts as back up for crank speed sensor. This sensor senses the grooves present on the rear side of the cam gear.



Rear side of the cam shaft gear

(3) Crank Speed Sensor

This is three wire sensors this determines engine speed and provides signal to ECM. It also, acts as back up for camshaft position sensor in case it malfunctions. This sensor works on the principle of Hall Effect. The sensor is mounted just above the tone wheel in these engines.



(4) Coolant temperature sensor

This is two wire sensor that operates between 0.2 to 4.8 Volts. This is sensor determines coolant temperature and provides signal to ECM. The sensor is located on the cylinder Head between rocker cover and engine water outlet.



(5) Barometric Pressure Sensor

This sensor is used to determine ambient / atmospheric pressure. This is mounted just above the ECM mounting bracket.



(6) Common Rail Pressure Sensor

This is three wire sensors which is used to determine fuel pressure in common rail. Input voltage is 5v. It works on metal thin film strain gauge principle. This is an integral part of common rail and is not supplied separately in spares.

(7) Intake Manifold Pressure & Temperature Sensor

This is four wire combination sensor used to determine Air intake temperature and pressure and provides signal to ECM. Depending on the temperature and pressure of intake air, ECM then determines quantity of fuel supply. This is mounted on intake manifold cover.



(8) Fuel filter cum water separator with ADV

Auto Drain system is provided on Fuel filter cum water separator ensures automatic draining of water present in fuel filter.

Draining dependency on the end user is eliminated. After Ignition Switch is turned ON, WIF (Water in Fuel) lamp on the dashboard turns ON for 3 sec and goes Off. If the water is not detected then the WIF lamp will remain OFF, if water is present lamp will be continuously ON.

When Ignition switch is turned off, water draining begins after 3 minutes if water is present. Water draining stops based on no water condition or elapse of 15 seconds whichever is early.



Fuel filter cum water separator with ADV (25 Micron)

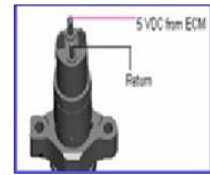
(9) Accelerator Pedal Sensor

It consists of 2 position sensors. Position sensors are used to measure throttle position. Both sensors receives 5v supply from ECM. Low signal voltage is received by the ECM when the accelerator pedal is at 0 percent. A high signal voltage is received by the ECM when the accelerator pedal is at 100 percent. The signal voltage for accelerator position 1 is twice as much as the signal voltage from the accelerator position 2.



(10) ACTUATORS Solenoid Injectors

This injector solenoid working as a switch. It regulates the flow of fuel to combustion. The Solenoid Switch close and open according to ECM signal. It has two connection points - Signal input (5VDC from ECM) and Signal output (return)



(11) M-prop

This engine uses Bosh CB28 fuel pump. This M PROP is fixed on this fuel pump. ECM provides signal to this to regulate the fuel to common rail. ECM gives PWM Signal for opening and closing of MPROP. It works as a switch in between Gear Pump and Radial piston pump. It regulates fuel flow to Radial piston pump.



D. Electronic Engine Features & Parameters

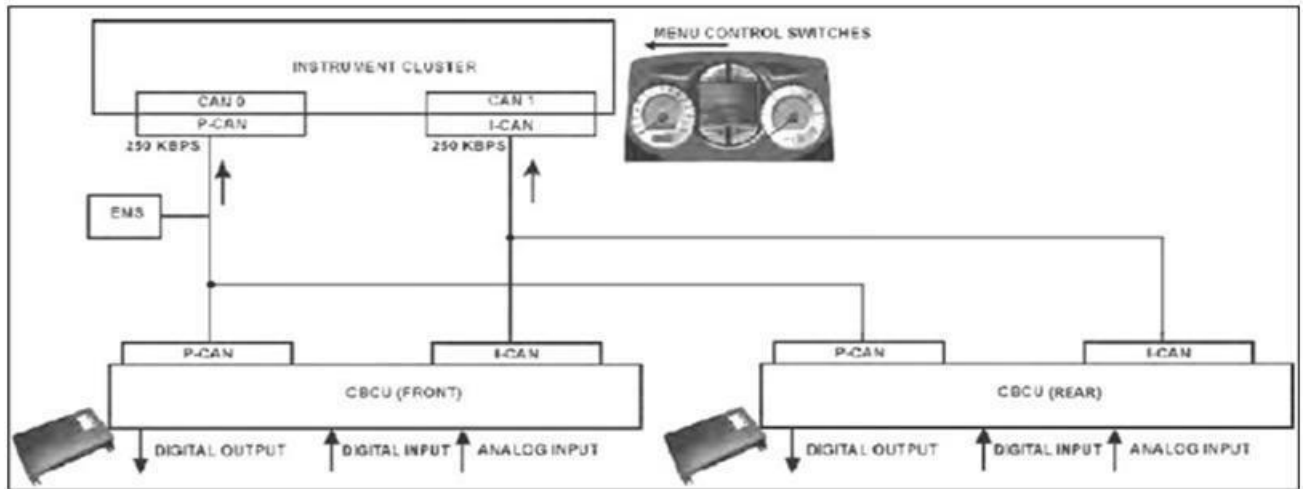
(1) The fuel economy of a vehicle is potentially influenced by the following engine parameters:-

- Load Based Speed Control (LBSC) – This parameter restricts the Engine RPM to the defined value in (1,2,3,4 Gears in a 6 Speed Gear box). At lower engine RPM if torques requirement is less then engine RPM is restricted so that driver is compelled to move to higher gears to increase the vehicle speed driver feels very irritated, thus it tends driver to change to higher gear.
- Gear down Protection (GDP) – This parameter restricts, Max speed the vehicle can go when the vehicle is under Heavy/Light load in 5th Gear in a 6 speed gear box.
- Road Speed Governor (RSG) – This feature is programmed to the vehicle maximum speed in top gear of your choice to maximize safety and increase fuel economy.
- Variable Acceleration Management (VAM) – Responsible for Vehicle Acceleration in each gear.

(2) Architecture of Multiplexing wiring system

Working of a Multiplex wiring system

Multiplex wiring is the concept of using just two (CAN) wires to perform the task of many wires. The multiplex wiring system allows multiple electronic messages to travel back and forth through the same data link wire, just as broadband cable allows telephone, television and internet connections to travel through the same line. The multiplex wiring system's electronic control modules remotely send information back and forth, monitoring vehicle components and interpreting messages transmitted through the wires. Multiplexing integrates electronic control units ECU'S into a network where coded digital information is transmitted through a single data cable. Common sensor data, such as vehicle speed, engine temperature etc. are available on the network – so data can be shared - thus eliminating the need for extra / redundant sensors.

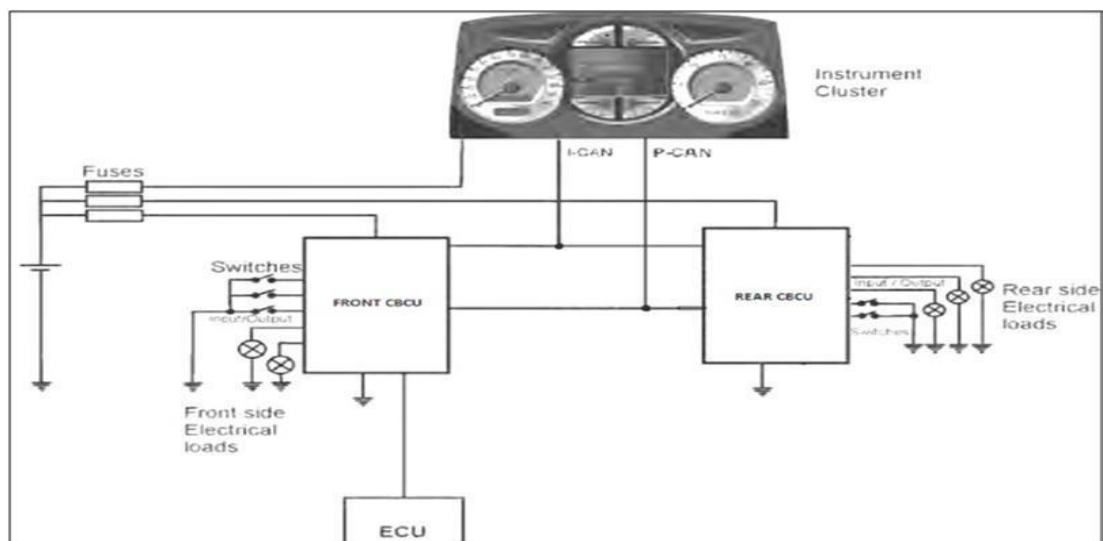
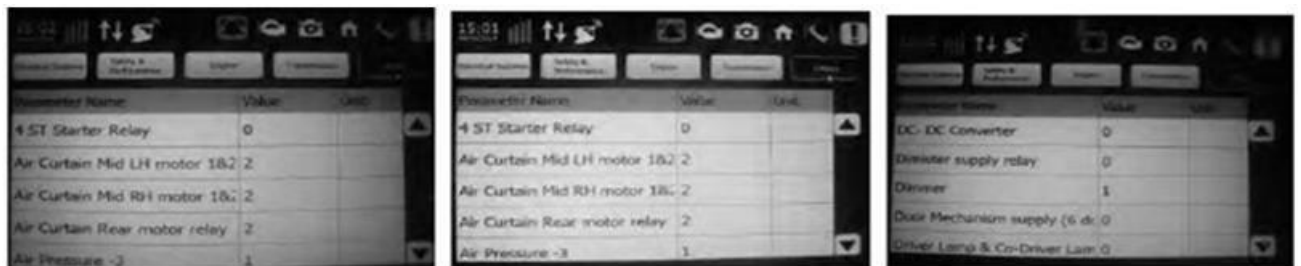


Integrated Vehicle Network

LCD display, tell tales for warning indication.

Front CBCU3-E - Central Body Control Unit- Enhanced at front end for collection inputs and distribution of vehicle & Rear CBCU3-E Enhanced at rear end for collection inputs and distribution of vehicle. The Front CBCU3-E communicates with the Rear CBCU3-E and Instrument cluster using P-CAN (Controller Area Network) and I-CAN (Controller Area Network).

Note: Errors related to Multiplex system (CBCU 3E - ERRORS) will be displayed on ITS BDC unit.



BDC for Diagnosis:

It can check the open circuit and short circuit errors related to the load failures through BDC provided on the dash board.

Advantages of Multiplex Wiring System:

Multiplex wiring system

Reduces the number of wires there by reducing possible failure points.

Improves vehicles integration process by reducing the number of parts that make up the vehicle cabling.

Complex knobs and switches can be replaced by cheaper touch keys.

Easier to modify

It is easier to add or remove certain additional features from the vehicle by just reprogramming the pro-cessor without actually changing the hardware. So the vehicle spends less time in the shop and more time on the road.

Improved Diagnostic Capabilities

Multiplex wiring system introduces the concept of on board diagnostics, which is a desirable feature in view of growing demands of safety and easy maintenance. Software can be easily programmed to handle many diagnostic features from the detection of blown light bulbs to the failure of emission control systems in an automobile.

E. OBITS (On Bus Intelligent Transport System):

Features and Functions

“On Bus Intelligent Transport System (OBITS)” comes from a family of new generation of Intelligent Transport Systems. OBITS is an integrated hardware and software wireless solution designed to track and monitor buses. OBITS enables tracking of vehicles and store, represent, display data of moving objects which is then transmitted to the vehicle tracking server via GPRS. It provides near to real-time services for passengers.

Main Features

Automatic Vehicle Location System (AVLS)

It helps to track the vehicle location and sends the raw GPS data to Central Control Centre (CCC) at user configurable frequency interval.

Passenger Information System (PIS)

It provides real time information about departure, arrival, next stop, and so on to bus passengers. It displays route information on LED boards and announces it on speakers.

Emergency Stop feature allows passengers to inform the driver and conductor about emergency stop request, by pressing an emergency switch provided in the bus. Thereafter an Emergency message will get displayed on LED board inside the bus.

Voice Calling enables the driver to make or receive a call from/to central control center (CCC) Driver can send pre- configured messages to CCC in case of a panic situation. It allows driver to display pre-recorded messages on LED boards and announce via speakers.

Security Camera Network (SCN)

It allows continuous or scheduled or event based video recordings of passenger movements inside the bus till the OBITS is on. It also allows the driver to check the live feed at any point of time on BDC .

All cameras are capable of high- resolution recording in case of event based triggering. The recordings in compressed format can be sent to the server via USB / Wi- Fi, only when the bus is in the depot. Bus Driver Console displays reverse camera streaming only in full-screen mode when reverse gear is engaged. Disconnected camera detection display on Bus Driver Console.

Vehicle Health Monitoring and Diagnostics (VHMD)

It allows monitoring the health of a bus. Single Control Unit will receive vehicle health diagnostic data from multiplexing nodes and PIS signs. The data from multiplexing nodes, on a single CAN 2B (J1939) bus will include parameters from:

Vehicle electrical system inclusive of PIS signs Safety and performance features such as brake condition, door interlock, and so on Engine and Transmission such as Engine Oil Pressure, Engine, Coolant temperature, Engine Speed in RPM, and so on SCU is able to communicate and send information related to VHMD parameters to CCC via GPRS at preconfigured time intervals.

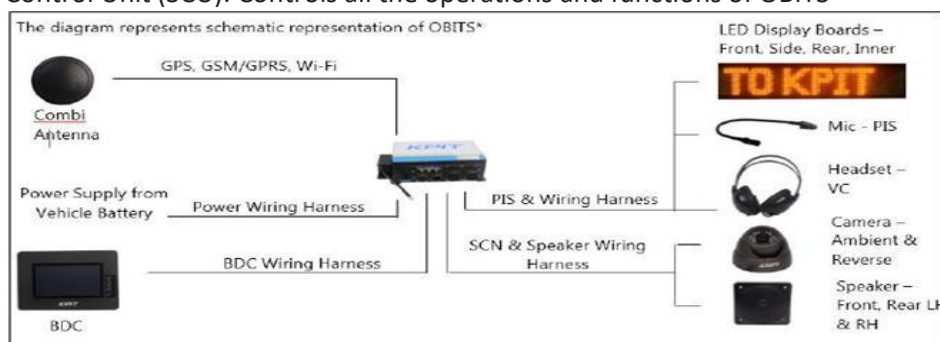
Provision for on-board Pole Mounted Ticketing Machines

OBITS support the integration with ETM via Ethernet as specified in Urban Bus Specifications (UBS)– II released by Ministry of Urban Development (MOUD)

* Parts shown in Schematic connections are for representation

OBITS Key Parts

Single Control Unit (SCU): Controls all the operations and functions of OBITS



Bus Driver Console (BDC): A touch screen LCD display for driver to operate OBITS. It is mounted on the dashboard for easy access to the driver.

Combi Antenna : Communication (send and receive) for GSM, GPRS, GPS, and Wi-Fi signals. It is mounted inside the bus without any obstacles blocking the signals.

LED Boards: Displays route information to passengers (For Standard bus: combination of front, side, rear, and inner LED boards) (For Mini/Midi bus: combination of front and inner LED boards)

Security Camera Network (SCN): Two cameras are placed inside the bus and record all the activities in the passenger and driver areas.

Reverse View Camera: Gives full screen display of rear view while reversing a bus. It is placed at the back of the bus.

S p e a k e r s : Announces route information and messages. (Two speakers are situated near each

door and remaining two are equally distributed on opposite side of the bus.)

Mic: Used to communicate with the passengers.

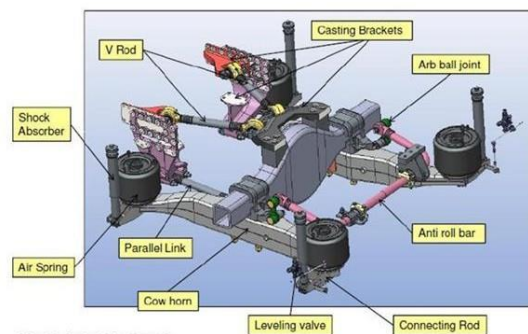
Headset: Used for making and receiving a call from CCC/Depot (subject to variant available in a bus) with the driver.

Wiring Harness (Set of four wiring harnesses of power, BDC, PIS & VHMD, SCN & Speakers)

F. Rear Air Suspension for 900 mm Floor height Vehicles

Basic elements of Rear Air Suspension:

- Mechanism to control axle motion in relation to chassis
- Four link type, non-torque reactive Suspension which has Control Arms constituting – 2 V Rods & 2 Parallel Links.
- AIR SPRING to offer low stiffness. 4 numbers of Air Spring per vehicle.
- Leveling Valve to sense height variation of chassis & enable change in Air Spring stiffness. 2 numbers of Leveling Valves per vehicle.
- Anti-roll Bar to control rolling of vehicle
- Shock Absorber to damp vibrations. 4 numbers of Shock Absorbers per vehicle. Shock Absorbers are of heavy duty type and specially designed for this application. Should not be interchanged with ordinary one.
- Heavy duty low amplitude disturbances through specially designed rubber bushes at pivot points.
- No lubrication is required as all joints have rubber bushes.



G. Troubleshooting Guideline

Sl.No.	Problem	Cause	Solution
1.	a) Undamped motion- Vehicle keep oscillating	a) Shock absorber oil leak, damping loss	a) Replace shock absorber.
		b) Worn out Bushes	b) Replace bushes
	b) Bumpy ride	a) Levelling valve malfunction, incorrect lever position.	a) i. Correct lever position. ii. Service Levelling valve.
		b) Incorrect air spring static height.	b) Correct air spring static height
	c) Vibration	a) Shock absorber failure.	a) Replace shock absorber.
		b) Worn out bushes	b) Replace bushes
2.	Noise	a) Loose bolts	a) Retorque bolts
		b) Worn out bushes	b) Replace bushes
3.	Vehicle tilted to one side	a) Air spring static height difference between LH & RH	a) i. Correct lever position. ii. Service Levelling valve.
			b) Check for Air Leak in clamp plate, piston and pneumatic fittings and arrest.

H. Service Schedule for maintenance as per Manufacture’s Guideline.

The Service Schedule as per manufacturer’s guideline is specified in Annexure -1 of this Volume-III

2.2. Warranty Terms

Authority intends to pass on the warranty benefits offered by Manufacturer to Operator. Manufacturer has offered following warranty benefits .

- Vehicle warranty: 2 Years / 24 months OR 2, 00,000 Kms, from the date of sale whichever expire earlier .
- Body warranty: 2 Years / 24 months OR 2, 00,000 Kms, from the date of sale whichever Expire earlier.

3. New fully built, 900 mm, Diesel Midi Non AC Buses under JNNURM by Tata Motors Limited

3.1. Technical Specifications

Offered Model : LPO 9.6T JnNURM2 Multiplexing - Midibus NAC 900mm, 9M BS III TATA Ultra Urban 9/9 (Non AC).



A. Technical Specifications

Description	Specification
ENGINE	
Engine Model	TATA 497TCIC BS-III; Water Cooled Direct Injection Diesel
No Of Cylinders	4 inline
Bore / Stroke	97 X 128
Engine Capacity	3783cc
MAX Engine Output	125PS at 2400 rpm as per CMVR TAP 115/116
MAX. Torque	400 Nm at 1300-1500rpm
CLUTCH	
Type	Single Plate Dry Friction type booster assisted
Outside dia	330 mm
GEAR BOX	
Model	G 550 Synchromesh 6 Speed
No of gears	6 Forward 1 Reverse
Gear Ratio	1st - 6.90, 2nd - 4.02, 3rd- 2.39, 4th -1.47, 5th - 1, 6th- 0.84, Rev-6.37
REAR AXLE	
Model	9.6T/8.5T TWIIN TYRE
Type	Single Reduction, hypoid gears fully floating axle shaft
FRONT AXLE	
Type	Heavy duty forged I beam, Reverse Elliot type with Drum brake
STEERING	
Type	Power assisted
BRAKES	
Service Brakes	Dual Circuit full S-Cam brake
Front Brakes	Front : Drum 325X140 mm
Rear Brakes	Rear : Drum 325X140 mm
FRAME	
Type	Ladder Type With Hump At RA
SUSPENSION	
Front	Parabolic Springs at front
Rear	Parabolic Springs at Rear
ELECTRICALS	
System	24 Volts
Battery	12V 150AH (2 NOS)
PERFORMANCE	
Max Speed	101 Km/Hr
WHEELS & TYRES	
Size & type	235/75 R 17.5 LT Tubeless
FUEL TANK	
Capacity (Litres)	160 Liters
WEIGHTS (Kg)	
Gross vehicle weight	9600KG
Kerb Weight	5660 kg

OVERALL DIAMENTIONS (mm)	
Overall Length with bus body	2900 mm
Overall Length with bus body	9200mm
Overall width with bus body	2650mm
Wheelbase (mm)	4920 mm

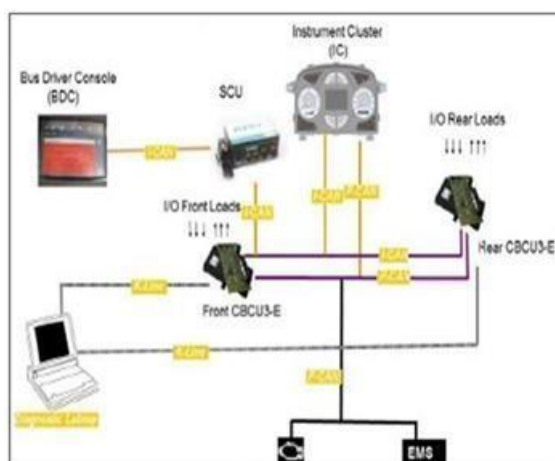
B. Bus Body specification

	Bus Body Specification	
	Overall Dimensions in mm	Length
	Height	2900 mm
	External Width	2340 mm
	WB	4920mm
	FOH	1800 mm
	ROH	2480 mm
	Saloon Height	1900 mm min
	Gangway/Aisle	600 mm min
	Floor Height	900 mm max
	Structure	Galvanized Tubular Structure
Flooring	Floor	wooden floor board
	Floor lining	3mm thick anti-skid type
Doors	No of passenger door	Two
	Type of passenger door	Jack Knife
	Operation	Electro pneumatically operated
	Driver door	Std Flap type driver door
Seats	No of Seats	34 seats
	Type of seats	Plastic molded seats
	Seating layout	2x2 seating layout & rear 5 seats
Emergency Exit	No & location	One no. at Rear of bus, breakable rear Glass with hammer
	Emergency Door	On RH side (RHD) with "Emergency exit sticker" on the glass
Windshield	Front Windshield	Pasted single piece laminated Glass
	Rear Windshield	Pasted single piece toughed clear Glass
Windows	Type of window	1/3 fixed & 2/3 Sliding glasses in Al frame
	Color of window glass	Clear
Electricals	Internal Lamps	LED lamps
	External Lamps	24 V with multiplexing
	Driver fan	1 number
	Driver fan	1 number
	Bell/Stop request switch	Bell push button fitted on all alternate stanchions / pillars
	Battery cut off switch	Provided on dashboard

ITS system	i. Passenger information system (PIS)	4 nos. speaker
	ii. Automatic vehicle location system (AVL)	GPS and GPRS antennae provided
	iii. Security camera network system (SCN)	High resolution cameras, one no to monitor bus interiors(doors, driver zone, ticketing zone etc) & one reversing surveillance camera provided
	iv. Vehicle health monitoring and diagnostics (VHMD)	Chassis fitment
	v. On-board pole mounted ticketing machines	Electrical socket for charging mobile ticket m/c on dash board provided
	vi. Destination board	2 nos electronic destination boards (one in the front and one inner sign)
Others	Fire extinguisher	2 nos
	Driver seat	PU molded seat with headrest & ELR seat belt
	Rear view Mirrors	Manual adjustable two RVM - LH & RH side
	Passenger Saloon area mirror	Provided
	Proximity Mirror	Provided
	Towing hook	At front behind front flap to be provided
	Battery box	Mounted under driver platform with flap & lock on LH side - As per TMML design
	Tool box	Provided near in driver cabin
First Aid box	One no. to be provided near driver with red cross	

C. Salient Feature of the Bus

The bus is equipped with improved multiplexing system having CBCU + CBCU i.e master +master combination instead of CBCU+Mux2B or master + slave combination. Representative figure is as given below.

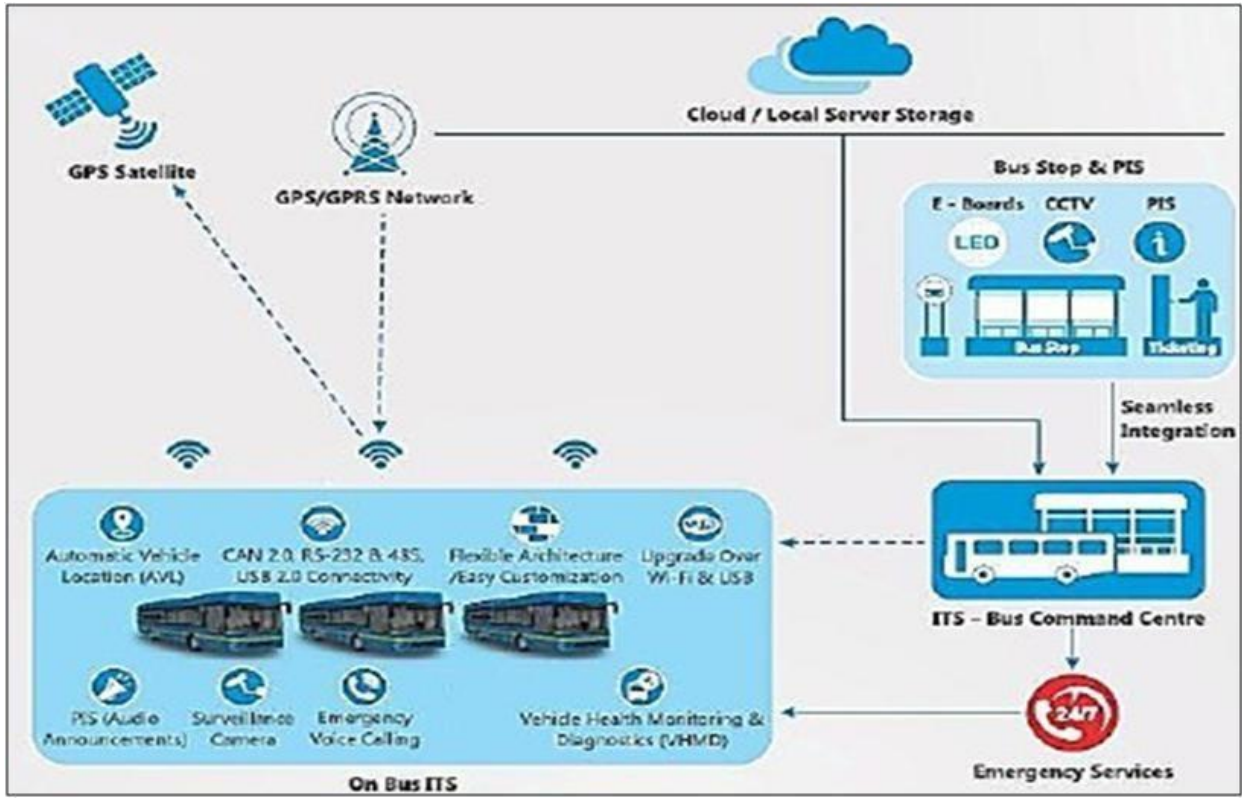


The bus is equipped with OBITS – On Bus Intelligent transport system provided by KPIT.

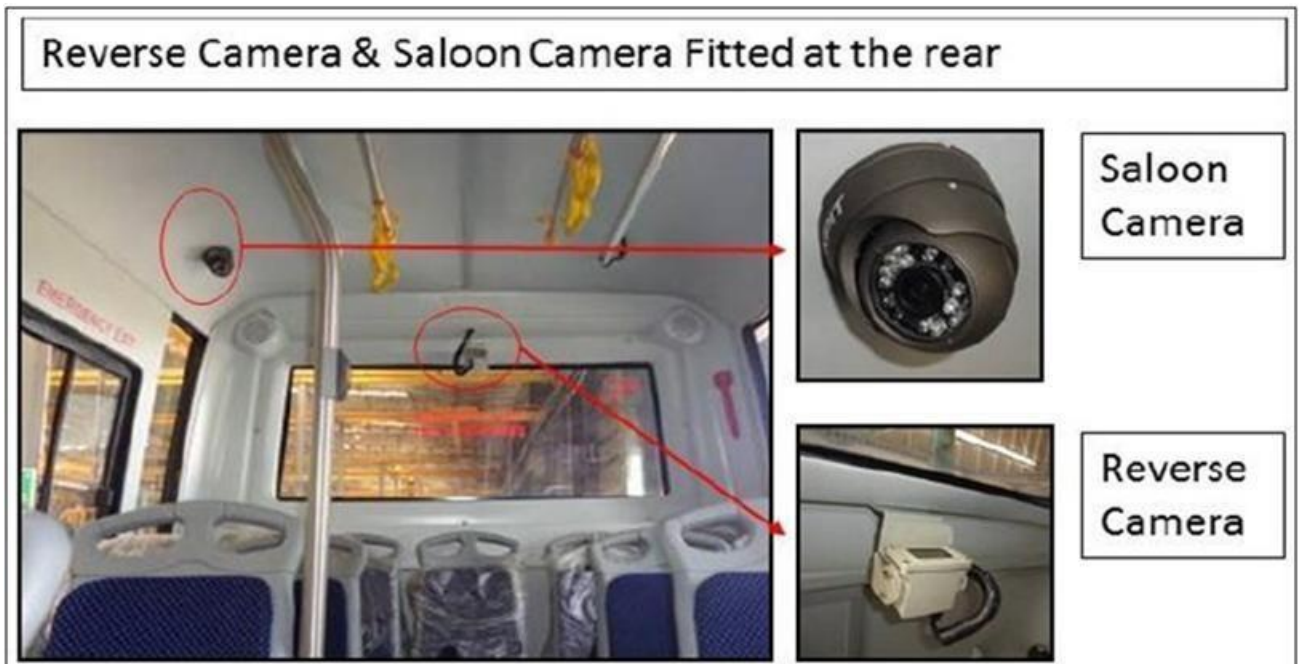
The system helps the central control system by relaying information such as location of the bus, certain vehicle related parameters. Display boards display the route progression and the information gets announced over the speaker. Security cameras installed in the bus streams the video of the passenger compartment on to the display unit fitted on the dashboard for the driver to see. The videos can also be streamed live to the central control centre. The console unit also displays vehicle related parameters that warns drivers in case of problem and also assist technicians in doing the diagnosis.

A reverse camera fitted on the rear windshield assists driver while reversing the vehicle.

Driver can also make and receive calls to central control centre in the event of an emergency. A layout of the entire system is as given below.



Bus body now has pneumatic doors and other features as outlined below:



Destination Boards - Lumax



LED Lights



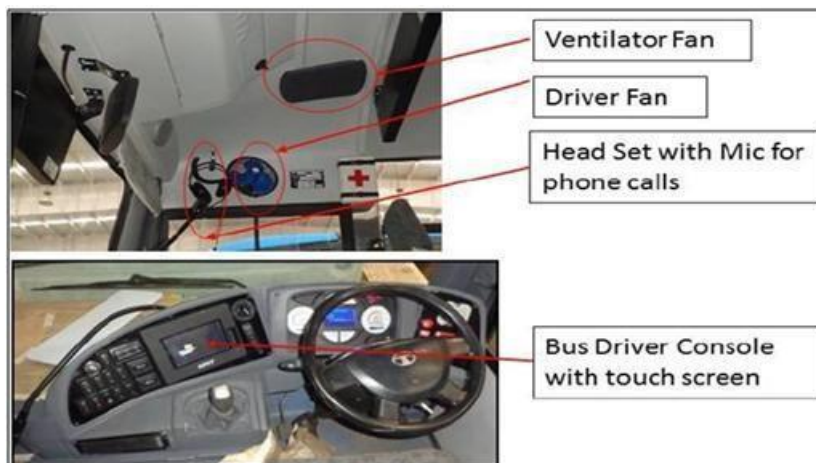
Internal LED Lights

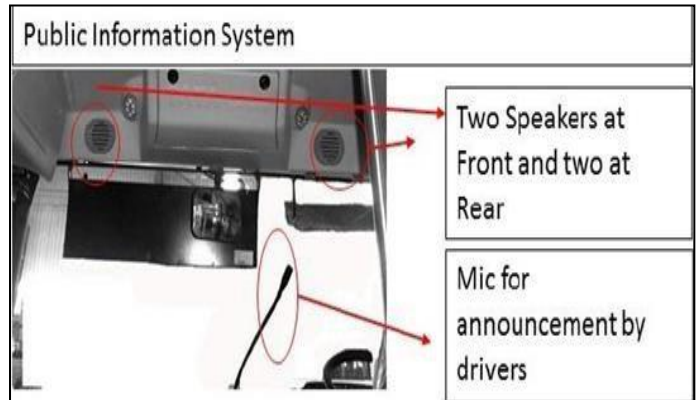


Light at Foot Step



Light at Door

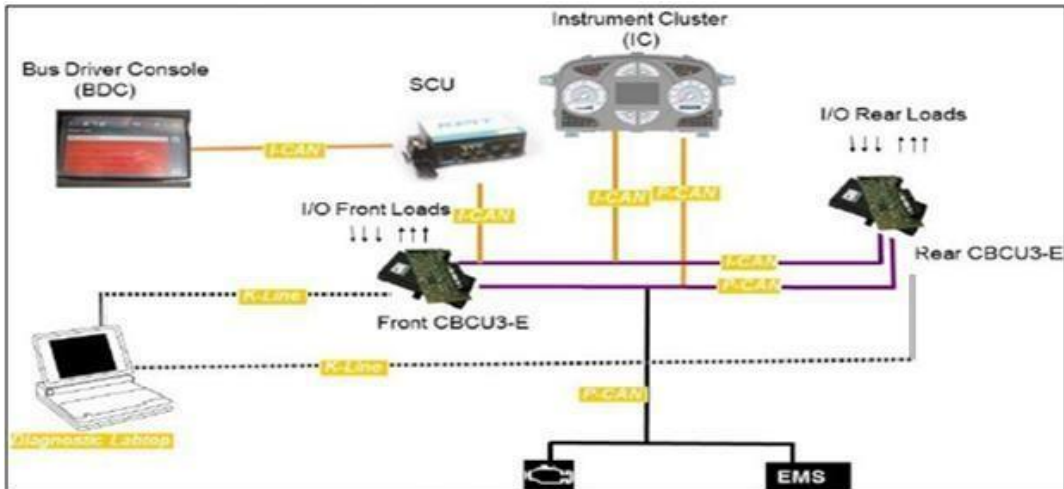




D. Electrical Multiplex wiring

Architecture of Multiplexing wiring system

- Multiplexing system consists of the following subsystems.
- CBCU - Central Body Control Unit at front end for collection inputs and distribution of vehicle load. Rear CBCU at rear end for collection of inputs and distribution of vehicle loads. Midline Instrument Cluster - Modular Instrument Cluster at driver cabin, which contains six gauges, LCD display. The front CBCU communicates with the Rear CBCU & instrument Cluster using P-CAN & ICAN.



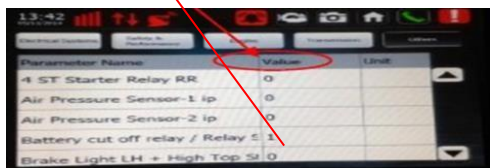
Difference between old and new Multiplexing system

- Instead of CBCU + MUX2B combination the new system has CBCU+CBCU. CBCU has higher capability & capacity than MUX2B and provides greater flexibility in design. Both front and rear CBCU have same hardware but different data files.
- The existing software for flashing the data file on CBCU will be required to be upgraded for JnNURM II multiplexing
- All the error codes were displayed on HMI fitted on the instrument cluster in the older version. In the current system the error codes gets displayed on BUS DRIVER CONSOLE unit , which is a part of OBITS.

Multiplexing Diagnostic

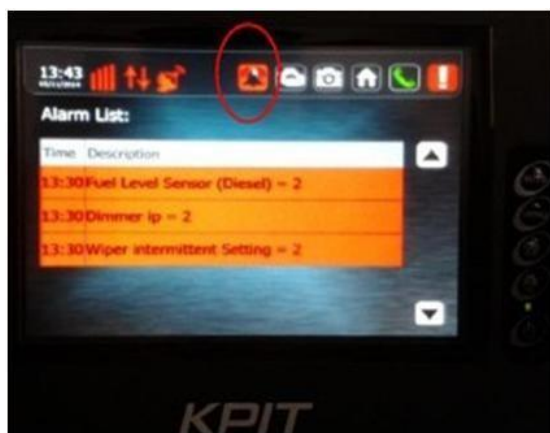
All the vehicle health related parameters are displayed on the Bus Driver Console (BDC) unit. The screen displays digital status of each electrical load when so selected through VHMD button on the BDC. There can be following four possibilities for each load.

Value	Meaning
0	off/ no failure
1	on/ no failure
2	on/ open load
3	on/ short circuit to ground



The following screen shows that

- 4ST Starter relay is switched off
- Air pressure sensor is switched off
- Battery cut off relay is switched on and working ok
- Brake light is switched off



The following screen shows:

- Fuel level sensor is open load
- Dimmer is open load
- Wiper intermittent setting is an open load

background color changes to red when an error is noted by the system.

The alarm symbol also turns red (highlighted in red circle). One can reach the screen shown by simply pressing the alarm button if it has turned red.

Troubleshooting with the help of multiplex software Logical 5.2

In order to understand the troubleshooting with the help of diagnostic, detailed logic of all functions shall be provided in manufacturer's workshop manual. For the purpose of understanding an example is quoted below for headlamp.

If driver wishes to switch on the headlamp of his vehicle then following logic will come into effect:-

Head Lamp: Inputs, Outputs & Logic:

Signal	Level Active	Type	CBCU3-E Pin Number
Ignition switch	High	Input	Front CBCU3-E (F_05)
Crank Switch	High	Input	Front CBCU3-E (D_26)
Head Lamp Switch	Low	Input	Front CBCU3-E (C_06)
High beam switch	Low	Input	Front CBCU3-E (C_07)

Flash	Low	Input	Front CBCU3-E (C_36)
Head Lamp Low beam RH	High	Output	Front CBCU3-E (E_03)
Head Lamp Low beam LH	High	Output	Front CBCU3-E (F_03)
Head Lamp Hi Beam Right + Left	High	Output	Front CBCU3-E (E_09)
Low Beam Tell Tale on IC (Instrument Cluster)	Data	CAN Output	
High Beam Tell Tale on IC	Data	CAN Output	

1. Head Lamp Low Beam:

The Head Lamp Low Beam Outputs (Left + Right) shall be switched "ON" if:

The Head Lamp Switch is "ON" AND High beam switch Input is OFF AND The Ignition Switch is ON. If any of the above conditions are not met, then the Low Beam Head Lamp Outputs are switched OFF.

2. Head Lamp High Beam:

The High Beam Outputs (Left + Right) shall be switched ON if:

The Head Lamp Switch is ON AND the High beam switch Input is ON AND The Ignition Switch is ON.

If any of the above conditions are not met, then the High Beam Head Lamp Outputs are switched OFF.

3. Head Lamp Flash:

The Flash function shall always be available to the driver, independent of Head Lamp switch state.

The Head Lamp High Beam Outputs shall be switched ON if Ignition & Flash Switch is ON.

E. OBITS (On Bus Intelligent Transport System)

"On Bus Intelligent Transport System (OBITS)" OBITS is an integrated hardware and software wireless solution designed to track and monitor buses. OBITS enables tracking of vehicles and store, represent, display data of moving objects which is then transmitted to the vehicle tracking server via GPRS. KPIT's OBITS provides near to real-time services for passengers.

Main Features

Automatic Vehicle Location System (AVLS)

It helps to track the vehicle location and sends the raw GPS data to Central Control Centre (CCC) at user configurable frequency interval.

Passenger Information System (PIS)

It provides real time information about departure, arrival, next stop, and so on to bus passengers. It displays route information on LED boards and announces it on speakers. Emergency Stop feature allows passengers to inform the driver and conductor about emergency stop request, by pressing an emergency switch provided in the bus. Thereafter an Emergency message will get displayed on LED board inside the bus. Voice Calling enables the driver to make or receive a call from/to central control center (CCC) Driver can send pre- configured messages to CCC in case of a panic situation It allows driver to display pre-recorded messages on LED boards and announce via speakers.

Security Camera Network (SCN)

It allows c o n t i n u o u s or scheduled or event based video recordings of passenger movements inside the bus till the OBITS is on. It also allows the driver to check the live feed at any point of time on BDC. All cameras are capable of high-resolution recording in case of event based triggering.

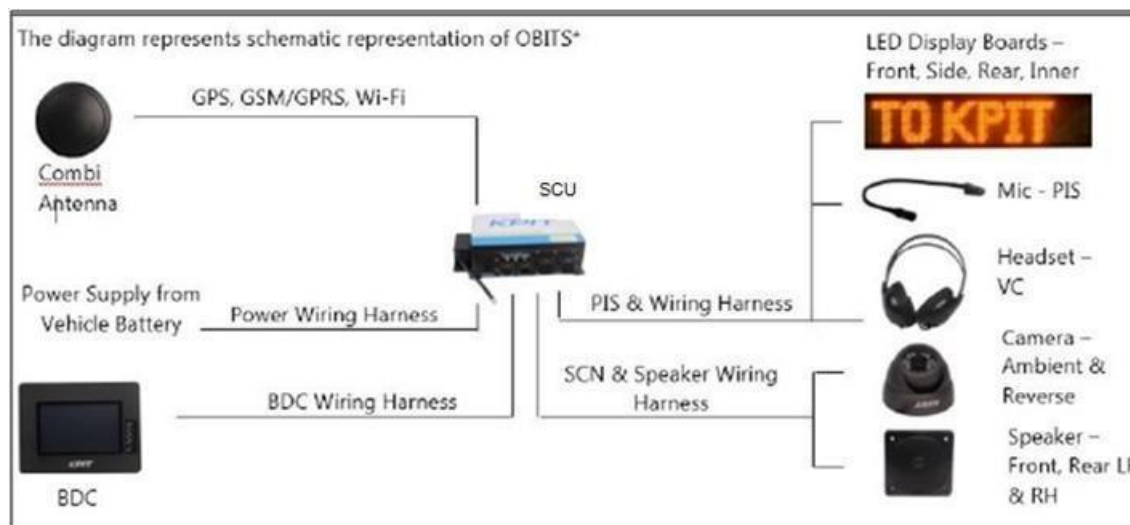
The recordings in compressed format can be sent to the server via USB / Wi- Fi, only when the bus is in the depot. Bus Driver Console displays reverse camera streaming only in full-screen mode when reverse gear is engaged.

Vehicle Health Monitoring and Diagnostics (VHMD)

It allows monitoring the health of a bus. Single Control Unit will receive vehicle health diagnostic data from multiplexing nodes and PIS signs. The data from multiplexing nodes, on a single CAN bus will include parameters from:

Vehicle electrical system inclusive of PIS signs Safety and performance features such as brake condition, door interlock, and so on Engine and Transmission such as Engine Oil Pressure, Engine, Coolant temperature, Engine Speed in RPM, and so on SCU is able to communicate and send information related to VHMD parameters to CCC via GPRS at preconfigured time intervals.

OBITS Key Parts



Single Control Unit (SCU): Controls all the operations and functions of OBITS. Has provision for SIM Card installation.

Bus Driver Console (BDC): A touch screen LCD display for driver to operate OBITS. It is mounted on the dashboard for easy access to the driver.

Combi Antenna: Communication (send and receive) for GSM, GPRS, GPS, and Wi-Fi signals. It is mounted inside the bus without any obstacles blocking the signals.

LED Boards (LUMAX Make): Displays route information to passengers (For Standard bus: combination of front, side, rear, and inner LED boards) (For Mini/Midi bus: combination of front and inner LED boards)

Security Camera Network (SCN): Two cameras are placed inside the bus and record all the activities in the passenger and driver areas.

Reverse View Camera: Gives full screen display of rear view while reversing a bus. It is placed at the back of the bus.

Speakers: Announces route information and messages. (Two speakers are situated near each door and remaining two is equally distributed on opposite side of the bus.)

Mic: Used to communicate with the passengers.

Headset: Used for making and receiving a call from CCC/Depot (subject to variant available in a bus) with the driver.

F. Diagnostic Tools for Multiplexing

For each model of bus, following are the software requirements for flashing/updating.

1. Multiplexing (CBCU) hardware and software

Part Number	Description
C66990000001	KIBES-32 Runtime software with Dongle*
C66990000002	K-Line adapter

* It consists of Logical 5.2 software and a USB key. To run the software on a laptop/PC this USB key must be inserted in the USB port

Two data files will be required for each bus model along with the above mentioned LogiCAD software: 1 for front CBCU, 1 for rear CBCU . These data files will be provided by TML

These two files would be required for flashing as well as for diagnostic purpose.

2. ITS software

KPIT OBITS configuration manager Lumax BRIS KPIT v2.0

Above two software along with one data file (in .zip format) will be provided by TML

G. Service Schedule for maintenance as per Manufacture’s Guideline.

The Service Schedule as per manufacturer’s guideline is specified in Annexure -2 of this Volume-III

3.2. Warranty Terms

Authority intends to pass on the warranty benefits offered by Manufacturer to Operator. Manufacturer has offered following warranty benefits .

- Vehicle warranty: 2 Years / 24 months OR 2, 00,000 Kms, from the date of sale whichever expire earlier as per JnNURM II Scheme.
- Body warranty: 2 Years / 24 months OR 2, 00,000 Kms, from the date of sale whichever Expire earlier as per JnNURM II Scheme.
- Note: - Warranty is applicable as per Tender conditions for different STUs

4. New fully built, 400 mm, Diesel Premium Segment AC Buses under JNNURM by Volvo India Limited

4.1. Technical Specifications

Offered Model: The New Volvo 8400 , UBS II compliant Buses.

The new Volvo 8400 Bus meets UBS II specifications, Bus body code IS14812 Rear under run protection, IS4682 lateral protection and new regulation on mirrors, interior fittings and indicators too.

The Technical Specification of Volvo 8400 Buses are specified in table below

A. Technical Specification

Description	Specification
Engine	
Model	Volvo D7E290
Type	Six-cylinder in line, Turbocharged and inter- cooled, Direct injection, Diesel Engine, complies with, BS-IV emission norms
Bore x Stoke, mm	108*130mm
Displacement	7146cm ²
Compression Ratio	18.1:1
Max, Engine output, KW @ rpm	213KW @ 2100rpm
Max, Torque, Nm @ rpm	1200NM @ 1050-1650 rpm
Air Cleaner Type	Paper filter, Dry type
SCR System - Selective Catalytic Reduction	
Additive used	Ad-blue (32.5% urea solution with de-ionized water)
Ad-blue tank capacity	40 Its
Transmission	
Model	Eco lite 6AP1400B
Type	Fully Automatic Transmission
No. of speeds	6 Forward + 1 Reverse
Gear selection positions	R- Reverse, N – Neutral, D - Drive
Maximum incoming torque	1400 Nm
Retarder	In- built hydro dynamic type
Gear Ratios	
1st	3.43
2nd	2.01
3rd	1.42
4th	1
5th	0.83
6th	0.59
Reverse	4.84
Front axle	Rigid Type, steerable & non - driven
Rear axle	Full Floating, non-steerable & driven 5.63:1
Front axle	

Type	Rigid Type, steerable & non - driven
Weight (legal)	6000Kg
Final Drive	
Type	Full Floating, non-steerable & driven
Weight (legal)	10200Kg
Ratio	5.63: 1
Steering	
Type	Integral hydraulic power steering
Wheel Diameter	500 mm
Mechanism	Height and angle adjustment
Brake System	
Service Brake Type	Volvo Electronic Braking System with disc brake in all wheels
Parking Brake	Air operated acting on rear wheel
ABS	Standard
Suspension	
Type	Electronically controlled Suspension (ECS)
Front	2 air bellow at front
Rear	4 air bellow at front
Shock absorbers	Hydraulic telescopic both front & rear
Antiroll bar	On front & rear wheels
Lifting Mechanism	Electronic level Control 03 positions - kneel, drive & lift + 60mm from drive position
Wheels & Tyres	
Wheel size	8.25"*22.5"
Tyres	Tubeless radial tyres - 295/BO R
Rim size	8.25"*22.5"
Laden tyre pressure - front, kg/cm2	7.7
Laden tyre pressure - rear, kg/cm2	7.4
Frame	
Type	All steel ladder type
Fuel Tank	
Total Capacity	310 Lt
Diesel capacity/ Nos.	155 its (2*155 its.)
Wiper Tank	
Capacity	10Lt
No of water tanks	10Lt * 1 no.
Electrical	
Voltage	24V
Battery	2 nos, 12 volts - 180 AH Batteries
Horn	24V, Electric
Alternator/ Inverter	24V,2 *110A
Invertors	1000VA
Architecture (BEA)	Master - master multiplexing of chassis aggregates Engine Management System, Transmission suspension, ECS) body multiplexing - handlamps, internal lamps, fans, horn and ITS equipment
Additional Features	PC Based diagnostic tool for trouble shooting and diagnostics
External Lighting	
Head lights	1 set
Extra Head lamp assy	1 set
Front marker lights	1 set
Fog lamps and indicators	1 set
Upper contour lights	1 set

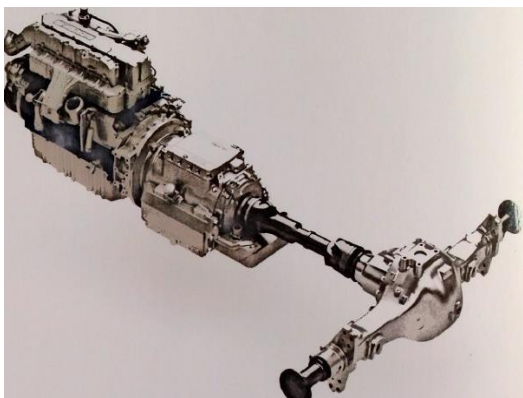
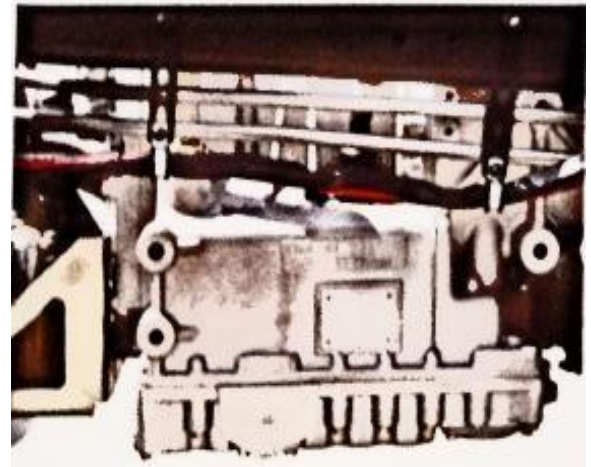
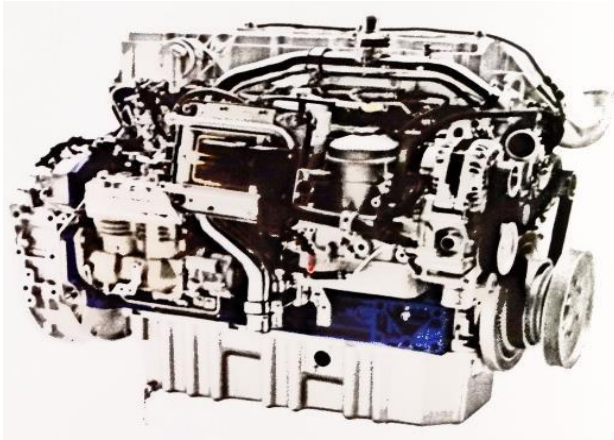
Side Blinkers	1 set
Brake lights	1 set
Extra brake lamp: 1 pc.	Cluster Lamps
Heights Markers	4 nos on each side
Indicator lamps upper contour lights	1 set
Side blinkers	1 set
External Electrical Equipment	
Rear view mirrors	Electrically Operated
Electrical horn	1 set
Internal Lights	
Lights mounted in the roof	1 set (tube lamps - left and right cluster)
Others	As per bus code
Dimensions (mm)	
Wheel base, mm	5940
Front Over Hang	2850
Rear Over Hang	3210
Overall length	12000
Overall Width, mm	2510
Overall Height	3200
Front Track	2070
Rear Track	1820
Minimum ground clearance	190
Floor height in drive position	350
Turning radius	9.00 mtr
Body Strength & endurance	
Structural Performance	Stability, Deflection, Vibrations, Roll over protection
Loads	(As per indian road congress) Braking and acceleration loads static and dynamic loads
Bus Body Insulation	
Roof	40 Kg/ m3, PU
Side	Polystyrene
Structural Body Specification	
Body Type	Galvanised tubular structure with anti - corrosive treated
Plywood	12mm with 1.2 gm/ cc, densities, laminated and compressed
Ply properties	BWP, marine board, fire retardant
Floor vinyl	3mm thickness, fire retardant
Outer Panel	Stainless Steel
Roof Inner Panel	GI
Roof Outer Panel	GI
Front/ Rear Panel	FRP
AC duct	Individual AC vents
Inner Panel	Suitable carpet to match the roof sheet color
Front windshield	Laminated single piece
Side window glass	Toughened safety glass
Rear glass on Panel	Standard toughened
Air condition	Main engine driven AC
Roof Ventilators	2 nos (one at front and one at rear)
Driver Area	
Seat Belt	3-point, ELR Recoil
Anchorage	As per bus body code
ITS system	
Destination Boards	Front, aide, rear, inside along with voice announcement system
ITS Modules	Automatic Vehicle system, Passenger Information System Security Camera Network, Vehicle Health Monitoring and Diagnostics, Ticket Validation

Passenger Seats	
Type	Luxury, high back
Material	PU foam
Seat Area	450 mm * 450 mm
No of Seats	32 + 1 (wheel chair space)
Pitch	750 mm
Passenger doors	
Type	Swing in/out
Layout	1+1
Dimension	1200mm * 900 mm (front and middle)
Safety	Sensitive edge and door brake
Fire Safety System	
Type	Automatic Detection and Suppression
Standard Accessories	
PWD Assistance Wheel Chair Ramp	
Type	Manual Sunken
Dimension	920 mm width
Capacity	300kgs
Restrainer	Provided
Crutch holder	Provided on priority seats
Stop request type	Push type Voice based
Location	on- each stanchions and wheel chair area
Emergency stop Handrails and stanchions	Push to lock switch
Material	Aluminum powder coated
Handrails	32mm dia, 3mm
Stanchions	40mm/ 3.15mm
Grab Handles	Provided, color contrasting

B. Salient Feature of the Bus

1. Engine and Automatic Transmission

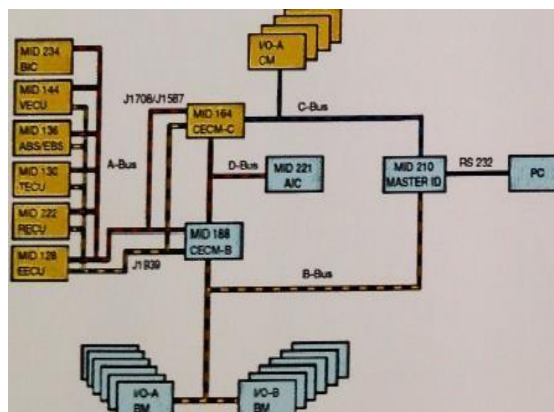
- The Volvo D7E290 Engine, is a modern 7-litre 6-cylinder diesel engine with a turbocharger and intercooler and having capacity of 290 HP.
- The engine generates a peak torque of 1200nm at very low rpm range aptly suitable for city bus load conditions.
- The engine with 290 hp is with EMS for efficient combustion, low emission, instant response, resulting in a good drivability & maneuverability.
- SCR technology is used for achieving BS IV norms, reducing the pollutants especially nitrogen oxide and particulates by as much as 30% & 80% respectively. It is a tamper-proof system with ad-blue as the fuel and engine duration feature.
- The 6 – speed automatic transmission with NBS feature. An integrated retarder with a unique torque converter enhances braking power. The transmission has a smooth shifting pattern that adapts to the technology & vehicle load, which helps optimize the fuel consumption and at the same time provides a jerk free ride experience.
- The Volvo D7E engine coupled with 6 – speed automatic transmission & integrated retarder and optimized rear axle ration delivers high performance required in city's start – stop, meaning quick acceleration in the least possible time to enable quickest transit time from bus stop to city road.
- The Volvo D7E engine supplies a peak power of 290hp I order to meet optimal power to weight ratio and ensure reserve power, which is critical to meet three areas for good city duty cycle – instant acceleration, air-conditioning performance, and gradability.



2. *Engine Management System and Bus Electronic Architecture*

- The Engine Management System (EMS) with bus Electronic Architecture (BEA2) in Volvo city buses help in quick engine diagnosis, notifications of server faults and maintenance schedules to ensure a high reliable vehicle. CRDI technology & precise fuel injectors ensure lower emission and good fuel economy through the life of the engine.

- Bus Electronic Architecture (BEA 2):** Volvo buses are equipped with modern bus electronic architecture (BEA), which is a 2- channels advanced from of a Master-master multiplex system. The architecture is an integration of all the key aggregates of the vehicle system like breaks, suspension, engine management, gearbox, etc. Each of the aggregates have a dedicated multiplexing node with a dedicated control unit. The controlled unit is programmed to monitor the particular functionality of the aggregate. In the BEA architecture each of the control unit can send and receive commands from other control units in the vehicle thus optimizing the operational parameters for its own functionality. Based on a modular concept BEA helps significant reduction in the wiring and fuses used in the vehicle and promotes use of correct wire sizes. This also is a safety feature, which can reduce the short circuits and wrong/faulty connections.



3. Steering and Driver Environment

- Steering System Architecture:** The steering System in buses offers flexible and easy driving drivers area that can be adjusted as per driver’s need. The telescopic steering column provided adjustments of the steering wheel with angular and up/down moments. The seats have 4 degrees of movement with pneumatic adjustment system which also acts like a cushion like comfort. The power assisted progressive steering ensures least effort while driving.
- Driver Environment**
 - Accessibility: Ergonomically designed and clearly marked satellite instrument panel switches.
 - Visibility: Wider and clear windscreen, Height and angle adjustable steering, individual lamp.
 - Effort: clutch free driving, powerful progressive power steering system.
 - Seat: Pneumatically adjustable seats;3-point seat belt
 - Climate & comfort: Individual AC console for the driver comfort.
 - Mirrors: Electrically operated RVM
 - On-board Diagnostics: Systems with up to date vehicle data & fuel consumption.



4. Breaking System

- Electronic breaking system** through electronically controlled disc brakes integrated with anti – lock braking system on all wheels for better braking efficiencies, lower heat dissipation, smaller stopping distance in city’s bumper – to – bumper traffic conditions and better vehicle control with minimum brake force.
- Disc Brakes:** The disc brakes in the front and rear are of the same type as those found in Volvo’s larger buses. The brakes features Volvo EBS providing the best braking power & shorter stopping distances.



- **ABS:** The brakes are designed in such a way that the disc brake is always in full contact with the brake lining regardless of the temperature. The brake disc is mounted on the hub via a patented splined like joint allowing the disc to expand symmetrically. The Volvo disc brakes at the front in combination with the drum brakes at the rear are designed for operating reliability and longer service life.
- **Hydrodynamic Retarder:** Retarder play an important role to enhance LCC for a city duty cycle. The brake blending feature of the EBS uses the retarder efficiently to provide a fool proof and efficient braking system.
- **Door Break System:** Passenger safety is enhanced with the Door Break System in Volvo City Buses. This system prevents the vehicle from moving if either of the doors is open. These doors are with sensitive edge technology so that people are not injured during the opening/closing of the doors. The driver dash-board also shows the status of a rear door open/close and hence, the driver can ensure the boarding/alighting had been completed.
- **Brake Blending:** Brake Blending is the function within the EBS system. This means that the wheel & the auxiliary brakes cascade with each other whenever the brakes are applied. When the driver step on the brakes the service brakes are initially does all the action. However, when the auxiliary breaks output increases they assume the brake action gradually resulting in minimal wear of the service brake. The EBS system also senses the wear level of the brake lining and levels the action between the axles ensuring that the axles always have the best brake lining for high performance.



5. NVH (Noise Vibration Harshness)

- NVH levels have been substantially reduced resulting in improved travel comfort & safety.

6. ECS (Electronic Controlled Suspension):

- The suspension system is designed in such a way that the entire interior load of the vehicle is distributed evenly across all type of duty cycles with factors like road shocks and road irregularities. This is possible with controlling and maintaining the spring rate of the each of the bellows under all loading conditions.
- This is ensured by the ECS system, which regulates the bellow height precisely as per load and road conditions ensuring a smooth ride experience for the passenger. This would also mean lesser vibration passing onto the chassis and bus body resulting in lesser wear and tear. Self-correction of the bellow height helps protect driveline angularity related problems, counters road unevenness; bellow failures can be easily monitored. The build quality and technology of the bellows in Buses meet and even exceed the demanding operations cycle in varying traffic, congestion and road conditions making it ideal for long duty cycle.

7. Air-conditioning

Buses are equipped with AC systems .Some of the silent features of air conditioning are as follows:

- 32KW AC capacity with pull down time of <30 minutes from >42 deg C to 23 (+2 deg C)
- Average air velocity at vents at 8m/s² (Volvo exceeds this MoUD specification requirement)
- Vehicle can scale 13.5 deg gradients without changes in AC characteristics or the need to switch off AC.

8. ITS Mobility System

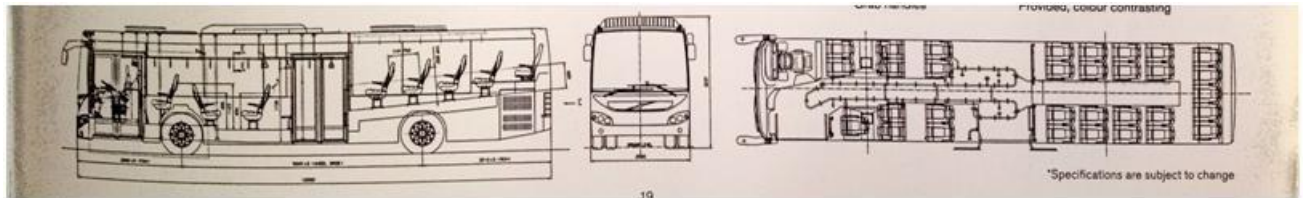
The ITS architecture comprises the following modules as per UBS – II specifications:

- PIS
- AVL
- SCN
- VHMD
- TM Pole Mounted and hand held ticketing machine

The ITS architecture communicates all the data from each of the module in pre- described protocols as per UBS – II guidelines to the CCC (common control centre). The ITS system has a two-way communication channel, which makes for a very dynamic system. All the above features would help passengers, drivers, and operators to enhance & provide a truly integrated system

The ITS components (like IP66 for destination board, & SCN vibrations, heat & cold protection, etc.) and the fitment on bus is of a high material ensuring integrity of the system during actual operations.

9. Bus Layout



4.2. Warranty Terms

Authority intends to pass on the standard warranty benefits offered by Manufacturer to Operator.

Annexure

Annexure 1: Service Schedule as per manufacturer's guideline for New fully built, 900 mm, Diesel Standard Non AC Buses under JNNURM by Tata Motors Limited

Service Operations Performed by Operator		
Sr. No.	Operation	Frequency
1	Check Coolant level & Oil level and top up , if necessary	Daily
2	Air Intake Piping - Check Inspect the intake piping daily for wear points and damage to piping, loose clamps, and punctures that can damage the engine.	Daily
3	Fan, Cooling - Inspect for Reuse A visual inspection of the cooling fan is required daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the cap screws, if necessary.	Daily
4	Crankcase Breather Tube - Check Inspect the breather tube for sludge, debris, or ice in the tube.	Daily
5	Air Tanks and Reservoirs - Drain If automatic purging or spitter valves are used, confirm the valves are operating correctly. If a manual drain valve is used on the wet tank, open the drain cock on the wet tank to drain any moisture accumulated in the air system. If oil is present, the air compressor system must be checked.	Weekly
6	Drive Belts Inspect the belts daily. Check the belt for intersecting cracks	Daily
7	Check ball joints of tie rod/drag link for wear/ boot for torn off, looseness of nut, split pin missing, wear etc if any.	Weekly
8	Check Brake Air Pressure level & warning indicators. Check fluid levels of Steering, Clutch, Coolant, Windshield washer, top up if necessary	Daily
9	Carry out visual inspection of vehicle for fuel leakages, traces of oil / fluid on ground, if any.	Daily
10	Check air filter Service indicator (for the red band) provided inside front flap. Contact nearest Tata dealership if red band appears. Do not clean air filter element.	Daily
11	Check 'Water in fuel' indicator on instrument cluster. Drain water sediments from water separator if indicator on instrument cluster is continuously ON. Not applicable for vehicles fitted with 'Auto Drain system'.	Daily
12	Check tyre pressure including spare wheel, inflate tyres to specified pressure, if necessary	Once in two weeks
13	Check tyres condition for abnormal wear. In case of abnormal tyre wear check wheel alignment values and correct if required. Rotate the tyre periodically for better tyre life.	Weekly Every 20000 kms.
14	Check for proper functioning of switches / gauges / warning lamps on instrument cluster, buzzers, all lights, other electrical controls.	Daily
15	Check head lamp focusing. Adjust if necessary.	As required
16	Check for air leakage in air suspension system	Daily
17	Check the Air in air spring. Check the Leveling valve position	Daily

18	Wash the vehicle	As required
19	Lubricate all chassis grease nipple points (Including king pin, tie rod, drag link, s cam brake etc.)	Monthly

Service Schedule (Workshop)

Sr. No.	Operation	Frequency in Km
ENGINE		
1	Drain off Engine oil while hot. Clean drain plug. Change oil filter & engine oil. Clean engine breather	Short Route:- 1st & 2nd at 20,000 , All subsequent at every 40,000 or 1 year whichever is earlier. Long route:- First at 40000 and subsequent at 60,000 kms. 2
2	Check following for free rotation/damage: (a) Water pump, (b) Belt Tensioner pulley, (c) Belt Idler pulley, (d) Fan pulley (e) alternator pulley	20000
3	Cooling Fan Belt Tensioner	20000
	Check the tensioner arm, pulley, and stops for cracks. If any cracks are found, the tensioner must be replaced."	
4	Check for external clogging of intercooler, condenser (if fitted) & radiator, clean if necessary with compressed air & water	20000
5	Turbocharger	20000
	Inspect the turbocharger compressor impeller blades for damage."	
6	Check proper sealing of air intake system by checking hose & pipe condition / proper tightness of clamps.. Replace any defective item.	20000
7	Check pipes & hoses of engine lubrication / fuel / coolant / wind shield washing system. Replace if required	80000
8	Check all hoses of radiator for cracks and cuts. Replace if required	Initial at100,000 Subsequently at every120,000
9	Check cylinder head valve clearance and adjust, if necessary.	Short Route:- Every 40000 kms. Long Route:- First at 40 K kms and subsequent 60 K kms.
10	Drain cooling system - reverse flush. Refill system with fresh coolant.	Initial at100,000 Subsequently at every120,000 or
	Add recommended quantity of anti freeze agent in specified ratio. Check thermostat for proper functioning and replace, if necessary.	2 years whichever is earlier
11	Check condition & tension of drive belts for water pump / alternator / fan / steering. If necessary adjust / replace belt.	20000
12	If Red band appears on Service indicator, replace primary filter (Do not clean). Replace secondary (safety filter) during every 3rd replacement of primary filter. Remove and Clean dust bowl of air filter	20000
13	Check for ECU errors with diagnostic system. (as applicable)	Whenever Engine DTC appears on HMI screen

14	Check vibration Damper rubber	Initial at 100,000 Subsequent at every 120,000
15	Check and replace engine mounting rubber pads	2,00,000 Km or two years whichever is earlier
16	High Pressure Fuel Pump (HPP)	20000
	Inspect the fuel injection pump mounting nuts, including the support bracket, for loose or damaged hardware.	
17	Change fuel filters and 'O' rings. Bleed the fuel system.	Short Route:- 40000 Kms Long Route:- First at 40000 kms and subsequent at 60000 kms.
18	Clean fuel tank strainer	Short Route:- 40000 Long Route:- First at 40000 kms and subsequent at 60000 kms
CLUTCH & TRANSMISSION		
19	Replace clutch oil. In case of any complaint on gear box front cover actuation, dismantle master cylinder / slave cylinder / clutch booster & replace affected parts.	80000
20	Change oil in gear box. Drain while hot .Clean drain plug and breather (This frequency is applicable for Long drain interval oil)	Short route:- Every 1,20,000 kms. Long Route:- First at 1,00,000 kms and subsequent at 120000 kms.
PROPELLER SHAFT		
21	Check propeller shaft splines for excessive wear and noise. Replace, if necessary	20000
22	Grease with grease gun: (a) Kingpins (b) Tie Rod ends (c) Drag link ends	20000
23	Remove front hub caps, fill 3/4th full with wheel bearing grease & refit	20000
24	Change grease in front hubs. Adjust the hub bearing play (applicable for synthetic grease 365)	Short route:- Every 1,20,000 kms. Long Route:- First at 1,00,000 kms and subsequent at 120000 kms
25	Change oil in rear axle, drain while hot, clean drain plug and breather. (This frequency is applicable for Long drain interval oil)	Short route:- Every 1,20,000 kms. Long Route:- First at 1,00,000 kms and subsequent at 120000 kms
26	Adjust crown wheel thrust pads	20000
27	Change grease in rear hubs. Adjust the hub / bearing play (This frequency is applicable for synthetic grease 365)	Short route:- Every 1,20,000 kms. Long Route:- First at 1,00,000 kms and subsequent at 120000 kms
WHEELS AND TYRES BRAKES AIR		
28	Check tyre pressure, inflate tyres to specified pressure, if necessary	20000
29	Rotate the tyres as per recommendation. In case any abnormal tyre wear observed, rotation to be carried out immediately for better tyre life.	20000
30	Check wheel alignment after changing related suspension & steering linkage parts & adjust if necessary. In case any abnormal tyre wear observed, wheel alignment has to be checked and corrected to the specification immediately.	20000

BRAKES		
31	Check for front & rear brakes uneven wear of brake linings and grease spilling on linings or past hub seals. Check all springs of brake shoe for no elongation. Attend if necessary	20000
32	Check for proper functioning of service brake, parking brake and exhaust brake/ Adjust / replace if necessary	20000
33	Drain off air from all air tanks. If condensed water is found, replace air drier desiccant cartridge.	20000
34	Check for oil droplets / excessive oil accumulation (slight traces of oil are acceptable) at air drier exhaust port. If yes, then carry out following activities : (a) check / replace compressor piston rings, (b) clean compressor head, (c) check / replace compressor outlet pipe in case of carbon formation (d) Clean oil separator	20000
35	Dismantle pneumatic aggregates of brake system. Clean / inspect & replace parts if necessary	200,000 or 2 years, whichever is earlier
36	Replace air drier desiccant cartridge and filter of air dryer/DDU	120,000 kms or 15 months whichever is earlier
TYRESBRAKESAIR COMPRESSOR		
37	Inspect the air compressor mounting nuts, including the tail support bracket, for loose or damaged hardware	20000
38	Drain off hydraulic oil of power steering. Replace filter cartridge. Fill in fresh oil. Test the system with test equipment	Short route:- Every 1,20,000 kms.Long Route:- First at 1,00,000 kms and subsequent at 120000 kms.
39	Check for proper tightening of fuel pipelines on to RH long member near Rear wheels	20000
40	Check ball joints of tie rod / drag link for wear / boot for torn off , looseness, damage , wear etc & rectify if necessary	20000
SUSPENSION		
41	Check suspension, attend if required :Shock absorbers for leak / damage and rubber bushes	20000
42	Check leaf springs for damage / sagging / bush wear out. Suspension bump stop damage Check for Antiroll bar for damage/ bush wear out, Check for shifting of anti roll bar. Rectify is necessary Check ball joints of anti toll bar looseness, damage, wear etc. & rectify is necessary	20000
43	Change Weveller suspension mounting rubber blocks.	40,000 (uneven & bad road)
		80,000 (plain & good road)
44	Check for any damage to air bellows of air suspension. Check function of level control valve	20,000 kms or 1 year, whichever is earlier
45	Check leveling valve and air spring assembly functions properly. Check rubber bushes for Parallel link, V rod and Anti roll bar etc.	Every 20000
46	Check shock absorber for oil leakage / damping loss. Check shock absorber rubber mounting and ARB bushes	Every 20000
47	Check mounting and static height of air bellows. Check the leveling valvelever is horizontal in static condition. Check pneumatic line for air leak.	20,000 kms or 1 year, whichever is earlier
48	Check for tightening torque of U bolts, torque rods and v rods. If found losse tightened it to specified torques Check the torque of all mechanical joints and mountings	20,000 kms or 1 year, whichever is earlier
Electrical		

49	Check proper functioning of switches / gauges/ warning lamps in instrument cluster, all lights, other electrical and pneumatic / hydraulic /buzzers	20000
50	Check Battery (Cable & Connection)	20000
51	(a) Check battery mountings, (b) Clean battery posts and terminals. Tighten terminals & smear petroleum jelly. Check battery condition like voltage / specific gravity / electrolyte level. Check with indicator on battery (wherever available)	20000
52	Check head lamp focusing. Adjust if necessary. (Additionally to be done after every bulb change).	20000
53	Check electrical system health : Ensure usage of genuine fuses with correct rating, Condition of fuse and relay holding base, Extra load tapping from un-authorized point, earthing connections, proper routing / clamping of wiring, intactness of grommets. Check Battery cable routing for any fouling loosening of clamps etc.	20000
ELECTRICALS43ON BOARD INTELLIGENT TRANSPORT SYSTEM		
54	Check the complete functionality of OBITS	20000
55	Check the functionality of LDR sensor of LED boards	20000
56	Check no loosening of parts like camera, LED boards, Speakers, BDC and Combi Antenna	20000
BUS Body		
57	Check for any paint peeling, rusting & damage to body panels & structure all around & underneath	20000
58	Check for proper functioning of doors, seat, sun visors. Check body for unusual noise	20000
59	Check for proper functioning of side & rear flap locks & gas stays, emergency roof hatch	20000
60	Check pasted & sliding glasses for intactness	20000
PNEUMATIC DOOR		
61	Change oil from the pneumatic door filter (add oil up to half of filter bowl)	20000
62	Clean/Replace Filter cartridge, Check sealing of Air cylinder, solenoids Valve, emergency switch valves, sensors	20000
63	Check sealing of Air cylinder, solenoids valve, emergency switch valves, sensors	20000

Other Guidelines

Sr. No.	Operation	Frequency in Km
General		
1	Wash the vehicle	20000
2	Check & top up levels of : 1. Oil (at engine, power steering, brakes). Oils of Transmission & rear axle need to be checked only if leakage is observed, 2. engine coolant, 3. windshield washer tank, 4. AUX 32 solution (for BS-IV vehicles)	20000
3	Check for / Rectify the leakages of1. Oil (at engine / gearbox / shock absorbers / rear axle/ power steering / brakes / AUX 32 tank (for BS-IV vehicles),2. Fuel at tank, pipelines & engine3. engine coolant,4. engine exhaust,5. Pneumatic & Hydraulic circuit (doors). Air bellows (rear)	20000
4	Check and tighten all fasteners if necessary as per the check list #	20000

5	Grease as per the list ##	20000
6	Apply oil as per the list**	20000
7	Conduct road test for vehicle handling and functioning of aggregates.	20000
# CHECK IIST OF FASTENERS REQUIRING PERIODIC CHECKING & TIGHTENING		
1	Engine peripherals : Engine mounting & accessories mountings, clamps, fuel tank brackets, all fasteners on turbocharger, air filter mounting, radiator mounting, thermostat, exhaust muffler/ pipe mounting hangers & brackets, air duct hose connections	20000
2	Driveline : Gearbox mounting / propeller shaft coupling flange / centre bearing bracket/ Rear axle carrier housing mounting studs., clutch housing, mounting of clutch master cylinder and slave cylinder, gear shift mechanism.	20000
3	Electricals : Starter motor / wiper motor / alternator/ switches & gauges / tail lamp / head lamp / blinker lamp.	20000
4	Steering : Steering box /drag link/ pitman arm/ Tie rod/Steering column. Steering tie rod and drag link ends/ ball joints for excessive play, rubber boot torn, nut loose if any , centre link, idler arm, ,pitman arm ,spindle / sleeves, column	20000
5	Suspension: Anti roll bar mounting / shock absorber mounting / suspension (leaf springs 'U' bolt mounting nuts i.e. main & check nut.	20000
6	Wheels & Tyres : wheel mounting nuts (also once after 100 kms after each wheelreplacement), mounting of spare wheel carrier	20000
7	Brakes: Spring actuators, pneumatic lines and hoses	20000
8	Body : Seats,RVM, floor cutouts, hat racks, pneumatic door rollers / guides/ brackets, fasteners& clamps underneath the bus & on the rooftop, RVM mounting, roof hatch, door hinges, side penal hinges, door locks, stay rods, door striker plates	20000
9	General : Apart from above check visually any other fasteners for loosening	20000
## LIST OF ITEMS REQUIRING PERIODIC GREASING**		
1	Clutch: Clutch release bearing , clutch cross shaft , clutch pedal bush	20000
2	Front Axle : King pin	20000
3	Prop shaft: UJ cross joints, sliding yoke (also check the condition of rubber boot), centre bearing	20000
4	Steering : Steering tie rod ends/ ball joints, Drag links, centre link, idler arm, spindle / sleeves, column	20000
5	Brake: Grease Front and Rear Brake S-cam- shaft bushes	20000
6	Body : Lubricate with oil can Door hinges, outer door handle, door latches, dove tails & striker plates, bonnet stay rod, pivot pins & luggage box door	20000
## LIST OF ITEMS REQUIRING PERIODIC OILING**		
1	Electricals: Pinion of sratter motor , wiper motor linkages	20000
2	Body: Top door guiding channel , door hinges , roof hatch	20000

Recommended Oil & Lubricants

Sr. No	Aggregates	Quant ity	Fluid type / Grade	Recommended Brands
1	Engine oil	Max - 14.3 lit Min - 12.3 lit	SAE 15W 40, API CI4 plus as per SS 6576	1. CASTROL- RX SUPER TURBO 15W40 (CI4 Plus) 2. BPCL-MAK Tata Motors CI4 Plus 3. Shell - Shell Rimula T4 15W40 (CI4 Plus)
2	Coolant	27 lit.	Non-Amino Base	1. BPCL -MAK TATA Motors Super Kool 2. Castrol - Long Life Coolant 3. IOCL- Servo Kool TM 4. Ultra Cool - Tata Genuine Coolant
3	Rear axle (LONG DRAIN INTERVAL OILS)	12-14 lit.	SAE 80W-140	1. BPCL - MAK TM SPIROL XL 80W140 2. Castrol - Axle Extended Drain GL-5 80W-140 3. SERVO TM 80W140 LL
4	Gear Box GB-750	7.5 lit	SAE80W90 Long Drain SS6577	1. BPCL - MAK TM SPIROL XL 80W90 2. IOCL- SERVO TM 80W90 LL 2. Castrol - Long Drain Transmission oil SAE 80W90
5	Power steering	As required	ATF- Dexron II-D	1. BPCL- MAK TATA Motors Autran II 2. Castrol -TQD 3. IOCL- Servo Steer TM 4. Shell- Spirax T2 ATF
6	Front wheel hub	450 gms	* Synthetic grease 365	Tata Genuine Grease Synthetic
7	Rear hub grease	650 gms		
8	All grease nipples	As required	* RR 3 Grease	1. BPCL- MAK Tata Motors RR 3 Grease 2. Castrol - Castrol AP Super Grease 3. IOCL-Servo Gem TM3 4. SHELL- Shell Gadus T1 5. Tata Genuine Grease+
9	Propeller shaft	210 gms.	Grade-NLGI-XHP222	

Annexure 2: Service Schedule as per manufacturer's guideline for New fully built, 900 mm, Diesel Midi Non AC Buses under JNNURM by Tata Motors Limited

Sr. No	Description	Frequency
ENGINE		
1	Change Engine Oil & Filter Note : Half above kms in case of severe duty operations like : short / city / hilly routes	40,000 kms
2	Clean engine breather	40,000 kms
3	Check following for free rotation/damage: (a)Water pump, (b)Belt Tensioner pulley (c) Belt Idler pulley, (d) Fan pulley (e)alternator pulley	40,000 kms
4	Check/clean external clogging of intercooler & radiator	40,000 kms
5	Check all hoses & pipes of diesel, air intake, cooling, lubrication	40,000 kms
6	Check/replace pipes & hoses of engine lubrication / fuel /coolant/ wind shield washing system	40,000 kms
7	Check/adjust cylinder head valve clearance	40,000 kms
8	Change engine coolant.	40,000 kms
9	Check condition & tension of drive belts for water pump / alternator / fan/ steering.	40,000 kms
10	Check red band at Air filter service indicator	40,000 kms
11	Check for ECU errors with diagnostic system	40,000 kms
FUEL SYSTEM		
1	Change Fuel Filter element	40,000 kms
CLUTCH AND GEAR BOX		
1	Check level of fluid in the Clutch Reservoir Bottle top up if necessary	40,000 kms
2	Replace Clutch fluid & carry out bleeding of Clutch Actuation System	80,000 kms
3	Change oil in gear box. Drain while hot. Clean drain plug & breather	80,000 kms
PROPELLAR SHAFT		
1	For sealed propeller shaft check for grease leakage at UJ kit & Sliding Yoke	40,000 kms
FRONT AXLE		
1	Change grease in front hubs. Adjust the hub play	40,000 kms
REAR AXLE		
1	Change oil in rear axle, drain while hot, clean drain plug and breather.	80,000 kms
2	Change grease in rear hubs. Adjust the hub play	40,000 kms
WHEELS AND TYRES		
1	Check tyre pressure, inflate tyres to specified pressure, if necessary	40,000 kms
2	Rotate the tyres as per recommendation	40,000 kms
3	Check & adjust wheel alignment	40,000 kms
BRAKES		
1	Check brake linings & all springs of brake shoe for no elongation	40,000 kms

2	Check for proper functioning of service brake, exhaust & parking brake	40,000 kms
3	Drain off air from all air tanks. If condensed water is found, replace air drier desiccant cartridge.	40,000 kms
4	Check for oil at air drier exhaust port	40,000 kms
5	Overhaul air brake components & replace air drier desiccant	2L km/ 2yr
SUSPENSION AND STEERING		
1	Replace hydraulic oil and filter cartridge of power steering	80,000 kms
2	Check suspension components (shock absorber, spring leaves, antiroll bar etc.)	40,000 kms
3	Check ball joints of tie rod / drag link for wear /boot torn off	40,000 kms
ELECTRICALS		
1	Check switches/ gauges/warning lamps in instrument cluster, all lights, other electrical and pneumatic /hydraulic /buzzers	40,000 kms
2	Check Battery	40,000 kms
3	Check & Adjust head lamp focusing.	40,000 kms
4	Check electrical system health	Every 1 year
BODY		
1	Check for any paint peeling, rusting & damage to body panels & structure.	40,000 kms
2	Check driver seat, sun visors	40,000 kms
3	Check side & rear flap locks & gas stays	40,000 kms
4	Check pasted & sliding glasses for intactness	40,000 kms
GENERAL		
1	Wash the vehicle	40000
2	Check all oil levels	40,000 kms
3	Check all leakages in oil & pneumatic circuits	40,000 kms
4	Check and tighten all fasteners if necessary as per the check list #	40,000 kms
5	Grease as per the list ##	40,000 kms
6	Conduct road test for vehicle handling and functioning of aggregates	40,000 kms

Check List of Fasteners requiring periodic checking & tightening

Sr. No.	Description
1	Engine peripherals : Engine mounting & accessories mountings, clamps, fuel tank brackets, all fasteners on turbocharger, air filter mounting, radiator mounting, thermostat, exhaust muffler/pipe mounting hangers & brackets, air duct hose connections
2	Driveline : Gearbox mounting / propeller shaft coupling flange / centre bearing bracket / Rear axle carrier housing mounting studs. clutch housing, mounting of clutch master cylinder and slave cylinder, gear shift mechanism.
3	Electricals : Starter motor / wiper motor / alternator / switches & gauges / tail lamp / head lamp / blinker lamp.
4	Steering : Steering box /drag link/ pitman arm/Tie rod/Steering column
5	Suspension: Anti roll bar mounting / shock absorber mounting / suspension (leaf springs 'U' bolt, spring pin, shackle pin, spring hanger & slide support bkt)

6	Wheels & Tyres : wheel mounting nuts (also once after 100 kms after each wheel replacement), mounting of spare wheel carrier
7	Brakes: Spring actuators, pneumatic lines and hoses
8	Body : Seats, floor cutouts, hat racks, pneumatic door rollers / guides/ brackets, fasteners & clamps underneath the bus & on the rooftop, RVM mounting, roof hatch, door hinges, side panel hinges, door locks, stay rods, door striker plates
9	General : Apart from above please check visually any other fasteners for loosening

List of items requiring periodic greasing

1	Clutch: Clutch cross shaft
2	Front Axle : King pin
3	Brake: Grease Front and Rear Brake S-cam-shaft bushes. Front & Rear Auto Slack Adjuster
4	Steering : Steering column/spindle

Service Schedule: To be performed by Operator

Sr. No	Operation	Frequency
1	Check Coolant level and Oil level , top up if necessary	Daily
2	Air intake piping – Check Inspect the intake piping daily for wear points and damage to piping, loose clamps and punctures that can damage the engine	Daily
3	Fan, Cooling – Inspect for reuse A visual inspection of the cooling fan is required daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tightened the cap screw if necessary	Daily
4	Crankcase breather Tube – Check Inspect the breather tube for sludge, debris or ice in the tube	Daily
5	Air tanks and reservoirs – Drain If automatic purging or sputter valves are used, confirm the valves are operating correctly. If a manual drain valve is used on the wet tank, open the drain cock on the wet tank, open the drain cock on the wet tank to drain any moisture accumulated in the air system. If oil is present, the air compressor system must be checked.	Weekly
6	Drive Belts Inspect the belts daily. Check the belt for intersecting cracks	Daily
7	Check Brake Air pressure level & Warning indicators. Check fluid levels of steering, clutch, coolant, windshield washer , top up if necessary	Daily
8	Carry out visual inspection of the vehicle for fuel leakages, traces of oil, fluid on ground if any	Daily
9	Check air filter Service indicator (for the red band) provided inside front flap. Contact nearest TATA dealership if red	Daily
10	Check Water in fuel indicator on instrument cluster. Drain water sediments from water separator, if indicator on instrument cluster is continuously ON. Not applicable for vehicles fitted with auto drain system	Daily
11	Check tyre pressure including spare wheel , inflate tyres to specified pressure if necessary	Once in two weeks
12	In case any abnormal tyre wear observed, rotation to be carried out immediately for better tyre life. Rotate the tyres as per recommendation	Weekly/2000 0 kms
13	Check the wheel alignment. In case of abnormal tyre wear wheel alignment to be checked and corrected for better tyre life.	Every 20000
14	Check for proper functioning of switches/ dashboard gauges /warning lamps on instrument cluster, buzzers, all lights, other electronic controls.	Daily
15	Check head lamp focusing , adjust if necessary	As required
16	Wash the vehicle	As required
17	Lubricate all chassis grease nipple points(Including king pin, tie rod, drag link, s cam brake etc if any)	Monthly

Manufacturer’s recommendation for Lubricants

Aggregate	Quantity	Grade	Recommended Brands
Engine with oil filter	10.5 lit. (Drain & Refill)	SAE15W40 API CI4 plus as per SS 6576	1. CASTROL- RX SUPER TURBO 15W40 (CI4 Plus) 2. BPCL-MAK Tata Motors CI4 Plus 3. Shell- Shell Rimula T4 15W40 (CI4 Plus)
Coolant	16.2 lit	Non-Amino Base	1. BPCL -Tata Motors Super Kool 2. Castrol - Long Life Coolant 3. IOCL- Servo Kool TM 4. Ultra Cool –Tata Genuine Coolant
Gear box	5.7 lit	SAE 80W-90 Long Drain SS65777	1. Castrol –Manual Extended Drain GL-4 80W 90 2. BPCL - MAK TM SPIROL XL 80W90 3. IOCL -SERVO TM 80W90 LL
Rear axle	RA 1068- 6.2 lit	SAE 85W-140 Long Drain	1. BPCL-MAK TM Spirol XL80W140 2. Castrol- Axle Extended Drain GL-5 80W 140 3. IOCL- Servo TM 80W140LL
Power steering	As required	ATF- Dexron II-D	1. BPCL- MAK TATA Motors Autran II 2. Castrol -TQD
Front wheel hub	210gm	Synthetic Grease *	Tata Genuine Grease Synthetic
Rear wheel hub	450gm		
Front King Pin, Clutch cross shaft, Auto slack Adjuster	As required	RR 3 Grease	1. BPCL- MAK Tata Motors RR 3 Grease 2. Castrol - Castrol AP Super Grease 3. IOCL-Servo Gem TM3 4. SHELL- Shell Gadus T1 5. Tata Genuine Grease+
Clutch Fluid	As required	DOT 4	1. Castrol Brake Fluid DOT 4

* The Operator has choice to use RR3 grease with change interval of 40,000 kms. Grade and brand mentioned in the chart above.